

Project partners:

Surveying and Mapping Authority of the Republic of Slovenia (www.gu.gov.si/en) Ministry of the Environment and Spatial Planning (www.mop.gov.si/en) Statens kartverk – Norway (www.kartverket.no/en) Landmælingar Íslands – Iceland (www.lmi.is/en)

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FINAL PROJECT REPORT 2013 - 2016

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MODERNIZATION OF SPATIAL DATA INFRASTRUCTURE TO REDUCE RISKS AND IMPACTS OF FLOODS







Table of contents



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EEA Financial Mechanism	3
Strengthening cooperation – exchanging ideas	4
Introductory words of the Minister	6
Introductory words of the project manager	8
Project description	10
Subproject GEODETIC REFERENCE SYSTEM	14
Subproject TOPOGRAPHIC DATABASE	18
Subproject INSPIRE	22
Subproject HYDROGRAPHY	26
Events, conferences, symposia, expert panels	30
Cooperation with our Norwegian and Icelandic partners	48
Project's visibility, media coverage	58

EEA Financial Mechanism

Strengthening cooperation - exchanging ideas

Norway, Iceland and Liechtenstein are states involved with the Financial Mechanism of the European Economic Area (EEA) and the Norwegian Financial Mechanism (EEA Grants and Norwegian Grants). Both financial mechanisms contribute resources for reducing economic and social disparities in the EEA as well as strengthening bilateral relations with eligible states. At this point there are 16 eligible states, Slovenia being one of them.

In the time period 2009 - 2014 Slovenia received almost 27 million FUR donations out of both financial mechanisms. These were used in different areas: the environment and climate change, civil society, human and social development, cultural heritage, research and studies.





In the financial period 2009 - 2014, the Surveying and Mapping Authority of the RS received donations for the execution of the project »MODERNIZATION OF SPATIAL DATA INFRASTRUCTURE TO REDUCE RISKS AND IMPACTS OF FLOODS«. The result of this project is the establishment of the vertical component of the national coordinate system as well as data layers of basic topographic and hydrographic data, compliant with the INSPIRE Directive.

Iceland, Liechtenstein and Norway are striving towards strengthened mutual relations through encouraging cooperation between Slovene subjects and donor state subjects on different projects. This collaboration has been increasing in the last few years. An excellent example of such partnership is the Surveying and Mapping Authority of the Republic of Slovenia (SMA). It has carried out a project with the help of donations in the former financial period 2004 - 2009, which was an important milestone for the Slovenian geodesy, establishing the horizontal component of the national coordinate system and establishing the national network of 15 permanent GNSS stations (Global Navigation Satellite System), named SIGNAL. The professional execution of this project and the excellent working relations between the Surveying and Mapping Authority of the RS and partners from donor states have led to a follow up project.



INTRODUCTORY WORDS OF THE MINISTER

Minister Irena Majcen (Ministry of the Environment and Spatial Planning)

We have to understand the risks regarding dangerous natural disasters, which include floods, and be as prepared as possible for their occurrence. We have to identify areas in need of improvement along with the most effective measures to reduce the risks and impacts of floods and approach flood protection in an organized manner.

The assessment of flood risks and potential flood extent is the result of hydrographic and hydrologic work, mainly hydrologic modeling. The credibility of these assessments, which are derived from spatial analysis expert models, depends on valid, high quality input data. The two key steps to improve flood protection are modeling and further down the line the inclusion of flood risk assessment results in spatial development, settlement and construction planning along with planning preventive flood measures. However, the quality of these expert assessments is highly dependent on the quality of used data. The project in this report represents an important step in updating the geodetic base, which gives the correct location information to all spatial data, and an important step for topographic data, specifically the terrain model and data access. Activities in these areas have been carried out considering international standards as well as our own professional expectations. With this project we made and important shift from cleaning up flood aftermaths towards preventive risk management.

The project was carried out by colleagues from the Surveying and Mapping Authority of the RS, the Ministry of the Environment and Spatial Planning and the Slovenian Environment Agency. Experts from the Faculty of Civil and Geodetic Engineering, University of Ljubljana and the Geodetic Institute of Slovenia have contributed towards the professional credibility of solutions produced in the scope of the project. An important role was played by colleagues from the partner

organizations, the national surveying and mapping authorities of Norway and Iceland. They provided solid and appropriate recommendations and quidance based on their own experiences, their knowledge regarding recommendations from international organizations and similar actions carried out in the European area. Of great importance is also the forming of good mutual relations and especially trust between institutions and on the personal level. The project has been carried out under the supervision of the Governmental Office for Development and European Cohesion Policy. The project management and reporting had to be in accordance with project implementation rules for projects with donations from the Financial Mechanism of the European Economic Area. Despite the complex and intertwined nature of project participants, institutions and rules, the project group proved their ability to prepare, manage and implement such a demanding project and in the end deliver the planned results.



For these reasons I have to give praise to the entire project group. For their motivation and concept of the project, acquisition of donations for co-financing the project, work in the preparation of project documentation, the implementation plan and the three yearlong project implementation. And of course for the achieved results, which will be of much use in our different professions.

It would be a shame if the conclusion of this project meant also the end of such a productive way of work. Experiences gathered in this project have already raised new ideas and propositions for the future.





INTRODUCTORY WORDS OF THE PROJECT MANAGER

Jurij Režek, MSc (Surveying and Mapping Authority of the RS)

We have been implementing the project »Modernization of spatial data infrastructure to reduce risks and impacts of floods« for a bit over three years, from September 2013 till November 2016. We organized it as four subprojects: Geodetic reference system (GRS), Topography (TOPO), Hydrography (HIDRO) and Inspire (INSPIRE), while the Informing and management along with the Advisory activities of project partners were conducted jointly for all four subprojects. The project management team consisted of colleagues from the Surveying and Mapping Authority of the RS, the Ministry of the Environment and Spatial Planning (MESP) and the Slovenian Environment Agency (SEA), with collaboration from the Norwegian and Icelandic surveying and mapping authorities (Kartverket and Landmaelingar Íslands) as partner organizations. We managed financial resources of the Surveying and Mapping Authority of the RS (614,000 €), Ministry of the Environment and Spatial Planning (360,000 \in), national co-financing funds from the Government Office for Development and European Cohesion Policy (313,000 €) and the EEA Financial Mechanism (1,773,000 €).

The project was divided into subprojects and each subproject into individual activities. These individual activities had a clearly defined timeframe as well as limited financial funds. The project management included careful planning of the project's objectives and milestones, monitoring the project's implementation, attentiveness regarding rational spending on one hand and timely procurement on the other, reporting and in the event of unpredicted situations quick intervention. Everything stated was not an easy task in the rigid environment of public administration. Management of such a large and complex project, which watches over so many participants, abides by budgetary rules and management rules for grant funds, the stipulated system of public tenders and the additional rules one has

to consider due to the nature of international financial mechanisms – all this has led to several stressful moments during project management. Timelines have been defined with regard to content of interconnected activities, also considering budget implementation rules and financial mechanism rules. Additionally, the national budget and the financial mechanism have each their own reporting methods (timeframe, structure, content), methods to determine justified expenses and monitoring of achieving set goals. But in conclusion we can determine that a bit over three years of successful joint work has strengthened the connection within and bettered the qualification of the project team for such way of project work.

The Department of Geodetic Engineering at the Faculty of Civil and Geodetic Engineering along with the Geodetic Institute of Slovenia have been included in the project, primarily in the subprojects Geodetic reference system and Topography, with the aim to ensure solutions of high professional merit. With supplementary professional counsel of our partners we steered the project towards high quality professional solutions. We had to coordinate high professional standards with the limited time and money frame. The opinions of the domestic as well as the foreign expert public are in agreement - the project resulted in credible and planned outcomes of high quality.

Our collaboration with the Government Office for Development and European Cohesion Policy (GODC), which also serves as the National Contact Point for the Norwegian Financial Mechanism and EEA Financial Mechanism, was professional. They had their own demands regarding reporting and documenting which was at times burdensome for the project leadership and administration. However, we understood that our colleagues at the GODC also had demands stemming from the Financial Mechanism Office in Brussels and we have to emphasize their continuous professional conduct and help with providing suitable propositions for the achieving of resolutions.

Many contractors and suppliers from the private sector were also involved in the project, performing different activities - from planning, construction and craftsmanship work, to computer services, with participation from surveying

contractors and suppliers of different, high tech surveying equipment. All of them preformed their tasks in the set timeframe and of the demanded and expected quality.

The capability of our project group to carefully design the project plan comes mainly from experiences we gathered in a similar project. We have been able to adapt the project plan as a response to unforeseen situations. The leadership of the Surveying and Mapping Authority of the RS has throughout the project displayed support towards it and showed the same support to outside stakeholders as well. The supervisory board's positive approach helped the project team in finding solutions while also considering their rules and demands. All colleagues were highly motivated as the project's goals coincided with their professional findings and motives, so working on the project did not present solely an additional workload but mostly a professional challenge and a responsibility to the profession and to the good reputation of the Surveying and Mapping Authority and the Ministry.

project.

Jurij Režek, MSc

For the successful implementation of the project I believe the most crucial aspects were: a good project implementation plan (timeline and financing), active support from the leadership as well as project supervisory board and the motivation of the project team.

The project was managed by the project group consisting of subproject managers and their deputies; the subproject Geodetic reference system was led by Klemen Medved, MSc, and Danijel Majcen, subproject Topography by Marjana Duhovnik and Danijel Boldin, MSc, subproject Hydrography by Boštjan Savšek and Primož Kogovšek (Ministry of the Environment and Spatial Planning and Slovenian Environment Agency, respectively), subproject Inspire by Tomaž Petek and Irena Ažman, MSc, and the Project Office was managed by Nives Jurcan, MSc. All of them deserve acknowledgment for the successful implementation of the

Director of the Geodesy Office Surveying and Mapping Authority of the RS







MODERNIZATION OF SPATIAL DATA INFRASTRUCTURE TO REDUCE RISKS AND IMPACTS OF FLOODS

PURPOSE OF THE PROJECT

Floods destroy property, endanger lives, the environment and businesses. Consequently, the capability for effective interventions when facing flood aftermaths is of great importance while preventive measures to reduce risks and impacts of floods are even more so. Geodetic and other spatial data are used in the preparation of flood studies and when executing preventive interventions in space. The credibility of each and every analysis, study, plan and measure is to a high degree dependent on the quality of data used in these activities. Hence, the updating, accuracy and accessibility of data is of key importance.



The ensuring of spatial data begins with the foundation - the national **geodetic infrastructure**, continues with **topography** data with focus on **watercourse network** data and is upgraded with an infrastructure for spatial information, which provides users continuous access to reliable data and information. All the stated aspects constitute subprojects of the project »Modernization of spatial data infrastructure to reduce risks and impacts of floods«.

The national geodetic infrastructure serves the physical establishment of the Slovene spatial coordinate system. It is used to determine and express precise location with 3D coordinates. The quality of the geodetic infrastructure (accuracy, accessibility...) determines the quality of coordinates for every natural or constructed object, phenomena or regime.

