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## **Country Report of Croatia \***

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\* Submitted by: Željko Bačić – Director General, State Geodetic Administration

REPUBLIC OF CROATIA  
State Geodetic Administration

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# GEOSPATIAL INFORMATION MANAGEMENT IN CROATIA

## 2011 Report

for the High-Level Forum on Global Geospatial Information Management  
and  
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*Prepared by:*  
*Msc Ljerka Rašić*  
*Assistant Director*  
*NSDI Sector, SGA*

*Submitted by:*  
*Prof. Željko Bačić, PhD*  
*Director General*  
*SGA*

## **Abstract**

*This report is dealing with current situation on management of geoinformation in Republic of Croatia, on state level. At this moment focus is on National Spatial Data Infrastructure, and geospatial services. At the territory of the South-Eastern Europe, the framework of their establishment is determined by the INSPIRE Directive of the European Union representing the framework of SDI establishment not only for the member states of the European Union, but for the other states of Europe as well. According to that Croatian NSDI has to be harmonized with the development of spatial data infrastructures on the European (INSPIRE) and global (GSDI, UN-GGIM) levels. Paper describes legal and institutional frame for development of NSDI, international cooperation on the field of spatial data and briefly describes services offered by national mapping agency as well as some examples of spatial data services under responsibility of other state bodies.*

## CONTENTS

1	Introduction .....	5
2	The National Spatial Data Infrastructure (NSDI) development .....	6
2.1	Institutional Framework.....	7
2.2	Legal Aspect on Spatial Data Infrastructure .....	8
3	International cooperation.....	9
3.1	Participation in International Organisations .....	9
3.1.1	EuroGeographics.....	9
3.1.2	Global Spatial Data Infrastructure Organisation (GSDI) .....	10
3.1.3	International Federation of Surveyors (FIG) .....	10
3.1.4	European Spatial Data Research (EuroSDR).....	11
3.1.5	United Nations Group of Experts on Geographical Names (UNGEGEN).....	12
3.2	Bilateral Cooperation and Donations .....	13
3.2.1	International NSDI Workshops – Sharing of Best Practices .....	15
3.3	Croatia as Initiator and Mover of NSDI Development in the Region.....	17
4	Geospatial Services .....	19
4.1	Geospatial Services Offered by SGA .....	19
4.1.1	E-Cadastre.....	19
4.1.2	Croatian Positioning System.....	19
4.1.3	Croatian Geographical Names Gazetteer Service.....	20
4.1.4	SGA Geoportal .....	21
4.1.5	EuroGeoNames .....	22
4.2	Institutional Cooperation dealing with Geospatial Information.....	22
4.3	Geospatial Services Offered by Other Institutions.....	24
4.3.1	CORINE - COoRdination of INformation on the Environment .....	24
4.3.2	ARKOD - The Land Parcel Identification System .....	24
5	Conclusion .....	26
6	More information can be found .....	27

## 1 INTRODUCTION

The most important activities related to Geospatial Information Management (GIM) in Republic of Croatia on state level, are done under the auspices of the State Geodetic Administration (SGA). SGA represents Croatian national mapping and cadastre agency, dealing with administrative and professional tasks in the field of geodesy, cartography, cadastre and photogrammetry. As part of its activity, the SGA also takes care of the computerization of the cadastre, geodetic and spatial system, State official cartography, geodetic and technical documentation, statistics about the real estate cadastre and spatial units and the geodetic works connected with the State border. Pursuant to the Law on State Survey and Real State Cadastre, Official Gazette 16/07 (further in text: Law), that came into force in February 2007, the SGA has become the Croatian National Spatial Data Infrastructure (NSDI) coordination body. It acts as the Secretariat of the NSDI Council, coordinates all NSDI bodies and provides technical support.

The SGA consists of the Head Office in Zagreb, 20 regional cadastral offices and 112 cadastral branch offices. The total number of employees in the State Geodetic Administration is 1,100.

The Head Office is divided into six sectors:

- Sector for legal and financial affairs,
- Sector for information system,
- Sector for topographic survey and state maps,
- Sector for cadastral system,
- Sector for state survey and,
- Sector for NSDI.

Main activities on geospatial information management in SGA could be divided in two main fields:

- Activities concerning Spatial Data Infrastructure
- Activities on different geospatial services offered by SGA.

## 2 THE NATIONAL SPATIAL DATA INFRASTRUCTURE (NSDI)

### DEVELOPMENT

It could be said that National Spatial Data Infrastructure represents the highest level of Geospatial Information Management for every country. Considering the issues of establishing national, i.e. national and regional SDI, at the territory of the South-Eastern Europe, the framework of their establishment is determined by the INSPIRE Directive of the European Union representing the framework of SDI establishment not only for the member states of the European Union, but for the other states of Europe as well. This framework is not obligatory for the moment for the states that are not the members of the European Union, but considering their tendency to become the member states, it actually presents the framework within these states develop their national SDI. The above stated results from the political attitudes of the states in the South-Eastern Europe, the level of their development and the economic power, as well as from their historical heritage.

According to that Croatian NSDI has to be harmonized with the development of spatial data infrastructures on the European (INSPIRE) and global (GSDI, UN-GGIM) levels, but beside the development at national levels, it has to influence the development of spatial data infrastructures at a local level.

Visions that defined road of development for the Croatian NSDI are:

- make existing spatial data available to all interested users,
- become a means for development and a goal of the Croatian spatial data market,
- harmonize the policy, technical standards and operational capabilities of the NSDI with European principles,
- become an integral part of the e-Government program,
- develop a well organized geoinformational community in the sense of open public-private-academic partnership.

