

Role of the Cadastre in the Sustainable Planning and Development in Croatia

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Key words: cadastre, sustainable planning

SUMMARY

In the past ten or so years, the Republic of Croatia has established a new, comprehensive physical planning system and built the physical planning institutions with the objective of achieving a sustainable and planned development. In this respect, the urban planning and construction inspection systems have been established with the aim of achieving the legality of constructions i.e. fighting the illegal construction in Croatia which was a wide-spread occurrence in the previous decades. The new Physical Planning and Construction Act of 2007 has created a new framework for legalizing the already built constructions that can fit into the adopted physical plans, thus curbing the illegal construction activity. The afore-mentioned act has assigned a significant role to the State Geodetic Administration i.e. the Croatian cadastre, both in the legalization sector as well as in the sector fighting the illegal construction activity and exploiting the national treasures. In less than three years of implementing the afore-mentioned act in Croatia, illegal construction of new objects has almost completely been halted although there are still problems with the disrespect of the construction documents and permits for exploiting the mineral wealth.

This paper describes the tasks of the cadastre i.e. State Geodetic Administration in implementing the afore-mentioned act with the emphasis on the special activities aiding its implementation, such as delineating the protected coastline belt. It states the manner of the task performance, scope of engagement, problems faced by the cadastre in its work and the perspective.

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1. INTRODUCTION

Space is a living organism where changes happen on a daily basis so the physical planning documentation and all other documents planning and regulating human behaviour in space represent the basis for passing sound decisions on the interventions in space as well as the capital for the development of any community. All these documents are subject to change overtime and must be adjusted and updated in accordance with the natural changes and human interventions. After gaining its independence 20 years ago, Croatia has been confronted with a number of problems in implementing development strategies. The problems have ranged from the war-time destruction, post-war reconstruction, economic transition and restructuring, and have included the issue of a wide-spread occurrence of illegal construction that had been tolerated for decades in the previous system because of the obsolete and lacking spatial planning documentation. The procedures for obtaining construction permits were complicated, protracted and expensive while the building inspection teams were scarce and ineffective. The fact that the State intervened rarely in this field has led to frequent and unsanctioned construction of illegal objects as well as the lack of and minimal awareness of the importance of legal constructions both among the citizens and economic subjects as well as the institutions. The change in political system of 1990 has uncovered that the sovereign and modern State with such a heritage cannot compete at the international economic scene so the approach to physical planning (guidelines and objectives) has significantly changed and the Physical Planning Act was passed soon thereafter. However, it was only after the adoption of the new Physical Planning and Construction Act (hereinafter: Act) in 2007 (Official Gazette, 2007) that this field has been fundamentally changed and regulated. The Act has been enforced since October 1, 2007.

2. PHYSICAL PLANNING AND CONSTRUCTION ACT

The Act has merged administrative physical planning and construction fields into a unified system and, as compared to earlier regulations, introduced the urban land consolidation as an instrument enabling the regulation of construction zones of a particular settlement. It has also strengthened the role of environmental protection in the physical planning. The Act regulates the jurisdiction of the State authorities and local and regional government units with regards to administrative and inspection operations. The responsibility of the investor, urban planner, licensed architect and engineer in the procedures of obtaining permits and in construction inspection operations has increased. Preconditions have been created to improve economic, social, natural, cultural and ecologic circumstances in the country, according to the sustainable development guidelines. In implementing the Act, a significant role has been assigned to the State Geodetic Administration (hereinafter: SGA) and its cadastral offices with regards to many segments such as:

- physical plans development
- drafting the project documentation
- establishing and recording construction parcels
- recording buildings and other constructions
- legalizing objects built without a construction permit
- during inspections.

