

Project partners:

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

Financial mechanism EEA 2009-2014:

EEA Grants, Iceland, Liechtenstein, Norway (www.eeagrants.org) Financial mechanism EEA, Slovenia (www.eeagrants.si)



www.gurs-egp.si

www.eeagrants.org



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



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Grants in Slovenia

Strenathening relations – exchanging ideas

The EEA and Norway Grants are contributions from Iceland, Liechtenstein and Norway to reducing economic and social disparities in the European Economic Area (EEA) and strengthening bilateral relations with the 15 beneficiary states. Slovenia has been a recipient of funding from the three donor states since becoming a member of the European Union and the EEA in 2004.

In the funding period 2009-14, Slovenia has been allocated €26,9 million, up from €18,6 million in the previous five-year period. Norway represents around 97% of the contribution. Public health initiatives, preservation of cultural heritage, environmental protection and civil society are all key areas of support.







Small but strategically located in the heart of Europe, Slovenia is a gateway to South Eastern Europe and the Balkans. In recent years, cooperation, exchange and trade have increased between Slovenia and Iceland, Liechtenstein and Norway. The EEA and Norway Grants aim to strengthen relations by facilitating joint implementation of the programs between Slovenian entities and donor-state counterparts.

An excellent example of such cooperation is also the Surveying and Mapping Authority of the Republic of Slovenia, which has in the previous financial period 2004-2009 already started the implementation of a project with the help of donations. This project was an important milestone for Slovenian geodesy because it established the horizontal component of the national coordinate system and established the national network of 15 permanent GNSS stations of the SIGNAL network. The system's quality of implementation and the establishment of great cooperation between the surveying services of Slovenia and the donor countries has led to another project in the financial period 2009-2014 in which the Surveying and Mapping Authority of the Republic of Slovenia obtained donations to implement the project »MODERNIZATION OF SPATIAL DATA INFRASTRUCTURE TO REDUCE RISKS AND IMPACTS OF FLOODS«. With this project we will also establish the elevation component of the national coordinate system and the data layer of basic topographic and hydrographic data which are compliant with the INSPIRE directive.



INTRODUCTORY WORDS OF THE PROJECT MANAGER

Jurij Režek, MSc

After a year of implementing the project we can evaluate its impact, the achieving of set goals in this period and also other factors that influence its execution and success. It has to be again highlighted that it is difficult to produce high quality assessments, plan good measures and implement field actions to improve flood protection, that are based on inappropriate data. All mentioned activities begin with analytical work by experts and planners, continues with implementing appropriate measures in the field and continue with constant monitoring of the effectiveness of these measures and followed by the assessment of necessary changes. So an important prerequisite for the appropriateness of the stated actions are a good presentation of terrain heights, high quality data on waterways and the accessibility of data for all the stakeholders in the system to ensuring flood protection.

With this project Slovenia is gaining a guality geodetic height reference system. The shortcomings and errors in the existing geodetic height system in Slovenia make it harder to build credible models of the magnitude of flash floods based on different hydrographic and hydrologic parameters. The existing geodetic height system in Slovenia stems from the previous century and is not up to date with today's satellite technologies for spatial positioning and the use of altitude data acquired with remote sensing techniques. In the scope of this project we are accelerating the establishment of a contemporary and accessible height reference system connected with the new horizontal georeferencing system, to establish the basis for flood protection measures. The result will be a new geoid of Slovenia, a mathematical surface, which represents the relief of Slovenia in the best possible way and will be integrated into different expert models and into all contemporary instruments for positioning, including altitude determination.

The

our environment.



standardization of data structures and the access of topographic and especially hydrographic data is the next goal of the project. We are establishing the compliance of these data with the data structure defined in European regulations which will enable their use in computer simulations and transnational data exchange. The standardization and accessibility of data is not just a formal obligation but a responsibility, especially towards the users of such topographic and hydrographic data. But the most important part in the scope of the project is the defining of procedures, jurisdictions and responsibilities of stakeholders in the system regarding data maintenance and we expect that these procedures will be established and honored in the continued life of these information.

The management and implementation of such a project in the state administration requires cooperation of different professions and also of public institutions. Professions have recognized the meaning and benefits of the project and are constructively cooperating whereas subjects of the state administration are too often guided by a stiff imperative of particular interests and a lack of decision making. We accept these facts as the price to pay for getting the donation as a state body, without which the same work would take at least another decade. It should be mentioned that the relationship with our partners in the project, the Norwegian and Icelandic surveying and mapping authorities is a constructive, frank and professional dialog along with a constant willingness to help with difficulties of any kind. We have to learn how to adopt these qualities into





VORITVENA KONFERENCA

TOREK, **4. FEBRUAR 2014** GOSPODARSKO LIUBLIANA

LAUNCHING CONFERENCE OF THE PROJECT

»Modernization of spatial data infrastructure to reduce risks and impacts of floods«

With the intention to inform the broadest possible public about an important international professional cooperation, which our project undoubtedly is, we organized a launching conference of the project in the beginning of the year 2014, on February 4 2014 in Ljubljana Exhibition and Convention Center (Gospodarsko razstavišče). The conference was attended by local project team members, partners from Norway and Iceland and almost 100 other participants, who could in the course of the day attend speeches by important speakers and high quality expert lectures on different topics, all relating to the flood related threats and geodetic data, which provide the basis for decisions in space.

