

SLOVAKIA CATCHING-UP REGIONS

GIS CuRI PREŠOV 2

Supporting the Uptake of the Regional
Spatial Infrastructure in the Prešov Region



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ACRONYMS AND ABBREVIATIONS

- CuRI** Catching-up Regions Initiative
- DCAT** Data Catalogue Vocabulary
 - EC** European Commission
- ESIF** European Structural and Investment Funds
 - EU** European Union
- GIS** Geographic Information System
- ICT** Information and Communication Technologies
 - IS** Information System
 - IT** Information Technology
- MRC** Marginalized Roma Communities
- NASES** National Agency for Network and Electronic Services
- OGC** Open Geospatial Consortium
- OPIS** Operational Program Information Society
- OSM** OpenStreetMap
- OSS** Open-source Software
- PSK** Self-governing Region of Prešov, or the Prešov Region (Prešovský samosprávny kraj)
- SDI** Spatial Data Infrastructure
- TAIEX** Technical Assistance and Information Exchange
- WB** World Bank

EXECUTIVE SUMMARY

This report summarizes the activities of the World Bank (WB) project to support the second phase of the Regional Spatial Data Infrastructure for the Self-governing Region of Prešov (PSK) in the Slovak Republic. The project is part of the Catching-up Regions 2 Initiative (CuRI 2) initiated by the European Commission (EC) and was implemented from September 2019 to December 2020.

The activity focused on supporting the PSK region in operationalizing and building the capacity of its geographic information system (GIS) unit, deploying a regional spatial data infrastructure (SDI), and ensuring the production, management, and availability of required geospatial data (as open data) in priority sectors. For this second year, the subactivities are the following:

- i. Capacity building in GIS and project management
- ii. Geoportal enhancement
- iii. Providing input into the design of data integration tools for the management of statistical data
- iv. Providing technical inputs into the design of a digital spatial platform which the PSK could eventually deploy in priority sectors (including education, tourism, and transport)
- v. Support in reviewing the technical appropriateness of the technical documents produced by the GIS department of the PSK
- vi. Provision of support to the PSK to assist the regional authorities in building partnerships with strategic organizations at the local, national, and international levels

During year two of CuRI, the GIS unit at the PSK was moved under the new Department of Strategic Development and Project Management, Institute of Development of the PSK. The GIS unit is composed of six staff, three full time, and three part-time associates through the University of Prešov.

The GIS unit at the PSK continues to work with, and champion the use of, both open-source software (OSS) and open data. The continued use of OSS protects the unit from potential vendor lock-in, reduces information technology (IT) spending, ensures interoperability, facilitates sharing of information, and fosters innovation. Openly hosted data allows for transparency and interoperability, reducing the redundancy of effort in data collection across the region.

The World Bank team continued to provide technical support to the PSK in maintaining and upgrading the geoportal. A dedicated content management system (CMS) was deployed to facilitate easier geoportal management, and data harvesters for the Statistical Office of the Slovak Republic and the Ministry of Labor, Social Affairs and Family of the Slovak Republic were initiated to facilitate streamlined access to their respective data products. The geoportal continues to be available online at geoPrešovregion.sk. It is branded as a platform with a focus on the region of Prešov but with data available to anyone connected to it.

The World Bank team continued to provide training and support to enable the GIS unit to perform data integration activities. Data integration is the process by which data coming from different sources and formats are integrated into a common platform so that they can be viewed and analyzed together. During CuRI 2, the World Bank team continued to support data integration activities, specifically associated with the automation of data integration from various national government sources, such as the Statistical Office, the Ministry of Labor, Social Affairs and Family, and the National Health Information Center (NHIC); and it also provided regular refresher training to the GIS unit on data integration practices.

Nine additional web map applications were designed, developed, and added to the geoportal. This brings the number of live web maps to 12. A web map application is an application accessible online that enables users to easily interact with geospatial data. The web map applications focus on the following areas: district and municipality profiles (for instance, employment, demographics), cultural heritage, and PSK facilities.

One of the most important achievements of the project was to identify and start to respond to the data demand from the departments of the PSK in order to foster the uptake of the SDI. The World Bank team supported the PSK in identifying its needs, in terms of data access, collection, analysis, and planning how to respond to them. The uptake has already been effective, as several departments of the PSK are now using the geoportal and collaborating with the GIS unit. As part of the COVID-19 public health response, the GIS unit published a map of the spatial distribution of COVID cases in the region. In addition to the daily updated overview of confirmed cases of COVID-19, the map also provides information on COVID-19 sampling points and disease-related health care.

Improving the social and economic integration of Roma communities is one of the key components of CuRI.⁴ The aim is to define and propose integrated development programs for pilot municipalities that address key priorities, such as social issues and access to services. Having access to high-quality spatial data is necessary to help plan these interventions. Therefore, the GIS unit, in association with the local development team, coordinated and led a community mapping activity to map six priority municipalities in the PSK: Ostrovany, Čičava, Varadka, Varhaňovce, Dlhé Stráže, and Krivany. The team worked closely with both municipal and community representatives in advance of the activities.

The PSK and the University of Prešov continued to work together over the course of Phase 2. The university provided technical assistance to the PSK staff, and the GIS students continued to contribute to the PSK projects, as part of their university curriculum. This included participation in a remote 'mapathon' and field mapping activities as part of the community mapping pilot.

REPORT CONTEXT

This report outlines activities in year two of the SR Catching-up Regions Initiative. Year one included the development of a dedicated GIS unit and the initiation of a spatial and open data infrastructure (see Box 1 for more detail). Building on that activity, year two focused on increased capacity building, provision of geospatial support to regional departments, and the strengthening of both regional and national relationships for the provision of openly accessible data. The report outlines the key steps, skills, technologies, and processes that were implemented, and draws the conclusions and lessons learnt from the second year of World Bank support.

The self-governing regions in the Slovak Republic are a relatively new administrative structure². Their scope of competencies includes most of the typical functions of a government: regional roads and public transport; secondary, professional, and vocational education; territorial planning and regional economic development; social welfare; participation in civil defense; health; culture in the form of regional theaters, libraries, museums, galleries, and cultural centers; as well as regional tourism planning and development.

One of the tasks of the self-governing regions is to draw public money into regional development projects. This is where data, and in particular, geospatial data, has a role to play. Without detailed information on its territory, the region is left with little evidence for decision-making, and often needs to rely on costly studies, or no information at all. Another pertinent issue relates to the transparency of the public administration's action and collaboration with other stakeholders and citizens.

While designing the Catching-up Regions Initiative (CuRI), the lack of data—in particular geospatial data—was identified as a key element hindering the capacity of the PSK to better support regional development. By deciding to directly address the issue, the PSK became the first regional authority to establish and manage its own spatial data infrastructure in the country, complying with national and European-level geospatial and open data standards. In the space of two years, the situation at the PSK has evolved from no GIS unit to an active team championing open data and running open-source software solutions (see Box 1 for more detail). The unit has progressed to supporting multiple other departments and units within the PSK with data assessment and inventory, data access, and data visualization through web mapping applications.

The overarching goal of the ongoing GIS component is to support local stakeholders to take control over the data infrastructures for their region for the benefit of the people who live there.