2.1. Physical plans development

The basic objective of adopting physical plans is to achieve a harmonized spatial development in line with the economic, social and environmental premises. They determine the conditions of spatial regulation, define rational use, purpose, design, renewal and reconstruction of the construction and other zones, determine the conditions for improved urban reconstruction of developed areas, environmental protection and preservation of the environmental quality, cultural property and especially valuable parts of nature. All local and regional government units (counties, towns and municipalities) bear the obligation of developing the physical plans while, depending on the level of the physical planning documents, the bodies adopting them are the Croatian Parliament, Croatian Government, county and town assemblies and municipal committees (as described in detail in Cesarec, Bačić, 2011). Before adopting a county plan, physical plans with special characteristics and physical plans within the protected coastal belt, the physical plan developer is obliged to obtain consent from the Ministry of Environmental Protection, Physical Planning and Construction. The physical plans adopted at the level of the State, county and the City of Zagreb represent plans of higher order while the plans of other towns and municipalities represent plans of lower order. Figure 1 shows a segment of the Physical Plan of the Koprivnica-Križevci County. It is a plan of higher order regulating the valorisation of landscape importance (for example, the first category representing national importance is marked in green while the second category representing regional importance is marked in yellow).

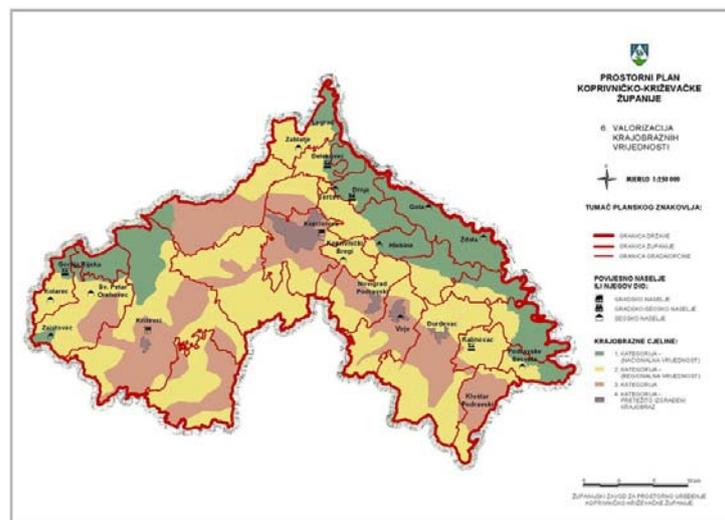


Figure 1. Segment of the Physical Plan of the Koprivnica-Križevci County

Before adopting a plan of lower order, the developer is obliged to obtain the opinion of the county i.e. consent on the extent to which a physical plan of lower order is harmonized with the county physical plan. The public is also involved in the procedure of adopting every physical plan by participating at organized public discussions. The plans must be passed also in digital format, which enables the uploading of the data into the information system of spatial data and protected areas (protected coastal seashore, natural, cultural and historic properties) at the State level. They must contain the textual part with the provisions on implementing physical plans as well as the graphical part. The graphical part of physical plans is produced by using official datasets of the SGA. The following is used in the production:

- Topographical map in scale 1:100,000 (TM100)
- Detailed topographical map in scale 1:25,000 (TM25)
- Digital Orthophoto map in scale 1:5,000 (DOP5)
- Croatian Base Map in scale 1:5,000 (CBM5)
- Digital Orthophoto map for developed areas in scale 1:2,000 (DOP2)
- Spatial unit register (to the level of streets and house numbers)
- Digital cadastral maps in raster format
- Digital cadastral maps in vector format

If the plan is of lower order i.e. more detailed, datasets in a larger scale are used. Thus, digital cadastral maps are often used in the production of the detailed urban plans or their parts. Figure 1 shows also part of the General Zoning Plan of the Town of Koprivnica produced on the basis of such a dataset.