The attendance of the Minister for Agriculture and Environment, Dejan Židan, MSc, as the patron and keynote speaker gave the event needed importance. In his speech he nicely placed the project into the Slovene environment and once again emphasized the importance of up to date spatial data when making the right decisions in space. He wished the project well and thanked the project partners for their cooperation and financial assistance.

The conference was followed the next day with two workshops on the themes of topographic data and INSPIRE that are presented in the activities report.



Below are a few interesting fragments from the introduction speech of the project manager, Jurij Režek, MSc: »The lack of relevant data, the weaknesses of the state geodetic height system and the not yet established spatial data infrastructure, are all contributing factors for unreliable and unconvincing foundations for planning and implementing construction interventions in space.

How can we improve the situation?

Luckily or sadly, however you wish to look at it, all indicated types of data are a mandatory part of the state spatial data infrastructure which has to be established in accordance with the EC INSPIRE directive and consequently the Slovenian legislation with which the directive was implemented into the Slovenian legal system. Data structures, data models and the establishment and use of the European coordinate system are also prescribed. All the stated points are not yet established in Slovenia, at least not in the regulated extent. Regardless of the fact that the implementing rules of the INSPIRE directive are obligating us to establish the before stated spatial data and height system in accordance with these provisions by the year 2017, we are also bound by responsibility. It is

our responsibility to provide safety for the property and population.

Only realistic and accessible spatial data along with a contemporary height system as a component of the European georeference system can be used in credible assessments of flood risks and hazards, in the processes of spatial planning and in the planning and implementation of measures, meaning in the implementation of construction interventions for flood prevention. All the implied problems with the project which we are beginning today will not be solved, but we will resolve a substantial part of them. So, our intent is to establish a quality height system in Slovenia, to improve coherence of topography data and Slovenia's hydrographic network with the European regulations and create the first web based services for accessing this data. All this is captured in the title of the project 'Modernization of spatial data infrastructure to reduce risks and impacts of floods'.« 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 ...





INTRODUCTION SPEECHES

The following honorary speakers greeted the conference and wished all the best on the projects path:

Dejan ŽIDAN, MSc, Minister for Agriculture and the Environment

»An adequate database has enabled us to predict the occurrence of sleet in time so that until now no fatalities occurred even though the forest is a life-threatening place at this moment. Updating the spatial data infrastructure is not necessary because of European directives but to protect our population«, this were the words of the Minister for Agriculture and the Environment at the beginning of the project for modernization of spatial data infrastructure to reduce risks and impacts of floods. He also mentioned that the Ministry decided for another upgrade to the static system of water management and he added that the year 2014 will be the year of water at the Ministry. Among other things they wish to transition from action operation to operating based on a six year plan for water management.





Bojan BABIČ, MSc, State Secretary at the Ministry of Infrastructure and Spatial Planning

»Because of the current economic situation it is of great importance that we were able to provide funding from donations out of the Financial mechanism of the European economic area. We are aware that the administrative management of such projects is already demanding let alone the achievement of set goals. The Ministry of Infrastructure and Spatial Planning will together with The Ministry for Agriculture and the Environment support the execution of the project. Ensuring the establishment of the new national spatial coordinate system is important and will help improve the situation as well as improve flood forecasting and increase flood protection.«

Aleš SELIŠKAR, Director General of the Surveying and Mapping Authority of the Republic of Slovenia

»The project to modernize the spatial data infrastructure to reduce risks and impacts of floods is these days unfortunately overshadowed by another big project of the Surveying and Mapping Authority - the evaluation and taxation of real estate. This may be the reason that today's project is viewed as less interesting by the public and media, unjustly so. The results of the project to modernize the spatial data infrastructure to reduce risks and impacts of floods will be of utmost importance for the Slovenian geodesy as a whole because it will provide the missing links in the national coordinate system. The Geodetic activity is always directed towards the users and it is the same with this project. Its results will influence the long term quality of life of the whole Slovenian population.«



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

Mr. Ostenson highlighted the excellent cooperation between institutions with regards to a former project of the Surveying and Mapping Authority from the previous financial perspective and he pointed out that the involvement of Norway and Iceland is not just as a financial donor but that the main point is the exchange of professional skills and substantive cooperation. He put special emphasis on the fact that due to climate change and its consequences, one of which are floods, Norway can also learn from Slovenia's experiences with them and in doing so the benefits of the project will be mutual.

Eydis Lindal FINNBOGADOTTIR, National Land Survey of Iceland, Director of Service and Spatial Data Infrastructure

»In Iceland, a small island state, we have a lot of topographic data. For us this is a professional challenge because our island is continuously shifting and so we have to have stable geodetic bases to observe and control these shifts. This is the reason why topographic data are essential, whereby they have to be integrated into the European spatial data currents which are regulated by the INSPIRE directive.«

EXPERT LECTURES



WHY IS HEIGHT MM IN EVENT OF FLOODS SO IMPORTANT?

Bojan STOPAR, PhD, University of Ljubljana, Faculty of Civil and Geodetic Engineering, Head of the Geodetic department

A professional contribution which highlighted the problematic which is addresses by the subproject GRS – geodetic reference system.

Slovenia

WHY IS THE ONLY DEFENCE FROM

FLOODING AN APPROPRIATE HYDROGRAPHIC MODEL? Matjaž MIKOŠ, PhD, University of Ljubljana, Dean of the Faculty of Civil and Geodetic Engineering,

A professional contribution which highlighted the problematic which is addresses by the subproject HIDRO – hydrography.

database.