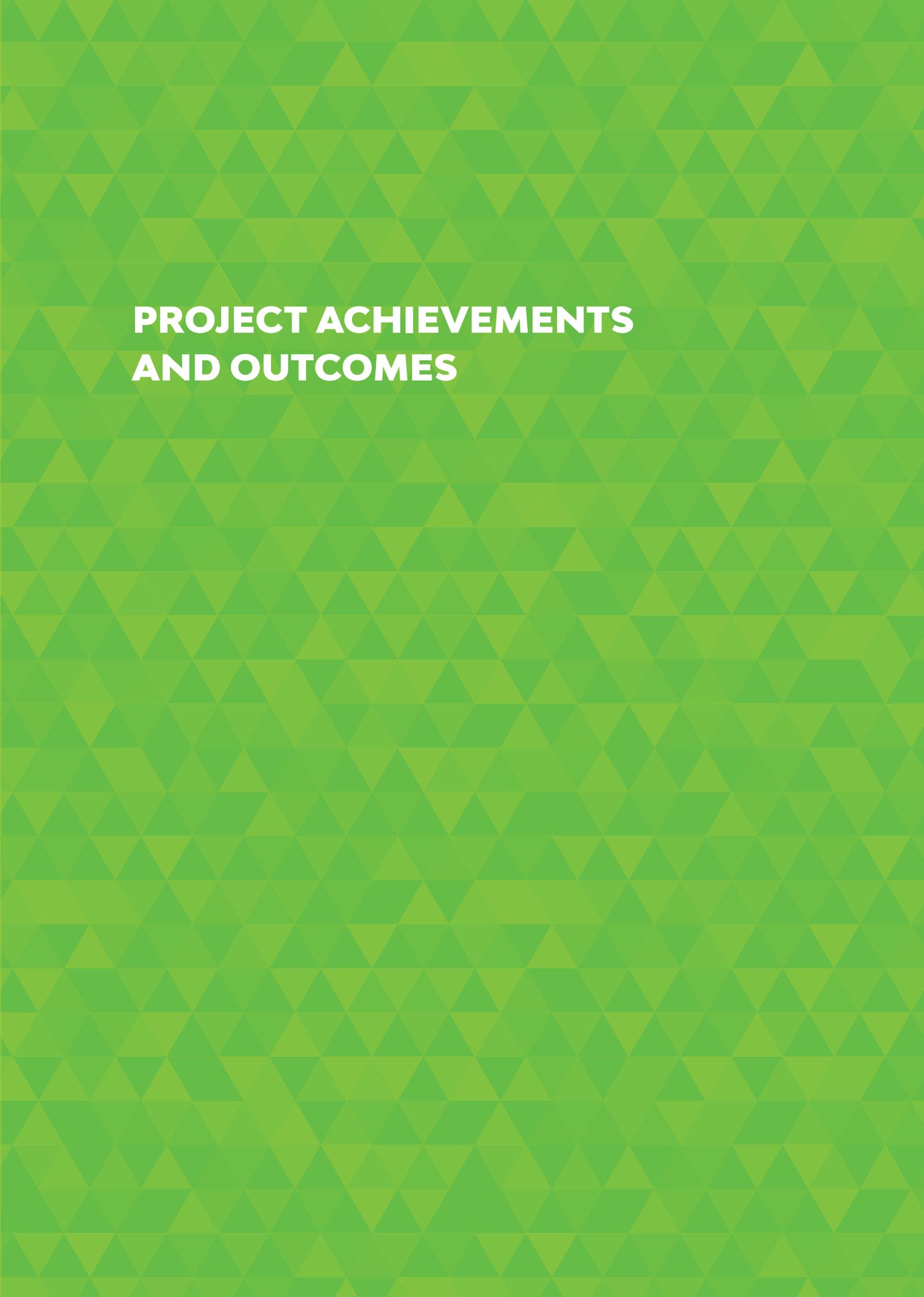
BOX 1. Open Data and Open-Source Software

Open data is data that anyone can reuse for any purpose. This means technically open (available online in open, machine-readable format), legally open (open license), and provided free of charge.

Open data is considered to benefit innovation, transparency, and accountability, as well as the performance of public services. One of the first beneficiaries of open data are the administrations themselves, who too often waste time and money finding and using other public sector information that they could get for free. Acknowledging the benefits of a proactive disclosure of government data for the society and the economy, the European Union integrated open data principles into the Public Sector Information (PSI) Directive.³

Open-source software (OSS) is widely used in free or commercial software products and is a core element of internet infrastructures. OSS is a type of software in which a source code is released under a license that grants anyone the rights to view, change, copy, or distribute the source code to anyone else, for any purpose.

QGIS, GeOrchestra, and Geonode are examples of open-source software to manage spatial data. QGIS is a free software used to view, edit, or analyze geospatial data. GeOrchestra and Geonode are used to deploy a geoportal, or even a complete SDI.

The background of the entire page is a repeating pattern of green triangles. The triangles are arranged in a grid-like fashion, with some pointing up and some pointing down, creating a tessellated effect. The colors range from a light, pale green to a slightly darker, more vibrant green.

PROJECT ACHIEVEMENTS AND OUTCOMES

CAPACITY BUILDING IN THE GIS AND PROJECT MANAGEMENT

Training on new geospatial tools, platforms, and techniques, along with advanced training on existing proficiencies, were a major feature of CuRI 2. Increased capacity in project management skills was also a key focus of training and support for the year. During the World Bank mission in November 2019, PSK and World Bank teams attended the ITAPA 2019 conference on IT and public administration, held in Bratislava from November 11–13. Both teams used that opportunity to make in-person introductions to attendees from other public organizations⁴ and companies, later leading to follow-up meetings and opening doors for future collaboration. The remainder of the mission was held in Prešov, where the PSK team received refresher training on the GeoServer platform, and also helped facilitate a problem statement development workshop, in conjunction with the Poloniny Trail development team. The objective of this geospatial project management approach is to deconstruct the issues at play and determine the critical datasets (and variables) required to inform decisions and perform analysis. This allows the GIS team to build a roadmap (and set expectations) for collaboration with other teams and departments. In addition, the GIS Team received project management training in January 2020, and as a result, a revised GIS budget was completed and presented to the Director of the PSK.

Due to COVID-19 travel restrictions, all subsequent World Bank-led training sessions were held virtually and were supplemented with additional regional training led by local firms. During these trainings, the PSK team covered topics such as content management system training, OpenLayers, relational databases and PostGIS, Python and Git, mViewer, webdesign and project management. In April 2020, 15 participants (from the PSK GIS team, and the University of Prešov) attended an OpenStreetMap (OSM) virtual workshop. Topics covered included OSM tools for geospatial project management, and Java OpenStreetMap (JOSM) for advanced editing and data validation. This training was a precursor to the community mapping activity held in September 2020.

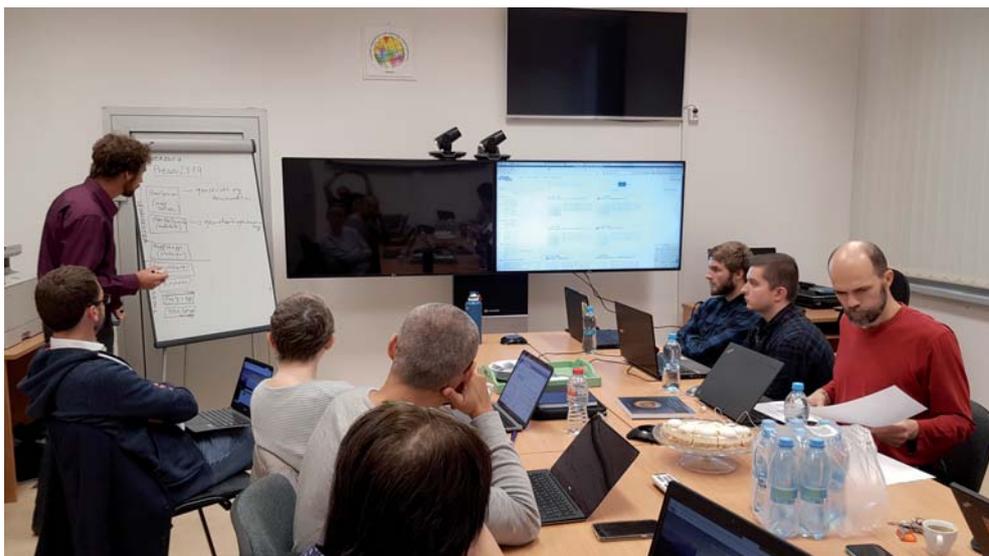
DATA INTEGRATION SUPPORT FOR STATISTICAL DATA AND LABOR DATA

Data integration is the process by which data from different sources and formats are merged and stored on a common platform so that they can be viewed and analyzed together. During CuRI 1, the GIS unit received training on core data integration practices. This training focused on (i) assessing, cleaning, and restructuring contributory data; (ii) transforming and preparing data; (iii) uploading data to the geoserver; (iv) publishing data as map layers; and (v) editing metadata entries. During CuRI 2, the World Bank team continued to support data integration activities, specifically associated with the automation of data integration from various national government sources and provided regular refresher training to the GIS unit on data integration practices.

- **Statistical Office:** There is now a tool that automatically harvests (and maintains the currency of) geospatial data directly from the Statistical Office data services and integrates it to the PSK geoportal. The data harvester source code is now publicly available at: <https://gitlab.com/po-kraj-sk/so-harvester>.
- **Central Office of Labour, Social Affairs and Family:** the PSK acted as the official testing partner for the Central Office of Labor’s data publishing services, followed by automated data integration in April 2020. This automated integration instance uses the same principles as the Statistical Office instance. The code for the harvester is publicly available at <https://gitlab.com/po-kraj-sk/upsvar-harvester>.
- Integration projects were also scaled up for:
 - **The National Health Information Center (NHIC):** This involved daily updates at municipality-level granularity of COVID-19 related data, which aided the PSK’s response to the pandemic. The code for the harvester is open source but it has not been made publicly available as yet, since the data in question is not currently considered open data. The source code can be shared and published once the NHIC fully opens the data in question. Please also refer to the section “COVID-19 support” for additional information.
 - **PSK IT:** Data for the PSK’s IT systems is managed by third parties. Healthcare data through these providers is integrated into the geoportal from the <https://eVuc.sk> service, and data about pandemic-related volunteer services is integrated from the dedicated <https://pskpreludi.sk> website.