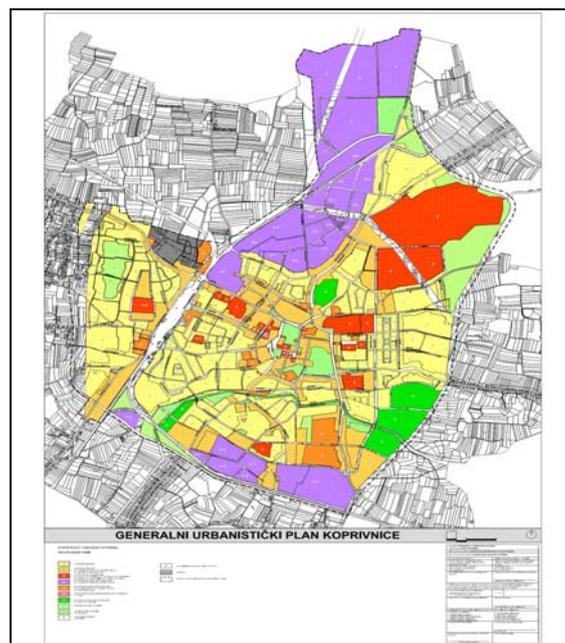


Figure 2 Digital cadastral map as a dataset for the urban plan

In order to promptly ensure updated physical datasets for physical plan developers, the SGA has concluded multi-annual agreements with the majority of counties, towns and municipalities in the territory of Croatia. The agreements define that the local and regional

government units co-finance the operations of updating official datasets of State survey and real property cadastre while the SGA, for the purpose of physical planning, delivers the same datasets to them without charging the fees for their use.

2.2. Project documentation drafting

Each intervention in space is conducted according to the physical planning documents and location permit. The location permit is an administrative act preceding the construction permit and issued on the basis of blueprints. The blueprint is a set of mutually harmonized drawings and documents giving the basic design and functional as well as technical solutions of the construction and the location of the construction on the construction parcel, as displayed on the corresponding special geodetic dataset (hereinafter: SGD). The SGD is developed by persons registered for performing the State survey and real property cadastre operations: licensed geodetic engineers. The SGD is always commissioned by investors i.e. the person preparing to submit a request for obtaining a location permit and always before the blueprints are produced. The SGD is a cartographic dataset: a topographic illustration or a digital orthophoto plan with altitude terrain models, integrated into a cadastral map (containing the cadastral parcel numbers with boundaries and borders of the land use, buildings and other constructions, house numbers and names) and containing also all cadastral parcels that will form the construction parcel. In order for the SGD to be used as a dataset for the blueprints i.e. in order to determine the shape and size of the construction parcel, it has to be authenticated by the cadastral office in charge. In the procedure of authenticating the SGD, the licensed cadastral officer determines whether the situation in the field is legally integrated into the cadastral map. If the condition of boundaries and other borders existing in the field significantly deviates from the cadastral map that must be illustrated by a black line, the condition of the boundaries and other borders derived from the situation in the field will also be shown in other type or colour of lines on the SGD.

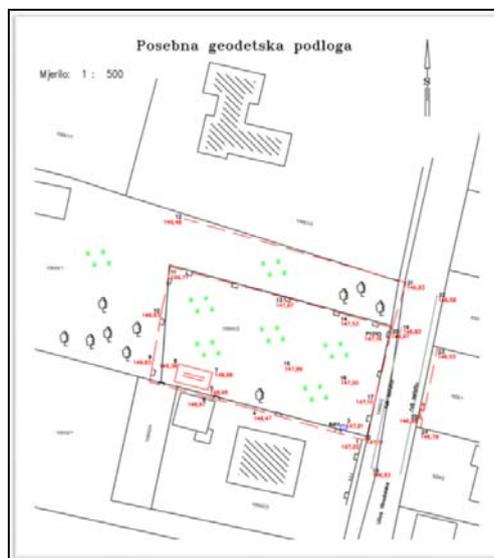


Figure 3. Special geodetic dataset – illustration of the situational difference

The rationale is submitted as part of the technical report that is an integral part of the SGD. Figure 3 illustrates the SGD where its discrepancy from the cadastral map is illustrated with the dotted red line. Before developing the main project, the situation in the cadastre and the situation in the field, shown on the SGD with regards to the location inside the construction zone, its shape and area i.e. the cadastral parcels serving to form the construction parcel, must be matching.