Horizontal and vertical (height) coordinates are determined directly using land surveying measurements or indirectly using other sources that are georeferenced in the coordinate system. In the past decade we carried out the transition from a geodetic infrastructure, which was based on foundations set in the previous century, into our own, state of the art Slovene realization of a

spatial coordinate system. This system is in line with the European Spatial Reference System - ESRS and presents our contribution for the realization of a European Spatial Reference System. The majority of activities for the transition were carried out in scope of projects that were co-financed with grants from the Norwegian Financial Mechanism (NFM) and the Financial Mechanism of the European Economic Area (EEA Grants). A network of 16 permanent GNSS (Global Navigation Satellite System) stations called SIGNAL was constructed. This system enables geodetic positioning of horizontal location with the accuracy of a few centimeters. In the frame of the project that we are summarizing in this final report a new realization of the height system was implemented along with a new calculation of the Slovene guasigeoid. This enables for a fast determination of height coordinates with the accuracy of less than a decimeter using geodetic satellite receivers. A network of 6 continuously operating national zero order geodetic points was established. These points connect the horizontal, height and gravimetric components of the national coordinate system while also providing uninterrupted monitoring of the coordinate system's state due to local and regional geotectonic events as small as a few millimeters.



Topographic data are data regarding the physical characteristics of land surface and physical phenomena in space, natural or constructed. Reliable and high quality topographic data are the foundation and necessity for comprehensive control and management of the national territory, planning economic and spatial development along with environmental protection. With the project we established a new data scheme (data model) for topographic datasets in a manner that is compliant with



the regulations of the European Commission INSPIRE Directive (Infrastructure for Spatial Information). All existing topographic data of the Surveying and Mapping Authority of the RS for the territory of Slovenia that are of an accuracy and scale of 1 : 5000 have been migrated into this new data system. Worthy of noting is the fact that all topographic data of the Surveying and Mapping Authority of the RS are represented in the new national coordinate system. Also, the acquisition of new topographic data using remote sensing techniques – aerial imaging and laser scanning – is adjusted to the new data standards. A publicly accessible view network service for the creation of maps in a scale of 1 : 5000 has been developed. We plan to produce missing or outdated topographic data for the entire country's territory as part of a new project for which some initial activities have already begun.

One important part of topographic data are **hydrographic data**. These are composed mainly of watercourse network data along with water land use data and data on water infrastructure objects. Thanks to remote sensing technologies (LIDAR, aerial imagery) hydrographic data for the entire territory of Slovenia have been captured. With equipment procured in the scope of this project, laser scanning data are being distributed to the user base. A



system has been established along with the necessary software to conduct a survey of water infrastructure. All these data are being incorporated in activities for hydrologic forecasting and water management. With the inclusion of georeferenced sources (LIDAR data) and the use of the new national geodetic infrastructure these data represent a quality increase for hydrological modelling and the analysis thereof, improved decision making regarding necessary protective measures and last but not least improvements for construction interventions for flood protection as all data and measurements exist in the same geodetic reference system.

Providing spatial data to users in the public and private sphere is a key step. A hallmark characteristic of quality data is also an informed expert public as well as other users about the existence of data and appropriate data descriptions (metadata), which enable case by case determination of data usefulness. Easy data access and information on data managers, who provide the individual datasets, are also important. All of the stated information and services are provided with the infrastructure for spatial information. In the frame of this project the metadata system for spatial data has been updated, discovery, view and download network servic-



All throughout the project our mind-set was that only high quality spatial data enable responsible spatial management. This project justifiably represents an important cornerstone for the Slovene geoinformatic infrastructure for responsible spatial and real estate management, to provide quality location services and along with that a foundation to prevent risks and impacts of floods.

es for topographic data, orthophoto and hydrography have been established; all in accordance with contemporary technological standards. Different activities were carried out to inform the user base regarding data, metadata and network services.





SUBPROJECT **GEODETIC REFERENCE SYSTEM (GRS)**

Subproject manager: Klemen Medved, MSc (Surveying and Mapping Authority of the RS)

SUBPROJECT OBJECTIVES

ESTABLISHMENT OF A NATIONAL COMBINED GEODETIC NETWORK	
IMPLEMENTATION OF THE VERTICAL COMPONENT OF ESRS	

DEVELOPMENT OF THE GEOID MODEL FOR THE TERRITORY OF SLOVENIA

Technological advancements and development guidelines for the land surveying profession require the enforcement of a contemporary **geodetic infrastructure**. It will serve as the basic geodetic reference for the future implementation of a fourdimensional geodetic reference system in Slovenia. For this reason a new national combined geodetic network was established, which provides a state of the art and high quality frame for the national network of permanent GNSS station, the national horizontal/terrestrial reference system, national height reference system and the national gravimetric reference system. It serves as a multipurpose calibration grid for quality and adequacy control of measuring equipment and methods as well as land surveying measurement procedures. Additionally, it enables monitoring of geodynamic processes inside the country's territory. This so called national zero order geodetic network is made up of six points, which are Prilozje (in Bela Krajina region), Areh (Frajhajm na Pohorju), Kog (in Prlekija region), Korada (Zapotok in Goriška Brda











Zero order network point - Prilozje



region), Šentvid pri Stični and Koper (tide gauge of the Slovenian Environment Agency). The key factors when considering the location of these points were: geological suitability of the location (away from tectonic faults), local terrain stability and the potential for performing quality geodetic measurements (horizon openness, lack of electromagnetic radiation sources). In the construction of the points quidelines from the International Association of Geodesy - European Reference Frame (IAG-EUREF) for the stabilization of geodetic reference points of the highest order were taken into account.



Each of the six points is stabilized with an oval shaped concrete pillar approximately 2 meters in height, on top of witch two GNSS antennas (four points) or one GNSS antenna (two points) are installed with satellite signal receivers. The pillar houses a box with all the necessary equipment (surveying and telecommunication), along with devices for monitoring point stability and a meteorological station. Boreholes for the monitoring of groundwater levels are located at two points (Prilozje and Šentvid pri Stični).

Equipment at the zero order network point

Every point has its foundation on three micropiles or bedrock. To avoid any potential deformations due to temperature changes all points are insulated and protected with stainless steel. A fence at each location provides physical protection. Around every point 3 to 4 additional witness network points are stabilized at a distance of approximately 30 meters.

At every zero order network point multiple geodetic measurements were done in intervals of a few months for the implementation of these points in the reference frame and determining their stability. This meant conducting classic, GNSS, levelling and gravimetric observations. All data gathered at the zero order network points are continuously transmitted to the control center at the GNSS Service, Geodetic Institute of Slovenia where they are analyzed and stored using specialized software.

For easier decision making and better intervention when trying to reduce risks and impacts of floods the basic requirement is a high quality height system. As a part of the European Spatial



Geodetic survey at the zero order network point Korada

Reference System (ESRS) Slovenia begun with the establishment of a new height system. A prerequisite for its implementation is the restoration of the levelling network. The project summarized in this final report enabled an accelerated implementation of a new land survey of the high precision levelling line network, which was successfully concluded at the end of 2015. The new network is made up of 13 levelling loops, which are composed out of 2097 levelled height differences with 2036 benchmarks in a total length of 1800 kilometers.

Gravimetric measurements (measuring gravitational acceleration) were carried out on over 85% of benchmarks, which enable



The new levelling network of Slovenia

the calculation and adjustment of the levelling network by the geopotential numbers. As a result we are introducing »normal heights« in Slovenia which consider Earth's gravitational field in their calculation. The results of network levelling are more than excellent as the accuracy estimation for observing height differences is 0.5 mm/km.

Another important development is the **changing of the height** datum of Slovenia as the starting point for the new Slovenian height system comes from the national tide gauge in Koper, which will replace the old »Austro-Hungarian« height datum with its starting point in Trieste. This change will result in a shift of the height system between 9 and 14 cm (due to the difference in both starting points and the new levelling network), regarding which all data users need to be made aware of and warned. For this reason and in the scope of this project a transition protocol to the new height system has been prepared, which will be carried out in line with the National Land Survey Reference System Act (Official Gazette of the RS, No. 25/14).

Contemporary land surveying techniques that utilize global navigation satellite system provide a fast and easy to use means for determining coordinates (horizontal and vertical). Such height measurements relate to the reference ellipsoid and as such do not provide much information regarding terrain altitude to users, because the physical heights are subject to Earth's gravitational field. So, to determine heights in the national height system a crucial part is the height reference surface, in other words a guasigeoid model.

To crown all the activities carried out and new data gathered in this subproject we approached the calculation of a **new quazi**geoid model for the territory of Slovenia. For a high quality determination we needed data of the absolute gravimetric measurements of all six existing absolute gravimetric points in Slovenia. Additional Regional gravimetric measurements were made in the northwest, central and southeast parts of Slovenia.

On the basis of these data and in the frame of this project a new high quality national quazi-geoid model of Slovenia was calculated, which enables height determination with a deviation of less than 10 cm.

All activities and especially results of this subproject, which are reflected in the new zero order network, the new height system







FINAL PROJECT REPORT 2013-2016

and the new quazi-geoid, represent a »physical milestone« for the Slovenian surveying profession and an important contribution to a high quality geodetic reference system. Only such a system enables the implementation of high quality and credible geodetic measurements and their use in planning preventive actions to reduce risks and impacts of floods.



Regional gravimetric measurement

The quazi-geoid model of Slovenia





SUBPROJECT **TOPOGRAPHIC DATABASE (TOPO)**

Subproject manager: Marjana Duhovnik (Surveying and Mapping Authority of the RS)

SUBPROJECT OBJECTIVES

CHANGE OF THE EXISTING TOPOGRAPHIC DATA MODEL WITH REGARD TO I
ESTABLISHMENT OF A PHYSICAL TOPOGRAPHIC DATABASE MODEL AND DI MANAGING DATA IN ACCORDANCE WITH THE NEW TOPOGRAPHIC DATABA
TRANSFORMATION OF EXISTING TOPOGRAPHIC DATA INTO THE NEW DATA
TOPOGRAPHIC DATA ACQUISITION IN ACCORDANCE WITH NEW INSTRUCTION
DEVELOPMENT OF NEW METHODS AND PROCESSES FOR THE MAINTENANO
CREATION OF A NETWORK SERVICE FOR VIEWING TOPOGRAPHIC DATA

The primary goal of the subproject TOPO was to ensure national topographic data in accordance with provisions of the INSPIRE Directive. For this purpose a new data model for topographic data was established. In Slovenia many different datasets of the same or comparable accuracy level exist that also include specific topographic data themes defined in the INSPIRE Directive. Hence, one of the subproject's objectives is for the new topographic model to become the basis for transforming these existing datasets into an INSPIRE compliant manner. For this purpose a proposition for a **new topographic data model**



MODERNIZATION OF SPATIAL DATA INFRASTRUCTURE TO REDUCE RISKS AND IMPACTS OF FLOODS





was prepared and presented firstly to the expert public. Because no substantive remarks were given the proposition was accepted as the data model for national topographic data -National Topographic Model (državni topografski model - DTM).

In the development and establishment of DTM individual themes from existing national topographic datasets were included: DTK 5 topographic data (scale of 1 : 5000), the Consolidated Cadastre of Public Infrastructure, Register of Geographic Names and the digital terrain model.