## 2.1 Institutional Framework

The Law defines the SDI institutional framework for the SDI establishment. A three-tier organization has been foreseen and is already established. Bodies of NSDI that represent main initiator or mover of NSDI development are:

- The NSDI Council,
- NSDI Board and
- Workgroups.

The supreme SDI governing body is the SDI Council appointed by the Croatian Government in 2008. It is the body at the highest, political level. Beside its president, the Council consists of 14 members coming from different ministries, responsible for the environmental protection and spatial planning, defence, land registry, transport and communications, agriculture, forestry and water management, science and education, culture, state administration body responsible for e-government, state survey and real property cadastre (SGA), statistics, Croatian Hydro graphic Institute, geodetic and geoinformatics economic community, IT economic community as well as the Croatian Chamber of Chartered Engineers of Geodesy. The SDI Council is responsible for leading the establishment of the national SDI and the coordination of the activities of the national SDI subjects. *SDI Council* is a body which implements the National Spatial Data Infrastructure within the Republic of Croatia and coordinates the activities of NSDI subjects within the scope and with rights and obligations determined by the Law.

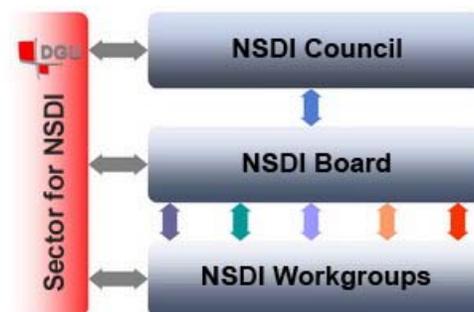


Fig 1: Relations between NSDI bodies in Croatia

At the managerial level, there is the SDI Board appointed by the Council in 2008. The SDI Board is a permanent executive body for the SDI establishment, and it is comprised of:

- three representatives of the NSDI Council,
- two representatives of the State Geodetic Administration,
- heads of workgroups.

At the operational level, there are workgroups. Heads of workgroups are appointed by the NSDI Council. Members of the workgroups are civil servants, regional, local or public officials, scientists and representatives of professional associations and experts from the private sector. There are five implemented workgroups at the operational level, dealing with specialized tasks:

- Workgroup for NSDI technical standards,
- Workgroup for NSDI data sharing,
- Workgroup for linking the NSDI program with e-Government,
- Workgroup for NSDI capacity building,
- Workgroup for NSDI business model.

The SGA, in fact the NSDI Sector in the SGA's Central office, acts as the Secretariat of the SDI Council, coordinates all SDI bodies and provides technical support. In 2010, the SGA has been nominated as the national INSPIRE Point of Contact.

Besides the workgroups, there are several projects at the operational level dealing with specific tasks and questions within the scope of NSDI.

## **2.2 Legal Aspect on Spatial Data Infrastructure**

The first legislation concerning the Spatial Data Infrastructure (SDI) in Croatia came into force in February 2007. A separate chapter (Chapter V) defining the SDI was included in the new Law on State Survey and Real Estate Cadastre (*Official Gazette* 16/07). The Law gives a definition of the NSDI and metadata, content of the metadata information, services, NSDI data and subjects that are obliged to participate in its establishment and maintenance. Equally important is that it provides the institutional framework and defines the NSDI bodies and their responsibilities. The SDI part of the Law is harmonized with the INSPIRE Directive whereby the main INSPIRE idea is accepted but the content represents only part of the topics comprised by the INSPIRE Directive. Currently, new law on SDI is being done, which

will be done as separate law, and will represent transposition of INSPIRE directive in Croatian legislation.

Croatia as a candidate country for the European Union was not obliged to implement the INSPIRE Directive until 2009 as member States are, but the Directive is the subject of the accession treaty. The NSDI development in Croatia is conformant to the INSPIRE Directive. In 2009, the INSPIRE Directive was included for the first time in the National Program for the European Union Accession and the transposition of the INSPIRE Directive was monitored. It is agreed that Croatia will transpose INSPIRE directive till joining European Union (2013).

### **3 INTERNATIONAL COOPERATION**

SGA is very active on Europe, but also on global level participating in different activities regarding spatial data. Our activity can be divided in two fields; active membership in international organisations and bilateral cooperation.

#### **3.1 Participation in International Organisations**

Active participation in international organisation gives us ability to be part of all current trends in spatial domain. According to this, SGA is recognized on Europe level like reliable partner.

##### **3.1.1 EuroGeographics**

SGA as Croatian NMCA is member of EuroGeographics. European NMCAs are united in EuroGeographics, a not-for-profit organisation formed in 2001 as the membership association and their representative body. Its mission is to further the development of the European Spatial Data Infrastructure through collaboration in the area of geographical information, including topographic information, cadastre and land information. Activities of EuroGeographics are:

- Engagement with European decision-makers in order to enables positive contribution to important initiatives, policies and projects.
- The exchange of best practice between members to understand and implement policies, procedures and technologies;

- Harmonising national spatial datasets into a portfolio of integrated pan-European products and related services;
- An ongoing programme of spatial data infrastructure projects, undertaken with academic and commercial partners, enables members to contribute to the creation of standard data specifications and policies.

Trough several projects EuroGeographics work with members, academia and commercial companies to develop specifications, products and services to fulfil its vision – one Europe united trough geographical information.

### **3.1.2 Global Spatial Data Infrastructure Organisation (GSDI)**

GSDI World Organization is an organization that brings together organizations, agencies, companies and individuals involved in establishing of spatial data infrastructure. The aim is to promote international cooperation in order to provide support to the development of local and national spatial data infrastructure as well as global spatial data infrastructure. State Geodetic Administration has been a member of the GSDI since 2010.