2.3. The purpose for developing the Special Geodetic Dataset

The purpose for developing the SGD is to warn about the discrepancy between the cadastral situation and the situation on the ground that is affecting the intervention in space and to propose the manner of solving the discrepancy. Thus, in the event of a discrepancy, the production of the subdivision or some other geodetic report follows the production of the SGD in order to harmonize the actual situation in the field (red line) with the situation in the cadastre (black line) or rather to correct the boundaries by transforming the red line into the official black line on the cadastral map.

If, when correcting the boundaries and other borders on the cadastral map in accordance with the surveyed situation on the ground, the areas of all cadastral parcels to be corrected would not be changed for more than 5%, this can be rectified on the basis of the *geodetic report for recording the actual position of individual, already recorded cadastral parcels* in accordance with the Law on State Survey and Real Property Cadastre (Official Gazette, 2007) and the Rules and Regulations on Subdivision and Other Geodetic Reports (Official Gazette, 2007). This actually rectifies erroneous or insufficiently accurately records of cadastral parcels in the cadastre, whereby the only condition is that the boundaries and other borders of these parcels are not disputed on the ground.

If, by correcting the parcel boundaries, the parcel areas would be changed in a larger percentage, the correction can be performed only on the basis of the *subdivision report*. If the construction parcel hereby encroaches on the neighbouring cadastral parcel of a different owner, then it becomes necessary to solve the issue of ownership over the newly created cadastral parcel. Once all the cadastral parcels are the property of the investor, the construction parcel can be formed.

3. LINK BETWEEN CADASTRAL PROCEDURES AND THE LAW

Cadastral procedures are considerably linked to the physical planning and construction, mostly with regards to the subdivision procedures, as testified by Article 119 of the Law: *„The subdivision of the land inside the borders of the construction area and the subdivision of the construction land outside the borders of that area may be implemented only in accordance with the physical planning documents”* and in the procedures of recording constructions in the cadastral municipal documentation, as testified by Article 268 of the same Law: *„A cadastral office records the construction in the cadastral documentation if a usage permit has been issued for the constructions for which a construction permit is issued, or rather the confirmation of the main project... The construction will be recorded in the cadastral municipal documentation if the construction (cadastral) parcel has been formed for the construction that is the subject of recording”* (Pahić, 2010).

3.1. Establishment of construction parcels

Pursuant to Article 119 of the Law, the subdivision of a construction area can be implemented in the cadastre only if performed in line with some of the following physical planning documents:

- Decision on the construction terms and conditions
- Location permit
- Decision on the construction parcel determination
- Detailed spatial plan

whereby the administrative body in charge for the physical planning operation issues a certificated on conformity. Subdivision reports, as well as the SGD, are produced by licensed geodetic engineers. Based on one of the above-mentioned documents issued by a body in charge of physical planning, they produce a subdivision report and, upon its production, must obtain from the same body a confirmation that the report has been developed in line with the issued document allowing the subdivision.

Thereafter, the licensed geodetic engineer must request that the responsible cadastral body reviews and confirms the subdivision report. The licensed officer in the cadastre reviews whether the report has been produced in accordance with the professional geodetic standards. Only then does the investor, having the reviewed and confirmed report prepared by the licensed geodetic engineer, submits an application at the cadastre to implement the subdivision in the cadastral municipal documentation. The cadastre passes a decision on creating cadastral parcels as proposed by the report by conducting an administrative procedure. After the implementation in the cadastre, the change is reported to the land registry *ex officio*.