DATA SET	LAYER	INSPIRE THEME
DTK 5	Building	Buildings
DTK 5	High object	Buildings
ZK GJI	Powerline	Utility and governmental services
DTK 5	Road	Transport networks
DTK 5	Railway	Transport networks
DTK 5	Cableway	Transport networks
DTK 5	Vegetation	Land cover, Land use
DTK 5	Special use area	Land use, Land cover,
DTK 5	Water area	Hydrography
DTK 5	Watercourse (line)	Hydrography
DTK 5	Water phenomenon	Hydrography
REZI	Geographical names	Geographical names
DMR	Digital elevation	Elevation

List of national topographic datasets, layers and themes, included in the DTM

The data models of individual themes follow the direction specified in INSPIRE Directive regulation and ISO international standards in the field of spatial data modelling. The complexity and detail of these data models varies as it depends on intended use of the datasets and connection with other themes content wise. The models differ in the number of features, number of attributes and entity relations.

In the next step DTM was established in physical form as an ORACLE Object-relational database with ESRI SDE components on a data server of the Surveying and Mapping Authority of the RS. After the physical establishment of DTM the database was filled with data from the before mentioned national topographic datasets (data migration from the old data model into the new, common DTM data model was executed for each individual dataset). Elaborate rules were prepared for the data migration, which describe the relationships of old and new attributes, define value ranges of new attributes for individual features and specify necessary changes to object geometry.

Because DTM includes additional content in regard to existing topographic datasets (new features, attributes, feature relations) some new information (attributes, relations) were added to spatial objects during the migration. At the same time some systemic errors in existing data were abolished, which were found during the initial data analysis. Additionally, some data had to be transformed from the old (D48GK)

into the new national spatial reference system (D96TM) during the data migration. This ensured that all data in the new national topographic dataset are in the new coordinate svstem.

For the management of the new topographic dataset an application was developed, which allows DTM managers to review topographic data in 2D and 3D view, export data for distribution and restoration, control of restored data and data import back into the database in a user-friendly manner.

New instructions for the acquisition and restoration of topographic data were prepared. They include an object

DTM - Navodila za zajem topografskih podatkov – ver 1 0

Način zaiema

- Poligon stavbe se zajame po okviru stavbe nad tlemi, tj. največjem obsegu stavbe nad tlemi. To je v večini primerov kap strehe. Zajame se vse vogale okvira stavbe, ki imajo vsak svojo Z koordinato (Z koordinata ustreza dejanski nadmorski višini vogala)
- Kadar okvir stavbe predstavlja streha stavbe (z napuščem ali brez), je vrednost atributa HZ REF GEO = 4 (strešni roh)
- · Kadar ima stavba ravno streho ali pa je streha celotne konstrukcije kombinirana, je vredno atributa HZ REF GEO = 1 (nadzemni okvir).



Centroid stavbe se zajame kot atribut (CENY, CENX), Referenčna točka za centroid je središče tlorisa stavbe in mora biti znotraj poligona stavbe

Pri stikih dveh stavb ali delov stavbe, kjer se strehi prekrivata, se v celoti zajame tisti obod, ki je višie (se ga vidi), nižie ležečega pa se zajame do preseka z višie ležečim



Nadstreški se ne zajemajo kot stavbe. Kjer iz virov ne moremo interpretirati ali gre za nadstrešek (se ne zajema) ali »prizidek« (se zajema), tak del zajamemo kot stavbo, Izpolnjevati mora kvantitativne kriterije za zajem stavb



Excerpt from the rules for acquisition and restoration of topographic data on structures

catalogue with feature descriptions, their attributes and code lists as well as rules for acquisition and attribution of individual features. The basic data acquisition method has also been changed. The current one is a combined photogrammetric acquisition based on results of cyclical aerial imaging and lasers scanning of Slovenia. Such a combined approach for topographic data acquisition enables a more precise determination of the third dimension (height) and topographic object attributes. In order to field-test the new acquisition rules a test acquisition of topographic data was carried out in a limited area.

> LITIJA Podkra



Simplified basemap version (created using WMS)



FINAL PROJECT REPORT 2013-2016

In the scope of the subproject a **network service for viewing** of raster topographic data (web map service – WMS) was developed. The first step was to create a draft plan for the first iteration of the basemap. The physical model had to be slightly updated due to data display and then followed the creation of the basemap view network service. Currently, a simplified version of the basemap is accessible, which will be supplemented with addition data layers. The simplified version includes all objects that were in the DTK 5 topographic dataset and geographical names.







SUBPROJECT INSPIRE (INSPIRE)

Subproject manager: Tomaž Petek (Surveying and Mapping Authority of the RS)

SUBPROJECT OBJECTIVES

CREATION AND IMPLEMENTATION OF THE CAPACITY BUILDING PROGRAM INSPIRE DIRECTIVE
PREPARATION OF INSTRUCTIONS FOR INTEROPERABILITY, THE COHERENTHE UPDATE OF THE METADATA SYSTEM
TRANSFORMATION OF SPATIAL DATA SETS IN THE DISTRIBUTION ENVIRON MAPPING AUTHORITY OF THE REPUBLIC OF SLOVENIA IN ACCORDANCE WI
CREATION OF DISCOVERY, VIEW, DOWNLOAD AND TRANSFORMATION N
INTEGRATION OF THE NETWORK SERVICES AND METADATA INTO THE SL

The subproject INSPIRE established part of the Slovene **infrastructure for spatial information**, meaning the inclusion of results from other subprojects in the frame of the project »Modernization of spatial data infrastructure to reduce risks and impacts of floods«. The Slovene infrastructure for spatial information is being established in accordance with the Directive 2007/2/EC of the European Parliament and of the Council establishing an Infrastructure for Spatial Information in the European Community (INSPIRE Directive). The Directive defines the general rules for establishing a spatial data infrastructure for the European Union as a collection of infrastructures for spatial information of individual Member States and is of great importance for managing











environmental policies as well as other public purposes. The Infrastructure for Spatial Information Act (ZIPI, Official Gazette of the RS, No. 8/10 and 84/15) introduced the INSPIRE Directive into the Slovene legislation and defines obligations stemming out of the INSPIRE Directive.

In the subproject spatial datasets that reside in the distribution environment of the Surveying and Mapping Authority of the RS were transformed into INSPIRE conformant data schemes. Discovery, view, download and transformation network services were created for topographic data, orthophoto, the Register of Spatial Units and hydrography. Together with data transformation the information system for metadata has been updated and new metadata descriptions have been created with an emphasis on network services. Metadata and network services have been integrated into the Slovene (http://www.geoportal.gov.si) and European geoportal INSPIRE (http://inspire-geoportal.ec.europa.eu/). Instructions for data managers on how to ensure interoperability and harmonization of spatial datasets and network services in accordance with the INSPIRE Directive along with instructions for the creation of metadata and network services have been updated. To further the efficient implementation of the INSPIRE Directive and increase the recognition of how important a Slovene infrastructure for spatial information is we designed a **capacity building plan** to fulfill provisions from the INSPIRE Directive and the Infrastructure for Spatial Information Act, prepared workshops with data users and organized a Slovene INSPIRE conference.



Elements of the Slovene infrastructure for spatial information

In the planning and analyzing phase of the common infrastructure for spatial information the first step was to prepare expert starting points, standards and recommendations, which all consider the INSPIRE Directive. An analysis of all the subprojects regarding their horizontal content was carried out and an approximate timeline was established. An initial IT architecture design with maintenance procedures was created for the Slovene Infrastructure for Spatial Information (IPI) that includes datasets from the list of data themes, metadata and services. The following products have been created:

- logic model of components and infrastructure for the distribution database and for the communication and information exchange system.
- logic model of the data transformation/replication system from the production system into the distribution system for hydrographic data,
- specifications for input and output parameters of specific network services,
- detailed model of the public viewer system "javni vpogled" and data download for data inside the distribution environment.
- logic model for the development and expansion of components

in the network service infrastructure of the distribution system.

These tasks were followed by activities to inform and train **stakeholders in the IPI**, with the intent to facilitate and accelerate execution of obligations from the INSPIRE Directive for the establishment of network services that will be integrated into the Slovene INSPIRE geoportal, putting emphasis of topographic data. An informing and capacity building program has been carried out, which included informing users regarding obligations and activities in the form of seminars, workshops, conferences and promotional materials. Instructions for preparation of metadata descriptions were prepared, the metadata information system on the Slovene INSPIRE geoportal has been upgraded and metadata for spatial data themes from Annex I, II and III of the INSPIRE Directive have been prepared and supplemented along with corresponding services.

The next phase was a detailed plan of the technical implementation. A plan for the creation of network services for topographic data, orthophoto, Register of Spatial Units and hydrography has been prepared. Instructions for ensuring interoperability of spatial data in the domain of other managers were prepared. In this phase a plan to integrate topographic data into the distribution system of the Surveying and Mapping Authority of the RS was prepared, which also defined the relation between the dataset production and distribution as well as interconnectivity and harmonization between hydrographic, topographic, transportation and building datasets.

In the technical implementation phase network services for some spatial data were established. These services are available for topographic data, orthophoto and Register of Spatial Units, addresses, hydrography and geographical names. They can be accessed through the Slovenian and European geoportal INSPIRE. Technologic solutions were designed acknowledging network service standards and spatial data interface standards developed and maintained by the Open Geospatial Consortium (OGC). The technical environment was established using a modified version of the Geoserver tool. It uses IAVA Runtime Environment and is compatible with equipment used in the common ITC infrastructure in the Slovene State Cloud (SSC) at the Ministry of Public Administration

On the basis of experiences gathered when creating the previously stated services, instructions and guidelines for the harmonization of other network services in accordance with the INSPIRE Directive were prepared. The information system for metadata at the Slovene INSPIRE geoportal was updated (new required metadata descriptions were added as well as additional functionalities of the geoportal). Metadata descriptions and corresponding network services for changed or updated datasets were prepared. For metadata descriptions discovery network services were created in accordance with the INSPIRE Directive. The Slovene INSPIRE geoportal was supplemented and partially redesigned. In now



Slovene geoportal

The use of quality and easily accessible data in spatial and environmental management processes enables the consideration of sustainable development principles in the economy, provides a foundation for managing environmental and spatial policies in Slovenia and ensures a base for effective spatial planning and management as well as environmental protection.





infrastructure



includes some new content, most notably a network viewer for INSPIRE services, overview of accessible network services, overview of accessible network displays of spatial data etc.

With the results of the subproject INSPIRE users are given a standardized means for quick and easy access to spatial and environmental data along with corresponding network services. Such an infrastructure is needed for efficient and effective decision making in spatial and environmental management, planning flood protection as well as enabling interoperability and reuse of data and services relating to spatial and environmental data.

Access points and portals in the frame of a common

24



SUBPROJECT **HYDROGRAPHY (HIDRO)**

Subproject manager: Boštjan Savšek (Ministry of the Environment and Spatial Planning)

SUBPROJECT OBJECTIVES

THE MIGRATION OF HYDROGRAPHIC DATA CAPTURED WITH A TEST ACQUISITION (320 SHEETS) INTO THE TOPOGRAPHIC DATABASE OF THE SURVEYING AND MAPPING AUTHORITY OF THE RS

UPDATE OF THE SPATIAL DATA INFRASTRUCTURE TO IMPROVE OPERATIONAL HYDROLOGICAL SYSTEMS

UPDATE OF THE WATER INFRASTRUCTURE DATABASE TO IMPROVE THE PROCESS OF WATER MANAGEMENT AND MAINTENANCE

The subproject HIDRO is closely connected with the other subprojects, hence a major goal was the integration of

MODERNIZATION OF SPATIAL DATA INFRASTRUCTURE TO REDUCE RISKS AND IMPACTS OF FLOODS

The main purpose of the subproject was to upgrade and improve the effectiveness of water management services and hydrological forecasting in such a manner that enables the establishment of a central data structure for water management and for new products, along with new findings, to be included in the process of generation of hydrological forecasts with the intention for effective flood protection.