The presentations are published on the web page of the project: http://www.gurs-egp.si 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/pmHJtvxWETtdLAj7F

The opening conference was organized and logistically planned by the company Digi data d.o.o.



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WHY THE WATER TAKES INTO ACCOUNT TOPOGRAPHY AND DOESN'T CARE FOR **ADMINISTRATIVE BOUNDARIES?** Irena AŽMAN, MSc, Surveying and Mapping Authority of the Republic of



A professional contribution which highlighted the problematic which is addresses by the subproject INSPIRE – infrastructure for spatial information in Europe.

WHY IS IT IMPOSSIBLE TO PLAN THE CORRECT PREVENTIVE MEASURES FOR FLOODING WITHOUT UP TO DATE AND ACCURATE **TOPOGRAPHIC INFORMATION?** Dušan PETROVIČ, PhD, University of Liubliana, Faculty of Civil and Geodetic Engineering, Head of the Chair of Cartography, Photogrammetry and Remote Sensina.



A professional contribution which highlighted the problematic which is addresses by the subproject TOPO – topographic





INTERNATIONAL WORKSHOPS OF THE SUBPROJECTS TOPO AND INSPIRE February 5 2014

After the successful opening conference we took advantage of the presence of the Icelandic and Norwegian experts and organized two workshops intended for the subprojects TOPO in INSPIRE. The workshops took place at the Surveying and Mapping Authority of Slovenia. The first point of action of the workshops was a plenary session with the following program:

PLENARY SESION OF THE WORKING GROUPS OF SUBPROJECTS TOPO in INSPIRE:

- Welcome speech by the project manager Jurij REŽEK, MSc
- INSPIRE introductory lecture and presentation of the subproject Tomaž PETEK
- TOPO introductory lecture and presentation of the subproject Marjana DUHOVNIK
- NORWAY DIGITAL national geographic infrastructure Tore HAYE, Norway
- NSDI and INSPIRE implementation in Iceland Eydis Lindal FINNBOGADOTTIR, Iceland

On the plenary session we got insight into the state of topographic systems and the implementation of the INSPIRE directive in all three states and then continued with the work in two work groups for the fields of topography and spatial data infrastructure.

International workshop of subproject INSPIRE



Workshop program:

- Presentation of the implementation of the INSPIRE directive in Slovenia and the introductory presentation of the capacity building program – Tomaž PETEK
- Capacity building program Irena AŽMAN, MSc
- Action plan for implementing the capacity building plan (workshop and conference) Tomaž PETEK



International workshop of subproject TOPO

Workshop leader: Marjana DUHOVNIK Workshop program:

• Topographic database – Gunnar H. KRISTINSSON, Iceland Presentation of open questions and dilemmas – Marjana DUHOVNIK

The workshops were very successful. The benefits were not just the gathered information and guidelines for effective work on the project but also the established contacts between experts from different countries. These formed relationships will be a huge help in the everyday work and cooperation on the project while modern information and communication technologies will enable us to stay in contact over distances.

On the right is a picture with the project leadership with the international consultants form Iceland and Norway.



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PROFFESIONAL VISIT TO OSLO Oslo, November 5 and 6 2014

At the start of November 2014 a meeting of the project consortium represented by members of the project leadership and project partners form Norway and Iceland was taking place.

The purpose of the meeting was to inform the project partners in detail about results of our first year of implementation of 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 we carried out to this point. The leaderships of the different subprojects reported in detail about the realized tasks and pointed out issues, where they expect cooperation from Icelandic and Norwegian experts. Following the individual reports a discussion took place in the second part of the two day workshop regarding still opened questions, after which the Slovene project team presented a proposition for the **project plan for the year 2015** to the project partners from Icelandic and Norwegian surveying and mapping authorities will participate. The project plan for the year 2015 envisions multiple study visits among which are visits to prepare and approve the project for capacity building, collaborate on the geoid calculation and other expert themes. The collaboration is intended to happen also through modern communication services – the World Wide Web and with the use of video conferences. We also presented the financial state of the project to our partners and pointed out some problems with the dynamic of drawing funds.

On the picture below the project manager Jurij Režek, MSc, is presenting the progress of the project and the future plans to the entire »international« project team consisting of experts form all three states.





ACTIVITIES REPORT 2014







PROJECT OBJECTIVES

THE IMPROVED COMPLIANCE WITH THE EUROPEAN AND SLOVENE ENVIRONMENTAL LEGISLATION	35%
ESTABLISHMENT OF THE SPATIAL INFORMATION INFRASTRUCTURE AS A PREREQUISITE FOR COMPREHENSIVE MONITORING	47%
ESTABLISHMENT OF THE GEODETIC REFERENCE FRAME, ESPECIALLY THE VERTICAL COMPONENT, WITH THE URGENT NEED TO MANAGE FLOOD RISK AND SPATIAL PLANNING	68%
PREPARATION OF SPATIAL DATA AND PRODUCTION OF NETWORK SERVICES COMPLIANT WITH THE INSPIRE DEMANDS	50%
IMPLEMENTATION OF MEASURES TO INCREASE CAPACITY FOR THE IMPLEMENTATION OF THE INSPIRE DIRECTIVE	50%
POTENTIAL INCREASE IN THE EXCHANGE OF DATA REGARDING ENVIRONMENTAL IMPACT ASSESSMENTS BETWEEN SLOVENIA AND OTHER MEMBER STATES	30%