### **3.1.3 International Federation of Surveyors (FIG)**

FIG is international federation of surveyors established in 1878 in Paris by 7 member associations (Belgium, France, Germany, Italy, Spain, Switzerland and UK) and today, FIG has got 273 national association members from 130 countries. State Geodetic Administration from Croatia became an affiliate member of FIG on 8 June 2010. FIG is the only international body which represents all surveying disciplines and its role is professional, institutional and global development of these disciplines. This is carried out through Annual FIG Working Weeks, FIG Congress every 4 years and work of 10 technical commissions. State Geodetic Administration has participated in FIG Working Week 2009 in Eliat in Israel (3 papers), XXIV FIG Congress 2010 in Sidney in Australia (6 papers) and FIG Working Week 2011 in Marrakech in Morocco (5 papers).

On 8 Marc 2011, SGA nominated a correspondent to FIG Commission 3 – Spatial Information Management. On 27 April 2011 SGA sent to FIG report about 2<sup>nd</sup> CROPOS Conference held on 8 April 2011 in Croatia, organized by SGA, Faculty of Geodesy, Croatian Chamber of

Licensed Engineers and Croatian Geodetic Society and that report was uploaded on the FIG Web site as a good news.

### **3.1.4 European Spatial Data Research (EuroSDR)**

*EuroSDR* organization was founded in 1953 in Paris on the recommendation of *The Council of Organizations for European Economic Cooperation* and it is one of the oldest organizations in the field of geoinformation. Founder countries are: Austria, Belgium, Germany, Italy and the Netherlands. EuroSDR is the research and development platform for national surveying institutions, research and development institutes, private sector, industry and other groups with respect to the European spatial data infrastructure. EuroSDR brings together research institutions and companies in the field of geoinformation. Member States of EuroSDR are: Austria, Belgium, Cyprus, Denmark, Finland, France, Croatia, Ireland, Italy, Netherlands, Germany, Norway, Spain, Sweden, Switzerland and United Kingdom. Croatia was admitted to EuroSDR membership on the 110th EuroSDR meeting which was held from 23rd to 25th May 2007 in Rotterdam.

EuroSDR defines research themes that will be implemented within five scientific committees:

1. Sensors, primary data collection and georeferencing
2. Analysis of images and getting information
3. Production systems and processes
4. Specification of data
5. Network Services

#### 117th EuroSDR meeting in Zagreb

117th European Spatial Data Research (EuroSDR) meeting was organized from 27<sup>th</sup> to 29<sup>th</sup> of October in Zagreb by the State Geodetic Administration and Croatian Geodetic Institute. This is the first time that Croatia hosts EuroSDR meeting. To strengthen the region in the field of geoinformatics and encourage the inclusion of countries in EuroSDR, representatives from countries in the region were invited. The invitation was answered by representatives from Bosnia and Herzegovina, Montenegro, Serbia and Slovenia.

Lectures were given by speakers from government and public sectors, universities, research and development sector and the private sector. At this meeting it is adopted the new Rolling EuroSDR Research Plan 2011 - 2014, as well as the plan and program of cooperation between EuroSDR and ISPRS, and other conclusions.

#### Visit of EuroSDR vice president to Zagreb

EuroSDR vice president, prof. Dr.-Ing. Christian Heipke from the Institut für Photogrammetrie und Geoinformation, Leibniz Universität Hannover, at the invitation of Croatian delegates, from 3rd to 5th April 2008 visited Zagreb. Organizers of the visit were University of Zagreb Faculty of Geodesy, State Geodetic Administration and Croatian Geodetic Institute. Prof. dr. Dr.-Ing. Christian Heipke, held a lecture entitled Prospects of photogrammetry and remote sensing in the digital area at the Faculty of Geodesy. Lecture, in addition to review in recent developments of sensors, techniques and products, elaborated the practical problematic of geometric / radiometric processing and image analyses. An overview of sensors is shown in the lecture: high-resolution satellite sensors (optical, multi-hyper spectral, radar), digital aero cameras (large and small format), Laser Scanning using LIDAR (aerial and terrestrial in combination with optical sensors), infrared sensors, etc. Sensor platforms and systems with particular emphasis on no-pilot aircraft were presented as well as sensor systems connected to devices for positioning and determining the height.

More about EuroSDR can be found on the website <http://www.eurosd.net>.

### **3.1.5 United Nations Group of Experts on Geographical Names (UNGEGN)**

UNGEGN is a body of United Nations Economic and Social Council (ECOSOC). UNGEGN is one of the seven expert bodies of ECOSOC.

Some of the main goals of UNGEGN are to encourage national and international geographical names standardization, to promote the international dissemination of nationally standardized geographical names information and to adopt single romanization systems. UNGEGN's goal for every country is to decide on its own nationally standardized names through the creation of national names authorities or recognized administrative processes.

The United Nations Conference on the standardization of geographical names is held every five years. To make the work easier, UNGEGN Divisions have been formed. East Central and South-East Europe (ECSEE) Division is one of the 23 UNGEGN Divisions. The countries of the **East Central and South-East Europe Division (ECSEED)** are: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Greece, Hungary, Montenegro, Poland, Serbia, Slovakia, Slovenia, The former Yugoslav Republic of Macedonia, Turkey and Ukraine.

State Geodetic Administration as representative of Republic of Croatia is chairing East Central and South-East Europe Division (ECSEED) since 2007.

### 3.2 Bilateral Cooperation and Donations

In last years SGA had very fruitful bilateral cooperation with several countries. In frame of the mention cooperation significant funds were received (table1).