Special in-depth training was provided by the World Bank team to the PSK GIS unit regarding data integration and harvesters. This training built upon previous related training modules, such as relational databases, PostGIS and Python, and focused on building a comprehensive understanding of how automation and harvesters fit into the overall picture of data management, data analytics, and IT operations.

FIGURE 1. Members of the World Bank Team and the PSK GIS Unit Participate in a Refresher Training on the Geoportal



Source: World Bank, 2020

Additionally, World Bank team members helped to draft and publish a blog post entitled *Automated import of data - Harvesters*⁵ to help educate others and serve as a base for potential collaborations with other public bodies that face the same tasks and challenges as the GIS unit at the PSK. Documenting activities and making this documentation public is an important part of the open-source software principles.

GEOPORTAL ENHANCEMENT

During CuRI 1, the World Bank team helped define, install, and set up the required hardware and software environment for the PSK geoportal using the OSS, GeOrchestra. This support continued during CuRI 2 and focused on improvements to the existing deployment in advance of the public launch. The geoportal was officially launched on April 20, 2019, and is now available online at <https://geoPrešovregion.sk>. Building up to the launch, a dedicated CMS was deployed to facilitate easier geoportal management, and data harvesters for the Statistical Office and the Central Office of Labor, Social Affairs and Family were initiated to facilitate streamlined access to their respective data streams. One of the PSK's major achievements in this regard is that they worked directly with both the Statistical Office and the Central Office of Labor, Social Affairs and Family to harvest their data automatically, which, in the case of the Statistical Office, required making their API openly available. More than **170 datasets** have been integrated and are now available on the geoportal from those sources.

On May 5th, the launch of the geoportal was announced through a press release and featured in numerous national and local media, including www.tv7.sk, <https://www.vranovske.sk/>, www.obecne-noviny.sk, www.ahoj.tv, Prešov.korzar.sme.sk/ and <https://Prešov.dnes24.sk>.

BOX 2. What is a Geoportal?

A geoportal is a GIS that focuses on sharing data on the web. It should not be confused with another type of GIS software that is more oriented toward the production and analysis of the data. In the case of the PSK, the need was to establish the whole spatial data infrastructure (SDI), including data collection, analysis, and the sharing of geospatial data internally, with different departments, and also with external stakeholders.

In more technical terms, a geoportal is a suite of software combining different components: a metadata catalog for the discovery, browsing, and querying of metadata or spatial datasets, spatial services, and other resources (for example, GeoNetwork); a spatial data service, serving geospatial data on the web from different sources (for example, GeoServer); a spatial database, to host and link different layers of spatial information (for example, PostGIS); and a web-map viewer, to visualize and interact with geospatial data online (for example, MapFishApp). Software, like GeOrchestra, combines all these different components into one package, making it easier to deploy and manage them all together.

GIS CROSS SUPPORT TO OTHER DEPARTMENTS AND SECTORS

The GIS unit at the PSK established cooperative projects involving geospatial and data management support with several PSK departments and sectors. The list of engagements includes (but is not restricted to) tourism, education, property management, the Department of Strategic Development and Project Management, local development, and health. Details of these engagements and the nature of the cross support are outlined below:

- **Tourism:** During the November 2019 mission, the GIS unit and the World Bank team co-led a problem statement workshop with the Poloniny Trail team⁶, to pinpoint and refine the issues to be addressed through geospatial data collection and management, and to develop next steps in their collaboration. Over the course of the year, the GIS unit has facilitated access to cadastral data and developed innovative web mapping products with overlay analysis of on-trail infrastructure. The associated map data was also pushed to the geoportal data catalogue.⁷
- **Education:** The GIS unit has agreed to provide support on data access and data quality for the Department of Education going forward, to facilitate better cartographic products to inform decision making. The GIS unit facilitated a meeting in January 2020 with the Center for Scientific and Technical Information (CVTI) of the Slovak Republic about data access, and subsequently published the school's dataset to the geoportal. Collaboration to develop a web map that visualizes school locations and student demographics is ongoing.
- **Health:** The GIS unit had agreed to provide support on data access and data quality for the PSK Department of Health. The GIS unit management has worked directly with the health department management to prepare a list of critical national level data, and have secured access to COVID-19 data, in order to facilitate public health planning at the local level. The team hopes to gain direct access to additional live databases from the National Center for Health in the near future. As of January 2020, the GIS unit has published two web maps on health care access and health data statistics.
- **Department of Strategic Development and Project Management:** The GIS unit developed a grant flow web map application for the Department of Strategic Development and Project Management to geotag the grants and subsidies provided by this department to various PSK organizations. The department wants a transparency overview of grant spending, and also an analysis of the spatial distribution of the funding they are providing.
- **Property Management:** In December 2019, the GIS unit agreed to formal terms of support for the Department of Property Management with regard to their geospatial needs. On behalf of the department, the GIS unit will receive data from Geodesy, Cartography, and the Cadastre Authority of the Slovak Republic, for visualization and decision support.
- **Local Development:** The GIS unit provided support to the Office of Local Development on their evolving data inventory, data integration (Statistical Office data), official data requests (from the Central Office of Labor, Social Affairs and Family, and the cadastral office), and the creation of open data on the OpenStreetMap platform for six priority municipalities of the local development component of CuRI II.

REGIONAL AND NATIONAL PARTNERSHIPS

During the course of CuRI 2, the team engaged with several regional and national agencies with a view toward formalizing partnerships on data standards and access.

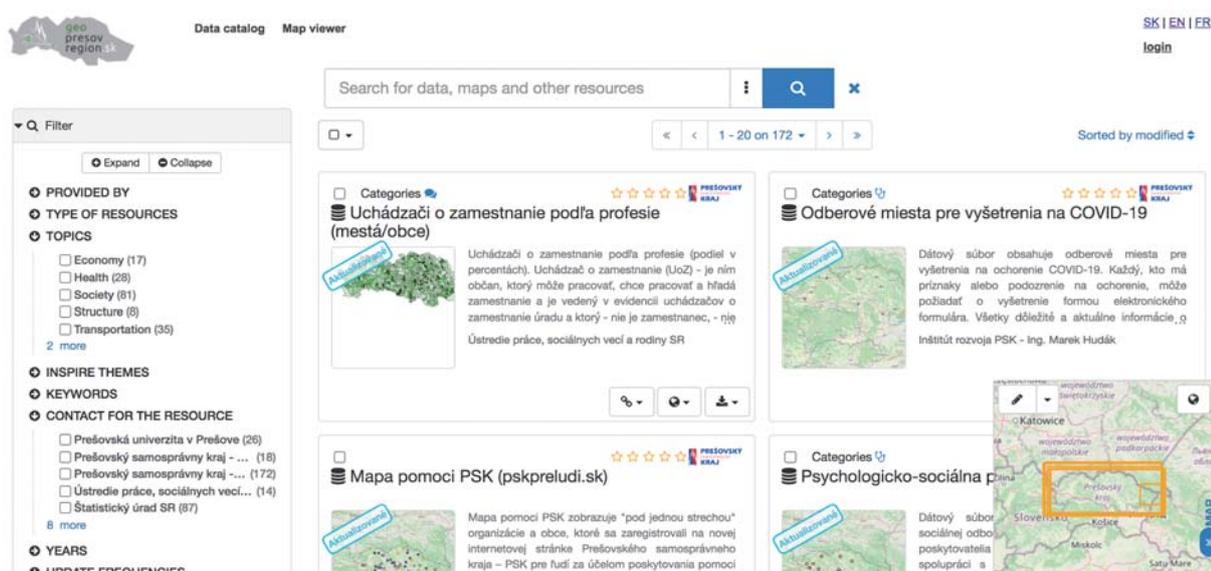
The GIS unit also has initiated several partnerships across regional and national actors. These include discussions with the Ministry of Investments, Regional Development, and Informatization; the Ministry of the Environment; the Central Office of Labor, Social Affairs and Family, the Center of Scientific and Technical Information; the City of Prešov, the National Health Information Center, and the City of Bratislava, which has its own open data portal <https://opendata.bratislava.sk/>.

In February 2020, the PSK signed an agreement on data provision with the Geodesy, Cartography, and Cadastral Authority for support of the Property Management Office, and are in the process of signing a partnership with the civic association, Alvaria, which is focused on open data (<http://www.alvaria.sk/>).

EXPANSION OF THE DATA INVENTORY

The team at the GIS unit continues to collate and inventory any geospatial data relevant to planning and development activities in the PSK. Building on the activities during CuRI 1, the team identified, assessed, and categorized datasets deemed useful for the development of the region, and made that data available on the geoportal. To date, the inventory contains metadata on more than 170 datasets.⁸ This includes data from the Geodesy, Cartography, and Cadastre Authority of the Slovak Republic, the Ministry of Education, the Statistical Office, the Central Office of Labor, Social Affairs and Family, as well as the National Center for Health Information. The data inventory also covers data producers from the private sector, academia, international and local entities, and data produced by the PSK itself.