The subproject has been concluded in 2015. All subproject objectives have been achieved and the use of created applications along with the hardware and software infrastructure have in a short period of time shown a much greater value of the subproject's results.

hydrographic data in the spatial data system of the Surveying and Mapping Authority of the RS. We carried out hydrographic data migration, which was gathered with a test acquisition, into the topographic database of the Surveying and Mapping Authority of the RS. These test data were captured and attributed in accordance with the INSPIRE Directive. At the same time a document was prepared that defines the **updating**, **upgrading** and maintenance procedures of hydrographic data.

Mass acquisition of hydrography and water land uses

The added value of updating the hydrographic data is not just significant in the scope of the topographic data system but also as an important part in models for hydrological forecasting. The system for hydrological forecasting has successfully incorporated surface laser scanning data, which improved the

accuracy of 2D hydrodynamic models. The software application VodePro, which provides support for work processes at the hydrology office, was updated. This software enables the use of analyzed satellite imagery in controls for hydrological forecasting. The satellite imagery is accessible in a modern manner over network services and available to analysts for hydrological forecasting. A lot of new ideas and momentum came from our young colleagues who partook in a bilateral workshop regarding hydrological forecasting in Oslo that was organized in the frame of the project »Modernization of spatial data infrastructure to reduce risks and impacts of floods«.

An important goal of the subproject was also the optimization and modernization of the water management process. For this purpose a system along with software were created to take inventory of water infrastructure objects. These solutions were already tested by registrars in a limited test area. The gathered data replenished the water infrastructure database in the testing areas. During the test new water infrastructure objects were registered and the designed software solutions proved to be appropriate. This presents a good foundation for continued improvements and filling of the water infrastructure database for the entire territory of Slovenia.

But the products of the subproject are useful in a broader scale, beyond the frame of this project. The results are being successfully incorporated into the mosaic of activities that were carried out in the field of water management data infrastructure and reduction

Improved input data for hydrodynamic models

Web viewer for LIDAR data of Slovenia, which enables data download free of charge

of flood risk. As a result there are available data for **hydrography** and water land in resolution and scale of 1:5000. All are captured in accordance with rules of the INSPIRE Directive and are available to the public through the **network viewer "Atlas voda". Analysis** and distribution of LIDAR data for Slovenia is being done on hardware procured in the subproject. This service has been chosen as the best public administration e-service in the year 2015 at the conference Informatics in Public Administration. LIDAR data for the entire territory of Slovenia are accessible for reuse free of charge. After the severe flooding in 2014 tools and software, which were acquired in the frame of the subproject HIDRO, along with the existing infrastructure for spatial information were used to support

an action plan of intervention activities against floods, which

enabled a practically real - time monitoring of the execution of

intervention activities, which got a lot of media coverage. At the

same time the established infrastructure presents an important

investment for future projects in the field of hydrography as it is

already used as a basis for the preparation and planning of new

projects concerning hydromorfologic monitoring and hydrological-

hydraulic modeling of borderline watercourses.

workshop titled »LIDAR - how to best use this spatial data "gem" « at the Slovenian Chamber of Engineers, both to great public interest. The success of both workshops has clearly demonstrated that the expert as well as the broad public anxiously awaited such a modernization of data infrastructure, contributions for which came also out of this project.

The LIDAR dataset was also presented to the public at a workshop at the Slovenian Environment Agency and at a professional

Attendees of the workshop LIDAR at the Slovenian Environment Agency

Recognition for the best e-service of public administration in 2015

OPENING CONFERENCE OF THE PROJECT »Modernization of spatial data infrastructure to reduce risks and impacts of floods«

Ljubljana, February 4 2014

OTVORITVENA KONFERENCA TOREK, 4. FEBRUAR 2014 GOSPODARSKO RAZSTAVIŠČE LIUBLIANA

With the intention to inform the broadest possible public about an important international professional cooperation, the **Opening conference of the project** was organized on February 4 2014 at Ljubljana Exhibition and Convention Center (Gospodarsko razstavišče). There the financial and timeline structure along with activities of the individual subprojects were presented to the public. The conference was attended by Slovenian project team members, partners from Norway and Iceland and almost 100 other participants, who could attend speeches by important speakers and high quality expert lectures on different topics, all connected to flood related threats and geodetic data, which provide the basis for decisions in space. The conference was followed the next day by two workshops on the themes of topographic data and INSPIRE.

The importance of the event was accented by the attendance of the Minister for Agriculture and

Environment, Deian Židan, MSc. and the State Secretary at the Ministry of Infrastructure and Spatial Planning, Bojan Babič, MSc. In his speech Minister Židan emphasized that the modernization of spatial data infrastructure is not important just for the compliance with European standards but mainly for the protection of endangered population in case of natural disasters where reliable and high quality spatial data enable effective decision making. The Director General of the Surveying and Mapping Authority of the RS, Aleš Seliškar, also spoke about the project's importance.

At the expert part of the conference our project partners from Norway and Iceland presented opportunities, where their own successful experiences could help facilitate the best possible implementation of the project, followed by lectures from the best Slovenian experts from individual areas, in which they presented their specific views on the project and subprojects.

Guests form Norway and Iceland

Conference participants

The conference has also had very good media coverage. A lot of reporters were attending the conference, who produced reports for TV Slovenia, POP TV, Svet na Kanalu A, Radio Slovenija – VAL202, Radio Kranj and for daily newspapers and internet portals Delo, Dnevnik, Finance, STA, Slowwwenia.com ... The whole conference was recorded and is accessible on the education portal of the Slovenian Chamber of Engineers on the web page: http://izs.mitv.si/ asset/pmHltvxWETtdLAi7F

The presentations are published on the web page of the project: http://www.gurs-egp.si.

24th EUREF SYMPOSIUM – PRESENTING OF THE NATIONAL **REPORT REGARDING THE REALIZATION OF THE GEODETIC REFERENCE SYSTEM IN SLOVENIA FOR THE PERIOD 2013-2014**

Vilnius, June 4 to 6 2014

The **24th EUREF symposium** took place from the 4th till 6th of June 2014 in Vilnius, Republic of Lithuania. EUREF is the International Association of Geodesy (IAG) Reference Frame Sub Commission for Europe. The symposium was organized by the National Land Service under the Ministry of Agriculture of the Republic of Lithuania and the Research Institute of Geodesy. The organizers presented the city of Vilnius as one of the most visited cities in the northeast part of Europe.

The annual EUREF symposia are of immense importance for the land surveying profession as they are meant as a platform for expert lectures, discussions and informing representatives of European

area states about the current implementation and maintenance of the common European Reference System. The symposia also provide the opportunity to present national reports on the activities of individual states in this field along with renewing and strengthening of relations between professional colleagues.

The symposium was attended by approximately 100 representatives from 31 states. During the event experts focused mainly on the importance of the real time development of the Global Navigation Satellite System, the development of ETRS89, the height system and gravimetry. The Slovenian representatives at the symposium, Jurij Režek, MSc, and Klemen Medved, MSc, presented the Slovene national report on activities in the field of the geodetic reference system and presented the activities of the subproject GRS.

Participants at the symposium

PRESENTATION OF THE NATIONAL COORDINATE SYSTEM AT THE EUROPEAN SPACE EXPO

Ljubljana, March 13 to 15 2015

Between the 6th and 15th of March 2015 Ljubljana hosted the traveling interactive exhibition of the European Commission European Space Expo. It has been on the road since 2012 and has left its mark on 27 major European cities where it was visited by more than half a million people. Its purpose is to present key information regarding the European Space Program and bringing today's space technologies closer to the mases. The visitors were able to get information regarding the satellite navigation system Galileo and EGNOS (European Geostationary Navigation Overlay Service) and the Earth observation program Copernicus as well as try out different applications of satellite technologies. The interactive nature enabled the visitors to learn about the practical applications of satellite technologies for traffic optimization, higher efficiency in agriculture and fishing, environmental protection, monitoring of climate change, managing of emergency situations due to natural or industrial disasters, humanitarian aid and better security of EU citizens.

In the frame of the exhibition short popular science presentations were organized each day with which national experts, engineers and scientists presented Slovenian activities and achievements in the field of space science and technologies.

The Surveying and Mapping Authority of the RS was also part of the Expo. On Friday, March 6, a special event took place organized by the EUROGI/CEKTRA titled »Halo Zemlja, tukaj Vesolje, imamo rešitev« (Eng. trans.: Hello Earth, Space calling, we have a solution). The contribution regarding the use of remote sensing in managing and maintaining geodetic data with the title **»Use of** remote sensing at the Surveying and Mapping Authority of the RS« was presented by Tomaž Petek. On Saturday, March 14, Klemen Medved, MSc, gave a presentation titled »No satellites - no national coordinate system«. He presented the meaning of a coordinate system and the activities carried out in this project for the establishment of its horizontal and vertical components.

The Space Expo tent at Congress Square

Klemen Medved, MSc, during his presentation

43rd LAND SURVEYING DAY – PRESENTING THE ACTIVITIES **NEEDED TO ESTABLISH A MODERN GEODETIC REFERENCE** SYSTEM IN SLOVENIA

Sežana, April 10 2015

Organized by the Association of Surveyors of Slovenia and the Surveyor Association of the Primorska region an expert gathering took place during the 43rd Land Surveying Day at Kosovelov dom in Sežana titled Land Surveying (r)evolution. This traditional annual expert gathering of surveyors is an important educational event and provides an opportunity to share experiences, knowhow and ideas on a broader scale. One of the high quality expert contributions from home and abroad was a presentation titled »Activities for the establishment of a modern Geodetic Reference System in Slovenia«, which was prepared as a collaboration between prof. Bojan Stopar, PhD, Assistant prof. Božo Kolar, PhD, Tilen Urbanč, Assistant prof. Miran Kuhar, PhD, Assistant prof. Polona Pavlovčič Prešeren, PhD, Oskar Sterle, MSc (UL FCGE); Jurij Režek, MSc, Klemen Medved, MSc, Žarko Komadina (SMA); Sandi Berk, Katja Bajec and Katja Oven, MSc, (GIS). The presentation was given by prof. Bojan Stopar, PhD.

It covered the activities which were carried out in the frame of the subproject Geodetic reference system of the project »Modernization of spatial data infrastructure to reduce risks and impacts of floods« from 2013 till the end of 2014. Emphasis was given to the activities for the establishment of the horizontal and vertical components of the new National Coordinate System. For the horizontal component these included the analysis of the existing terrestrial reference system, analysis of different implementation possibilities for the realization of a new geodetic datum and defining the role of the combined zero order geodetic network in the frame of the national spatial reference system. The other tasks included work on the level-

ling and gravimetric networks, the execution of regional gravimetric measurements, quality control of existing geoid models in Slovenia, activities for the realization of the new vertical datum and the future establishment of the Global Height System in Slovenia.

