

Developing Infrastructural Frame for Nationwide Management of Spatial Information's in Croatia

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Key words: NSDI, legislative frame, infrastructural frame, exchange and use of spatial data

SUMMARY

For the purpose of efficient management of spatial information on national level in Croatia, State Geodetic Administration (SGA) of Republic of Croatia prepared strategically document on establishment of National spatial data infrastructure (NSDI) in Croatia. Based on that document SGA has launched activities towards establishment of infrastructural frame, which should enable successful and efficient usage of spatial information for all segments of Croatian society. Therefore new Law on State Survey and Real Estate Cadastre with a new chapter on NSDI has been sent in to the parliamentary procedure, following also recent developments on INSPIRE Directive. Furthermore, first step in establishment of NSDI, national spatial data geo-portal (first phase), has been realized and serves as a tool of NSDI implementation. Circumstances of development of infrastructural frame for nationwide management of spatial information in Croatia and strategic decisions for establishment of NSDI, as well as undertaken practical steps are described in this paper.

SUMMARY (Croatian)

U svrhu efikasnog upravljanja prostornim podacima na nacionalnoj razini, Državna Geodetska Uprava (DGU) Republike Hrvatske pripremila je strateški dokument o uspostavljanju Nacionalne Infrastrukture Prostornih Podataka (NIPP) u Hrvatskoj. Temeljeno na tom dokumentu DGU je započela sa nizom aktivnosti sa ciljem uspostavljanja infrastrukturnog okvira koji bi trebao omogućiti uspješnu i efikasnu razmjenu prostornih informacija u svim segmentima Hrvatskog društva. Stoga je novi zakon o Državnoj izmjeri i katastru nekretnina sa novim poglavljem o NIPP-u prosljeđen u saborsku proceduru, slijedeći također aktualni razvoj INSPIRE direktive. Nastavno, prvi zadatak u realizaciji NIPP-a je uspostava nacionalnog Geo-portala prostornih podataka (prva faza), koji je realiziran te kao takav služi kao alat za implementaciju NIPP-a. Ovaj članak opisuje okolnosti razvoja infrastrukturnog okvira na nacionalnoj razini za upravljanje prostornim podacima i strateškim odlukama u Hrvatskoj, kao i poduzete praktične korake.

1. NSDI STRATEGY

At the beginning of the new millennium SGA initiated first practical steps for creation of modern NSDI structure. At that time SGA started to execute new national Programme on State Survey and Real Estate Cadastre for period 2001-2005 through which massive digitalization of existing and production of new spatial data sets was launched. Investing lot in new highly developed hardware and software solutions, GIS needs were becoming to play significant role in the new business application in state administration and economy. But, at the same time lack of national strategy in field of production, collection, organization, distribution and management of spatial data, increased customer need for well managed and easy available spatial data become evident as a problem and growing with the time. Missing national digital databases, uncompleted data sets, non-existent GIS services and slow exchange of spatial data fulfil that picture.

Initiated by SGA, first study on geographical information requirements towards establishment of NSDI was contracted to BlomInfo A/S and done by Arponen at all¹ in 2001. Analysis of situation and inventorying by questionnaires the stakeholders and wide area of users of spatial data was their methodology of work. That first study gave very important start point for developing NSDI idea, sufficient to go in line with the political changes. Therefore, research has been focusing on EU requirements for GI infrastructure, and it described situation in Croatian spatial data market, making compares with EU needs and progresses by creating recommendation of required actions for Croatia.

After the elections in year 2003, new Croatian government specifies in its Program for Mandate 2003-2007², its priorities. Under the segment of, Environmental protection, spatial planning and construction, 6.3., spatial planning, the cadastre and land registry, it say:

“...The reorganization of the land registry and cadastre is a priority for the legal security of citizens and the development of the economy. Legal security in trade in real estate is a prerequisite for stable economic development, investment and entry into the European Union.

The Government will modernize the cadastre and geodetic system; launch a program to bring the land registry into line with the cadastre and geodetic register according to the standards of the European Union, with the aim of establishing an integrated system throughout the entire country. The Government will also initiate work on national infrastructure for spatial data.”