FIGURE 2. The Data Inventory on the PSK Geoportal

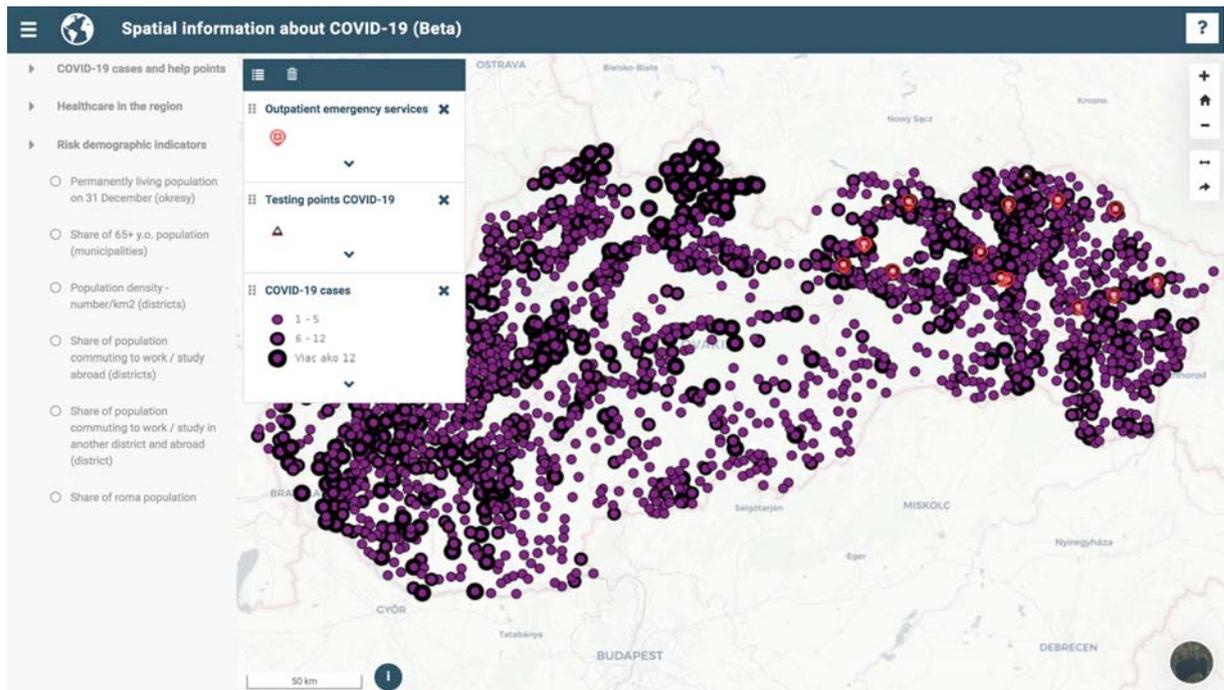


Source: Geopresovregion.sk

COVID-19 SUPPORT

As part of the COVID-19 response, the GIS unit published a map on the spatial distribution of COVID cases in the region. In addition to the daily updated overview of confirmed cases of COVID-19, the map provides information on COVID-19 testing centers and disease-related health care. The map also displays risk demographic indicators that experts say may affect the spread of the disease or show a group of people at risk. The main data sources are the National Center for Health Information and the Statistical Office of the Slovak Republic. The map can be found here: Spatial information about COVID-19: <https://geoPrešovregion.sk/mviewer/?lang=en#covid-en>.

FIGURE 3. The Spatial Information About COVID-19 Web Map



Source: Geopresovregion.sk

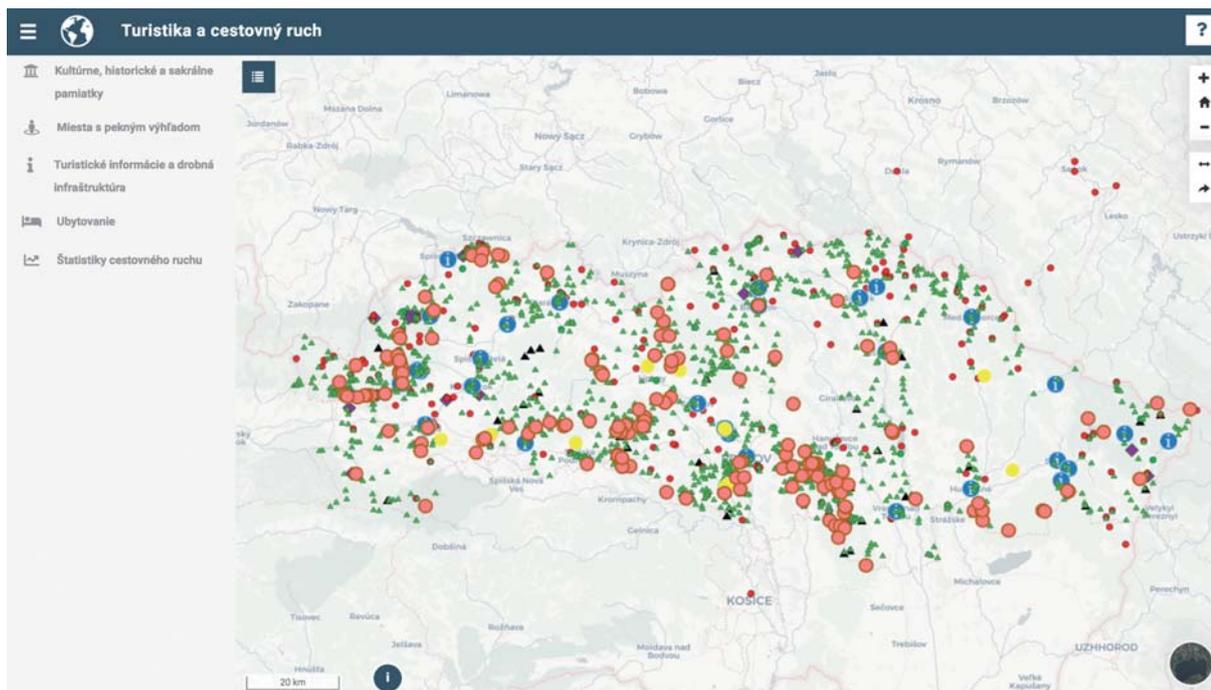
WEB MAP APPLICATION EXPANSION

Visualization and interactivity unlocks the power of geospatial data for decision-makers. To facilitate this for the PSK, the GIS unit has developed 12 web map applications. A web map application is an application accessible online that is based on enabling users to interact easily with the geospatial data. Beyond the deployment of the geoportal, the World Bank team identified a need to deliver products and services tailored to the specific users, especially the departments of the PSK and the citizens of the Prešov Region. Three of these maps were initially developed during CuR1 1, but were improved during Phase 2.

Tourism

- **Tourist infrastructure map:** This map shows tourist attractions and points of interest of various types, tourist infrastructure, and tourism statistics. The data is sourced from the Prešov Self-governing Region, the Statistical Office of the Slovak Republic, the Regional Tourism Organization (northeast Slovak Republic), the University of Prešov, and OpenStreetMap.
- **Poloniny Trail web map:** this map depicts the Poloniny Trail, a multipurpose tourist route, which will be connected to the network of existing cycling routes on local roads, tourist, and cycling infrastructure.

FIGURE 4. Tourist Infrastructure Map



Source: Geopresovregion.sk

FIGURE 5. Poloniny Trail Web Map



Source: Geopresovregion.sk

Health

- **Emergency healthcare and pharmacies:** The thematic map shows the location of emergency health care providers and pharmacies in the territory of the Prešov Region.