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

The project »Modernization of spatial data infrastructure to reduce risks and impacts of floods« is one of the largest and more important projects of the Surveying and Mapping Authority of the Republic of Slovenia when regarding the number of participants and the funds for the project's implementation. Besides participants from the Surveying and Mapping Authority (project management) there are also participants from the Ministry for the Environment and Spatial Planning and the Slovenian Environment Agency. Because of the way the project is financed - with the co-financing from donation from the European Economic Area (EEA) – an important role also plays the Government office for Development and European Cohesion Policy (GODC) which represents the National contact point of the mechanism and is the link with The Financial Mechanism Office in Brussels (FMO). Because The Republic of Slovenia is a financial contributor The Ministry of Finance is consequently also a project participant. Of great importance to the project are the two international partners, the Norwegian and Icelandic surveying and mapping authorities. All the mentioned institutions are co-financing the project from their own resources and are involved in its implementation along with the help from external contractors. These contractors come from the (public) Research and Development sphere and from the private sector. They ensure expert solutions as well as operational capacity.

The resources coming from the donations from the EEA financial mechanism represent 58% of the funds in the financial structure of the project. The Republic of Slovenia directly contributes 10% of the project's funds through the GODC while the rest comes from budget appropriations from the Ministry for the Environment and Spatial Planning, Water Fund.

In regard to content the project is divided into 4 subprojects in which different intertwined activities are carried out - firstly such activities inside the different subproject and later on between the subprojects. Every activity has a defined timeframe along with the necessary resources for implementation. In accordance to the guidelines of the financial mechanism we have to structure the resources regarding the financial types (services, equipment, land...), the budgetary items and we have to fulfill the reporting demands. This makes for a very differentiated project plan (implementation, financial) which determines a complex project organization and real-time (sometimes even crisis) management along with the coordination of the entire project. The management monitors the implementation of the project and implements changes to the project's plan which occurred quite often through the course of the project so far due to the complex environment. Some of these unexpected influence factors are described later on.

The pictures below show sections from the financial plan and time schedule of the project.



Previous management of a few similar projects and the experiences gatherer from this one reaffirm our belief that the administrative system of the public administration, which determines the dynamic of the project's implementation, is not to the benefit of the project's execution. More than a year has passed from the start of the preparation work, the forwarding of the necessary documentation to the National contact point at the GODC to the actual approval of the project. Because of the immovable timeframe of the project (conclusion in April 2016) this presents a problem right from the start. Additionally, different reorganizations took place since the project's beginning inside the governmental services as well as the Ministries. This meant multiple times explaining and convincing the leadership along with organizing the individual participants once again. An additional obstacle is the now almost yearly premature closing of the integral budgetary items and as a result a slowing down of activities in the best cases and a full stop in the worst. Also the rules for implementing public tendering, although necessary, are not helping the temporal dynamic of such projects. The subproject Hydrography suffered serious hardships. It was redefined during its implementation: the entire project group composition was changed along with the objectives of the subproject and as a result the financial dynamic also changed.

These outside factors which hinder the smoothness of implementation are not specific to this project. Similar projects in Slovenia as well as in other countries face similar obstacles. Nevertheless, the project management, while adhering to the project's plan and its adjustments, is striving for a positive appearance of the project and of Slovenia to the outside partners which are represented by the financial mechanisms in Brussels, our international partners (Norway and Iceland) and the diplomatic sphere (embassy of the Kingdom of Norway).

The project management, represented by the project manager, the subproject managers and the deputies, is aware that without a targeted plan and focused work we cannot come to the needed results. The project's way of work produces a positive pressure and, with predefined objectives and resources, a motivation that can actually lead to some changes at the conclusion of the project – specifically, that Slovenia will receive a geodetic height system and a georeferencial system comparable to the European standards. This basis for a topographic system means a redefinition of the work we did in the previous century and at the same time it will present at least a partial upgrade to the underlying data in the field of hydrography. With these measures we will point the way forward as well as implement a portion of activities demanded by the INSPIRE directive.

The most important result of the project will be the obtained foundations for more effective (faster, higher quality) work of professionals and the administration in regard to reducing flood damages. This goal and the individual professional objectives encompassed by the four subproject's activities along with the responsibility to carry out this project are for us enough of a motive to bring the project to the planed results. In this report we are presenting its partial results at the midpoint of the projects implementation. They are a good indication for the realistic prospect for the successful conclusion of the project.

ZA VARNEJŠI **JUTRI**



POSSOUTY MEDITIONIA PODATECTOR ACTIVITY ACTIVITY





SUBPROJECT **TOPOGRAPHIC DATABASE (TOPO)**

Subproject manager: Marjana Duhovnik

SUBPROJECT OBJECTIVES



CHANGE OF THE EXISTING TOPOGRAPHIC DATA MODEL WITH REGARD TO INSPIRE **DATA RULES**

- The task of changing the existing topographic data model with regard to INSPIRE data rules was conducted by the Geodetic Institute of Slovenia.

