

Regional SDI Cooperation – SEE Inspiration in South-Eastern Europe

Željko BAČIĆ, Croatia, and Željko OBRADOVIĆ, Bosnia and Herzegovina

Key words: regional SDI cooperation, Inspire, SEE Inspiration

SUMMARY

The development of the National Spatial Data Infrastructure (NSDI) and the involvement of individual countries in global activities, such as the establishment of the European Spatial Data Infrastructure (ESDI) through the implementation of the INSPIRE Directive and the Global Spatial Data Infrastructure (GSDI), require from any country and its institutions, regardless of the level of their development, to build significant scientific, organizational and financial capacities. The challenge of the NSDI establishment in the transitional countries, e.g. in the area of South-Eastern Europe, is greater because these countries face in parallel the development of the market economy, State structures and institutions, including the modern National Mapping and Cadastre Agencies (NMCA), by regulating the situation in obsolete registers (cadastre and land registers) as well as a number of other problems.

Aware of these facts and having realized that the lack of knowledge and capacities is the main constraining factor to building the NSDI, the NMCA's of South-Eastern Europe have agreed to cooperate and thus accelerate the development of the SDI in their respective States as well as the implementation of land administration reforms. Apart from exchanging the information and documents, and organizing regional annual conferences, the agreement encompasses the implementation of joint projects and the strengthening of regional and bilateral ties between the agencies.

The first project, formed as part of the cooperation established between eight NMCA's, is the SEE Inspiration Project. This regional project aims at establishing the legislative framework for the NSDI in the countries of the region, their mutual harmonization as well as their harmonization with the EU INSPIRE Directive, and at accelerating the land administration reform by implementing a number of activities and developing joint bodies such as the Permanent Technical NMCA Commission. The quality of the project has also been recognized by the European Commission so the project has been accepted as part of the multifunctional component of the IPA assistance program of the European Commission, targeting the countries of the region.

The South-Eastern Europe (SEE) Inspiration Project define, in a certain sense, the regional strategy for developing and establishing the Spatial Data Infrastructure (SDI) that enables to concentrate regional capacities and for systematically accelerating the SDI establishment through joint activities and mutual cooperation. This paper describes the genesis of the regional cooperation, the basic principles defined by the participants as well as the SEE Inspiration Project itself and its expected results. By implementing this and other follow-up projects, we can see that a quality framework for the regional cooperation has been established, enabling the achievement of a number of important objectives for each NMCA, and fit to be implemented elsewhere.

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1. INTRODUCTION

The ICT revolution, that has in the past twenty years completely changed the communication modes between people and thus also the mode of using the information in general, has influenced the spatial data in a special way. The initial problem of storing, processing, interpreting and using the spatial data seems laughable from today's perspective but until very recently this was not the case. Almost simultaneously, the former-Communist countries of Europe underwent a change of the social and economic system. This change has resulted in the introduction of democracy and market economy as well as in the break-up of some countries. Some of these processes were peaceful while the break-up in the territory of the former Yugoslavia entailed several war conflicts in the period between 1990 and 1996. The newly created States of South-Eastern Europe, i.e. Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Kosovo and Macedonia along with Albania that did not change, soon started a comprehensive reform of the land administration and institutions responsible for this field, pressed on one hand by the development of the real estate market and economy and on the other hand by the poor state of land registers, primarily in the cadastre and land registries, but also other relevant registers.

Table 1: SEE countries, facts about them and NMCA's

State	Size in km ²	Population	GDP/capita	NMCA
Albania	28.748	3.150.000	6.000 US\$	Agency for legalization and urbanization of informal settlements
Bosnia and Herzegovina	51.129	3.750.000	6.500 US\$	Federal Administration for Geodetic and Real Property Affairs of the BiH Federation Administration for Geodetic and Real Property Affairs of Republic Srpska
Croatia	56.537	4.400.000	16.100 US\$	State Geodetic Administration
Kosovo	10.887	2.000.000	2.300 US\$	Kosovo Cadastral Agency
Macedonia	25.713	2.050.000	9.000 US\$	Real-Estate Cadastre Agency
Montenegro	13.812	625.000	9.700 US\$	Administration for Real-Estate
Slovenia	20.251	2.000.000	29.500 US\$	Surveying and Mapping Authority
Serbia	77.474	7.850.000	10.900 US\$	Republic Geodetic Authority