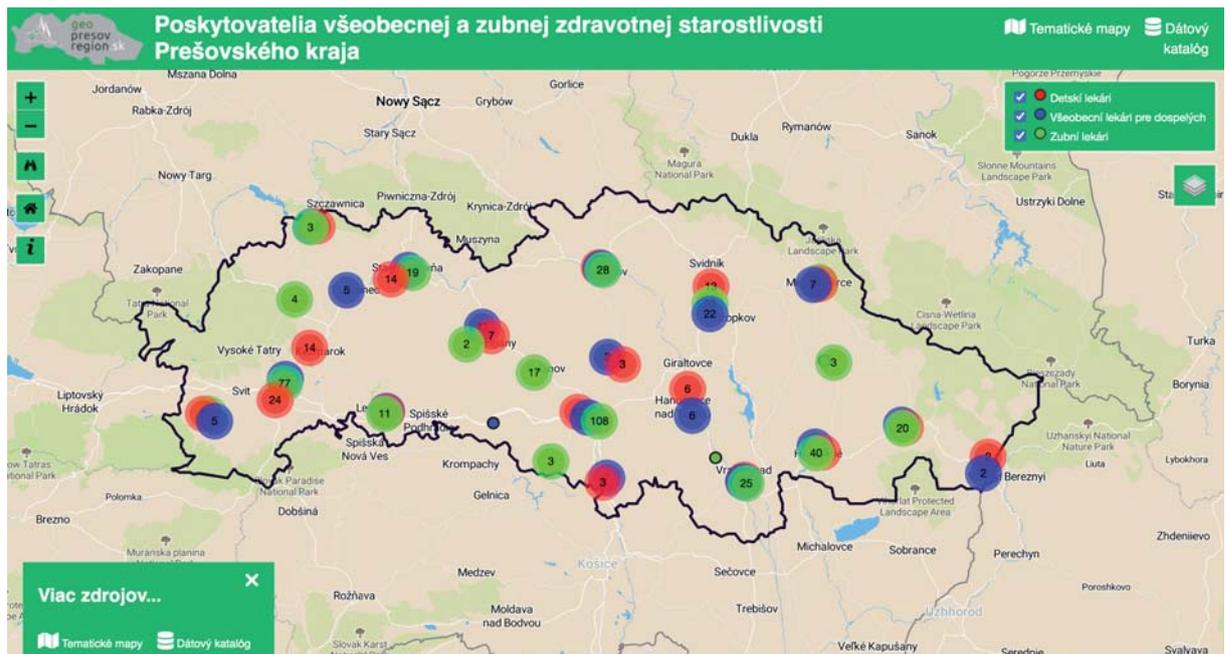
FIGURE 6. Emergency Healthcare and Pharmacies



Source: Geopresovregion.sk

- **Outpatient healthcare:** This thematic map shows the location of outpatient, general and dental, healthcare providers in the region. It also displays the number of inhabitants over 24, and up to 24 years of age per single general practitioner and/or pediatrician per district.

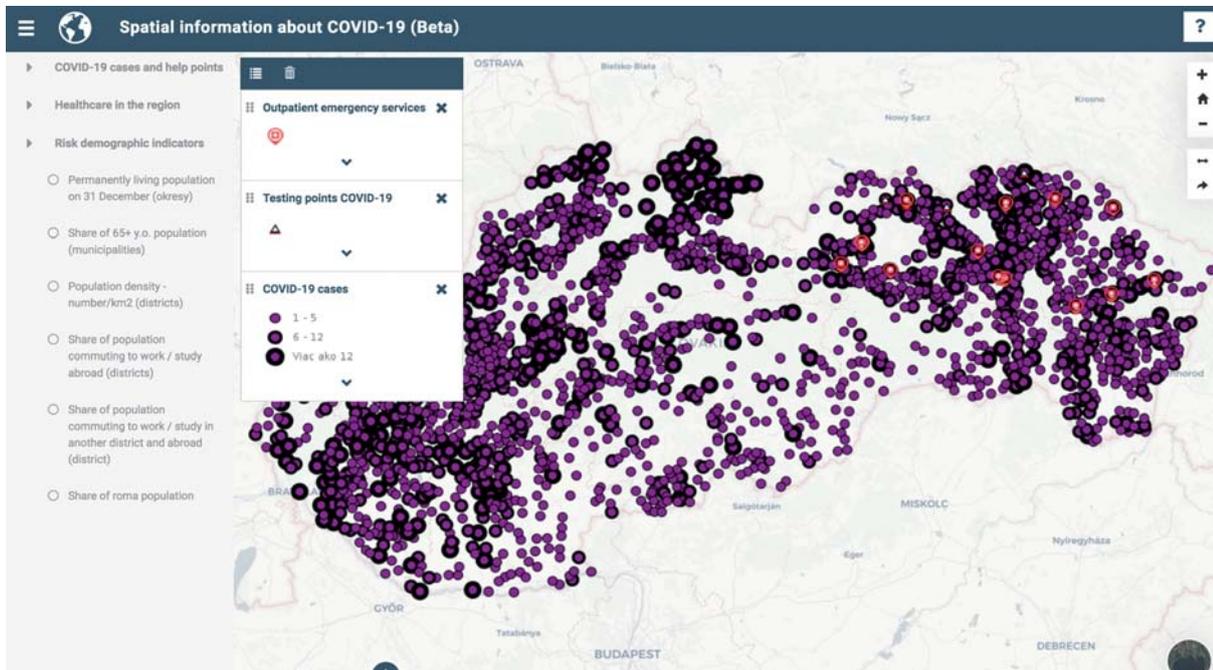
FIGURE 7. Outpatient Healthcare Map



Source: Geopresovregion.sk

- **Spatial information about COVID-19:** This map depicts the daily updated overview of confirmed cases of COVID-19 in the region, as well as COVID-19 and other disease-related health care locations. The map also displays PSK support points and risk demographic indicators that experts say may affect the spread of the disease.

FIGURE 8. Spatial Information COVID-19



Source: Geopresovregion.sk

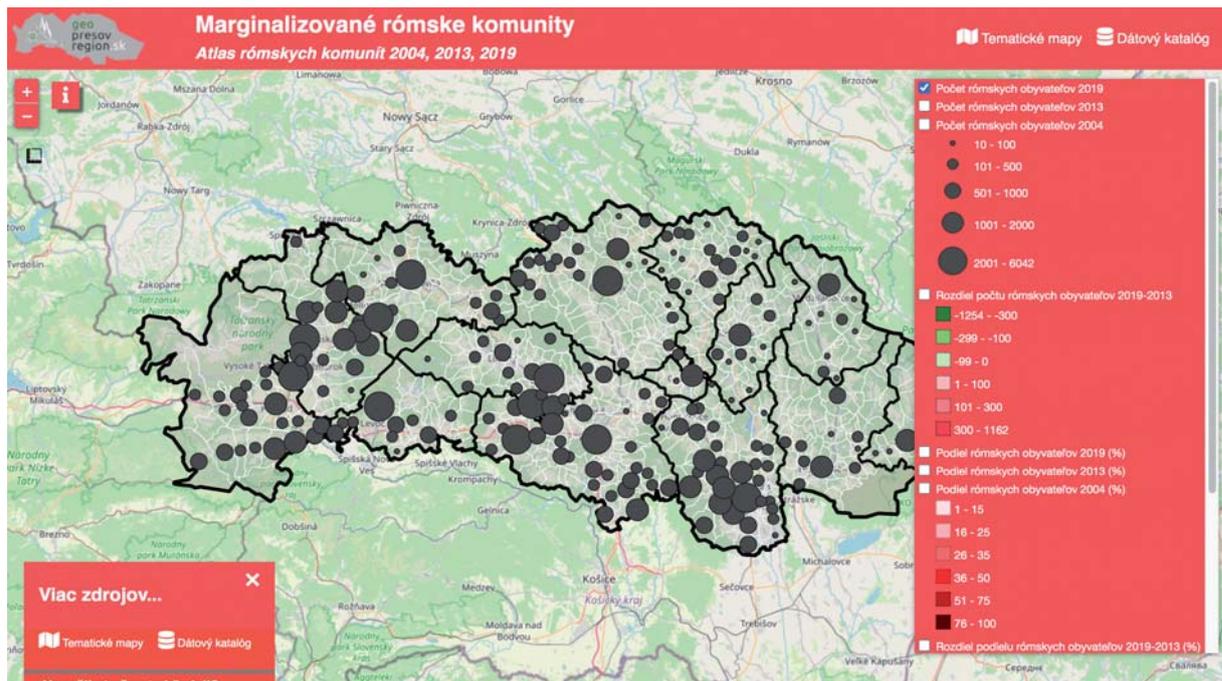
Department of Strategic Development and Project Management

- **Grant flow— Call for Region 2019:** This thematic map shows funded projects from the first and second round of the Call for Region 2019 from the PSK budget and their distribution to municipalities.
- **Microprogram PSK 2020:** This thematic map shows funded projects from the 2020 PSK Microprogram. This program finances projects to support public life in cities, municipalities, legal entities, interest groups of citizens, nonprofit organizations, and other eligible applicants in districts of the Prešov Self-governing Region.

Local Development (with focus on disadvantaged areas of the PSK)

- **Roma communities:** Improving the social and economic integration of Roma communities is one of the objectives of the Catching-up Regions Initiative in the Self-governing Region of Prešov. This thematic map shows the proportion and number of Roma population in the municipalities that are part of the Atlas of Roma Communities 2019. The aim of such mapping is not to identify the Roma communities, as such, but to help target investments to the communities most in need. Identification of infrastructure gaps through GIS is an important element to inform investment planning for marginalized groups. In order to manage such datasets with an ethical mindset, and to exclude any possible publication allowing for a misuse of sensitive data, the Plenipotentiary Office for Roma Communities is consulted.