The task was divided into 6 phases:

- examination of the existing topographic model and INSPIRE data specifications in the light of topographic data (1st phase); proposition for the changed topographic data model (2nd phase);



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

ACTIVITIES REPORT 2014



INSPIRE DATA SPECIFICATIONS	100%
EVELOPMENT OF APPLICATION TABASE MODEL	100%
A MODEL	10%
SNC	0%
CE OF TOPOGRAPHIC DATA	0%
	0%

• estimation of needed financial resources (3rd phase); • presentation to the expert public (4th phase); • approval of the new data model (5th phase) • preparation of a quality model (6th phase)

The substantive analysis has identified the following facts:

 topographic data have to provide the location and dimension of spatial realities in the state's territory, meaning that they are not just inputs to produce graphical displays;

• in the existing state topographic data sets there is redundancy of data (semantic disparities and duplication, multiple geometries of the same spatial reality, management of



similar attributes multiple times) and disparities in different registers (e.g. buildings in the National topographic map at 1:5000 scale - DTK5 and building cadastre, roads in DTK5 and public infrastructure cadastre):

- individual INSPIRE theme specifications **exceed the topographic** framework (transport networks, buildings...) e.g. it contains sets of non-topographic attributes which require a broader examination of themes and the integration of additional data sets on the state level;
- INSPIRE specifications for individual themes require additional contents regarding existing topographic layers (geometry, attributes, relations);
- the examined state topographic data are (contextually) classified based on one or more INSPIRE theme

The following conceptual baselines for the changed topographic data model were taken into account in the proposition:

- \cdot the modeling process took into account the needs for the existing data sets which are being changed in **accordance** with INSPIRE specification - nothing gets lost!
- the new topographic model enables **connectivity** of data sets into functional units, **connectivity** with data sets from other producers (e.g. real estate register) and upgradability with additional content (modularity and scalability)
- the implementation of data migration of existing data into the new data model will encompass transformation into the new national spatial coordinate reference system (ETRS89, EVRS)
- after the INSPIRE data model structure along with its contents will be adopted the national specificities will be added to it
- the proposed data model also includes selected content which exceeds the topographic frame (in the light of a long term unification)
- the proposition of the new data model excludes some INSPIRE content because it **does not appear** in our geographic territory and because it is not in the domain of the Surveying and Mapping Authority or because its intended use is entirely non-topographic
- the new topographic data model also presents the starting **point** for the modeling of other data sets in Slovenia which contain data relevant to individual INSPIRE themes (of a comparable accuracy level) into an INSPIRE consistent scheme

Additionally some propositions were formed. Their realization is connected with the continuations of the subproject EEA TOPO:

- the central management of geographical names
- national rules to determine an unified identifier (INSPIRE ID)
- a proposition of the needed steps for the migration and upgrade of existing content into the new data model

- \cdot a proposition for a code list on the themes LAND USE and I AND COVER
- a proposition to establish a national list of registers, designations and data storage descriptions in Slovenia called »SLO Registry« under the management of the Surveying and Mapping Authority. It would be modeled after the »INSPIRE Registry«

With the new data model a UML diagram was also presented.



In addition object catalogs of 8 addressed INSPIRE themes were prepared. The definitions of the individual theme elements were taken from the INSPIRE specifications and the Commission regulations for implementing the directive. Definitions for the added national elements were taken from the existing national data sets (DTK5, public infrastructure register, the register of geographical names - REZI).

An estimation of needed financial resources regarding the establishment of the new topographic data model was made and structured into the following sections:

- The establishment of the topographic data base including hardware and software
- The migration of data into the new model
- The topographic data acquisition in accordance with the proposed model

The new topographic model was presented to the expert **public** in May 2014. On the basis of that event's discussion these conclusions were formed:

- 1. There were given no remarks regarding the substance of the new topographic data model that would mean changing or supplementing it
- 2. A higher participation of the INSPIRE project team is **needed** (especially in the professional-technical area) regarding activities of the individual departments which are directly or indirectly connected with the implementation of the INSPIRE directive in Slovenia
- 3. The Surveying and Mapping Authority of the Republic of Slovenia should encourage the Ministry for Agriculture and the Environment to accelerate their implementation of the subproject EEA Hydrographic database (HIDRO)

The last phase of the subproject was the presentation of the quality model which is used by the INSPIRE directive. It is based on the ISO/DIS 19157 standard for Geographic information Data quality. The INSPIRE data specification define the important elements for the individual themes.

THE ESTABLISHMENT OF THE PHYSICAL TOPOGRAPHIC DATABASE **MODEL AND DEVELOPMENT OF THE MANAGEMENT APPLICATION FOR** DATA IN ACCORDANCE WITH THE NEW **TOPOGRAPHIC DATABASE MODEL**

This task consisted of establishing the high resolution and high accuracy topographic database in accordance with the INSPIRE directive and **developing the application** which enables the data management of the new database. It was carried out by the companies Monolit and Geodetska družba from Ljubljana, with professional support from the Surveying and Mapping Authority of the Republic of Slovenia and the Geodetic Institute of Slovenia.

At the beginning the **physical data model of the topographic** database was created in accordance with the guidelines of the INSPIRE directive and on the basis of a previous project - »The change of the existing topographic model in regard to the INSPIRE data rules«. The result is a physical database model (GeodataBase) in ORACLE and ESRI environments.

The database was **filled with test data** with the help of a simplified migration process meant for testing the application. The transformation from the logical to the physical model is supported by a feature catalog and simplified diagrams in a HTML form structure.



TOPO.

ronment

The developed ArcMAP tollbar enables the viewing of data in **2D and 3D**, the export of data for distribution and reambulation (updating process), the control of the reambulated (new) data and the import of data into the database in a user-friendly way. The application is part of the production system of the Surveying and Mapping Authority of the Republic of Slovenia.

practical examples.