Solemn opening of the Land Surveying Day

Project promotion at the Land Surveying Day

REPORTING ON THE PROJECT AT THE INSPIRE CONFERENCE IN LISBON

Lisbon, May 25 to 29 2015

From May 25 till 29 2015 an **INSPIRE conference** was taking place in Lisbon, which was organized together with the Geospatial World Forum - GWF. The conference was attended by 1714 visitors and lecturers form 104 countries, who presented 374 reports divided into 11 parallel sections. Because of its size this conference is counted amongst the leading global events in the field of geoinformatics, the ensuring and use of spatial data. All contributions and documentation is available on the web page of the conference http://www.geospatialworldforum.org/.

At the conference the INSPIRE subproject manager Tomaž Petek presented the intermediate results of the project »Modernization of spatial data infrastructure to reduce risks and impacts of floods« and its long term goals: managing of water sources and reducing the risk and impacts of floods as well as improve data harmonization and network services in accordance with the INSPIRE Directive.

Tomaž Petek presenting the Slovene contribution

Participants in the Spatial Data Infrastructure (SDI) section

25th EUREF SYMPOSIUM – PRESENTING OF THE NATIONAL **REPORT REGARDING THE REALIZATION OF THE GEODETIC REFERENCE SYSTEM IN SLOVENIA FOR THE PERIOD 2014-2015**

Leipzig, June 3 to 5 2015

From the 3rd till 5th of June 2015 the jubilee 25th annual International Association of Geodesy Reference Frame Sub Commission for Europe (EUREF) symposium was held in Leipzig, Germany, which was organized by the German Federal Agency for Cartography and Geodesy (BKG).

The symposium was attended by 110 representatives from national surveying authorities and other geodetic institutions, which look after the European Geodetic Reference System in 32 states, including Slovenia (picture below). In the scope of the three day gathering the participants could listen to 41 lectures and 24 national activities reports.

The Slovene national activities report was prepared in cooperation with the Surveying and Mapping Authority of the RS, the Geodetic Institute of Slovenia and the Faculty for Civil and Geodetic Engineering, University of Ljubljana. Klemen Medved, MSc, the GRS subproject manager, presented the report at the symposium.

26th SEDLAR MEETING

Ljubljana, June 12 2015

Planning.

The expert gathering was divided into three thematic sections. In the first, introductory

part, the honorary speakers gave welcome speeches, the second part was dedicate to the work of prof. Maks Fabiani, PhD, and the third for expert presentations of contemporary solutions and projects. In the last section Jurij Režek, MSc, presented his contribution »Can bad spatial data change the course of water?«.

Mr. Režek emphasized the importance of a georeferenced infrastructure, which consists of the National Spatial Coordinate System along with some spatial data, important mostly for displaying the height component of space. He described the efforts of the land surveying profession along with the public and education sectors for a professional establishment of a geodetic and georeferenced data infrastructure in accordance with international standards. He mentioned activities, which were and are still carried out through projects, financed with the help of international financial mechanisms. He stressed the need for informing the professional public – experts from other professions who use spatial data – on the risks presented by a lack of knowledge of spatial and geodetic data specificities when they use them as input in their everyday work. This can lead to questionable solutions even though they were prepared with the aid of best practice methods.

During his showing Mr. Režek also presented the importance and results of the project »Modernization of spatial data infrastructure to reduce risks and impacts of floods«.

MODERNIZATION OF SPATIAL DATA INFRASTRUCTURE TO REDUCE RISKS AND IMPACTS OF FLOODS

Organized by the Town and Spatial Planning Association of Slovenia (TSPAS) the 26th Sedlar meeting took place on the 12th of June at the Ljubljana City Museum. The meeting was aptly titled Spatial Development Visions - Water Space

UNVEILING OF THE ZERO ORDER NATIONAL GEODETIC **NETWORK POINT - PRILOZJE**

ZERO ORDER NETWORK WORKSHOP

Prilozie, September 11 2015

Prilozje, September 11 2015

On Friday, September 11 2015, the first working zero order network point was solemnly unveiled and put into operational use with all the necessary geodetic and telecommunication equipment. It is situated near the recreational airfield in Prilozje, municipality of Metlika. Because this presents a special occasion in the modern land surveyor history an informational plaque has been placed there to communicate the purpose and importance of the network point to the broad public alongside the significant role the financial mechanisms had in the construction of the basic geodetic infrastructure in Slovenia.

The event was attended by the Minister of the Environment and Spatial Planning Irena Majcen, who in her speech emphasized the importance of high quality data and the establishing of a geo-information infrastructure based on common, European guidelines and technologies to ensure international cooperation and economic, spatial, environmental and social development. And the core component of such infrastructure is the so called European Reference System, which has to be established by each EU member state.

The gathered public was greeted by the Director General of the Surveying and Mapping Authority of the RS Anton Kupic and the Director of the Geodesy Office at the Surveying and Mapping Authority of the RS Jurij Režek, MSc, who emphasized the significance of a national geodetic reference basis and the importance of the Norwegian financial mechanism and the EEA Financial Mechanism, which together with the Surveying and Mapping Authority of the RS co-financed tasks relating to the National Geodetic Reference System for the past ten years.

The event was attended by around 60 people, mostly co-workers form the Geodesy Office, which deserve the main credit for the establishment of the Slovene georeferencing system, colleagues for the Department of Geodetic Engineering, Faculty of Civil and Geodetic Engineering, University of Ljubljana, representatives from the Geodetic Institute of Slovenia, which prepared the expert basis for its establishment, as well as colleagues from the Geodetic Association of the Dolenjska region, Regional offices of the Surveying and Mapping Authority of the RS and others. The event also sparked attention in the press which reported on it in different media.

Solemn unveiling of the point

Colleagues form the Geodesy Office with the Minister and the Director General

In the beginning of September at the unveiling of the first national zero order geodetic network point at Prilozje, municipality of Metlika, a workshop was organized titled National combined geodetic network, zero order point Prilozie. The participants firstly toured the point's location and then Klemen Medved, MSc, described the professionally demanding topic of our basic national geodetic network as a fundamental part of our national infrastructure in a colorful manner to around 50 listeners. He presented some activities that were implemented in the frame of the subproject Geodetic reference system and emphasized the significance of two key tasks, the establishment of high quality horizontal and vertical components of the national coordinate system.

professional views

Participants touring the zero order network point and Klemen Medved, MSc, during his presentation

FINAL PROJECT REPORT 2013-2016

The presentation was followed by a lively discussion and Q&A panel with the presenter. The event concluded with the informal part of the workshop at which participants exchanged their

FIRST SLOVENE INSPIRE DAY

Ljubljana, September 21 2015

8th SYMPOSIUM OF CHARTERED GEODETIC ENGINEERS OF CROATIA

Opatija, October 23 to 25 2015

In the organization of the Surveying and Mapping Authority of the RS and in the scope of the subproject INSPIRE the First Slovene INSPIRE conference with international participation was held on September 21 2015. The main theme of the conference was network services while its purpose was to present experiences experts have gathered during the establishment of network services and spatial information abroad as well as present INSPIRE compliant network services, which are being implemented in Slovenia in the frame of the project »Modernization of spatial data infrastructure to reduce risks and impacts of floods«.

More than 70 people were attending the conference, from the public and private sector, who over the course of the day listened to important lecturers and expert presentations and also used this opportunity to exchange and convey experiences with the implementation of the INSPIRE Directive.

In the introductory part of the event the attendees were greeted by State Secretary at the Ministry of the Environment and Spatial Planning Tanja Bogataj, MSc, who highlighted the importance of readily accessible and quality spatial data for sustainable development and efficient spatial and environmental management. Then followed the solemn speeches from Deputy Director of the Surveying and Mapping Authority of the RS Erna Flogie Dolinar, MSc, and the INSPIRE subproject manager Tomaž Petek. He spoke a few introductory words on the meaning and overall theme of the Slovenian INSPIRE day and with his opening presentation INFRASTRUCTURE FOR SPATIAL INFORMATION IN SLOVENIA commenced the expert part of the conference.

Everyone attending the conference received a document titled ABC INSPIRE, in which all the main tasks and responsibilities stemming for the INSPIRE Directive and the national Infrastructure for Spatial Information Act (Official Gazette of the RS, No. 8/10 and 84/15) are summarized for an initial overview for providers of spatial data sets.

All presentations are available on the project's web page http://www.gurs-eqp.si/podprojekti/inspire/dokumenti.

policy for the future«.

This established gathering of Croatian land surveyors is the biggest professional event in the country, which is attended by more than 700 chartered surveyors as well as representatives from the Croatian Surveying Authority and the Faculty for Geodesy, Zagreb. The event organizers have been for the past few years trying to include international participation at their symposia and the foreign lecturers at the 8th symposium were especially interesting. Amongst the presenters where: the Council of European Geodetic Surveyors - CLGE President Maurice Barbieri, IG PARLS President Clemens Kiepke, Dean of the Faculty for Geodesy in Munich, prof. Thomas A. Wuderlich, PhD, and the representative from the Surveying and Mapping Authority of the RS Jurij Režek, MSc. All the honored guests were partaking in a round table at the opening ceremony in which they discussed the current state of geodesy in modern society.

The symposium was divided into sections. In the one title **»European experiences for Croatian land surveying«** the »Modernization of spatial data infrastructure to reduce risks and impacts of floods« Project manager Jurij Režek, MSc, presented his contribution titled »Geodetic infrastructure - pointless cost or component of statehood?«.

Participants of the round table debate

MODERNIZATION OF SPATIAL DATA INFRASTRUCTURE TO REDUCE RISKS AND IMPACTS OF FLOODS

FINAL PROJECT REPORT 2013-2016

The Croatian chamber of chartered geodetic engineers organized the eight symposium of chartered geodetic engineers of Croatia in October 2015 in Opatija titled »Geodetic

> The presentation displayed the results of both Slovene projects financed out of the Norwegian Financial Mechanism and the EEA Financial Mechanism. It also showed global, regional and national geodetic infrastructure and encouraged appreciation of geodetic infrastructure as a component of statehood. In the closing of his presentation Mr. Režek concluded that the level of appreciation for geodetic infrastructure is definitely too low in the confines of the surveying profession, let alone policy makers and broad public, who have a hard time understanding this demanding and expert topic and its importance in everyday life whilst ironically being highly dependent on it in their daily activities without their knowledge. The logical inference of this conclusion is the need for a more active communication and awareness raising about land surveying and what it actually means and encompasses and how its products and applications impact everyday activities of users.

44th LAND SURVEYING DAY - PRESENTING THE **ACTIVITIES FOR THE ESTABLISHMENT OF THE NATIONAL TOPOGRAPHY MODEL IN SLOVENIA**

Laško, March 3 to 4 2016

The International Cartographic Association - ICA has with support from the United Nations declared the years 2015 and 2016 as International Map Year. This naming has prompted the organization of many events. The Association of Surveyors of Slovenia and the Surveyor Association of Celje have in Laško organized the 44th Land surveying day at which a professional conference titled Maps for good decision **making** took place as a dedication to cartography and to the International Map Year.

WE MAPS

The presentations of foreign and domestic experts at the conference showed the role, importance and achievements in the fields of cartography and spatial data display whilst also outlining the future uses of modern technology. They stressed the need for high quality spatial data and the appropriate visualization thereof in support of decision making and development processes. The presentations concluded with a round table titled Spatial data in support of decision making and development. The partakers of the round table debated the meaning of spatial data for the state and its administrative bodies, their appropriateness

and usefulness in spatial planning, their use in predicting natural disasters and interventions and their use in European cohesion projects for municipal infrastructure. The debate also touched on the quality, adequacy and accessibility of spatial data and needed resources to improve the stated areas along with propositions for changes to construction and spatial legislation.