This statement is strategic decisions for further steps of implementation of NSDI idea. Implementation of NSDI means creating functional infrastructural framework for spatial data management including legislative, institutional and organisational framework.

¹ Arponen, M., Eggers, O., Larsen, P.E., Skender, I. (2001): Review of EU requirements for Geographic Information Infrastructure in Croatia - Final Report. BlomInfo A/S for SGA in frame of WB Technical Assistance Project for institutional Reform for Private Sector Development, Review, see <http://www.blominfo.dk>, fetched June 03rd 2006

² Government of the Republic of Croatia (2003): The Program of the Government of the Republic of Croatia for the 2003-2007 Mandate, presented on December 23rd 2003 in Croatian Parliament, see <http://www.vlada.hr/DOWNLOAD/2004/02/04/VRHProgramVRHeng.pdf>, fetched June 03rd 2006.

Based on mentioned Governments priorities, the findings of the BlomInfo study and fact that Real Property Registration and Cadastre Project, supported by The World Bank and European Union, foreseen as a major instrument of reforms in land administration and filed of spatial data, has started in year 2003, work on NSDI development continued. Second study was tendered in 2005 and contracted to Conterra GmbH and executed by Wytzisk at all³. Study, should deliver proposal for development of NSDI. Respectively, proposal of the “road map” for Croatian implementation of NSDI is defined and detailed described in that study and it direct the development of NSDI towards of e-government strategy. Main segments of proposed road map are:

- update of boundary conditions and requirements,
- roadmap development, policy, management and operational level,
- deduction of follow up actions.

The roadmap was based on of comprehensive analysis of present status in Croatia, conditions and requirements resulting especially from European and national policies, present legal framework, relevant technical standards and data and technology available in Croatia. Based on those inputs roadmap elaborates, through three major parts, how to establish NSDI in Croatia. Those three major parts, representing three interrelated organizational levels of an SDI address NSDI at the following levels:

- policy level: pointing to the overall objectives and legal regulations,
- management level: addressing organizational aspects, concepts and standards,
- operational level: dealing with actual implementation procedures.

Following developed roadmap the study proposes at the end a number of practical steps towards gradual establishment of NSDI.

2. SPECIFICS OF CROATIA

To be able to understand undertaken activities considering establishment of Croatian SDI it is necessary to explain situation in Croatia regarding spatial data. Practical research⁴ shaped in questionnaire was done to discover existing situation regarding usage, capture and exchange of spatial data in Croatia. For this purpose most frequent spatial data users of SGA products have been identified, as many as 151 of them. By the nature of Croatian legislation, participated group of users of NSDI are; ministries and governmental agencies, regional and local government - counties and towns, private surveying, geoinformatic and IT companies, other private and public companies (traffic, telecommunications, civil, air traffic, designers and physical planners), educational institutions, cadastre and land registry offices. Out of identified users 51 answered the questionnaire. Results that are given through this research describe problems, solutions and specifics of Croatia in a field of spatial data.

Taking into consideration further implementation of NSDI the problems that practical research has identified detected also critical obstacles in its establishment. Below is listed summary of answers that are given on question “what problems do you see in exchange of data?”. Those open topics that seek for regulations and discussion are; price policy, definition

³ Wytzisk, A., Buehler, W., Remke, A., Stipić, D. (2005): Study on Development of the National Spatial Data Infrastructure, Final Report, Conterra GmbH, see <http://www.Conterra.de>, fetched April, 22nd, 2006

⁴ Šainović, I. (2006): Development of NSDI in non-standard environment - Croatia as Case study, submitted Master thesis, on Land Management Study at Royal Technical University (KTH) in Stockholm, Sweden.

and implementation of standard, collection, maintenance and quality control of data, support of NSDI in technology and staff, removing slow administrative procedures and limitations of access to spatial data, creation of coordinated processes, promotion of NSDI through education and awareness campaigns, lack of legislation and regulations considering exchange of data and duplication of data.