3.2. Recording constructed objects in the cadastre

Pursuant to Article 268 of the Law, the cadastre records the construction if the usage permit has been issued for the constructions requiring a construction permit or some other physical planning act for the constructions not requiring a construction permit and only provided that a construction (cadastral) parcel has already been formed in the cadastre for the construction to be recorded. The recording of constructions is proposed in the geodetic report with the aforementioned supporting documentation. The documentation is kept by the cadastre as a proof that the recording of the construction in the cadastral municipal documentation has been founded in law.

The licensed geodetic engineer is obliged to, also in the reports whose basic purpose is neither recording, deleting nor changing the data on buildings and other structures, express the data on the unrecorded and changed structures that exist on cadastral parcels that are the subject of the report. The cadastre must double-check the documentation on these constructions as well and decide on the registration.

If the report proposes to register a building without the required supporting documentation, the cadastre records it only as *developed land* and it is shown in a separate data layer on the cadastral map, in accordance with the Land Cadastre Rules and Regulations (Official Gazette, 2007). Such constructions are shown on the drawing without shading, as shown in Figure 4 for the building drawn in red.



Figure 4. Survey drawing with the illustration of the developed land

The cadastre must inform the building inspection about the registration of such construction, after the decision changing the land use in the cadastral municipal documentation for the developed land enters into force. Thus, the cadastre additionally collects, along with the building inspection, the data on illegally built constructions and contributes to the regulation of the physical planning and construction system.

4. LEGALISATION OF OBJECTS

The Law has also opened up the possibility to legalize previously built constructions under certain conditions. If these conditions are met, such constructions can be recorded in the cadastre and then in the land registers while the main control whether the afore-mentioned conditions are met is again carried out in the cadastre. According to the Law, the constructions built before 15 February 1968 can be legalized without any documentation related to the construction. In order to prove whether a certain construction was built prior to that date, it can suffice to obtain a certificate from the cadastre on whether the construction is recorded in some parts of the cadastral records before that date (most often it is on CBM5). In this case, the area of the built construction in the field cannot differ from the area found on the map for more than 15%. Apart from this criterion of area, the positional requirement must also be met i.e. the position of the built construction on the cadastral parcel must match the map illustration. Given that such certificates are the basis for further procedures proving that the construction was built prior to that date, e.g. the assessment by a construction court expert and in order to enforce the rights to utilities, the scope of work in issuing such certificates has significantly risen after the adoption of the Law. Figure 5 illustrates the overlay of the construction screened on the ground (marked in red) with the situation on CBM5 built before

15 February 1968 (marked in black and shaded) that is an integral part of the certificate that will serve to allow the registration in the cadastre without a construction permit because the area and location of the constructions on the cadastral parcel match the situation shown on the map.

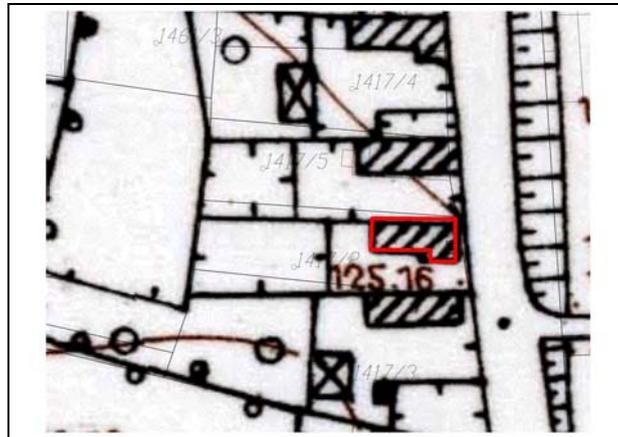


Figure 5. Base Croatian Map illustrating the situation in the field (red)

The Law has simplified the legalization process also for the constructions built before 19 June 1991 for the reconstructed or rehabilitated constructions under the project aimed at renewing houses damaged or torn down by the war, for the constructions whose construction permit or other corresponding document has been destroyed or cannot be accessed due to a natural disaster, war and other destructions and for the constructions serving to house people in accordance with the Law on Special State Care.