With regards to the land administration, the countries in the SEE region have inherited different situations because the historical and legislative frameworks were different, but there is a lot of similarity in the reforms conducted in past ten years. On the other hand, since the newly created countries did not have their own official mapping (in the former Yugoslavia, the mapping was under the military jurisdiction), these activities have developed differently. The speed of the land administration reform also varies because it greatly depends on the economic strength of each country, the stability of its political system and the speed of

passing the necessary legislation facilitating the implementation of the reforms. As an illustration, the Gross Domestic Product (GDP) per capita of Slovenia is 12 times the GDP of Kosovo while other countries are somewhere in-between.

Historical legacy and especially the events that took place between 1990 and 2000 and the degree of the economic and institutional development have determined the speed and direction of the implementation of the land administration reforms and NSDI establishment in each country.

2. COOPERATION OF NMCA's IN THE REGION

2.1 International cooperation

The international cooperation between the regional NMCA's with regards to the land administration reform and SDI establishment has in essence followed a similar path in all of the countries of the region with some smaller exceptions in Slovenia that has, being the most economically advanced State (see: Table 1), completed as first the circle of reforms that included international donors and the World Bank. As a rule, inspired by the fast, post-war economic development with a particularly prominent and sudden growth of the real estate market, the countries in the region as well as the donor States and international organizations and institutions have recognized the need to start with the land administration reform in the countries of the region in order to create preconditions for further economic development of these countries, based on safe real property legal transactions as well as modern registers offering high-quality information on the situation in the field and the use of space. Almost as a rule, the international cooperation started with the bilateral technical assistance projects with donor countries such as Germany, Norway, the Netherlands, Austria, USA, UK, Sweden or Japan (see: Table 2). The defining of the basic reform directions through bilateral projects was followed by a project assisted by the expertise in implementing large reform projects and the financial support: World Bank loans that were as a rule further financially assisted and boosted by the European Union assistance. As already mentioned, Slovenia completed this type of cooperation a few years ago, Croatia is near the end, countries such as Albania, Bosnia and Herzegovina, Macedonia and Serbia are at different stages of the projects funded by World Bank loans while Montenegro and Kosovo have just started with them.

In the past 15 years, over US\$ 250 million in total has been allocated for a number of the land administration reform projects that contained in almost all countries one or several components or project tasks directly or indirectly linked to the SDI establishment in the countries in the region (Bačić et al., 2009). One should be added to this an equal amount of funds that the countries themselves allocated from their budgets for the realization of these programs and projects. Apart from the fact that significant funds have been collected through donations, assistance and loan funds representing the biggest portion of allocations, it should be underlined here that an extremely valuable component of the international cooperation is the knowledge engaged by the donor countries in the implementation of the afore-mentioned programs and projects or rather the transfer of knowledge gathered along the way. The foregoing is certainly one of the important reasons for being able to speak with certainty about the significantly increased human capacities of the regional NMCA's, equipped with the

know-how related to the system management and establishment of modern registers, use of advanced technologies and findings about the SDI.

Table 2: International participation in reform programs (Steiwer et al, 2008)

International institution	ALB	BiH	KOS	CRO	MAC	MNE	SLO	SRB
EU programs	•	•		•				•
Germany (GTZ)		•	•	•		•		•
Japan (JAICA)		•			•	•		•
Netherlands (Kadaster)		•		•	•			
Norway (Statens kartverk)			•	•				•
Sweden (SIDA)		•	•	•	•			•
Switzerland		•	•					
UK (DFID)				•				
USA (USAID)	•			•				
World Bank	•	•	•	•	•	•	•	•
Austria		•						
France								•

The expressed indicators of international cooperation point to the fact that the level of success in implementing the afore-mentioned programs and projects is very high as well as the fact that not only the donor countries but also the fund beneficiary countries have paid special attention to the coordination of the donor activities. The standard forms of such coordination are donor conferences held or previously held every year by the countries in the region, depending on the stage of the reform implementation, by coordinating the mission dates of various donors with the World Bank missions in order to have at least a partial overlap between the two, thus enabling a multiparty exchange of information and harmonization of activities. Such forms of activity coordination have proven to be very useful for all partners because they reduce the risks of implementing the projects, or rather the engaged funds yield a better effect in the reform implementation.