Results of questionnaire indicated which data are recognized by users as core data, see Figure1. Survey results are analyzed and adjusted to reflect, as best as possible, the framework data needs of the GIS user community in general. Charts are showing groups of data in which just few of data are creating global level data or Core data, detailed data are the one that are rarely used from certain groups and more professionally orientated. Expectations are that no single set of criteria will be appropriate for all GIS users. Identified sets of criteria best meet such criteria as NSDI framework is, and will be base for improving such data to meet the full needs specified by the different sets of criteria

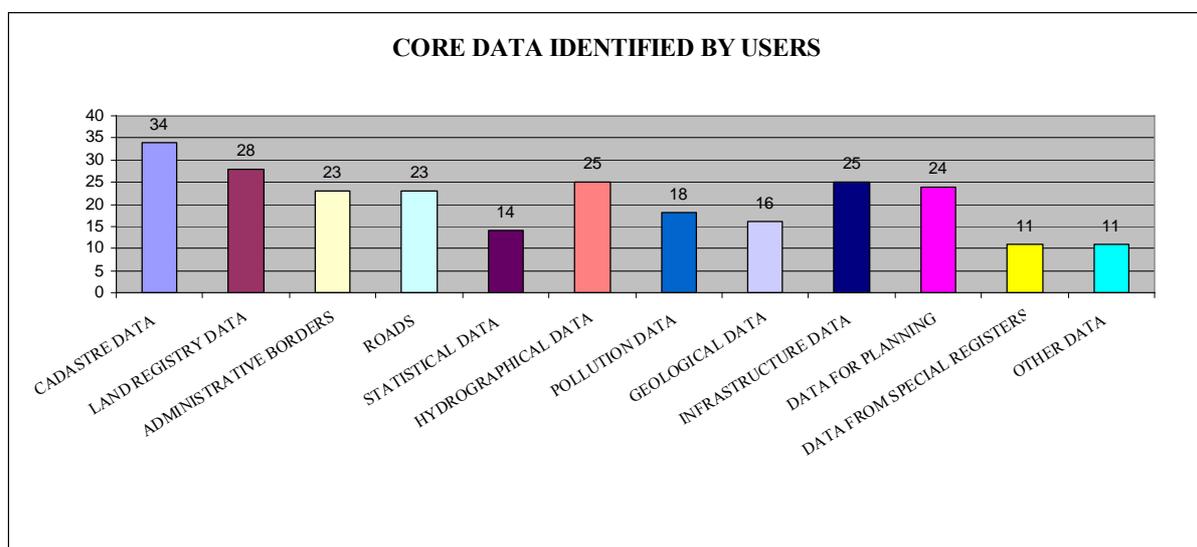


Figure 1: Core data identified by users, questionnaire result, indicated answers out of 51

Results about core data are also in line with present situation about exchange of the data. In Figure 2 results are shown about mostly exchanged data, indicating also partly availability of data and organizational culture of stakeholders. From both figures it is visible that there is in general no big difference in recognition of core data and mostly exchanged data, but some indicative differences show level of readiness of some stakeholders of data.

Main concept of NSDI is to define that data are *accurate, up to date, qualitative*, and where can we find them together with providing sustainable system of continuation of such processes. Strategy of NSDI is streaming towards users and providence of services of relevant data. Possible services as proposed by INSPIRE are the visualisation of information layers, overlay of information from different sources, spatial and temporal analyse. Accent is in cadastral data that have significant role in visualisation and representation of data.