5. PROTECTED AREAS

The efforts of the State and the whole society after the end of the Homeland War in the mid-1990's and the adjustment of the Croatian legislation to the EU *acquis* have resulted at the beginning of the last decade in a great number of specific regulations stipulating for the areas of special interest separate regimes of behaving, managing and disposing with the real properties encompassed by individual regimes. This involves a number of regimes such as the construction, tourist, agricultural or forest land, water or maritime domain and nature or cultural protection areas. The adoption of these regulations in the past decade did not go hand-in-hand with the establishment of registers or databases enabling a unified identification of these real properties although this has been defined by almost all specific regulations.

5.1. Recording of special regimes

Having recognized the problem of identifying the parcels subject to special regimes and their recording, the SGA has proposed and the Croatian Government or rather the Parliament have adopted, by passing the afore-mentioned Law on State Survey and Real Property Cadastre of 2007, the addition of a data layer on the regimes in the cadastral municipal documentation.

This has created a precondition of merging all records in one place and the illustration of all legal regimes on the lands in Croatia whereby such information would, at the same time, become easily accessible to all users and, especially in the present context of the economic situation, to all investors.

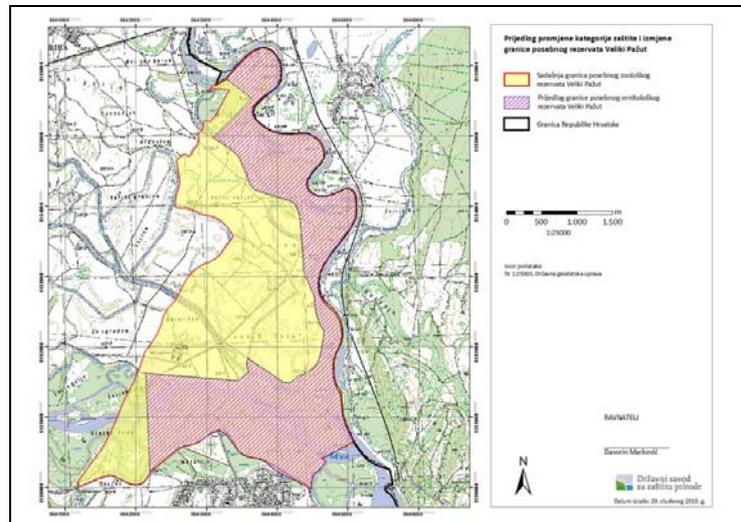


Figure 6. Modifications to borders and categories of the Veliki Pažut nature reserve

The adoption of regulations itself does not suffice to create records because it has become obvious through the activities of collection the information on the manners of passing decisions and defining the nature area borders defined by separate regimes that, as a rule, the border illustrations are neither adequate nor accurate enough to satisfy the accuracy criteria for drawing on cadastral maps. The exception to the rule is the water and maritime domain, where determined, while the borders of other regimes are, as a rule, delineated on CBM5 and TM25 topographic maps, see Figure 6. The afore-mentioned awareness has resulted in the SGA having to retract its steps and address the problem solving for transforming the borders of separate regimes or rather of bringing them to the level appropriate for being registered in the cadastre. For this purpose, several pilot projects have been initiated, most notably the pilot project of registering protected areas of nature and cultural properties with the Ministry of Culture.

5.2. Protected areas registration project

Because of its biological diversity, Croatia is among the richest European countries, thanks to its specific geographic position and characteristic ecological, climate and geo-morphological conditions. Despite its highly valuable nature, many of its components are extremely endangered due to the unbridled exploitation of natural resources for commercial purposes. The pressure of human activities and natural resources use in the past several decades has significantly increased. That is why Croatia today has 449 protected areas divided into the following nine spatial categories according to the Nature Protection Act (Official Gazette, 2005): strict reserve area (2), national parks (8), special reserve area (78), nature park (11),