2.2 Bilateral cooperation

In the past ten years, the broken relations between the NMCA's have started to be rebuilt on the high-quality basis and the bilateral projects with the donor countries carried out in the past few years as well as the projects supported by the World Bank loans that have contributed to it. The basic form of cooperation is most often defined by cooperation agreements between the NMCA's related to the State survey, cartography and cadastre, i.e. the core activities of these institutions. Tako ilustracije radi, formalna suradnja između Surveying and Mapping Authority of Slovenia and State Geodetic Administration of Croatia funkcionira već osam godina, a suradnja između dvije Administration for Geodetic and Real Property Affairs iz Bosne i Hercegovine and State Geodetic Administration of Croatia funkcionira četiri godine.

The cooperation defined by the afore-mentioned agreements as a rule presupposes the informal as well as formal cooperation manifested in the form of annual gatherings of the institutions' managements as well as the exchange of border topographic maps and GNSS service data, and often through the exchange of rules and regulations, standards and

specifications adopted by respective countries. Table 3 illustrates the linking of GNSS networks of the countries in the region. Although the linking has not been completed, Table 3 indicates the high degree of GNSS network linking, with the exception of the MAKPOS network that is still in the testing phase.

Table 3: GNSS networks in the region and realized data exchange between them

Country	GNSS network	No. of pages	Lined to other networks
Montenegro	MONTEPOS	9	Croatia
Croatia	CROPOS	30	Slovenia, Hungary, Montenegro
Macedonia	MAKPOS	14	-
Slovenia	SIGNAL	15	Italy, Austria, Hungary, Croatia
Serbia	AGROS	32	Hungary, Bulgaria

The two main areas of the data exchange are certainly the cadastre or rather the land administration reform and the establishment of the spatial information infrastructure. When talking about the cadastre and land administration, this primarily refers to the exchange of experiences in organizing the projects, building specific capacities required not only for the project management but also for the institutions themselves, and considering certain specific issues of integrating certain solutions in the legislation and practice of the countries in the region. The establishment of the spatial information infrastructure refers to the exchange of ideas related to the infrastructure itself and the solutions implemented in the countries in order to define them in terms of legislation and organization.

2.3 Regional cooperation

Inspired by more intensive bilateral cooperation which is naturally linked also to the realization of numerous projects and many meetings at the scientific and expert gatherings, the State Geodetic Administration, assisted by the Norwegian Mapping and Cadastre Authority (Statens Kartverk) organized the First Regional Conference on Cadastre between 8 and 10 June 2008 in Opatija (Figures 2 and 3 – cover page and participants). This gathering was attended by the top management representatives of seven regional NMCA's from Bosnia and Herzegovina, Montenegro, Kosovo, Macedonia, Slovenia, Serbia and Croatia, as well as the European Commission and World Bank representatives and donor countries of Norway, the Netherlands, Germany, Sweden and Great Britain.

In preparation to the conference itself, the Norwegian and Croatian experts developed the Regional Study on Cadastre (Steiber et. al, 2008) presented at the Conference (Figure 1 – Study cover page).

Apart from this comprehensive study and a number of presentations, the conference ended by the conclusion of the NMCA's present that they opted for the regional cooperation in order to establish security in the real property legal transactions with the help of the modern and up-to-date registration, acceleration of the land administration reform implementation and exchange of the experiences and lessons, cooperation on the projects and agreement that the regional conferences on cadastre should be held every year.