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In the scope of the task technical guidelines were created regarding the method of data recording. These guidelines will be used for data migration in the further tasks of the subproject

For the data management of the new topographic database an appropriate application was developed in the Java programming language as an extension for the ArcGIS - ArcMAP envi-

After the completion of all these tasks we carried out **training** which consisted of the use of the application with the help of



SUBPROJECT **GEODETIC REFERENCE SYSTEM (GRS)**

Subproject manager: Klemen Medved

SUBPROJECT OBJECTIVES

IMPLEMENTATION OF THE VERTICAL COMPONENT OF ESRS	ESTABLISHEMENT OF A NATIONAL COMBINED GEODETIC NETWOR	<
	IMPLEMENTATION OF THE VERTICAL COMPONENT OF ESRS	

DEVELOPMENT OF THE GEOID MODEL FOR THE TERRITORY OF SLOVENIA

NATIONAL COMBINED GEODETIC **NETWORK**

Its main function is to ensure the infrastructure for permanent monitoring of geodynamic processes in the state's territory. It will enable long term and quality georeferencing with the future ambition to establish a 4D reference system.

The combined geodetic network or in other words the zero order geodetic network will be based on six national geodetic points. These points will represent the »physical landmarks« when establishing the new order of national geodetic points and will be the backbone of the national reference system which is being established in Slovenia.

The microlocations for all six points were chosen based on pre-viously determined **macrolocations** and a complex procedure of taking into account local and physical features. In the choo-





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sing process land surveyors, geologists, geophysicists, civil engineers and hydrologists all collaborated and determined the following locations: Prilozje, Kog, Areh na Pohorju, Šentvid pri Stični, Korada in Koper. The locations of these points of the zero order geodetic network are depicted in the picture below.

Many different criteria were considered in the final selection of points. These criteria can be divided into groups:

- geometrically optimal placement with regard to the shape and size of the state
- relief conditions, vegetation and climate conditions (accessibility, visibility, scheme...)
- geological, hydrological and geotectonic conditions (stability, groundwater, faults...)
- geodetic criteria (horizon openness, possibility to conduct measurements...)
- other influential conditions (public ownership, proximity of infrastructure, accessibility, conformity with spatial plans of municipalities and obtaining building permits...)

Project documentation was produced for the physical construction of every point. These points will be stabilized with an oval shaped concrete pillar approximately 2 meters in height onto which a GNSS antenna with a receiver will be placed. Due to reliability two antennas will be placed onto most of the pillars. The pillars will also house a box for all the necessary geodetic and telecommunication equipment. An inclinometer for stability monitoring and a meteorological station will also be installed onto these points. The IAG-EUREF quidelines (International Association for Geodesy - European Reference Frame) for geodetic reference points of the highest importance will be taken into account at the placement of the reference points.

Every point will have its foundation on three micropiles drilled into the ground at an angle and the depth of each will depend on the geological structure of the soil at each location. To avoid any potential deformations due to temperature changes all points will be insulated and protected with stainless steel. A fence will be erected around every pillar for physical protection.

Around every point 3 to 4 additional security network points with deep foundations will be stabilized at a distance of approximately 30 meters. All zero order network points will be connected to the high precision levelling network and to the gravimetric network.

The construction works on the first two points (Prilozie, Kog) have been concluded. The picture on the right shows the finished point at Prilozje in the municipality Metlika. The point is over 2 meters high and the micro piles are drilled and stabilized at a depth of 24 meters. Near this point a borehole for



monitoring groundwater levels is also located.

In the year 2015 the remaining points of the zero geodetic order network will be stabilized and in the framework of the project the necessary equipment will be acquired and installed. The next step of the project will be to include the combined geodetic network points into the highest order of geodetic networks and into the national network of permanent GNSS stations of the SIGNAL network.

THE VERTICAL COMPONENT OF THE **GEODETIC REFERENCE SYSTEM**

A prerequisite to establish a quality vertical component of the geodetic reference system is a new measured levelling network of Slovenia. Therefore the measuring of high precision levelling lines has been accelerated and in the first year of the project over 300 km of levelling lines were measured. Gravimetric measurements have also been carried out on all of the measured benchmarks which will enable the calculation of the geopotencial numbers and result in the introduction of »normal heights«.

Control of the calculations of all measured levelling polygons so far was carried out along with calculations of the geopotencial differences of benchmarks, unification of levelling polygons into loops and analysis on the closing of loops. Up to this point 11 of the altogether 15 levelling loops were me-

asured. On the basis of the calculated loops we can conclude that the results of the measurements of the levelling lines are excellent. The deviations resulting from the closing of levelling loops are shown on the picture below.



We expect that the levelling network measurements will be concluded in the year 2015 after which we will carry out the final adjustment of all observations and the calculation of the new heights.

This year and in the context of this project absolute gravimetric measurements were carried out on all of the six existing absolute gravimetric points in Slovenia. These points represent the basis for all further gravimetric measurements (local terrestrial observations of the gravitational field). In 2015 we plan to conclude the gravimetric measurements of the detailed points that are necessary for a high quality determination of the new Slovene national (quasi) geoid.

The picture on the right shows the absolute gravimetric measurements on the point Kluže – AGT600.