FIGURE 9. Marginalized Roma Communities Map



Source: Geopresovregion.sk

Transportation

- **Road and railway networks in the Prešov Region:** This thematic map shows line layers of highways, expressways—I, II, and III class—in the Prešov Region. The map also contains polygon layers showing the number of kilometers of each type of road and the density of the road network by districts.

PSK Administration

- **PSK organizations:** This map shows the location of organizations within the founding competence of the Prešov Self-governing Region: this includes schools, cultural organizations, sanitary facilities, and organizations of the PSK Road Administration and Maintenance Agency.
- **Unemployment, people, and businesses:** this map visualizes the structure of job seekers by profession, education, duration of registration, and selected demographic and economic indicators at the level of municipalities/districts.
- **Life and work:** This map provides a comprehensive overview of the population (demographics) living in the region, as well as selected economic indicators.

COMMUNITY MAPPING ACTIVITY

Improving the social and economic integration of the Roma communities is one of the components of the Catching-up Regions Initiative in the Prešov Region. The aim is to define and propose integrated development programs for pilot municipalities that address priority areas—with

particular emphasis on housing, education, employment, and health quality—while also taking into account cross-cutting issues, such as equal opportunities, combating poverty, and preventing discrimination.

FIGURE 10. GIS Unit Team, and University of Prešov Team Assembled for the Mapathon



Source: Miloslav Michalko, 2020

On June 24, 2020, the PSK GIS unit and a team from the University of Prešov, including faculty members and student members of the UNIPO Youthmapper society, participated in a virtual ‘mapathon’ to update the OpenStreetMap for six priority municipalities in the PSK (Ostrovany, Čičava, Varadka, Varhaňovce, Dlhé Stráže, and Krivany). These specific municipalities are part of the local development component to support the Roma community through CuRI 2. Over the course of three hours, mappers contributed **1,156 buildings, 62 kilometers of new roads, and edited 1,026 existing features in OSM**, using the openly available high-resolution orthophoto imagery from the Cadastral Authority of the Slovak Republic.

Over the next several weeks, the team worked with the local development team to develop a data model and survey for a field data collection exercise to add detailed attribution to these mapped features. The field mapping component of this community mapping exercise was focused exclusively on the collection of building and visible infrastructure data (roads, and so on) to support decisions around urban planning

FIGURE 11. Members of the University of Prešov Being Interviewed by Local Media in Advance of Their Field Mapping Activities

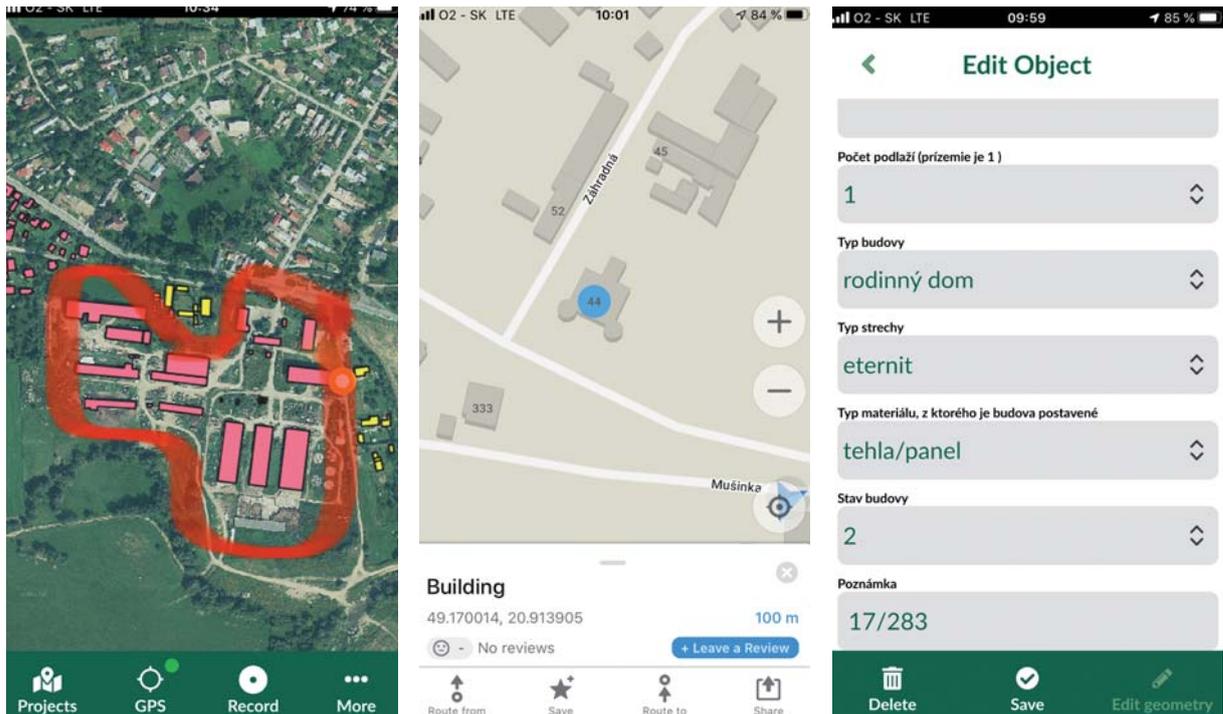


Source: Miloslav Michalko, 2020

and access to services. Prior to the field work, the GIS unit and the local development team met with the municipality and Roma community representatives to explain the scope and nature of the mapping exercise.

On September 11, 2020, the GIS unit, consisting of seven people, conducted a pilot mapping in the municipality of Krivany, including local representatives and mappers from the University of Prešov. Smaller teams mapped the remaining municipalities over the course of the next week.

FIGURE 12. Screenshots of the Open-Source Application 'Input' Developed by the Slovak firm Lutra Consulting (This mobile application was used in the field to locate and validate the buildings and infrastructure traced during the remote mapping activity)



Source: Miloslav Michalko, 2020

The team's field mapping activities were covered by local media, as well as by two nationwide broadcasters, TV Markíza: <https://videoarchiv.markiza.sk/video/televizne-noviny/epizoda/31018-televizne-noviny>, and RTVS: <https://www.rtvs.sk/televizia/archiv/13982/240790#1957>.

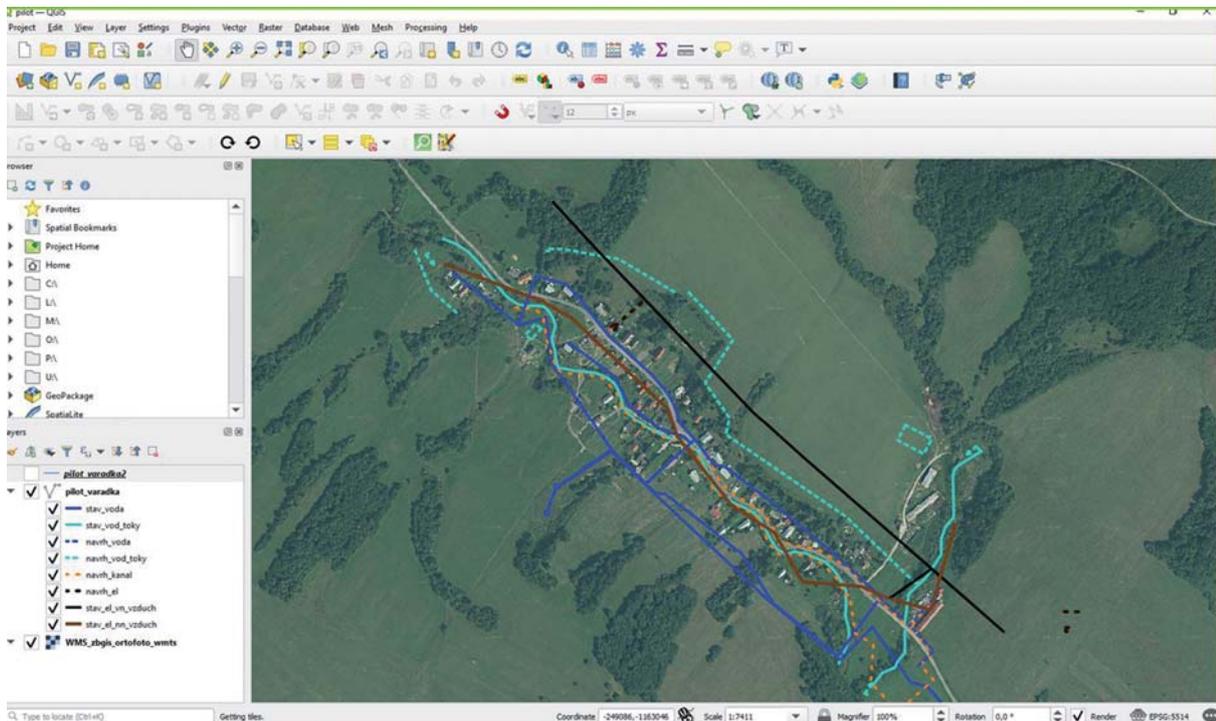
FIGURE 13. GIS Team Leader, Marek Hudák, Being Interviewed by RTVS; and GIS Unit Team Members Capturing Field Data During Mapping Exercise



Source: RTVS, 2020

Data from the field mapping activity is currently being validated and will be published to both the OpenStreetMap platform and the geoportal by the end of the year. The GIS unit is also collating data from land-use plans, as well as utility and service providers for these municipalities, to complete the geospatial data picture. Validation on this collation effort is ongoing, and will be combined with the field data to establish a comprehensive picture in due course.