Figure 1: Cover page 1. Regional Study on Cadastre



Figure 2: Poster of the First Regional Conference on Cadastre



Figure 3: Participants of the First Regional Conference on Cadastre, Opatija, 2008

The Real-Estate Cadastre Agency of Macedonia organized the Second Conference between 25 and 27 May 2009 in Ohrid (Figure 4). Apart from cadastral issues, the emphasis of the Second Conference was already partially directed at the issues of the NSDI establishment and the organization of its establishment. Thus, the Second Regional Study on Cadastre was extended with a separate chapter on the condition of the SDI in the countries of

the region (Steiwer and Roić, 2009), Figure 5 (cover page of the Second Study). The Second Conference has also resulted in conclusions and the following two need to be singled out:

- A permanent technical commission will be established in order to ensure continuous cooperation related to resolving the issues of interest to all NMCA's
- NMCA's that participated at the Conference adopted the initiative of jointly acting towards the European Union and other donors and to propose, depending on the circumstances, regional projects.



Figure 4: 2. Regional Conference on Cadastre, Ohrid 2009

Figure 5: 2. Regional Study on Cadastre

The Third Regional Conference on Cadastre will be held in the spring of 2010 in Montenegro and will be organized by the Administration for Real-Estate of Montenegro.

3. SDI DEVELOPMENT IN THE REGION

The establishment of the spatial data infrastructure in the countries of the region is still at a low level, as compared to the most developed countries of the world, especially with regards to its practical implementation. The majority of countries have chosen to implement the SDI by defining the legislative framework. This has so far been carried out in Croatia, Macedonia and Serbia while Slovenia has chosen to realize its SDI by implementing the provisions of the INSPIRE Directive (European Union, 2007).

Croatia was the first to incorporate in its legislation the basic SDI principles and organizational structure of its establishment (Republic of Croatia, 2007) based on the results of the National Spatial Data Infrastructure Study developed for the State Geodetic Administration (Wytzisk et al., 2005). The afore-mentioned law defined the NSDI, its activities and bodies for the infrastructure implementation. In 2008 and 2009, the NSDI bodies were established in Croatia in line with the legal provisions. The umbrella organization, NSDI Council, was established first and tasked with managing and supervising the NSDI development, passing formal decisions and liaising with the Government, followed by the NSDI Board representing the infrastructure implementation body. Finally, five NSDI working groups were established to cover the key areas of the NSDI development:

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- technical standards,
- joint use of spatial data,
- business model,
- linking the NSDI and e-Government activities,
- capacity building,

Pursuant to public announcements, 65 experts of various profiles and professions are involved in the work of the above-mentioned working groups. The first two working groups, i.e. for technical standards and joint use of spatial data have been active for over a year and have achieved the first results so the implementation of the metadata rules has been prepared in order to establish the national metadata service in Croatia.

Apart from the activities of working groups, special attention is paid to public awareness campaigns. Therefore, a leaflet on the NSDI was printed in 2009 and distributed via professional magazines and newsletters and the First Croatian NSDI and INSPIRE Conference was organized on 26 November 2009. The conference (see: Figure 6) attracted 220 experts from Croatia and ten other countries. It was organized by the Croatian Cartographic Society and State Geodetic Administration in combination with the Fifth Conference on Cartography and Geo-Information.

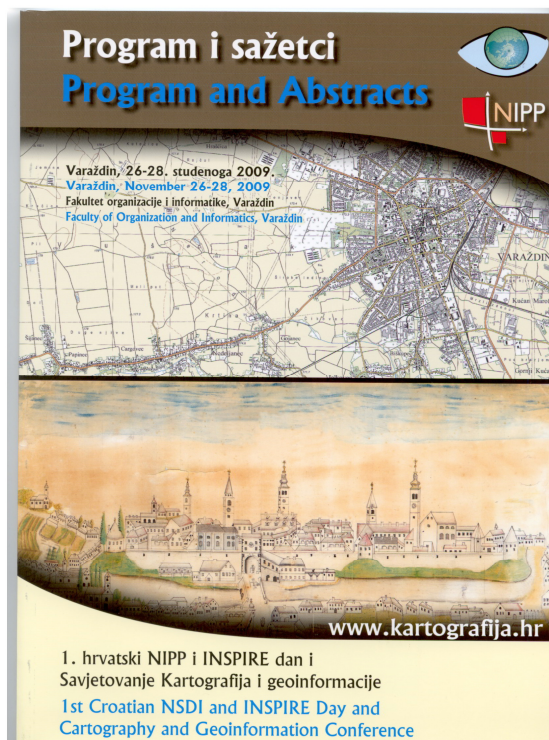


Figure 6: Proceedings of 1st Croatian NSDI & INSPIRE day

Unlike Croatia, Slovenia is obliged to implement the provisions of the INSPIRE Directive as a member State of the European Union so it has started with its direct implementation and development of the elements of its SDI-a. Thus, its spatial portal (<http://prostor.government.si>) launched in 2003 (Steiber and Roić 2009) established SDI

services available to everyone (metadata and view) and to authorized users and local government bodies (download and invoke).