The TOPO subproject manager Marjana Duhovnik presented her contribution at the conference titled Activities implementing the national topographic model. She informed the attendees about the tasks of the Surveying and Mapping Authority of the RS for the establishment of the national topographic model that were being carried out in the frame of the subproject TOPO.

Attendees of the Land surveying day

Marjana Duhovnik during her presentation

26th EUREF SYMPOSIUM – PRESENTING OF THE NATIONAL **REPORT REGARDING THE REALIZATION OF THE GEODETIC REFERENCE SYSTEM IN SLOVENIA FOR THE PERIOD 2015-2016**

Donostia-San Sebastian, May 24 to 27 2016

In the coastal city of Donostia-San Sebastian, Spain, the annual EUREF International Association of Geodesy Reference Frame Sub Commission for Europe (EUREF) symposium took place between the 24th and 27th of May 2016. The main purpose of EUREF is the definition, realization and maintanance of the common European referenc coordinatre system.

Around 100 representatives from 28 countries were attending the symposium. Among them were also the Slovenian representatives Klemen Medved, MSc, from the Surveying and Mapping Authority of the RS and Sandi Berk, from the Geodetic Institute of Slovenia. They presented the Slovene national report. It was prepared by colleagues at the Surveying and Mapping Authority of the RS, Geodetic Institute of Slovenia and the Faculty for Civil and Geodetic Engineering, University of Ljubljana and depicts activities regarding the national geodetic reference frame, the network of permanent station and other tasks carried out in the period 2015-2016. The result and work done so far of the subproject GRS was presented.

The program of the symposia was split into four parts; the first day a workshop on the European terrestrial reference system, followed by a series of expert lectures and discussions, presentation of national reports and concluded with the adoption of resolutions.

27th SEDLAR MEETING

Ljubljana, June 3 2016

LIDAR EXPERT WORKSHOP

Ljubljana, June 23 and September 1 2016

On the 3rd of June 2016 the **27th Sedlar meeting** took place at the City museum of Ljubljana. The Town and Spatial Planning Association of Slovenia (TSPAS) organized the event, which was called Spatial development vision: Green railway infrastructure. The purpose of the meeting was to encourage the expert and broad public to partake in a debate while also spur local and national government to enact timely and appropriate decisions and activities for the development of the railway network.

The gathered crowd (more than 70 people) were welcomed by the TSPAS President Liljana Jankovič Grobelšek, PhD, the Mayor of Ljubljana Zoran Janković and the Director General of the Spatial Planning, Construction and Housing Directorate at the Ministry of the Environment and Spatial Planning Barbara Radovan.

The introductory part was followed by interesting expert lectures. One among them was the presentation of the TOPO subproject manager Marjana Duhovnik titled »The new topographic data model as the basis for planning«. The presentation was co-authored by her, Primož Kete (Geodetic Institute of Slovenia), Danijel Boldin, MSc, and Jurij Režek, MSc (Surveying and Mapping Authority of the RS).

In her presentation she outlined the importance of the project »Modernization of spatial data infrastructure to reduce risks and impacts of floods« and activities carried out it the subproject TOPO: the establishment of the new national topographic data model, acquisition of topographic data and development of applications for data management and use. In her conclusions she emphasized the usefulness of the new national topographic data model data, which are managed in the new national coordinate system, for spatial planning and geolocating new railroad infrastructure, as they are used do define the geolocation for each and every spatial objects.

Marjana Duhovnik during her presentation

Organized by the Surveying and Mapping Authority of the RS and in the frame of the project »Modernization of spatial data infrastructure to reduce risks and impacts of floods« an expert workshop titled: »LIDAR - How best to use this spatial data "gem" was being held on the 23rd of lune 2016.

The workshop was centered on presenting this immensely important source of information: data acquisition method for the entire Slovenian territory and its accuracy as well as usefulness, presented with the help of best practice examples and finished projects. An important part was also the presentation of possible uses for LIDAR data and the potential this source of information represents for land surveying as well as other professions.

The workshop was carried out at the premises of the Slovene Chamber of Engineers. More than 80 participants listened to excellent presentations regarding terrain laser scanning and the use of LIDAR data.

In the introductory part the project manager, Jurij Režek, MSc, welcomed all participants and the expert part of the workshop was opened by the presentation given by Dušan Petrovič, PhD, titled »LIDAR KOT PODATKOVNI VIR ZA TOPOGRAFIJO« (Eng. trans.: LIDAR as a data source for topography), who also took over the moderator role. Following were presentations of the different lectures and the formal part of the workshop concluded with an expert discussion. The participants were actively involved in the discussion as the presentations sparked their interest for creative ways to use LIDAR data in their everyday work.

Welcome speech of Mr. Režek to the participants

Expert discussion after the presentations

EXPERT LECTURES

CLOSING CONFERENCE OF THE PROJECT

Ljubljana, October 18 2016

LIDAR KOT PODATKOVNI VIR ZA

Dušan PETROVIČ, PhD, Faculty for Civil and Geodetic Engineering, University of

LIDAR KOT SISTEMSKI VIR ZA ZAJEM VOD TER POTENCIALI, KI JIH PONUJA GEODEZIJI Mihaela TRIGLAV ČEKADA, Geodetic Institute of Slovenia

ODPIRANJE PODATKOV LIDAR IN PRIMERI DOBRIH PRAKS Primož KOGOVŠEK, Matej CUNDER, Slovenian Environment Agency

UPORABA LIDAR DMV ZA POTREBE IZDELAVE HIDROLOŠKO – HIDRAVLIČNIH MODELOV

Primož BANOVEC, PhD, Faculty for Civil and Geodetic Engineering, University of Ljubljana

ALI JE LIDAR NA DRONIH PRIHODNOST? Marko MESARIČ, Vid PETERMAN, Modri planet d.o.o

The workshop was a resounding success. Due to the overwhelming interest of the professional public the workshop was repeated in September which was also attended by more than 80 listeners.

The workshop participants received a leaflet titled »Raising data infrastructure standards - for simplified decision making and better actions«, which summarizes the results of the project.

All presentations are available on the project's web page http://www.gurs-egp.si/novice/172/strokovna-delavnica-lidar.

POSODOBITEV PROSTORSKE PODATKOVNE INFRASTRUKTURE ZA ZMANJŠANJE **TVEGANJ IN** POSLEDIC POPLAV

ZAKLJUČNA **KONFERENCA** CLOSED

KRISTALNA PALAČA LJUBLJANA

www.eeagrants.org

TOREK, 18. OKTOBER 2016

11:00 - 11:30 BRFAK

- GEODETIC INFRASTRUCTURE
- TOPOGRAPHIC INFRASTRUCTURE
- HYDROGRAPHIC INFRASTRUCTURE Primož KOGOVŠEK, subproject HIDRO
- Tomaž PETEK, INSPIRE subproject manager

CLOSING REMARKS

- Geodetic Engineering

èeea grants

www.gurs-egp.si

8:30 - 9:00 ARRIVALS

9:00 - 9:45 INTRODUCTORY SPEECHES

• Irena MAJCEN, Minister of the Environment and Spatial Planning • Alenka SMERKOLJ, Minister for Development, Strategic Projects and Cohesion • Kathrina RAMBERG, Chargé d'Affaires a.i., Royal Norwegian Embassy Matjaž MIKOŠ, PhD, Dean of the Faculty of Civil and Geodetic Engineering and Chairman of the Slovenian National Platform for Disaster Risk Reduction • Anton KUPIC, Director General of the Surveying and Mapping Authority of the RS

9:45 - 11:00 ABOUT THE PROJECT

• Jurij REŽEK, MSc, Project manager, Director of the Geodesy Office, Surveying and Mapping Authority of the RS

• Olaf Magnus ØSTENSEN, Director for Strategic Planning and Technological Development, Norwegian Mapping Authority

11:30 - 13:30 PRESENTING THE PROJECT'S RESULTS

Klemen MEDVED, MSc, GRS subproject manager

Marjana DUHOVNIK, TOPO subproject manager

INFRASTRUCTURE FOR SPATIAL INFORMATION

 INTERNATIONAL PARTNERSHIP AS ADDED VALUE Eydís Líndal FINNBOGADÓTTIR, Director of Service and Spatial Data Infrastructure, National Land Survey of Iceland

• WHAT HAVE WE LEARNED – WHAT HAS OUR PROFESSION GAINED? Bojan STOPAR, PhD, Head of the Geodetic department, Faculty of Civil and

13:30 - 14:30 CONCLUSION OF THE CONFERENCE

> COOPERATION WITH OUR NORWEGIAN AND ICELANDIC PARTNERS

INTERNATIONAL WORKSHOP IN LJUBLJANA Workshops of the subprojects TOPO and INSPIRE

February 5 2014

After the successful conclusion of the opening conference of the project »Modernization of spatial data infrastructure to reduce risks and impacts of floods« two international workshops were organized on the next day, February 5 2014, for the subprojects TOPO and INSPIRE. They took place at the Surveying and Mapping Authority of the RS and were attended by 27 representatives from 13 different institutions along with representatives from Norway and Iceland. The foreign participants presented the progress their respective countries made with similar projects and gave some professional guidance for project implementation in Slovenia.

The first part of the workshop was a plenary session of the subprojects' TOPO and INSPIRE workgroups at which the two subprojects were presented, followed by state of play presentations from the representatives of Norway and Iceland in the fields of topography and establishment of the national infrastructure for spatial information in their respective countries. The plenary sessions was used to familiarize the participants with the topography systems and the implementation of the INSPIRE Directive in all three countries and was followed by the division into workgroups for the infrastructure for spatial information and topography.

In the first workgroup led by Tomaž Petek, the INSPIRE subproject manager, the INSPIRE subproject capacity building program was discussed (showing the implementation of the INSPIRE Directive in Slovenia, capacity building program, action plan for the implementation of the capacity building program).

The second workgroup was led by Marjana Duhovnik, TOPO subproject manager. They discussed topographic data, topographic data models and INSPIRE data specifications. The Norwegian and Icelandic guests presented experiences of their respective surveying authorities regarding topography in connection with the INSPIRE Directive. The main topic of the discussion was the change of the existing topographic data model in accordance with INSPIRE Directive data rules.

INSPIRE and TOPO workgroups

PROFESSIONAL VISIT TO OSLO Meeting and workshop of project partners

Oslo, November 5 to 6 2014

At the start of November 2014 a meeting of project partners from Norway and Iceland was taking place along with a two day workshop.

The purpose of the meeting was to inform the project partners from Norway and Iceland in detail about results of the first year implementing all four subprojects, the verification of the planned program for cooperation with institutions from both partner states for the year 2015 and to discuss problems regarding the financial dynamic.

In the first part of the meeting the representatives of our partner institutions were informed about the work done. The leaderships of the different subprojects reported about the realized tasks and pointed out issues, where they expect cooperation from Icelandic and Norwegian experts. In the second part of the two day long workshop a discussion took place regarding still opened guestions. after which the Slovene project team presented a proposition of the Project plan for the year 2015 to the project partners from Iceland and Norway, which was later on accepted. It envisioned multiple study visits among which were visits to prepare and approve the project for capacity building, collaborate on the geoid calculation and other expert themes. The collaboration was envisioned to use also modern communication services - the World Wide Web and video conferencing. The financial state of the project was also presented to our partners and some problems with the dynamic of drawing funds were pointed out.