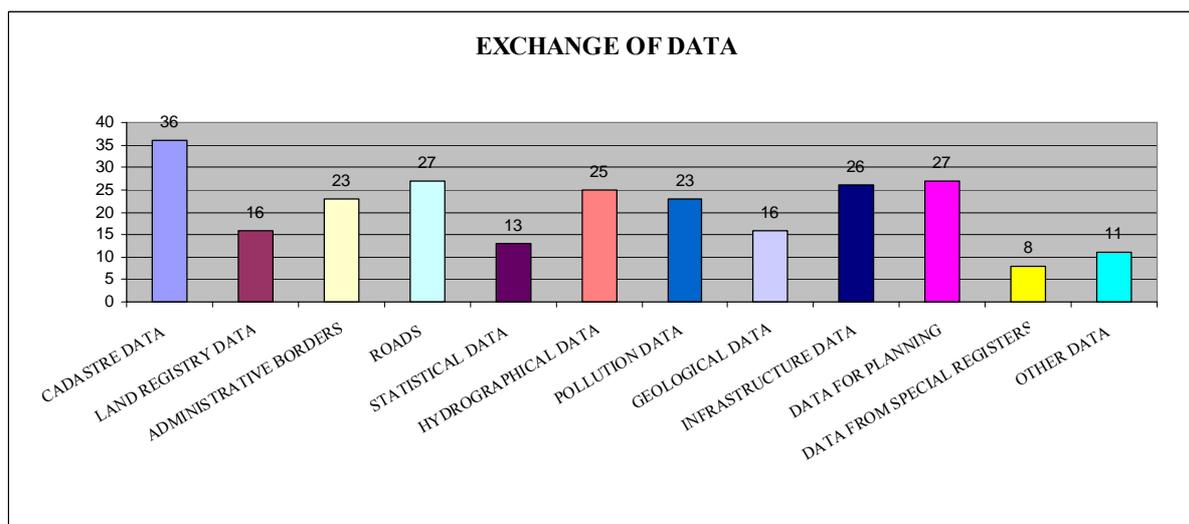


Figure 2: Mostly exchanged data by users, questionnaire result, indicated answers out of 51

Web services are fetching for data for users applications, where users do not need to seek for data and do not need to know for organisational background of the data. Such view is helping users, making him not to worry about processes that leads up to the provided service.

Making of responsibilities over organisation to create compatible core data to be able to be used by other organisation mean to create NSDI, means exchange and update of data. Therefore strong customer need is force for update and maintain of data, which will create a stronger integration and different processes inside of each organisation. Standards and metadata standards has been a necessary step in realizing true integration, it is now necessary to use the standards to actually achieve integration. Policy that will guide NSDI is multi-organisational policy, with emphasise on spatial data segments, which promotes and increase value of spatial data through harmonisation of spatial data, creating new products out of it and providing services for it. Products in today Croatian organisational structure should be created on a global level of data, thinking on core data, meaning first harmonisation of just most exchanged data.

Among above mentioned problems and needs logically parallel processes are happening in a field of implementation of GIS systems for purpose of proper usage of spatial data. But the present risk consists in fact that those activities are not coordinated, at least on a conceptual level, resulting in treat that those systems will not match to each other. This we have seen in developed countries in past twenty years and how demanding was later on harmonization. To avoid that creation of GIS systems in Croatia results in wasting resources, coordinated processes that are structured in NSDI strategy should be imposed now, on the beginning of increased efforts towards establishment of new integrated GIS systems in Croatia.

Visualisation products of harmonised global level data or core data will help for better understanding and further promotion of NSDI idea and therefore, of course, is needed to establish harmonisation among core data, to accelerate the further deeper integrations.

In today spatial data development key term is Infrastructure, as a basic content and services that are insured from public sector and which are important for functioning of NSDI. Division based on elements of work is;

- Institutional – legislation, regulation and organisation
- Personal - research and education
- Physical - equipment

Among the missing parts for creation of NSDI highlighted is lack of definition of SDI on national level in legislation, as well as legislation about NSDI itself. That's the part that should allow us to open the gate for NSDI to enter into the system.

3. LEGISLATIVE FRAMEWORK

Present legislative framework in Croatia is not supporting NSDI. There are fragments of general NSDI concept in various regulations but they are scattered and too weak to be used as a platform for establishment of NSDI. In this context Law on State Survey and Real Estate Cadastre and Law on Intellectual Property Rights can be mentioned that are covering some tasks regarding NSDI. But, as it is not case in many other countries, Croatia does not have codified Land Law, where tasks regarding land are separated under many of different law provisions. Organizationally, there is no institution which can directly be recognized in structure of Croatian administration as a responsible one for NSDI development. Such situation is creating high demand for new legislation which should fill present gap and also establish links to European Unions proposed Directive on Infrastructure for Spatial Information in Europe⁵ (INSPIRE Directive). Respectively described situation, INSPIRE Directive presents therefore challenge but at the same time opportunity (driver) for introduction of necessary legislation. Demand for NSDI legislation is additionally increased with the fact that major IT projects are under preparation or in execution on national level. Initiated by various governmental institutions or public enterprises those IT projects are oriented towards establishment of national data bases for various data sets accordingly to the subject's responsibility. In this very moment those projects are not in line with national NSDI concept.