Following the example of Croatia, Macedonia adopted the new Law on Real-Estate Cadastre (Republic of Macedonia, 2008) in 2008 and Serbia adopted the new Law on State Survey and Cadastre (Republic of Serbia, 2009) in 2009. Both regulations also contain a chapter on the NSDI that similarly regulates the issue of the NSDI establishment in the countries which started establishing the stipulated bodies. This very fact, as well as the intention of other countries in the region and the realization about how demanding this whole activity really is, has led to the consideration of the possibility to approach the issue of the NSDI establishment and the process harmonization in the countries in the region in an organized way, given that all these countries, after joining the European Union, will sooner or later be obliged to implement the INSPIRE Directive. This opinion and call to propose regional projects as part of the IPA 2010 Multi-Beneficiary Programs of the European Union led in early 2009 to the conception of the projects serving to incite and guide the SDI establishment in the region.

4. SOUTH-EASTERN EUROPE INSPIRATION PROJECT

4.1 Project background, objective and purpose

Using the opportunity, the South-East Europe Inspiration – Regional Awareness, Capacity and Legislation Building on Spatial Data Infrastructure Project, or abbreviated SEE Inspiration Project, has been prepared by the State Geodetic Administration of Croatia jointly with the NMCA's from six other countries in the region (shown in Figure 7) and proposed to the European Commission to be financed within the framework of the IPA 2010 Multi-Beneficiary Program (Bačić et al., 2009)

Recognizing that the development of national SDI's requires special care, and that the precondition for the national SDI development is the capacity building and sufficient level of knowledge about the SDI concept as well as familiarity with the INSPIRE Directive guidelines and other knowledge related to these issues (educational system, business models, public relations, etc.), the regional NMCA's proposed the SEE Inspiration Project. In order to create a critical mass of knowledge, capacities and public awareness of the SDI in these, for most countries, still initial stages of the NSDI development, extraordinary efforts must be invested in order for the key institutions, NMCA's, universities, professional associations and SDI stakeholders to quickly learn about the SDI concept and the INSPIRE Directive, and to start incorporating them or rather applying them in their respective countries. In this context, a harmonized approach to the NSDI development in the countries in the region certainly brings advantages as compared to the strictly individual approach to their development.

Therefore, the overall objective of the Project contribution has been defined as the creation of accurate, up-to-date, high-quality, well-structured and accessible *spatial data* in the local, regional and State administrative bodies in the countries of Western Balkans. In this context, the purpose of the SEE Inspiration Project is to promote SDI as a concept in order to prepare countries in the region for the implementation of the INSPIRE direction.



Picture 7: Countries participating in SEE Inspiration Project

The comprehensively conceived purpose of the Project has also required an assessment of the Project impact. The assessment has been made also in the context of the overall objective of the Project and it has been defined that the Project will achieve the objectives in the following way:

- The preconditions will be created for the legislative defining of NSDI and the implementation of INSPIRE Directive in the countries of the region;
- The preconditions will be created for the continuation of the accelerated LA reform in the countries of the region, and especially the good quality building of the LPIS system
- The preconditions will be created for the education of highly professional staff in the NSDI domain;
- The regional cooperation of NMCA's in order of capacity building will be supported;
- The activities so far conducted to inform the public on the LA reform will be extended to the SDI area with the special emphasis on the SDI stakeholders;
- For the purpose of informing and training, 500 participants will be involved and they will become familiar with SDI, LA and capacity building
- With the project implementation, all categories of participants (primary, secondary and tertiary) will have increased knowledge or capacities to support the implementation, and they will be aware of the interaction between the projects that are relevant for the process of EU accession (LA, SDI, LPIS; CORINE, ...)
- With the organization of workshops and trainings, a network will be created at the national level of stakeholders and their communication will be improved
- With the regional cooperation, the subject activities, as is the intention of INSPIRE Directive, will be harmonized and accelerated because the mutual cooperation will also mean encouraging one another