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SUBPROJECT **INFRASTRUCTURE FOR SPATIAL INFORMATION (INSPIRE)**

Subproject manager: Tomaž Petek

SUBPROJECT OBJECTIVES

CREATION AND IMPLEMENTATION OF THE CAPACITY BUILDING PROGRA INSPIRE DIRECTIVE

PREPARATION OF INSTRUCTIONS FOR INTEROPERABILITY, THE COHER THE UPDATE OF THE METADATA SYSTEM

TRANSFORMATION OF SPATIAL DATA SETS IN THE DISTRIBUTION ENVIR MAPPING AUTHORITY OF THE REPUBLIC OF SLOVENIA IN ACCORDANCE

CREATION OF DISCOVERY, VIEW, DOWNLOAD AND TRANSFORMATION

INTEGRATION OF THE NETWORK SERVICES AND METADATA INTO THE S GEOPORTAL

The subproject INSPIRE is extremely important for the establishment of the Slovene infrastructure for spatial information. Its results will on one hand raise INSPIRE awareness of partners and producers of spatial data and on the other the already established network services, the overhauled metadata descriptions and the transformed data sets will ensure its realization in accordance with time constraints for the implementation of the INSPIRE directive.

Two tasks took place in the year 2014 in the frame of the subproject INSPIRE – the first had its main goal in promoting, informing and training while the second was dedicated to establishing the network services system.

ORGANIZATION, INFORMING AND TRAINING IN THE SUBPROJECT INSPIRE





A AND THE PROMOTION OF THE	90%
ENCY OF SPATIAL DATA SETS AND	30%
ONMENT OF THE SURVEYING AND WITH THE INSPIRE DIRECTIVE	20%
NETWORK SERVICES	80%
SLOVENE AND EUROPEAN	40%

Increase of the general recognition of the INSPIRE directive and the awareness of the importance of a national infrastructure for spatial information were this project's basic areas of work. Regarding the fact that two key groups are involved in the process, one being the managers and producers of data and the other being the users of these data, both have to be given a lot of attention and different activities have to be carried out so that the first group can be trained to transform their spatial data in accordance with the INSPIRE directive and the second group



gets **knowledge of** and **access to** the infrastructure for spatial information

Promotional materials based on a created **integrated graphics** design were prepared for the purpose of informing the general and professional public about the infrastructure for spatial information. These materials were distributed at meetings with spatial planning experts and at workshops organized for the managers of spatial data. The promotional materials were meant to further the recognition of the subproject and consisted of folders, notepads, USB keys, pens and presentations. The final goal is to better the understanding of this very important European directive which was integrated into the Slovene legal system with the Infrastructure for Spatial Information Act (ZIPI).



An important part of the subproject was the **creation of the ca**pacity building program. This program determines the methods which will ensure adequate qualification and strengthening of skills of all the stakeholders (individuals, organizations and civil societies) for the efficient use of resources when establishing and using the infrastructure for spatial information.

In the scope of this subproject we created:

- »Capacity building program« document,
- an action plan for strengthening knowledge, acquiring skills and raising awareness,
- an action plan to ensure monetary funds,
- instructions to organize and implement the informing and training,
- a instructional handbook to form data policy for data access and services
- Guidance and recommendation on the Regulation on access to spatial data sets and services of the Member States by Community institutions and bodies under harmonized conditions

- Technical guidance for the INSPIRE schema transformation network service
- INSPIRE Metadata Implementing Rules Technical Guidelines for creating metadata elements
- and organized seminars and workshops.



Despite the fact that the activities regarding organization, informing and training have mostly come to an end we have to be aware that capacity building is a PROCES which must not stop because of the completion of one project. It has to be permanently carried out and alongside that even more attention should be given to the general public, to inform them of the INSPIRE directive and the possibilities it offers to every user of spatial data.

COMMON INFRASTRUCTURE - ANALYSIS AND PLANNING IN THE SUBPROJECT INSPIRE

The main purpose of this part of the subproject is the **accelera**ted implementation of obligations prescribed by the INSPIRE directive with the establishment of INSPIRE network services. These will be integrated into the national INSPIRE geoportal with emphasis on establishing a common data information infrastructure and ensuring spatial data in the appropriate data format and data scheme.

In this fashion the Surveying and Mapping Authority of the Republic of Slovenia is **upgrading the existing infrastructure**, the so called distribution system of the Mapping and Surveying Authority of the Republic of Slovenia, with INSPIRE network services. The INSPIRE compliant infrastructure of web services is based on the existing information infrastructure with a few upgrades with INSPIRE data schemes. The web service types are WMS (discovery service) and WFS (download service).



All rules regarding access and use of data (data policy, security policy) are the same as in the existing infrastructure for web services of the Surveying and Mapping Authority of the Republic of Slovenia.

The technological infrastructure used for the establishment and the operation of web services compliant with INSPIRE is the same as the infrastructure which is used in the distribution system of the Surveying and Mapping Authority of the Republic of Slovenia These are open source **infrastructures Geoserver** (www.geoserver.org) and **GeoNetwork** (geonetwork-opensource.org/).

At the implementation of the download service such application schemes were use that enable the defining of complex WFS service types (nesting of elements, referencing). The target WFS schemes are specified in detail in the corresponding XSD schemas which are available on the INSPIRE web page (http://inspire.ec.europa.eu/schemas/).

The results of the project so far are the **implemented WMS and** WFS web service types which are working with the more important data sets managed by the Surveying and Mapping Authority of the Republic of Slovenia. Special attention was given to the creation of the **web services connected to hydrography.**



services:



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With the help of the HUMBOLDT HALE computer tool which is meant for web page modeling we created the following WFS

WatercourseLink,

 ManMadeObject: Crossing, DamOrWeir, Embankment, Lock, ShorelineConstruction,

 Waterbodies: Waterbodies, Watercourse, StandingWater, HydroPointOfInterest: Rapids, Falls.