Evaluating all those inputs, balancing between demands and possible optimal solutions, SGA has recognized its responsibility and therefore has proposed to the Government of the Republic of Croatia placement of basic NSDI legislation under the Law of State Survey and Real Estate Cadastre⁶. By the logic of work and providence of framework data such solution presents one of possible solutions and we can even say in Croatian relations has to belong.

Draft of NSDI legislation in Croatia as it is today is covering all the basic needs that NSDI have to have. Legislation proposal includes:

- definition and content of NSDI,
- defines stakeholders and their obligations,
- defines spatial data included in NSDI,
- definition of metadata and metadata services,

⁵ European Commission (2004): Proposal of a Directive of the European Parliament and of the Council establishing an Infrastructure for Spatial Information in Community (INSPIRE) Commission of European Communities, Brussels.

⁶ Republic of Croatia (1999): The Law on State Survey and Real Property Cadastre. Official Gazette of Republic of Croatia no. 128/1999

- interoperability of spatial data services,
- criteria for spatial data usage and exchange and
- NSDI bodies, their members and responsibilities.

As mentioned above, this proposal is very much related to solutions implemented in proposal of INSPIRE directive leaving space to draft detailed procedures and needed specification upon need. Legislative proposal for NSDI implemented in Law on State Survey and Real Estate Cadastre is send to parliament for their consideration. Expected is to enter into force before end of this year (2006).

4. INFRASTRUCTURE FRAMEWORK

Producers and organisations holders of spatial data are nowadays challenged to bring their products to market. To fulfil this request they need to be customer oriented, original and creative. They have to replace their old processes with new more efficient ones. Possibilities to solve the problems are opening by calling in new technologies. They can speed up production, enable effective quality control and coordination of data sharing. Infrastructural framework will create a field for new processes, exchange and share of data, driven by the organisational culture and customer need, supported with technology as facilitator.

Considering proposed NSDI legislation it is fitted to Croatian realities and general institutional framework. In the context of land registration, the institutional framework defines the properties and property rights, procedures of their exchange and the way of their registration. In addition, in the context of NSDI, institutional framework defines the spatial data, their rights, standards, harmonisation and leads to interoperability of collected spatial data, leaving at the same time to each institution (ministry) freedom to write specific technical regulation under the domain of their area of competence. In addition, involvement of international standards is directly leading to synchrony of institutional structure. Methodology of such development should be towards decentralism, also because of different nature of data.

Institutional reform is an important prerequisite to the successful application of the new concept (NSDI) and technologies (GIS). Special role in implementation of NSDI therefore should have National SDI Board, appointed by the Government of Republic of Croatia. Looking for an optimal composition of NSDI Board and reflecting realities in Croatia, sixteen most important stakeholders or representative of stakeholder groups are identified and proposed to become members of that board. It is a combination of governmental institutions, private sector and representative of municipalities. Such board should be able, supported by executive board and working groups and facilitated by SGA, to manage establishment of SDI in Croatia. This is also in line with INSPIRE, proposing measures that allow to member state to keep organisational structure as it is, with the same responsibilities and jurisdiction over data. To make our SDI functional, it will also have to include the organisational agreements needed to coordinate and administer system on national, regional and local level as well as internationally.

Nationwide management of spatial information therefore will build it idea on decentralisation, strong idea of harmonisation of data and activation together with well-planned and supported education.

Filling the last piece of a puzzle is putting different services in use, giving a few different perspectives over the existing data by creating visualisation and giving a value to those data. Since major form of human communication is transferring from written towards

visual, it is essential to deliver information, meaning also spatial data in such form. GIS software's and existing hardware are today sufficiently powerful and able to create such graphical representation of spatial data. By teaching people how to use data, providing a services and data we will be able to implement and attract many, where by a greater attention more of energy will be invested in updating and collecting of data.

5. UNDERTAKEN STEPS

Even without legislative frame SGA is undertaking activities which are directly or indirectly supporting development of Croatian SDI or should in future become part of it. Those activities are integral part of SGA vision and among the goals to be achieved till year 2010. Depending on the character of those activities and building pieces of SDI they can be grouped as follows:

- establishment of data sets of spatial data,
- establishment of customer services and
- horizontal networking of stakeholders.