It is obvious that the above-mentioned measures cannot be directed towards all the SDI stakeholders so the following three groups (levels) of users have been defined:

- **Main:** National Mapping and Cadastre Authorities (NMCA's) of Beneficiary countries
- **Secondary:** Ministries covering environment and Universities providing education in surveying, geodesy and geomatics
- **Tertiary:** NSDI stakeholders in each country (other governmental institutions, especially Ministries of Agriculture (LPIS)); private surveying, GIS and geomatics commercial sector in each beneficiary country.

The project is currently in its final stage of preparation and a public tender for the provision of services related to the Project execution will be announced in mid-2010. The Project will be carried out in the 2011-2013 period.

4.2 Project activities

The Project envisages a series of concrete activities. They can be divided into the following three basic groups:

- development of studies, analyses and reports at the level of the region and of each country (13 documents in total),
- offering support in the production of 3 regional studies on cadastre and organization of 3 regional conferences on cadastre,
- offering support and organizing a series of seminars, courses and workshops aimed at establishing the capacities for the SDI establishment and the NSDI adoption, and
- preparation and implementation of the initial public awareness campaign in all the countries in the region.

This refers to the following activities:

- Development of the **Regional SDI Legislation Framework Analysis** for each of the states, including an individual and aggregate comparison of harmonization with the INSPIRE Directive requirements, i.e. the provisional rules. Existence and work of formal and informal national SDI bodies will be analyzed as well as the participation of the subjects. With the completion of the survey among the SDI subjects, mark will be given on how the subjects are informed about the SDI, the INSPIRE Directive and its significance, and the knowledge on the national SDI framework.
- Development of the **Regional SDI Establishment Recommendations Report**. Based on the Regional SDI Legislation Framework Analysis study, the report should give recommendations for the upgrade of national SDI's of each country into the regional and European SDI with the elaboration of the implementation mechanism.
- Development of the **Country wise SDI Legislation Recommendations Report** (6 reports). This activity will result in 6 national legislative recommendations and draft SDI regulations, i.e. each report will propose the legislative framework for the definition of NSDI in each state with the draft of basic articles of the future regulation harmonized with the INSPIRE Directive. The report will define and describe the NSDI bodies in accordance with the defined draft regulation, and also describe their tasks and propose the schedule and dynamics of the implementation of the proposed measures.

- Production of the three Annual **Regional Cadastral Studies** and providing a support to the Permanent Regional Technical Commission in development of 3 Regional Annual Cadastral Studies through the analytical processing of the collected data and its systematization, interpretation and formatting into a study.
- Production of the **Regional SDI & LA Capacity and Education Study**. The Study will, for all countries in the region, analyze capacities available for development of SDI and modern LA and existing curricula of universities for the SDI and LA experts.
- Production of the **Regional SDI & LA Capacity and Education Recommendations Report**. This report will propose to the beneficiary countries and their relevant institutions the scope of knowledge necessary to the experts who will be actively involved in the development and implementation of NSDI, as well as the basic part of the curriculum contents on NSDI, i.e. it should point to the direction in which it is necessary to go regarding the curricula and build the links and references with the NSDI curriculum and knowledge.
- Provide support in organization of Capacity Building and Education in field of Surveying, Geomatics and SDI Conference.
- Organization of 3 training courses on INSPIRE implementation and its relevancy for each society for people directly involved in INSPIRE establishment & implementation.
- Organization of 2 two-days workshops in each of involved countries on implementation issues and regarding delivered analysis and recommendations.
- Production of the **Regional Public Awareness Study** which will comprise public opinion on SDI and LA in each of the involved countries, as well as the activities that the bodies of these states, with the special emphasis on NMCA, undertake with the objective to develop public awareness on issues relevant for SDI and LA.
- Production of the **Regional Public Awareness Recommendations Report**. Report will suggest the methods for informing the public and increasing public awareness, and will also give templates of promotion materials for the implementation of campaigns in each beneficiary country.
- Preparation and execution of initial **Public Awareness Campaign** in each country about SDI and LA reform respectively to conditions. Based on Regional Public Awareness Study the Public Awareness Campaign (PAC) is to inform stakeholders and citizens of the beneficiary countries about LA reform and implementation of SDI (implemented activities, involved beneficiaries and general benefits for the state and citizens).
- Provide support in organization of 3 annual Regional Cadastre Conferences.
- Provide organization of seven INSPIRE day conferences.