SUBPROJECT **HYDROGRAPHY (HIDRO)**

Subproject manager: Boštjan Savšek

SUBPROJECT OBJECTIVES

THE MIGRATION OF HYDROGRAPHIC DATA CAPTURED WITH A TEST AC THE TOPOGRAPHIC DATABASE OF THE SURVEYING AND MAPPING AUT

UPDATE OF THE SPATIAL DATA INFRASTRUCTURE TO IMPROVE OPERA

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

The general theme of the subproject Hydrography is **»Updat**ing and upgrading the hydrographic data infrastructure to improve the operational hydrological systems and the data structure in the field of water infrastructure with the goal to improve the process of water management«.

The purpose of the subproject is to **upgrade and improve the** operational efficiency of water management services as well as hydrological forecasting in such a way which will initiate the implementation of a unified central data structure for water management along with the ability to include new products and findings in the workflow process of producing hydrological forecasts with the intent for a more effective flood protection. All the newly formed data sets will meet the requirements for

ensuring access and use of spatial data sets defined with the INSPIRE directive.

part of the project.



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QUISITION (320 SHEETS) INTO HORITY OF RS (SMA)	0%
TIONAL HYDROLOGICAL SYSTEMS	40%
E PROCESS OF WATER	40%

In the year 2014 we actively approached the implementation of the subproject. Our first step was to redefine the proposed subproject's plan because of administrative (and staff) changes and because of the late start of the whole project. The Slovenian Environment Agency (SEA) was also included in the collaboration. After a few months of intensive work we managed to establish the new organizational structure of the subproject in such a way that we successfully retained the subproject's fundamental objectives. This was a crucial step for the start of the operational



UPDATE OF THE SPATIAL DATA INFRASTRUCTURE TO IMPROVE OPERATIONAL HYDROLOGICAL SYSTEMS

The cross sections of a stream that are in hydrological modeling are based on different data sources. The existing data based on Light Detection And Ranging (LIDAR) at SEA is relatively small and made up out of spatially and temporally fragmented recordings from different sources. At this moment it restricts the modeling for parts of the Savinja River, Ljubljana Moors and the coastal region. The modeling of areas outside of the existing LI-DAR database is possible only with the use of the Digital height model at 1:5000 scale - DEM5 which is not an adequate quality data source for the production of forecasting flood extents.

The ensuring of uniform LIDAR recordings of equal quality for the entire territory of Slovenia will produce a database which will be the foundation for the production of new operational two-dimensional hydraulic development models as well as used for updating and increasing the guality of existing hydrological models. This data set will present an opportunity for the production of a wide variety of products which will help with water management and flood protection.



In this year and in the frame of this activity the SEA has acquired the hardware needed for storage and processing of LIDAR data. Additionally, an application was developed for the data visualization and access with the help of web based services.

The migration of LIDAR data to the SEA along with their inclusion into the working processes, thereby improving the accuracy of the water surface state in the hydrodynamic model, is planned



for next year. The establishment of the vertical component of the geodetic reference system which will be realized in the scope of the subproject Geodetic reference system (GRS) will also increase the accuracy of these models.

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

Updating the database of water infrastructure is crucial for further use in determining the flood risk and planning in the field of water management. The construction and maintenance of water infrastructure is a major financial burden for the state. Nevertheless, the state is obligated to maintain the water infrastructure in a good condition to ensures life and property protection. An obvious rise in the intensity and frequency of natural disasters due to climate change has occurred in the last years. These extreme occurrences do not just cause a lot of damage but also demand a faster response time regarding reporting and intervening. The goals which we pursue in the scope of this activity are: The updating and upgrading of water infrastructure registers, the optimization of data acquisition if the field and the quarantee of data interoperability.

The information system for water infrastructure data acquisition in the field is shown on the picture below.



A portion of existing data acquired with previous inventorying of water infrastructure is of high enough quality and will be therefore incorporated into the new database. But because of the need for further analysis and the accurate positioning of water infrastructure the graphical part of the water infrastructure database has to be upgraded. The existing solutions were based on the positioning of phenomena and objects with only one pair of coordinates (centroid). In the frame of this subproject we will upgrade the graphical editor in such a way that it will enable a better schematic display of location and the type of individual water infrastructure objects. And additional data layer is planned which will be used as a »financial frame« for groups of water infrastructure objects. This layer will make it possible to connect the water infrastructure object register and the financial part which will enable better management in this field.

The implementation of this subproject has clearly shown the need for such applications in the operational work the SEA is carrying out in the field of water management. The system for mapping in the field has already gone through operational testing in the scope of carrying out the action plan of intervention steps because of floods which struck Slovenia in the year 2014. This system also plays a crucial role in informing the public about intervention steps.

In addition, certain technical and administrative procedures for data updating and maintaining will be defined for for each of the organizations which are responsible for the management and have the authority over the hydrographic data sets. These activities will include analysis of all the participants, analysis of their roles and the responsibility for hydrological data acquisition. We will organize workshops with every stakeholder of this system and in doing so we will help raise awareness of the importance of such a system of organized data acquisition and data maintenance.



The application for water infrastructure data acquisition in the field was established this year along with the web service for water infrastructure data entry and data management. The preliminary test of the application was carried out. We will begin with its final testing in the start of the year 2015 if the weather conditions will be suitable

The inventory of water infrastructure objects will be carried out next year and we expect that the database will be established at the end of the same year.