regional park, nature monument (103), significant landscape (70), forest park (38), landscaping monument (135). One area is under preventive protection and some are under international protection (UNESCO, RAMSAR) and recorded in the Register of Protected Natural Values. However, the Register data is not suitable for the modern spatial data processing technologies because the majority of data dates back to the 1949-1965 period. The insufficiently developed system of data collection and recording is today one of the key issues in the nature and cultural property protection. The data is collected and sporadically updated in various thematic databases that are often inadequate, mutually incompatible and hosted by various bodies. This prevents the monitoring and updating of the relevant data, its processing and analysis as well as its accessibility. Considering these issues and the fact that the protected areas amount to 9.5% in total of the continental territory of Croatia and that there are 7,300 protected cultural properties, it is visible that the Project of Registering Nature and Cultural Property Protected Areas is of extreme importance and that it is a very extensive effort. The Project objective is:

- production and creation of datasets and other data in the territory of the Republic of Croatia for the purpose of protecting the nature, cultural heritage and landscapes
- implementation of the pilot project of developing the methodology and registration of the nature protected area regimes and the protection of cultural heritage and landscapes on selected pilot locations
- implementation of the pilot project of linking the nature protection information system of the Ministry of Culture, Nature Protection State Institute and SGA.

The pilot project will encompass:

- development of the methodology of delineating and adopting the protected area borders described by laws and decisions of the representative bodies up to the level of accuracy sufficient for the registration of protected areas regimes in the cadastre and land registers
- development of sample geodetic datasets and reports for selected pilot locations for the purpose of the registration in the cadastre (on cadastral maps)
- preparation and submission of the registration applications for the purpose of registering protected areas in the cadastre and, subsequently, in the land registers.

After the completion of the project, a single IT system will be introduced, encompassing all documentation on recorded nature and cultural properties. This will enable a clever, throughout and sustainable usage of natural resources and facilitate the protection of the existing biological, landscape and geological diversity and thus the fulfilment of the obligations of the Republic of Croatia in the process of its association with the European Union.

5.3. Protected coastal seashore

Having in mind the topic of this chapter, it is important to underline that the Law regulates also the protection of the coastal seashore that is of special interest for the State in terms of its rational, sustainable and economically viable use. The protected coastal area encompasses all islands, the coastal belt stretching up to 1,000 meters from the coastal line and sea belt stretching 300 meters from the coastline. The borders were determined in 2004 and shown on CBM5 supplemented by orthophoto maps. The law gives a number of guidelines regarding the physical planning inside the Protected Coastal Belt. The following are stated as most important:

- rational use and protection of nature properties,
- protection of cultural properties and values,
- well organized division and regulation of the construction land,
- protection and integrity of valuable coastal eco-systems and the quality of the sea for swimming and recreational purposes,
- protection of the quality and beauty of the developed environment, in particular in the coastal area along with the protection of the narrower coastal area for further development.

In order to plan certain interventions inside the Protected Coastal Belt, there must be a number of restrictions so that no plans can be made nor location permit or decision on construction terms and conditions can be given in contravention to the afore-mentioned guidelines.

6. CONCLUSION

These days we witness the extent of what the nature is capable of doing in a very short span of time so it is clear that we, as a regulated community, must respond to these events. Today, in this context, Croatia has three levels of physical plans covering the entire State territory and enabling, along with modern legislative solutions, a sustainable development of Croatia along with the protection of natural resources that we, if considered properly, have just borrowed from the future generations. Bearing in mind also all the changes that have affected the territory of the Republic of Croatia that have been primarily political and economic and striving to provide answers to the growing private building initiative, the physical planning State information system has been developed, county and other physical plans have been adopted, the protected coastal belt has been defined and the corresponding information has been published on web portals. However, a lot of work still has to be done in the field of sustainable development. Along with fact that a number of other basic registers of space have also been digitized in the past ten years, such as the cadastre, orthophoto and topographic maps, land registers, natural environment and nature database, farm register, Croatia has reached the state of being digitally ready for the next big step which is the implementation of the digital data on space into a unique system of the geo-enabled society. Aimed at protecting natural resources, easier planning of future activities and better coordination with the spatial stakeholders.