FIGURE 14. Validation of the Utilities and Services Datasets for Varadka



Source: Miloslav Michalko, 2020

BOX 3. Community Mapping

In recent years, the use of crowd-sourced geographic information for government use cases, has gained considerable attention, both in data-scarce countries and also more advanced countries, where spatial data collected by volunteer mappers is now being integrated as part of public information.

The success and long-term sustainability of these initiatives is grounded in the principle of local data stewardship, meaning that municipal and community leadership should have a voice in deciding the types of information to collect. Community residents, and in particular local youth, can be equipped to perform data collection and validation activities in conjunction with their local authorities; and communities can access, use, and take ownership over the data collected about them.

Many community mapping initiatives use OSS and platforms like OpenStreetMap (OSM) to create and host their data. OSM is a collaborative project to create a free editable map of the world. OSM data is now considered of high or sufficient quality in many parts of the world, so that OSM has become a source of information for many GPS applications and public organizations, who in return, contribute or support its improvement. Data collected through OSM is made available as open data through an ODbL license.⁹

Local implementation teams can be trained on open-source technologies, which will allow the data collected to be more accessible and adaptable for the needs of the region. Because the limitations of proprietary software are removed, these initiatives can focus on developing the digital skills of a greater number of young people and enable local university partners to further scale this approach. These competencies can also serve to enhance the job prospects of participants beyond the life of the project.

FIGURE 15. A community mapping initiative in Mixco, Guatemala, in conjunction with the Pan American Development Organization (PADF)



Source: World Bank, 2020

PROJECT ACTIVITIES AND ASSOCIATED DELIVERABLES

The World Bank team undertook a number of activities that generated deliverables in the following categories: technical support, capacity building, partnership building, and user engagement. These activities are described below.

TECHNICAL SUPPORT

Geoportal enhancement

- The World Bank team provided technical support to the PSK in improving the overall geoportal deployment, initiated during CuRI 1, including the development of a new user-friendly interface, which was officially released on May 4, 2020.
- World Bank team members helped initiate a content management system (CMS) to support the geoportal in January 2020, and provided training to the members of the GIS unit on the new system.
- Geoportal functionality was also extended due to improved data integration activities outlined in the next section.

Data integration

- During CuRI II, the World Bank team continued to support data integration activities, specifically associated with the automation of data integration from various national government sources, and provided regular refresher training to the GIS unit on data integration practices.
 - Statistical Office: World Bank team members worked on the data harvester to retrieve geospatial data directly from the Statistical Office data services, and worked with the statistical service to ensure open access to the harvester source code. The Statistical Office Data Harvester became openly available January 2020.
 - the Central Office of Labor, Social Affairs and Family: World Bank team members worked with the Central Office of Labor Social, Affairs and Family to test their data publishing services, and worked on the automatic data integration for the Central Office of Labor, Social Affairs and Family that was launched in April 2020.
 - National Health Information Center (NHIC): during April 2020, the World Bank team members worked on automatic data integration for COVID-19 related information provided by the NHIC.

Technical documentation and cartographic product review

- The World Bank team assisted in reviewing the technical appropriateness of the technical documents produced by the GIS department of the PSK, including inputs to a revised GIS budgetary plan that was completed and presented to the Director of the PSK in January 2020.
- The World Bank team provided the review of maps and analytics developed to support both the PSK health department—for the marginalized Roma communities (MRC) component¹⁰ (in the context of the COVID-19 situation) and the PSK education department—including inputs to Šariš hackathon preparation (held on October 4–6, 2019, in Prešov).
- World Bank team members assisted with the development of documentation on the data integration processes. This consisted of two main contributions:
 - Overall description of automated data integration published as the blog post *Automated import of data - harvesters*.¹¹ The blog post was made public, since such general principles can also help other municipalities and regions.
 - More detailed technical information about how the harvesters are deployed and configured on the GeoServer. This information is part of the internal PSK wiki on GitLab¹², along with other documentation and source code.
 - The World Bank team assisted with the position description for the database architect position profile, developed in January 2020.

CAPACITY BUILDING IN THE GIS AND PROJECT MANAGEMENT

- The GIS unit participated in several training sessions delivered by both the World Bank team and local companies. The complete list of trainings is as follows:
 - GeoServer refresher training (November 2019)
 - Problem statement workshop (November 2019)
 - Project management (January 2020)
 - Content management system training (February 2020)
 - OpenStreetMap virtual workshop. Topics covered included: tasking manager for OSM project management, and JOSM for advanced editing and data validation (April 2020)
 - Git (June 2020)
 - Relational databases and PostGIS (June 2020)
 - mViewer (June 2020)
 - Python (June 2020)
 - OpenLayers (June 2020)
 - Harvesters (July 2020)

- On June 24, 2020, the PSK GIS unit and a team from the University of Prešov, including faculty members and student members of the UNIPO Youthmapper society, participated in a virtual mapathon to update the OpenStreetMap for six priority municipalities in the PSK. The World Bank team provided a short training session and technical support throughout the event.
- The World Bank team provided advice to the PSK to enhance the utilization of digital spatial platforms in at least three different departments or sectors.

PARTNERSHIP BUILDING AND USER ENGAGEMENT

- The World Bank team facilitated and/or provided support to the PSK in building partnerships with strategic organizations at the local, national, and international levels. These included the following:
 - The Statistical Office: integration of data
 - The Ministry of the Environment: integration of the PSK geoportal with the national Spatial Data Registry, as part of the INSPIRE-related activities and alignments (activity ongoing, not concluded yet)
 - The Ministry of Investments, Regional Development and Informatization (formerly Office of the Deputy Prime Minister of the Slovak Republic for Investments and Informatization): integration of the PSK geoportal with data.gov.sk (activity started, not concluded yet), possibilities for funding (for open-source migration, IT in general, for process improvements, and so on)
 - The Central Office of Labor, Social Affairs and Family: integration of data
 - The National Health Information Center: integration of data
 - The Center of Scientific and Technical Information: integration of data (activity ongoing, not concluded yet)
 - Geodesy, Cartography, and Cadastre Authority: integration of data (activity ongoing, not concluded yet)
 - The City of Bratislava: exchange of know-how and the mapping of common topics and projects for future collaboration (the best candidate being automated data integration with the Statistical Office)
 - The City of Prešov: exchange of know-how and mapping of common topics and projects (the best candidate being shared GeoServer infrastructure)
 - National Agency for Network and Electronic Services (NASES): integration of the PSK geoportal with data.gov.sk (activity ongoing, not concluded yet)
- In February 2020, the PSK signed an agreement on data provision with a multi-stakeholder engagement event planned for May 2020, but the event had to be postponed due to COVID-19 travel and gathering restrictions. The event will be held at a future date.

The background of the page is a repeating pattern of green triangles in various shades, creating a textured, geometric effect. The triangles are arranged in a way that they interlock, forming a larger-scale pattern of squares and hexagons.

MAIN IMPLEMENTATION CHALLENGES AND MITIGATION MEASURES

COVID-19 RESTRICTIONS

The COVID-19 pandemic restrictions presented several challenges during Phase 2. In-person World Bank travels to Prešov were cancelled and were replaced by virtual mission events. Several training events intended as in-person sessions were also moved online. Exclusively online learning can present several challenges, from technical issues and communication issues, to learner isolation. In-person troubleshooting, open discussion, and fluid feedback are critical parts of a functional learning environment that can be difficult to simulate in an online setting. Peer-to-peer assistance is also hard to recreate during online engagements.

Despite these obstacles, the GIS unit participated in several successful online training events with the World Bank team (mViewer, open-source tools for data collection, and virtual mapathon)—and overall became quite comfortable with the virtual learning environment. The teams made creative use of multiple online platforms and creative file-sharing techniques, and developed several contingency plans, in terms of backup conferencing platforms.