Project manager Jurij Režek, MSc, presenting the project

The entire *»international« project team consisting of experts* from all three states

INTERNATIONAL WORKSHOP IN LJUBLJANA

Workshop of the subproject TOPO

Ljubljana, February 18 2015

In the frame of the subproject TOPO an international workshop was organized in the offices of the Surveying and Mapping Authority of the RS on February 18 2015. Besides the employees of the Surveying and Mapping Authority of the RS it was attended by representatives from participating companies in the subprojects TOPO and INSPIRE as well as representatives from the partner organization – Norwegian Surveying Authority (Statens kartverk).

The first part of the workshop was dedicated to the presentation of network services developed in the subproject INSPIRE. Following were presentations of individual tasks of the first stage of the subproject TOPO, from the development of the INSPIRE compliant logic model, to its physical realization in the selected database system. Additionally, a practical solution for topographic data management was presented along with the envisioned data migration model for the transfer of existing data into the new data model. During the workshop guestions and dilemmas were exposed and addressed with the help of the representatives from the partner organization.

Workshop participants

PROFESSIONAL VISIT TO OSLO Workshop of the subproject HIDRO

Oslo, April 15 to 17 2015

In April 2015 representatives from the Ministry of the Environment and Spatial Planning and the Slovenian Environment Agency, both collaborating institutions in the subproject HIDRO, participated in a study visit to Oslo.

The visit's theme was hydrography with the purpose to acquire operational experiences on the workings of the Norwegian Water Resources and Energy Directorate regarding data management on the Geoportal and the publication/distribution of LIDAR data in the domain of the Statens kartverk - Norwegian Mapping Authority.

In the first part of the visit the working processes of the Norwegian Water Resources and Energy Directorate relating to hygrometry were presented (field measuring and analysis), flood and landslide forecasting, hydrologic modeling, determination of danger zones, avalanche warning systems and glacial monitoring. The practical use of data and software solutions (for example Geoportal layers) available to the broad public (application for collecting data on flood events, landslides, avalanches, snow weather conditions...) as well as software solutions, data and models meant for internal use (analysis and forecasting) were presented on actual cases. The workings of the before mentioned models were presented in connection with datasets of spatial elements and the entire procedure in the case of heightened risk levels.

The second part was the presentation of the **Geoportal** and the **different uses of available spatial data**. They also showed the structure and workings of the information infrastructure system in detail and gave useful advice regarding system optimization. Additionally, orthophoto recordings of Norway and test LIDAR scans were presented to the workgroup. During this visit it was concluded, that for the most part presented solutions are in a similar way also applicable in projects being carried out in Slovenia.

Representatives of the study group

PROFESSIONAL VISIT TO HØNFFOSS Meeting of the project partners and workshops of the subprojects TOPO and INSPIRE

Hønefoss, November 3 to 6 2015

In the Norwegian town of Hønefoss a meeting of the »Modernization of spatial data infrastructure to reduce risks and impacts of floods« Project Council took place in the begging of November 2015. The meeting was attended by representatives from the Surveying and Mapping Authority of the RS, Slovenian Ministry of the Environment and Spatial Planning, Slovenian Environment Agency and representatives from the project partners Norway and Iceland. The purpose of this event was to overview all the executed tasks and report on the individual results of the subprojects along reporting on organizational and financial matters. Two individual workshops were also carried out for the two subprojects TOPO and INSPIRE. In the topographic workshop the modeling of height data, network modeling and the efficient management of a topographic database were addressed. In the INSPIRE workshop the Slovenian representatives presented the existing infrastructure of network services which are being developed by the Surveying and Mapping Authority of the RS for the purpose of INSPIRE and European Location Framework (ELF) projects.

The working visit continued with addressing different technical and contextual aspects of network services. Participants of all three collaborating countries exchanged experiences with the introduction of standardization in the field of spatial data infrastructure and the establishment of compliant network services.

The attending representatives shared their experiences regarding the coordination and financing in the Norway Digital project and NODE as well as the working of the NSDI in Norway and Iceland. The debate also touched on standardization in the field of service metadata and the existence of a national data and metadata standard. At the conclusion of the visit the prospects for further cooperation (donation) in the upcoming financial perspective was discussed.

Group photograph of the Slovene representatives and outside project partners

Reporting on the project's results

INTERNATIONAL WORKSHOP IN LJUBLJANA Workshop of the subproject GRS

Ljubljana, May 3 to 5 2016

On the premises of the Surveying and Mapping Authority of the RS an international workshop - Implementation of the new height model was taking place from the 3rd to the 5th of May 2016. Besides experts from the Surveying and Mapping Authority of the RS, the Department of Geodetic Engineering, Faculty of Civil and Geodetic Engineering, University of Ljubljana and the Geodetic Institute of Slovenia, experts from our project partners Norway and Iceland also participated.

In the introductory part of the workshop domestic experts summarized activities done in the scope of the subproject GRS (new first order leveling line measurements with a combined length of around 1800 km, gravimetric measurements on benchmarks, new regional gravimetric survey, stabilizing so called GNSS/levelling points, the zero order network). The foreign experts presented the way new height systems were introducing in Norway and Iceland. Following was an expert discussion on the topics of how to prepare transformation models for height data for datasets in the domain of the Surveying and Mapping Authority of the RS and other data managers, possible ways of informing users and possible user services when transitioning to the new height system.

Another topic of discussion was the calculation of the new quazi-geoid for the territory of Slovenia which will be done in cooperation with Norwegian experts. A high quality Slovene quazi-geoid enables height determination using GNSS technology with a precision of 10 cm. The prepared data for the calculation of the new guazi-geoid of the territory of Slovenia and the neighboring countries were reviewed.

The realization of the national zero order geodetic network was presented to the project partners, who have a high opinion of its implementation. They also got the chance to tour the national zero order geodetic network point at Šentvid pri Stični.

PROFESSIONAL VISIT TO HØNFFOSS Workshop of the subproject TOPO

Hønefoss, June 8 2016

In the begging of June 2016 representatives of the Surveying and Mapping Authority of the RS participated in a workshop in Hønefoss, Norway. There they discussed further possibilities for the use and possible developments of topographic data with representatives from Norway and Iceland. All participants considered aspects of positioning topography in a broader international frame regarding content and service interoperability.

The workshop was attended by: Olaf Magnus Østensen, Sabrina Grimsrud (Statens kartverk), Gunnar Haukur Kristinsoon (Landmælingar Íslands), Marjana Duhovnik, Jurij Režek, MSc, and Danijel Boldin, MSc, (Surveying and Mapping Authority of the RS).

Further development of the topographic database (especially high scale data) has to follow modern trends in this field. The increasing focus on mobile applications and services requires different models for digital content management. New methods and techniques of remote sensing and content recognition on one hand and the search for appropriate crowdsourcing arrangements in the process of providing up to date data on the other have to be taken into account. Our Norwegian

MODERNIZATION OF SPATIAL DATA INFRASTRUCTURE TO REDUCE RISKS AND IMPACTS OF FLOODS

FINAL PROJECT REPORT 2013-2016

colleagues (Statens kartverk) showed a use case of their system. It enables reporting of topographic data changes, which are identified by the broad public, verification of the new data and finally placement thereof in official topographic datasets.

Regarding domestic development, the Slovene experts emphasized the need for providing homogeneous coverage of topographic data for Slovenia, as only a comprehensive coverage provides the means to develop appropriate products and services

54

PROFESSIONAL VISIT TO AKRANES Closing meeting of project partners

Akranes, September 6 to 9 2016

In September 2016 the final planned annual meeting of the Slovene project group and the project partners from Norway and Iceland (Statens kartverk and Landmælingar Íslands, respectively) took place. Its purpose was to review the work done in the subprojects, compare reached goals with the set objectives in the project plan and overview the financial management. The discussion also touched on professional topics relating to individual subprojects. All attending the closing meeting also jointly designed the schedule of the project's closing conference (October 2016) and discussed the possibilities and content of further cooperation in the next financial perspective with the conclusion that such cooperation would be in the best interest of everyone - the Norwegian, Icelandic and Slovene surveying authorities. The Icelandic hosts also described the areas of work and responsibilities of their agency and organized a tour of their facility.

After the welcome address from the Director General of Landmælingar Íslands Magnús Guðmundsson, and the introduction speech from the Project manager Jurij Režek, MSc, the meeting continued with presentations of the results of each subproject.

The GRS subproject manager presented the results of the subproject. All subproject goals defined as indicators of success in the project documentation were reached. The national zero order geodetic network has been established, the measurement and calculation of the new high accuracy levelling network and gravimetric measurements were carried out. The following discussion was centered mainly on the new height system and the finalization of the quazi-geoid calculation process.

The TOPO subproject manager showed the subproject's achievements and concluded that all indicators for the subproject's success have been reached. The structure of topographic data is compliant with data standards and a test data acquisition has been carried out along with migration of all existing topographic data into the new data model. The discussion centered on possibilities for

MODERNIZATION OF SPATIAL DATA INFRASTRUCTURE TO REDUCE RISKS AND IMPACTS OF FLOODS

expanding the topographic data model and on topographic data maintenance processes; mainly the inclusion of the public in the updating process and cooperation with other institutions.

The INSPIRE subproject manager described performed tasks and the discussion was about the ways of coordinating and managing national spatial data infrastructure in Iceland and Norway and the collaboration with stakeholders in those countries. He also presented the advantages and open issues regarding the practical implementation of spatial data network services, the capacity building mechanism and challenges of further activities for the realization of the INSPIRE Directive and its regulations.

The HIDRO subproject representative expressed his appreciation for the opportunity to collaborate with the project partners and exchange experiences, putting special emphasis on the working visit to Norway in 2015 of the Slovene group from the Ministry of the Environment and Spatial Planning and the Slovenian Environment Agency. He highlighted the usefulness of the subproject's results in the area of water infrastructure registration and the distribution system of LIDAR data.

At the meeting a debate developed regarding the need for topographic data acquisition for the entire territory of Slovenia in accordance with the new standards. The subproject TOPO delivered very good results with the new topographic data model, which is compliant with the data structure used by the European Union in the new data management system. Where the national topographic dataset system falls short is that only 20% of data have been updated accordingly (the updating was not part of the subproject). For a credible use of topographic data in the processes of spatial planning, construction of infrastructure, planning intervention measures and actions in the event of natural disasters, spatial monitoring as well as providing quality procedures for defining and maintaining national borders, a substantive update of the topographic dataset is needed.

A joint realization of all project partners was that the three yearlong project cooperation and the formed connections between the collaborating institutions were of benefit to both sides, the donor representatives (Statens kartverk, Landmælingar Íslands) and Slovenian representatives (Ministry of the Environment and Spatial Planning, Surveying and Mapping Authority of the RS, Slovenian Environment Agency). Partner cooperation enables the gathering of experiences for all participating parties. In case of development projects this cooperation presents itself as the gathering and sharing of experiences from similar projects in different countries and results in good references for institutions. The individuals participating in workgroups of such projects gain professional and management experiences and outside experts, who collaborate in them, acquire professional references. Such projects undoubtable contribute to the development of every participating profession.