Donor/ Source	Project Title	Main Results
Kingdom of Netherlands	Cadastral Pilot Project Babina Greda	1999-2003 -to introduce new technologies in cadastral surveys (wide application of digital ortophoto maps), -the closest possible contact of the contractor with the population involved in the measuring, and the analysis of work procedure, cost, technology and the time necessary for the survey. -During the Pilot Project implementation, the Cadastral and Court Committee, in accordance with the legal regulations in force, conducted and applied legal provisions in the procedure of establishing a new land registry, so that the actual establishment of new land registry is performed on the basis and in accordance with the procedure conducted in that Pilot Project.
FR Germany	Project of Technical Cooperation between the Federal Republic of Germany and the Republic of Croatia for Improvement of the Cadastral System in the Republic of Croatia	2000-2003 -development of a new cadastral data model, application of new methods in cadastral survey, -data exchange among the Cadastre, Land Registry and local self-government units, -potential of establishing a communal information system based on such data.
United Kingdom	Preparation Phase of World Bank project on Property Rights and Registration in the Republic of Croatia	05/2001-05/2002 -many workshops and work meetings, presentations of research and study results were organized, as well as study tours - 40 documents were prepared containing almost 1.200 pages needed for the main Project implementation
Kingdom of Norway	Project for Improving Capacity of Establishing Cadastral and Topographic Databases in Croatia – CRONO GIP I	17.12.2001-2010 - establish capacities within the SGA (Scanning Centre) in order to construct a cadastral data base by scanning the existing archaic paper-based maps and develop and demonstrate practical solutions for using databases in regional/local cadastral offices; -established capacities within the SGA with the goal of constructing

Donor/ Source	Project Title	Main Results
		and maintaining a digital topographic data base (topographic maps) and demonstrate that the SGA can provide the users from the private and public sector with digital and topographic maps and plans; - establishing quality control system for TM 1:25.000 and DOF 1:5.000 on chosen amount of samples plus to work out a model of internal control of external producers of those products.
Kingdom of Sweden	Project for Capacity Building for the Implementation of National and International Projects within the frames of the State Survey and Real Estate Cadastre Program for the period 2001 - 2005 and the Real Property Registration and Cadastre Project (SB) – Phase I,II and III	2003-2008 -organization of advanced preparation trainings for the PIU, Project Support Units within MoJ and SGA, as well as for MoJ and SGA official -organised seminars, workshops and study tours for: I phase -72 employees II phase - 463 employees III phase - ongoing
Kingdom of Netherlands	Capacity Building at MOJ and SGA necessary for Systematic Development of Property and Cadastre Registers	2003-2004 -Proposal of Measures for Capacity Strengthening at the Department and in education and training program for the new Department's employees -Participants of the Project, Ministries' representatives, Municipal Courts' Presidents and land registration judges analyzed, with the support from Kadaster and SGA, the status of the land registration
Kingdom of Norway	Project for Improving Capacity of Establishing Cadastral and Topographic Databases in Croatia- CRONO GIP II	5.12.2002 - further development of procedures of vectorization and production line - development of application for vectorization of Croatian basic map in the scale 1:5.000 - further capacity-building of the CGI in establishing quality control system - development of GIS environment for the Public Institution of the National Park Kornati, based on the cadastral survey data and land registry renewal for the Cadastral Municipality Kornati, the area under multiple protection regimes (National park, maritime domain, Islands Act) and development of procedures for such areas.
FR Germany	Project of Technical Cooperation between the Federal Republic of Germany and the Republic of Croatia for Improvement of the Cadastral System in the Republic of Croatia – extension	2003-2005 - Pilot Project Labin; land registry renewal and data integration into the GIS of the City of Labin; intended experience distribution to other local self-government units, - testing new survey techniques and procedures on a polygon in the river Neretva valley, - further activities in defining data model for the real property cadastre and - conducting a study on GPS application at national level in Croatia.
Kingdom of Norway	Pilot Project for Maritime Domain Registration in the County of Zadar	2004-2006 • Improvements are introduced into the pilot area aiming at expediting the establishment of maritime domain and ensuring continued maintenance and regular dealing with concessions. • procedures and technical instructions for the establishment of maritime domain lots are tested, assessed and improved for the further regular use. • maritime domain areas (lots) are established for the pilot areas and entered into the Cadastre and Land Registry, and prepared for entering into the County Register of Concessions. • the Pilot Project is well documented and will be beneficial as the basis for planning further projects on the Croatian coast.

Donor/ Source	Project Title	Main Results
Kingdom of Norway	CRONO GIP III	2006-2008 -preparation of products specifications and quality assurance mechanisms for cadastral resurveys -Geographical Names Information System
Kingdom of Norway	CRONO GIP IV	2006-2007 -efficient storage and access to geographic names and accompanying data in digital form -optimal methods for efficient transformation of maps scaled 1:5000 from analogue to digital -efficient delivery of digital maps to customers -development of internet access to topographic maps in scale 1:25 000
FR Germany	Project of Technical Cooperation between the Federal Republic of Germany and the Republic of Croatia for Improvement of the Cadastral System in the Republic of Croatia – extension	2006/2007 - Pilot Project Labin; land registry renewal and data integration into the GIS of the City of Labin; intended experience distribution to other local self-government units, - testing new survey techniques and procedures on a polygon in the river Neretva valley, - further activities in defining data model for the real property cadastre and - conducting a study on GPS application at national level in Croatia.
Kingdom of Norway	LPIS support project	2007/2008 -final product specifications implemented and production and quality control processes for relevant products in place -improved functionality for scanning and georeferencing cadastral maps implemented -database of cadastral maps operational on 24/7 basis efficiently servicing the LPIS -improved data centre at SGA –phase 2 upgrading -SGA management strengthened to efficiently deal with data preparation, data production, and data dissemination relevant to LPIS -CGI strengthened to efficiently undertake it’s obligations in respect to undertake quality control of data for the LPIS -A regional seminar on preparation of cadastral data and harmonization with land registry data shall be executed
Kingdom of Netherlands	Business plan project	2007/2008 - Development of business plan of the State Geodetic Administration and Ministry of Justice regarding Joint Information System
Kingdom of Netherlands	Key registers project	2010/2011 - Introducing Key registers concept to most important stakeholders in Croatian state administration and developing concept on implementation of this concept in Croatia based on and around development of Joint Information System of Land Registry and Cadastre in Croatia