The GIS unit and the World Bank team had plans in place for an April 2020 event entitled *The GeoPrešov Showcase*. The event was intended as an exhibit space for the achievements of the GIS unit to date, and an opportunity for stakeholders in the PSK region to participate in training on open-data tools and methodologies that could potentially assist with operations management in their fields. The PSK team planned to host the team from GeoBretagne (in return for the Bretagne-based study visit and informational exchange during Phase 1). GeoBretagne planned to present on how to establish and maintain a regional spatial data infrastructure in the context of the European framework, and participate in a field visit to the Poloniny Trail.

The showcase has been postponed, pending improvements in travel accommodations in the near future. Ideally, this event would run with in-person attendance, but should international travel restrictions persist, accommodations will be made to host a virtual showcase in the near future.

WORKING WITH MARGINALIZED COMMUNITIES

The GIS team planned and successfully executed a pilot community mapping project in the municipalities of Ostrovany, Čičava, Varadka, Varhaňovce, Dlhé Stráže, and Krivany. This project presented several logistical and organizational challenges for the team. The goal of the mapping effort was the collection of current, high-resolution building and visible infrastructure data (roads, and so on) to support decisions around urban planning and access to services.

The GIS unit worked closely with the local development team to establish a data model that addressed the data need of the local development component, while respecting the privacy of the communities being mapped. The applied standards shall exclude any possible misuse of personal data. The data collection effort focused exclusively on the built infrastructure and the utility services serving the communities; and steered away from household survey-style data collection, which was beyond the scope of the mapping exercise. The team also worked closely with community representatives

to facilitate neighborhood introductions, and mitigate any potential hostility or reluctance community members may have had about the process. The team had to plan for, and employ, social distancing for the training and mapping activities associated with the pilot.

DATA BARRIERS

One of the main challenges continuing to face the GIS unit is access to high-value datasets. While Phase 2 of CuRI saw formal agreements materialize with the Statistical Office, the National Labor Office, and the National Health Information Center (for COVID-19 data), the PSK continues to struggle with access to high-value datasets owned by private utilities and other government agencies.

Some of the challenges in achieving this goal are: i) a lack of available base data from existing official sources (buildings, roads, and other critical infrastructures) in the areas of the region where investments are needed; ii) a lack of standardized low-cost data sharing mechanisms and tools between data providers and data users (a lot of public money is still invested in purchasing and using data created for public purposes); and iii) the lack of awareness about GIS and related digital government issues among senior management, which restricts their ability to channel investments and implement GIS and digital projects successfully.

The work of the PSK contributed to creating more demand for data owned by private utilities and other governments, but it also helped to expose the more foundational barriers to public data sharing in the Slovak Republic, in particular when it comes to high-value datasets. Those issues may include public data ownerships and rights, data literacy within the administration, as well as funding models, procurements rules, and contracts related to public data.

The Government of the Slovak Republic may have an opportunity to address those issues with the revision of the EU directive on the reuse of public sector information. Member states have until July 16, 2021 to transpose the new directive into national law.

FUNDING MODELS AND THE SUSTAINABILITY OF TECHNOLOGY IN GOVERNMENT

Managing a spatial data infrastructure requires a skilled well-trained staff, and a management structure that can address day-to-day concerns directly. Although the GIS unit has addressed the sustainability challenge to a great degree through the adoption of open-source tools and platforms, the training of staff on evolving platforms and the customization of these platforms is an ongoing expense. The team could also benefit from the skills of a permanent database architect and/or systems administrator. The World Bank team assisted with the position description for a database architect position in January 2020, but as yet the position is unfunded/unfilled. To further develop the capacity of the PSK GIS team, and to support their plans for scaling, the team plans to apply for several calls for proposals anticipated in spring 2021, especially in the area of improving and streamlining digitization (including open data).

LOOKING FORWARD

Going forward, the PSK seeks to scale the geo-infrastructure that was implemented during CuRI 1 and successfully deployed during CuRI 2 by sharing tools, skills, and knowledge with other municipalities, regions, and national-level stakeholders, in an effort to contribute to the development of open data and the digital economy in the Slovak Republic.

This objective will involve the following activities: i) scaling up the use and adoption of the geoportal by local and national partners; ii) expanding GIS data collection activities throughout the region; and iii) continuing to build the capacity of regional institutions and the local population (especially the youth) in GIS and associated digital skills.

Scaling up to national and municipal levels

- Reinforce partnerships under the spatial data infrastructure through collaborative agreements with regional and national partners (including companies, universities, and public authorities)
- Promote increased awareness and usability of the PSK's geoportal through a series of trainings for external stakeholders on how to contribute to, and access, the GeoPrešovregion.sk platform
- Provide support for these stakeholders on the compilation of high-value datasets for the region (in accordance with the new EU and INSPIRE Directive)
- Review and agree on new PSK GIS activities and related World Bank support going forward, taking into account the impact that COVID-19 has had on jobs and the economy

Data collection through community mapping

- During the pilot community mapping activity, the PSK GIS unit discovered the potential of open-source mapping workflows and data for urban planning and infrastructure management. In cooperation with other local communities in the PSK region, the GIS unit plans to expand this type of mapping activity to achieve better targeted data-led regional development planning.
- The World Bank team will collaborate with the PSK to provide technical support and guidance to build the capacities of the entire region to create, compile, and use high-value open data using low-cost scalable community mapping approaches with a focus on the most vulnerable populations and areas where investments are needed (trainings associated with this objective are outlined in the digital skills and education section below).
- With the support of the World Bank geospatial team, the GIS unit will continue to collate and validate data collected and acquired during the mapping activity of disadvantaged areas inhabited by marginalized Roma communities.

- The GIS unit will continue to become a more active part of the open-source and open-data community at the national level, and will contribute to, and communicate with, user and developer communities to promote the platform, identify needs, and target value-added use cases.

Digital skills and education

- The World Bank and the PSK GIS unit will work together to provide training and support to local, regional, and CuRI partners, to improve their GIS and data analytics skills.
- In support of the community mapping initiative, this training and support will cover:
 - Training and guidance on the overall methodology, including problem statement development; ensuring data collected will respond to the needs identified
 - Organize dedicated GIS and mapathon events in the region
 - Training and guidance on open-source data collection tools and digital platforms, such as OpenStreetMap
 - Support for building a network of local mappers in strong cooperation with the University of Prešov
- Support capacity building in the region by publishing final versions of the geoportal documentation and guidelines, as well as training documentation
- Participation in peer-to-peer exchanges and events at the national and EU level
- Support identifying investment opportunities and digital skills capacity-building opportunities

Partnerships and outreach

- Outreach to local and national stakeholders to promote and encourage the adoption of open-source tools and approaches prepared under CuRI Phases 1 and 2
- Build partnerships with other public bodies and establish joint development and maintenance of IT solutions, that is, geoportal, harvesters, and so on, which address needs common to many, not just the PSK
- The team will adapt to the restrictions of the COVID-19 pandemic, and if rescheduling the GeoPrešov Showcase is no longer feasible, the event will be taken online, and will include the participation of the team from GeoBretagne. This event will be held in 2021.

NOTES

1. For more information, please refer to the related report entitled *New Perspectives on Integration of Marginalized Roma Communities in Prešov Region Through Local Development*.
2. In July 1996, the country was subdivided into eight regions, or kraje, which then became self-governing regions in 2001.
3. A current revision of the PSI Directive is under way that should reinforce the provision for open data for all public sector information and may require governments to publish high-value datasets as open data by default. See <https://ec.europa.eu/digital-single-market/en/proposal-revision-public-sector-information-psi-directive>.
4. The most notable public organizations (but not the only ones) were the Ministry of Investments, Regional Development, and Informatization (formerly, at the time of the conference—the Office of the Deputy Prime Minister of the Slovak Republic for Investments and Informatization), and the City of Bratislava.
5. This blog post is available in the Slovak language, at: <https://geoPrešovregion.sk/home/2020/10/05/automatizovany-import-udajov-harvestery/>
6. World Bank, Due Diligence Report on the establishment of a Poloniny Trail Park, August 22, 2019, <http://documents1.worldbank.org/curated/en/866041573459577859/pdf/Due-Diligence-Report-on-the-Establishment-of-a-Poloniny-National-Park-Trail.pdf>
7. See https://geoPrešovregion.sk/web/web_pt/
8. PSK Data Catalogue: <https://geoPrešovregion.sk/geonetwork/srv/en/catalog.search/>
9. “The Open Database License (ODbL) is a copyleft (‘share alike’) license agreement intended to allow users to freely share, modify, and use a database while maintaining this same freedom for others.” Excerpt from Wikipedia article. See https://en.wikipedia.org/wiki/Open_Database_License
10. The objective of the MRC component is to support the integration of marginalized Roma communities.
11. <https://geoPrešovregion.sk/home/2020/10/05/automatizovany-import-udajov-harvestery/>
12. <https://gitlab.com/po-kraj-sk>