5. CONCLUSION

The NSDI establishment in the SEE countries encompassed by this paper, as part of the land administration reform programs and projects, is one of the priorities and clearly defined tasks of the NMCA's of these countries. Given that the NMCA's of most countries act as implementing institutions for the SDI establishment and relying on the established regional

cooperation and awareness of the lack of capacities and resources for the infrastructure establishment in the countries in the region, a joint project to be carried out with the help of the European Union funds has been defined. The Project entitled “SEE Inspiration” will create a precondition for the adoption of the NSDI legislation harmonized with the INSPIRE Directive in all the countries involved in the Project, the necessary capacities will be built, the public awareness campaign will be carried out and the capacities in all agencies will be joined in order to achieve synergy between the agencies as well as catalytic effect of increasing the capacities of the countries in the region on their way towards the European Union.

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BIOGRAPHICAL NOTES

Prof. Željko Bačić, Ph.D., graduate geodetic engineer

Graduated in 1986 from the Faculty of Geodesy, University of Zagreb, and obtained his Ph.D. at the Institute for Applied Geodesy and Photogrammetry at the Technical University in Graz in 1997. He started his professional career as a teaching assistant at the Faculty of Geodesy in Zagreb. In 2002, he was elected Professor at the Satellite Positioning and Navigation Chair of the same Faculty. In 1999, he was appointed Deputy Director and in 2000 Director-General of the State Geodetic Administration of the Republic of Croatia. In period 2002-2009, he was member of the EuroGeographics Management Board and served as President in 2005-2007 period. Since 2008, appointed by Croatian Government as a member in the Croatian National Spatial Data Infrastructure Council and President of the NSDI Committee. Member of Croatian Chamber of Licensed Surveyors. Honorary member of Croatian Cartographic Society and Geodetic Association of Herceg-Bosna. Member of Cambridge Conference Advisory Board since 2005. He authored or co-authored more than 50 papers in various fields of geodesy and geoinformatics.

Interests: SDI, cartography, satellite positioning, GNSS permanent networks, capacity building in surveying, ...

CONTACTS

Title, given name and family name: Prof. Željko Bačić
Institution: State Geodetic Administration of Republic of Croatia
Address: Gruška 20
City: 10 000 Zagreb
COUNTRY: CROATIA
Tel. + 385 1 6165-444
Fax + 385 1 6157-389
Email: zeljko.bacic@dgu.hr
Web site: <http://www.dgu.hr>

Željko Obradović, graduate geodetic engineer

Graduated in 1990 from the Faculty of Civil Engineering, University of Sarajevo. He started his professional career in 1991 in local and regional cadastre offices in Bosnia and Herzegovina. In 2005, he was appointed Director of the Federal Administration for Geodetic and Real-Property Affairs of Federation of Bosnia and Herzegovina. Since 1995 member of Geodetic Association of Herzeg-Bosna, and served as President in 1995-1997 period. Member of the State Commission for Nacional Boredr since 1997. Member of Eurogeographics since 2006 and elected in Management Board in 2009. He authored or co-authored more than 10 papers in various fields of geodesy and geoinformatics.

Interests: cadastre, digital mapping, physical planning, ecology, cartography

CONTACTS

Title, given name and family name: Željko Obradović
Institution: Federal Administration for Geodetic and Real Property Affairs
Address: Reisa Džemaludina Čauševića br.6
City: 71000 Sarajevo
COUNTRY: Bosnia and Herzegovina
Tel. + 387 33 215 304
Fax + 387 33 201 784
Email: zeljko.obradovic@fgu.com.ba
Web site: <http://www.fgu.com.ba>