Table 1: SGA’s bilateral cooperation

### 3.2.1 International NSDI Workshops – Sharing of Best Practices

According to the Law, SGA acts as coordination body for SDI establishment since 2007. But much before, SGA took the first steps towards SDI establishment. The SGA recognized the importance of education of the NSDI subjects and awareness rising of the general public; therefore a series of activities to meet these objectives was carried out.

In order to inform the overall geo-information society about the National SDI concept and introduce the preparations for the work of the Council and other National SDI bodies, the SGA has organized the consultancies and brought in experts from the countries where the National SDI development had been the most successful. The following four workshops were organized in order to share the experiences:

- In collaboration with the Swedish Agency for Development Cooperation (SIDA) and the Swedish Geodetic Authority (Lantmäteriet), the first consultancy on the National SDI establishment was organized on May 29, 2007, for the representatives of the institutions contributing their members to the National SDI Council, and on May 30, 2007, for the representatives of all National SDI subjects (approx. 150 members).
- On September 12, 2007, the SGA organized in cooperation with the Canadian Embassy in Zagreb the presentation of the Canadian model of the National SDI establishment. The consultancy participants represented a cross-section of the geo-information society in Croatia and got the opportunity to see a new concept of the successfully established National SDI.
- In cooperation with the German Association for Technical Assistance (GTZ), a two-day consultancy was organized, presenting the National SDI system of the Federal Republic of Germany. The consultancy was held on May 26, 2008, for the members of the National SDI Council while on May 27, 2008, it was held for the representatives of all the National SDI entities. The consultancy participants had an opportunity to get familiarized with the spatial data infrastructure of Germany in the context of the European guidelines and the INSPIRE Directive as well as with a concrete example of the development of the spatial data infrastructure in the Lower Saxony.
- As part of the CRONO GIP (CROatian-NORwegian GeoInformation Project) cooperation, the fourth workshop for sharing experiences was held on November 26, 2009, in Varaždin by presenting the Norwegian model of the SDI establishment.

### **3.3 Croatia as Initiator and Promotor of NSDI Development in the South-East Europe Region**

In the last years, preparing for the introduction of the National SDI, and later through the implementation of the provisions of the Law on State Survey and Real Estate Cadastre referring to the establishment of the National SDI, the State Geodetic Administration has gathered new experiences in the field that was not within the scope of its activities earlier. It implied additional efforts for SGA to start working on the activities connected with the National SDI along with numerous activities connected with the land administration reform that had been carried out in the Republic of Croatia until the first Law on State Survey and Real Estate Cadastre was passed (1999). The experience has been gathered with the help of international experts and by means of financial means provided by donor countries, the European Union and the World Bank credits. The other countries in the region have started with similar activities almost at the same time, or a few years later, recognizing SDI as an important conceptual and operational matter. As the result of these efforts, the basic National SDI legislation has been adopted in Croatia, but also in Macedonia (2008) and in Serbia (2009) while in Bosnia and Herzegovina this legislation is in preparation. The implementation of that legislation in each of these countries is the responsibility of the National Mapping and Cadastre Authorities (NMCA's).

Recognizing the fact that all geodetic administration in neighboring countries are carrying out the land administration reform, and are initiating the activities of introducing the National SDI in the similar way, SGA has suggested the initiation of the regional development project SDI. The project was directed to the solution of the problems recognized in all countries: lack of awareness related to the National SDI, lack of capacities and technical knowledge, lack of various national databases and relatively low data exchange culture. The project has been supported by six countries along with Croatia that are located in the area of South-Eastern Europe, i.e. as described in the project in the area of the Western Balkans: Albania, Bosnia and Herzegovina, Kosovo, Macedonia, Montenegro, Serbia. The essence of the project "INSPIRATION – SDI for the Western Balkans" is contained in the cooperation of the included institutions and countries and in providing multiple benefit from the mutual work on the development of IPP. The concentration of the existing capacities and the

involvement of the capacities of project contractors will provide together with other activities such as Regional Conference on Cadastre and its bodies and working groups the accelerated development of national SDIs, the development of necessary capacities, the notion of the need to cooperate on smaller known sample, as the prelude for the process of including into the European Union and the development of services and tools that will be available not only to the organization that has developed certain service or tool, but to the other participants in the project.

The project proposal was preceded by the first Regional Conference on Cadastre held in June 8-10 2008 in Opatija, Croatia where all NMCA's of region countries agreed referring to the mutual endeavor to provide for the citizens, economic subjects and institutions opportune, updated, accurate, reliable spatial information in efficient and rational way, having in mind ever growing significance of cadastre and spatial data infrastructure for the development of modern societies based on georeference data. At the same Conference there was also the first mutual project initiated: the preparation of the Regional study on cadastre intended to collect the information about legal, institutional and organization framework of the land administration, reform programs and the situation in land cadastre of the countries included into the work of the Regional Conference on Cadastre (Slovenia, Croatia, Bosnia and Herzegovina, Monte Negro, Serbia, Kosovo, Macedonia), and their processing and interpretation according to the unique criteria.