5.1 Establishment of data sets of spatial data

SGA made major effort in past six years towards production of new spatial data sets for Croatia and development of databases in which those data will be stored. In creation of fully new topographical database in scale 1:20.000 and production of topographical map 1:25.000 till now has been invested 20 million € and is expected that project will finish, covering whole Croatia in year 2008. Last tender for production of ortophoto maps finishing coverage of Croatia has been released with delivery deadline end of 2007. In past three years, since Scan centre has been established in SGA with support from Kingdom of Norway, some 25.000 sheets of cadastral and topographic maps have been scanned and geo-referenced. Biggest amount of money has been invested in cadastre resurvey and vectorization of existing cadastral maps. In present 172 cadastral municipalities, out of 3.350 covering Croatia, are newly surveyed or in resurveying process. For those cadastre municipalities as well as vectorized ones central vector data base of cadastral maps has been developed.

All those activities are focused towards achieving one of most important goal of SGA, to have all our spatial data in digital form till the end of year 2010. SGA finds this requirement, for second, after adoption of NSDI legislation, most important issue of SDI establishment in Croatia.

5.2 Customer services

As in other countries demands from customers for services providing various types of spatial data is growing rapidly. Additionally, real estate market in Croatia, due to liberal regulations on transactions valid also for foreigners is growing exponentially and therefore additionally generating pressure on spatial data services. In mentioned studies, Apronen et al (2001) and Wytzisk et al (2005) a question has been put to customers to indicate most important issues present situation regarding spatial data in Croatia. In both of those questioners, customers replayed that most important issues is availability of data. Accuracy of data, usually most important for surveyors, customers have put on third place. Therefore,

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XXIII FIG Congress

Munich, Germany, October 8-13, 2006

SGA has launched several projects bringing cadastral, cartographic and other professional data kept by SGA to customers using internet technology.

In November 2005 a browser in alphanumeric part of cadastre in Croatia has been released. Cadastral data for complete Croatia are available, free of charge, to any internet user on web address www.katastar.hr. Katastar.hr provides an insight into the central base of cadastre data. Central base is database of cadastre data, which is unifying official cadastral data from all SGA 115 cadastral offices in Croatia. Till July 15th around 3,5 million entries in to the data base have been made, producing an average of almost 15.000 entries daily, representing almost 4% of Croatian population. Browser of cadastral data works in parallel with the land registry data browser, available on web page www.pravosudje.hr. Details about browser of cadastral data are presented in paper Pahić and Magdić⁷. Releasing those two services to the public, SGA and Ministry of Justice made big step forward in making real estate and ownership data available. But, questions put to us through the browsers help desk, show us that this is not enough. In first two months, one third of questions were asking when SGA will release cadastre map viewer.

So, SGA's next project, just to be finished, is release of first phase of geo-portal, Landek at all⁸. SGA intention is to use Geo-portal as a major tool for dissemination of graphical spatial information, for providing metadata services and to serve as a NSDI communication and interaction platform. In a first phase, beside major investment in ICT infrastructure, five databases are loaded in to the system and made available to customers. Those data bases are:

- Croatian base map in scale 1:5.000 (9821 sheets),
- Ortophoto map in scale 1:5.000 (9821 sheets),
- Cadastral map (raster) in scales 1:1.000 – 1.2904 (11.400 sheets at present out of 56.000 sheets),
- Central database of administrative units and
- Database of points of the permanent geodetic points.

Beside those databases, functionalities have been built in the system, providing metadata service, purchasing data via internet, tailoring data to be purchased, etc.

Following first two services, for the end of year 2007 release of Croatian positioning system, abbreviated CROPOS, service is foreseen, Marjanović and Bosiljevac⁹. CROPOS should include 30 GNSS stations with permanent working satellite receivers, first GPS, then also from other systems and providing to the customers 24/7 positioning service in three accuracy ranges. Another system in preparation is Joint Information System of real estate cadastre and land registry. It is expected that this system will achieve full functionality in three years. At the moment, for both systems tenders have been released, expecting start of their implementation at the beginning of year 2007.