> **PROJECT'S VISIBILITY, MEDIA COVERAGE**

PROJECT COMMUNICATION AND VISIBILITY

The project »Modernization of spatial data infrastructure to reduce risks and impacts of floods« is a highly professional project, which means to raise the standards of data infrastructure. Its results are fundamental for different areas of geodesy and hydrography an in many ways present a milestone for the basic coordinate system, topography and other spatial information. So an important aspect is also the dissemination of information about the project and its results to the professional and broad public. Due to the expert nature of the project its communication to the public was more difficult, so all manner of media tools were used – classic print media publications, brochures, leaflets as well as modern digital media like e-mail, project web page, Facebook page. As the project was co-financed through international financial funds all information were relayed in both the Slovene and English language.

We are aware that this project is of great importance to the Slovene geodesy, so we wished to provide the professional public access to the project's results long after its conclusion. For this purpose we presented the project at different expert meetings and conferences and published the project's contributions in individual conference booklets. The same goes for written contributions, which were published in expert magazines from the fields of involved professions and also forwarded to different national and foreign libraries of expert articles.

The project »Modernization of spatial data infrastructure to reduce risks and impacts of floods« is a positive example of systematic communicating of a large project. The high public awareness regarding the importance of the project results and the positive assessment regarding the quality of project implementation from foreign evaluators are results of high quality work carried out to ensure the project's visibility.

On the following pages we will display activities carried out to ensure the project's visibility and list the project's media coverage

The Financial Mechanism of the European Economic Area is very precise in prescribing the means for ensuring project visibility, media coverage and way of communication. In the scope of the project we prepared an internal handbook for the integrated graphics design of the project and developed applications to communicate the project's intermediate and final results. A special mention deserves that, after the formal conclusion of the project and the approval of the project's results by the supervisory mechanisms, a special media event will be organized for the broad public with the intent to present the project's results in the light of improvements to flood protection and a more effective preventive approach for reducing risks of floods.

DIGITAL COMMUNICATION TOOLS

CLASSIC COMMUNICATION TOOLS

WEB PAGE: www.gurs-egp.si

The intent of utilizing the project's web page was to disseminate information to a public as broad as possible on the national, regional and local levels (including the interested parties), to emphasize the role of the EEA Financial Mechanism and to provide an overview of the project. For this purpose and considering the integrated graphical design of the EEA Financial Mechanism the web page www.

gurs-eqp.si has been created, which presents information in Slovene and English language:

- information on general goals of the Financial Mechanism;
- information on bilateral cooperation with the donor countries;
- link to the web page of the Financial Mechanism;
- links to the web pages of other important institutions;
- contact information;
- information on the project, its goals, realization and products;
- information on the subprojects;
- archive on past news and notifications.

FACEBOOK PAGE: EEA and Norway Grants Slovenia

The web promotion was also done over the EEA and Norway Grants Slovenia Facebook page.

Matual Golic: + EEA and Norway Grante Sloven 25 100 0

V okviru projekte "Poepdutider prostorske podalkovne infrastrukture za zmanišanje fregeti in postettic poplar". Ni pa izvala Geopetata uprava RS, se la oberal odvitata zanimiva skolicyna delevnica o lasenskeet snemetik Skovenile oz sporahi LIDAR postation. Vel loveste na spodol prveznil.

http://www.gurs.egp.al/novice/172/strokcoma-delavinica.http:

EEA and Norway Grants Slovenia

V okviru projekta "Posodobitav prostorske podatkovne infrastrukture za zmanjšanje tveganj in posledic poplav", ki ga izvaja Geodetska uprava RS. je bila na nivoju države vzpostavljena mreža najbolj natančnih geodetskih točk, ki so jih poimenovali Geodetska mreža 0 reda. Vse točke so že dokončane, pred kratkim pa so bile opremijene tudi z informativnimi tablami z opisom točke in projekta (donacije), ki je omogočil postavitev za Slovenijo zelo nomembre mreže

PRESENTATION LEAFLETS OF THE PROJECT

The first project leaflet »Za varnejši jutri« (Eng. trans.: »For a safer tomorrow«) was designed as a summary of the project and subprojects at the start of their implementation. We handed it out to the participants of the project's opening conference and further on in 2014 and 2015 at all events that related to the project.

The second project leaflet »Dvigujemo standarde podatkovne infrastrukture« (Eng. trans.: »Raising data infrastructure standards«) was designed and printed in 2016 and already showed specific results of the project. It was handed out to participants at every professional workshop and event, where we actively promoted the project. The leaflet was prepared in Slovene and English language and will also serve as promotional material at the closing conference of the project.

ANNUAL ACTIVITIES REPORTS AND FINAL PROJECT REPORT

PRESENTATIONAL PANELS OF THE PROJECT

The project »Modernization of spatial data infrastructure to reduce risks and impacts of floods« has been actively carried out for three years. At the end of each calendar year we prepared and printed an annual activities report presenting the implementation and achievements of the project. At the conclusion of the operational implementation of the project, in October 2016, a final project report was designed, which summarizes all activities done in the course of the project. In other words, it presents a document that describes the achieved goals of the project and all activities, which were carried out in expert circles or for informing the public on the project and its accomplishments.

Content of the report:

- description of the EEA Financial Mechanism,
- introductory words of the project manager,
- project and individual subproject descriptions,
- conferences, symposia, expert panels,
- cooperation with our Norwegian and Icelandic partners,
- project's visibility, media coverage.

The reports were designed in 20 x 20 cm format and prepared in Slovene and English languages.

To improve visibility of the project at different events (symposia, conferences, workshops...) presentational (roll up) panels were designed in 100 x 200 cm format. They were also placed at the entrance hall of the Surveying and Mapping Authority of the RS, where they were meant as a constant reminder of the project.

COMMEMORATIVE PLAQUE AND MARKING OF THE ZERO ORDER GEODETIC NETWORK POINTS

At the opening of the first zero order geodetic network point in Slovenia, located in Prilozje in the Bela Krajina region, a commemorative plaque was placed as a permanent source of information, which was unveiled by the Minister of the Environment and Spatial Planning Irena Majcen. Similar informational plaques were also placed at the other zero order network points. These plaques are 80 x 100 cm in dimension, made out of a weather resistant plastic material and provide a long lasting statement on the project's results.

MEDIA COVERAGE AND PROJECT PRESENTATION

Informing on the project was carried out with regular publishing of news, event announcements and relaying of information through the project's web page http://www.gurs-egp.si/, on the web page of the Surveying and Mapping Authority of the RS and the Ministry of the Environment and Spatial Planning, with the publishing of professional articles in expert journals, presentations at expert and other events in Slovenia as well as abroad and through media coverage of individual events in printed and electronic media, radio and television.

PUBLISHED PROFESSIONAL ARTICLES

- National report regarding the realization of the geodetic reference system in Slovenia for the period 2013-2014. 24th EUREF symposium, 2014.
- Oržavni geodetski referenčni sistem bomo zgradili tudi z evropskimi donacijami. Geodetski vestnik 2014, Volume 58, Issue 1, Pages 167-172.
- Activities for the establishment of a modern geodetic reference system in Slovenia. Land Surveying (r)evolution, Proceedings of the 43rd Slovenian Land Surveying Day, 2015, Pages 37-56.
- Lahko slabi prostorski podatki spremenijo tok vode?. Material of the 26th Sedlar meeting, 2015.
- Lahko slabi prostorski podatki spremenijo tok vode?. Urbani izziv, Special Edition 2015, Issue 5, Pages 38-46.
- National report regarding the realization of the geodetic reference system in Slovenia for the period 2014-2015. 25th EUREF symposium, 2015.
- Odprtje prve državne geodetske točke 0. reda Prilozje. Geodetski vestnik, Volume 59, Issue 3, Pages 634-636.
- Dejavnosti v okviru projekta Posodobitev prostorske podatkovne infrastrukture za zmanjšanje tveganj in posledic poplav v letu 2015. Geodetski vestnik. Volume 59. Issue 4. Pages 823-834.
- Geodetska infrastruktura besmisleni trošak ili element državnosti?. Material of the 8th HKOIG symposium, 2015.

Dejavnosti pri vzpostavitvi državnega topografskega modela. Proceedings of the 44th Slovenian Land Surveying Day, 2016, Pages 21-22.

FINAL PROJECT REPORT 2013-2016

Novi državni topografski model kot podlaga za načrtovanje. Material of the 27th Sedlar meeting, 2016., Page 19.

Poročilo o izvajanju direktive INSPIRE. Geodetski vestnik 2016, Volume 60, Issue 2, Pages 305-314.

National report regarding the realization of the geodetic reference system in Slovenia for the period 2015-2016. 26th EUREF symposium, 2016.

Novi državni topografski model kot podlaga za načrtovanje. Urbani izziv, Special edition 2016, Issue 6.

A Highly Accurate Absolute Gravimetric Network For Slovenia. Conference paper of the 26th IUGG General Assembly, 2015.

Postavljeni sta prvi dve točki kombinirane geodetske mreže, Geodetski Vestnik. Volume 58, Issue 4, Pages 774-782.

Recent Developments of Spatial Reference System in **Slovenia.** Proceedings of the 3rd CROPOS conference, Opatija, 2013, Pages 57-62.

Modernization of spatial data infrastructure to reduce risks and impacts of floods - Application paper. World Engineering Conference on Disaster Risk Reduction, Lima, Peru, December 3/9/2016.

PUBLICATIONS ON THE LAUNCHING CONFERENCE OF THE PROJECT

- Geodetski podatki za manjše tveganje ob poplavah. Delo.si, Web edition, 4/2/2014.
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- Presentation of the »National report regarding the realization of the geodetic reference system in Slovenia for the period 2013-2014«. 24th EUREF symposium, Vilnius, 2014.
- Presentation on the national coordinate system at the European Space Expo titled »No satellites -no national coordinate system«. European Space Expo, Ljubljana, 2015.
- Presentation on the activities needed to establish a modern geodetic reference system in Slovenia titled »Activities for the establishment«. 43rd Land Surveying Day, Sežana, 2015.
- Project presentation »Modernization of spatial data infrastructure to reduce risks and impacts of floods«. INSPIRE conference, Lisbon, 2015.
- Presentation of the georeferenc infrastructure and the project's results titled »Lahko slabi prostorski podatki spremenijo tok vode?« (Eng. trans.: »Can bad spatial data change the course of water?«). 26th Sedlar meeting, Ljubljana, 2015.
- Presentation of the »National report regarding the realization of the geodetic reference system in Slovenia for the period 2014-2015«. 25th EUREF symposium, Leipzig, 2015.
- Presentation titled »Geodetska infrastruktura besmisleni trošak ili komponenta državnosti?« (Eng. trans.: »Geodetic infrastructure - pointless cost or component of statehood?«). 8th symposium of chartered geodetic engineers of Croatia, Opatija, 2015.
- Presentation on the activities for the establishment of the national topographic model titled »Dejavnosti pri vzpostavitvi državnega topografskega modela. 44th Land Surveying Day, Laško, 2016.
- Presentation of the »National report regarding the realization of the geodetic reference system in Slovenia for the period 2015-2016«. 26th EUREF symposium, Donostia -San Sebastian, 2016.
- Presentation on the project's importance titled »Novi državni topografski podatkovni model kot podlaga za načrtovanje«. 27th Sedlar meeting, Ljubljana, 2016.