At the next three regional conferences (June 2009 in Ohrid, Macedonia, June 2010 in Bečići, Monte Negro and June 2011, Bled Slovenia) the program of cooperation included the exchange of experiences and the creation of the bases for the establishment of national and regional SDI recognizing the importance of the concept of spatial data infrastructure on national as well as on regional level. Having such vision of cooperation in mind, all countries of the region have confirmed their mutual willingness to realize a mutual project with the aim to develop national and regional spatial data infrastructure in accordance with the standards of INSPIRE Directive.

## 4 GEOSPATIAL SERVICES

As it is known fact, core business of every NMCA is spatial data. But, other institutions, to which spatial data are not their primary task, also have their own services dealing with spatial data. On next pages we described SGA services and services offered by other institutions.

### 4.1 Geospatial Services Offered by SGA

As a governmental body answerable for data collecting, processing and simulation in Republic of Croatia, SGA represent its datasets, products and services to the public, its customer. Following the market needs, SGA has produced several web services.

#### 4.1.1 E-Cadastre

Alphanumeric cadastral data are the first group of the SGA's data completely transformed into digital format and offered for public use via Internet on [www.katastar.hr](http://www.katastar.hr). Alphanumeric cadastral data are originally maintained by cadastral offices and their data can be accessed through the cadastral map browser used for searching databases produced in the SGA central office. One of the basic principles of the browser is its „completeness“, thus it enables the possibility of accessing official data for all cadastral municipalities which exist in the country on a certain day. The data can be accessed by entering a certain parcel number in the selected cadastral municipality or by entering the proprietorship certificate number.

There is great interest, both professional community and the citizens, to provide insight into the digital cadastral maps in the same way, thus using the Internet, via the Browser of cadastral data. SGA has undertaken the first activities in order to fulfil mentioned requirements.

#### 4.1.2 Croatian Positioning System

Croatian Positioning System (CROPOS) was established in 2008. During more than two years of operation, 348 companies have been registered. CROPOS enables simpler, more efficient and reliable use of GNSS (Global Navigation Satellite System) measurements. In order to ensure the best possible coverage of the

Croatian border areas and increase the reliability of the system in the event of an unplanned downtime of a reference station, with 30 Croatian GNSS stations in a networked solution and the correction parameters determination seven Slovenian, four Hungarian and two Montenegrin stations are included. In order to provide users with the determination of the coordinates in real time during conducting field measurements, both, in the old coordinate system (HDKS) and new reference terrestrial system (HTRS96) and the determination of heights in the old high-altitude system (Trieste) and the new vertical reference system (HVR571), a unique transformational model T7D and a new model of the geoid (HRG2009) were developed and integrated into CROPOS system.

Thanks to high technology and the technical quality of all system components, but also daily system maintenance and administration, reliable system operation has been ensured, so that in the past 28 months the system was unexpectedly unavailable only 20 hours, which means that the system availability was 99.9%. Some 400 users are registered in system with 950 receivers which monthly use of system is between 500.000 and 600.000 minutes.

Through the establishment of CROPOS systems and development of a unique model of transformation and its implementation in CROPOS system, a significant technological step forward was realized, enabling the distribution of data in real-time and application of modern measurement methods in solving the task of surveying the more rapid, simpler and more reliable way. It is important to emphasize that the Republic of Croatia is one of the first countries in Europe that have successfully implemented a transformation model into system of networked reference stations, allowed sending of transformation parameters and performing transformations during field measurements.

#### **4.1.3 Croatian Geographical Names Gazetteer Service**

Croatian geographic names information system is developed in accordance with UNGEGN, EuroGeoNames and INSPIRE principles. The geographical names web service is published on the Internet address <http://cgn.dgu.hr>. The Gazetteer contains endonyms. The service provides search of geographical names on the Croatian territory by name or part of the name, according to the classification of geographic objects and spatial search by counties.

Spatial querying after counties is giving opportunity to search for names only in selected counties.

Visualization of a name could be made choosing Google Map background. Service enables to report on or off-line correction of the name or name attributes. Service is also enabling to make on or off-line proposal of the new geographical name. For the queried name is feature given in ten languages: English, German, French, Italian, Spanish, Dutch, Hungarian, Slovenian, Slovakian and Czech.



Fig. 2: Geospatial Services offered by SGA

#### 4.1.4 SGA Geoportal

Trough the Program of State Survey and Real Estate Cadastre for the period 2001-2005 several databases in SGA had been developed. The next step was development and establishment of SGA Geoportal which became operational in May 2009. SGA Geoportal is designed as geospatial portal according to Reference architecture of geospatial portals defined by Open GIS consortium (OGC), built on Service Oriented Architecture (SOA) principles and in-line with ISO/OGC standards and INSPIRE directive. The Geoportal offers a metadata-driven catalogue-service for publish-and-find functionality. The catalogue contains

metadata descriptions of all resources and allows users and other applications/portals to query and find these resources. The metadata records are also accessible for engine-to-engine access in a standardized ISO-based structure. In the first phase five data sets have been put on the Geoportal: orthophoto, cadastral maps in raster format, Croatian base map at the scale 1:5000 and already existing geodetic points and register of spatial units systems are linked. At the same time Geoportal has web sale functionality.