5.3 Horizontal networking

⁷ Pahić, D. and Magdić, I. (2006): e-Katastar – the Browser of Cadastral Data. Paper submitted to FIG Congress 2006.

⁸ Landek, I., Vilus, I., Vujić, Z. (2006): Establishment of the National Spatial Data Geoportal in Croatia. Paper submitted to FIG Congress 2006.

⁹ Marjanović, M. and Bosiljevac M. (2006): New Official Geodetic Datum of Croatia and CROPOS System as its Implementation. Paper submitted to FIG Congress 2006.

Beside efforts to develop its databases and services to the customers, third focus area for SGA is development of horizontal ties to other governmental institutions, public enterprises and county and municipal authorities, trying to raise their awareness about NSDI as well as to bring them in to the NSDI pool. Way of doing it is through execution of specific projects of common interest. Such cooperation creates specific situation, real public-public partnership, since our customers become at the same time our partners, participating in creation of new data sets, standards, specifications or services. Those projects enable SGA to promote implementation of adopted standards and specifications, to get clear picture about customer needs and to support them in their development of own geoinformation capacities. Examples of such projects are:

- Production of spatial data and establishment of GIS for national parks and cultural heritage in them for Republic of Croatia, between Ministry of Culture and SGA,
- Joint production of ortophoto maps and other spatial data for the purpose of establishment of CROMAC GIS, between Croatian Mine Action Centre and SGA and
- Joint digitalization and production of spatial data for the purpose of establishment of vineyard cadastre in Croatia, between Croatian Institute for Vineyards and Vines and SGA.

Such or similar projects, defined through formal agreements or contracts SGA has signed with more than 50 subjects building network of involved institutions and regional and local governments also participating or contributing in development of Croatian SDI.

Since SGA is outsourcing almost whole production, special ties, a public-private partnership, has been developed with the private geodetic, GIS and ICT sector. SGA supported creation of association of IT employers and association of geodesy and geoinformatics employers expecting to get strong partner in development of SDI. Therefore representatives of those two associations should also have, according the Law proposal, a place in National NSDI Board. On another side SGA is making efforts to standardize data models and procedures and create environment for stakeholders easier to make investments in area of production and usage of spatial data, as well as to private sector to be able to deliver expected products. Joint attempt of SGA and twelve Croatian companies, institutes and associations at the INTERGEO 2006 Exhibition is visible sign of this established cooperation and partnership.

6. CONCLUSION

Creation of NSDI has in mind to solve most problems that are today happening in field of exchange of spatial data, together with giving a possibility for their broader use. As a solution or as an only way towards dynamic use of spatial data, NSDI is not fixed framed solution, but moreover an open dynamic idea with strong political will and technology driven performance.

Taking in account Croatian realities, major effort has been made towards creating legal and infrastructural framework for SDI in Croatia, supported by practical activities undertaken by SGA and other stakeholders. It is clear that process will be lasting, but on the experiences

from other countries we hope to be able to speed up the process of establishment of Croatian SDI.

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BIOGRAPHICAL NOTES

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Born on January 11th 1961 in Zagreb, Croatia. Graduate geodesy on University of Zagreb and took his PhD in Satellite Geodesy at Technical University Graz, Austria. Worked at Faculty of Geodesy University of Zagreb since 1987 and presently holds position of professor for Satellite Geodesy. Published 55 papers.

In 1999 appointed for Deputy Director and in year 2000 for Director of State Geodetic Administration of Republic of Croatia. Elected President of EuroGeographics in year 2005 and member of Advisory committees of Cambridge Conference and CELK. Member of Croatian Geodetic Society and Croatian Chamber of Architects and Civil Engineers.

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Born on August 4th 1977 in Karlovac, Croatia. Graduate geodesy on University of Zagreb. Msc student on Land Management at KTH Stockholm, Sweden. Published 1 paper.

Through student internship, participate at projects in TU München and Helsinki University of Technology in years 2001 and 2002. Employed in State Geodetic Administration of Republic of Croatia since 2003. Member of Croatian Geodetic Society, and Engineers Without Borders- INUG/Stockholm. Former member of IAESTE.

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