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Becici, Montenegro International Conference on Impact of EU Legislation on Cadastral Operations, 20 – 22.10.2008. - participant

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Zagreb, Croatia 1st CROPOS Conference, 8 – 9. 6. 2009. - participant

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Zagreb, Croatia 4th Croatian Congress on Cadastre, 15.-17. 02. February 2010 (coauthor, theme: 10 years of cadastral resurvey in the Koprivnica-Krizevci county)

Sydney, Australia FIG Congress 2010, Facing the Challenges Building the Capacity 11-16.4.2010. (author, theme: Cadastre Involvement in Sustainable Development as an Essential Component)

Bečići, Montenegro 3rd Regional Conference on Cadastre 9 – 11. 6. 2010 – (author, theme: E-Services of Land Administration Data created by SGA)

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Since 2009 Croatian Cartographica Association, honorary member

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Since 2005 Cambridge Conference Advisory Board, member

Conferences & statement (in past 2 y):

Cavtat, Croatia UN ECE Working Party on Land Administration Workshop on Influence of the Land Administration on People and Business, 2-3 October 2008 - participant

Sibiu, Romania	EuroGeographics General Assembly 2009, 6.-8.10.2008. (author, theme: Challenges in the bright new world - how to survive)
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Washington, USA	FIG & WB Conference on Land Governance in support of the MDGS: Responding to new challenges, 9.-10.03.2009. - participant
Eilat, Israel	FIG Working week 2009, 3.-8.05.2009. – (co author, theme: Croatian SDI: a Tool for Accelerated Development of the Geo-Conscious Society)
Ohrid, Macedonia	2nd Regional Conference on Cadastre and Land Administration, 25.-27.5.2009. – participant & panelist
Zagreb, Croatia	1 st CROPOS Conference, 8.-9.6.2009. (author, theme: Efficient usage of technology and knowledge development – precondition for modern geodesy)
Rotterdam, The Netherlands	GSDI 11, 15.–19.06.2009. – (author, theme: Process of Transition and SDI: Interaction, effects and the role of the NMCA)
Southampton, UK	Cambridge Conference – The exchange 2009, 12.-15.07.2009. (author, theme: Challenges of economic turbulences and how mapping can help to solve it - Transitional world)
Varaždin, Croatia	1 st Croatian NIPP & Inspire Day and 5 th Conference “Cartography and Geoinformation 16.-17. 11. 2009. - participant
Zagreb, Croatia	4 th Croatian Congress on Cadastre, 15.-17. 02. February 2010 (author, theme: Present status of State Geodetic Administration)
Sydney, Australia	FIG Congress 2010, Facing the Challenges Building the Capacity 11-16.4.2010 (coauthor, themes: South-East regional SDI cooperation – SEE Inspiration; The Role of National Mapping and Cadastre Agencies in Establishment of NSDI: Croatian Example The implementation of new official geodetic datum and map projections in the Republic of Croatia; Official Spatial Data as the Basis for Management in Agriculture)
Bečići, Montenegro	3 rd Regional Conference on Cadastre 9 – 11. 6. 2010 – (author, theme: Regional projects in Land Administration)
Krakow, Poland	4 th Inspire Conference 7. 2010 – (coauthor, theme: Regional Cooperation on SDI: Inspiration - SDI in Western Balkans)
Opatija, Croatia	International GISData User Conference, 23 -24. 9. 2010. – (author, theme: Spatially enabled Government – where are and what are limitations in SDI implementation)
Opatija, Croatia	3 rd Symposia of Croatian Licensed Surveyors, 23. -24. 10. 2010. – (author, theme: Spatial information – surveying profession – economic recovery – what to do and what are the perspectives)
Interests:	SDI, cartography, satellite positioning, physical planning, capacity building in surveying...

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