#### 4.1.5 EuroGeoNames

EuroGeoNames (EGN) is a service of European geographical names infrastructure. EuroGeoNames system is under the EuroGeographics jurisdiction. In the EGN system is included thirteen countries (see Fig. 3). Croatian national EGN system was developed and Croatia was connected in to the EuroGeoNames system. EuroGeoNames web service can be called from website <http://www.eurogeonames.com/refappl>. Croatian interface should be called by selecting the language at the top right corner of this web site. Croatian database of geographical names is maintained by the State Geodetic Administration of the Croatia.

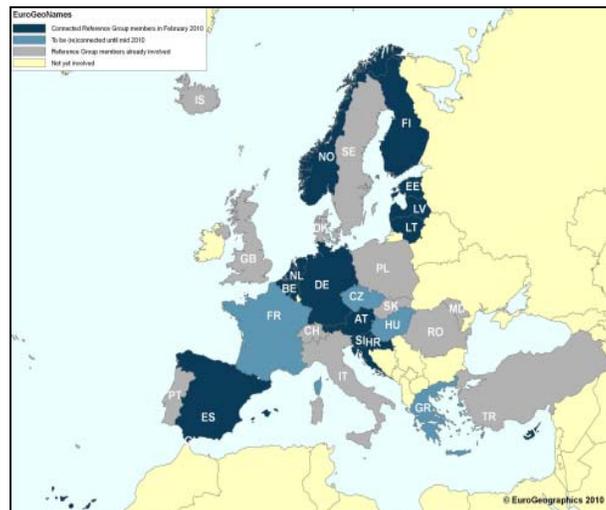


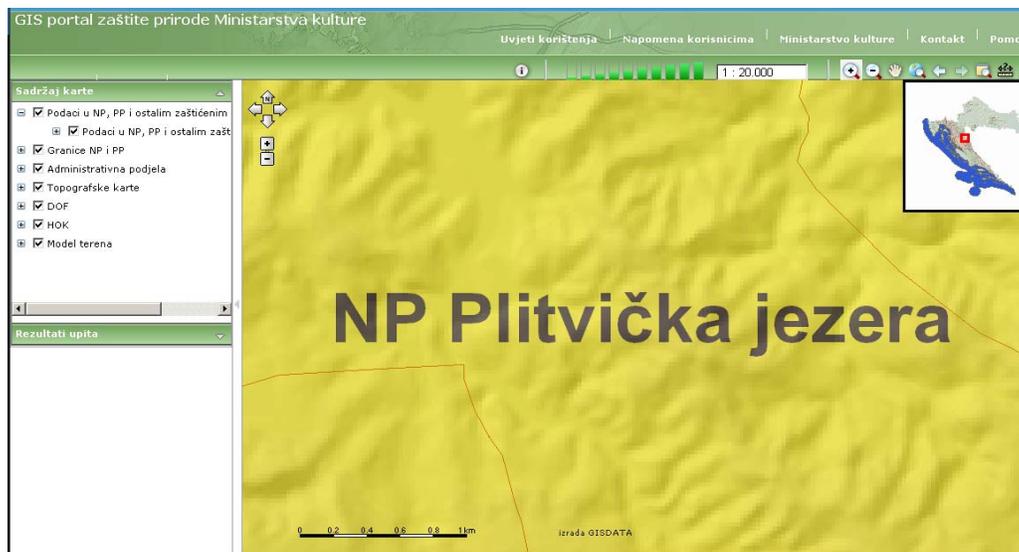
Fig. 3 EuroGeoNames countries.

## 4.2 Institutional Cooperation dealing with Geospatial Information

The State Geodetic Administration has very long tradition in cooperation with other state and self-government bodies in order to produce spatial data under its jurisdiction, as primary set of spatial data needed for different purposes.

One of the most fruitful cooperation among public sector is cooperation between State Geodetic Administration and Ministry of Culture. Cooperation started in 2006 in frame of the Agreement on cooperation in the development of spatial data and establishment of GIS for national parks and cultural resources in national parks. Multiyear efforts and activities resulted with establishment of Protected Areas Management System (PAMS), fig. 4, based on spatial data produced in SGA. The main results of the PAMS projects are:

- access to standardized digital information that include spatial information regarding the protection areas,
- regarding the cultural heritage,
- updated spatial data (topographic, orthophoto and cadastral) for protected areas,
- more efficient national parks management and coordination of the policy of the national parks protection,
- better protection and management of the protection areas and the cultural heritage.



*Fig 4. Protected Areas Management System*

Cooperation continued in frame of the new agreement, regarding activities and jurisdiction from both sides, concerning spatial data, registration of special regimes of protection and IT interconnection. Both partners found mutual interests for accessing truthful, updated spatial data that shall demonstrate protected areas of cultural and natural heritage in unique, standardized way with international standards, as to public knowledge and as well for all professionals in the protection institutions and for sharing with other public bodies and local

self-government. The new activities are focused on using spatial data from SGA geoportal on-line what is the base concept of the SDI.

### **4.3 Geospatial Services Offered by Other Institutions**

There are several spatial data services offered by other state bodies as well as by self-government bodies. Below are shown some examples.

#### **4.3.1 CORINE - COOrdination of INformation on the Environment**

Croatian Environment Agency (CEA) is the national focal point for collaboration with the European Environment Agency (EEA) included in the European Environment Information and Observation Network (EIONET). The purpose of CORINE program (COoRdination of INformation on the Environment) is identification and meaningful categorisation of land cover that includes defined nomenclature of coding and production of the quality database needed for supervising, organizing and managing natural resources on regional and national level. CEA is the national focal point for management and dissemination of CORINE data bases.

Corine Land Cover Croatia (CLC Croatia) is a project which resulted in digital up-to-date land cover database according to CORINE nomenclature, which is consistent and homogeneous with data across entire Europe. OIKON Ltd. and GISDATA Ltd. were responsible for the CLC interpretation to produce the CLC databases and the CLC-Changes database by using the satellite images.

The results of the CORINE Land Cover project for Croatia are digital databases for the reference year 2006, 2000, 1990 and 1980, including Land Cover change databases and are owned by Croatian Environment Agency. Corine land cover map 2006 of Croatia consists of 24630 polygons classified into 39 classes (out of 44 classes on third level of Corine Classification).

#### **4.3.2 ARKOD - The Land Parcel Identification System**

The Land Parcel Identification System in the Republic of Croatia was published under the acronym of „ARKOD” in the summer of 2009. ARKOD is a national system of identification of

land parcels, or records of use of agricultural land in Croatia. ARKOD goal is to provide farmers easier and simpler way of applying for incentives as well as their transparent use. The farmers can register in ARKOD free of charge and the registration is performed in the regional offices of the Agency for Payments in Agriculture, Fisheries and Rural Development as well as in local offices of the Croatian Agricultural Agency. ARKOD is based on the existing, alphanumeric Farm Register.

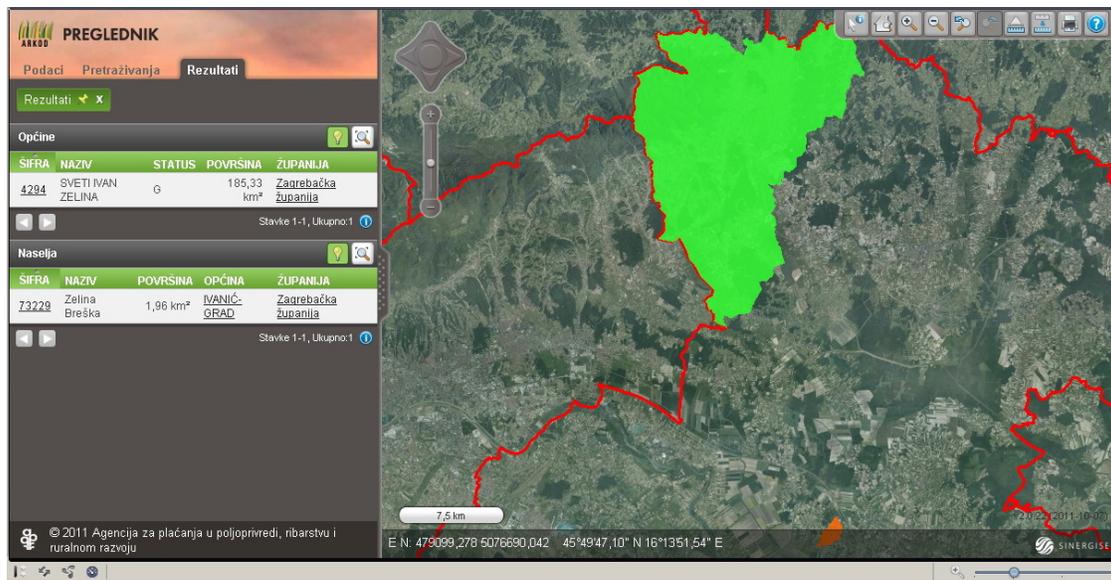


Fig. 6. ARKOD viewer

The project was initiated by the Ministry of Agriculture, Fisheries and Rural Development in collaboration with the State Geodetic Administration and Croatian Geodetic Institute of the Central State Office for Administration. To implement ARKOD on the ground, about 240 employees will be in charge in state administration offices in counties and in the City of Zagreb.

## CONCLUSION

Croatia is on the way to build NSDI in line with European INSPIRE directive. Institutional framework is already in function. SGA as body responsible for technical support has undertaken several activities. The main current activities are focused on preparing a new law on NSDI fully in line with INSPIRE directive.

Several spatial data services produced by SGA, as well as by other state and self-government bodies, are already in function. The next step is to harmonise all data services according to the technical standards coming from European and international level, and network all them via national geoportal.

Through international cooperation in which SGA actively participates through various processes, Croatia is trying to become truly a geo enabled society in the fullest sense of the word.

## MORE INFORMATION CAN BE FOUND

<b>NSDI web site</b>	<a href="http://www.nSDI.hr/">http://www.nSDI.hr/</a>
<b>State geodetic administration</b>	<a href="http://www.dgu.hr/">http://www.dgu.hr/</a>
<b>SGA Services</b>	
e-cadaster	<a href="http://www.katastar.hr/">http://www.katastar.hr/</a>
CROPOS	<a href="http://www.cropos.hr/">http://www.cropos.hr/</a>
SGA Geporta	<a href="http://www.geo-portal.hr/">http://www.geo-portal.hr/</a>
Croatian Geographical names gazetter service	<a href="http://cgn.dgu.hr">http://cgn.dgu.hr</a>
EuroGeoNames	<a href="http://www.eurogeonames.com/refappl">http://www.eurogeonames.com/refappl</a> .
<b>Other institutions and their services</b>	
ARKOD	<a href="http://www.arkod.hr/">http://www.arkod.hr/</a>
PAMS	<a href="http://www.zastita-prirode.hr/pams/sto-je-pams.html">http://www.zastita-prirode.hr/pams/sto-je-pams.html</a>
Croatian Environment Agency (CEA)	<a href="http://www.azo.hr">http://www.azo.hr</a>
CORINE	<a href="http://www.azo.hr/Default.aspx?sec=500">http://www.azo.hr/Default.aspx?sec=500</a>