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Strategy and System of Quality Control of the Official Geographic Data produced by Private Companies in Croatia

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Summary

Recognizing specific needs of the Republic of Croatia regarding the official geographic (topographic) data needs in transition period, specific strategy for production of data and quality control system for produced data are defined by responsible government administration bodies and professional institutions. The Strategy yields so called "Croatian model" which is based on interaction and coordination between three main subjects at national level, e.g. State Geodetic Administration (SGA), Croatian Geodetic Institute (CGI) and private companies licensed for carrying out state survey works. Each subject has precise role and responsibility in the process of producing geographical (topographical) data or "geodetic products" specified by SGA product specifications. The products are at disposal to all users from private persons or companies to governmental and non governmental institutions. The above mentioned "Croatian model" is still being developed and implemented with so far good results achieved.

Regarding the Croatian Geodetic Institute participation in "model" implementation, the main objectives are establishment and implementation of the Quality Control System which should provide efficient, transparent and professional quality control of specified data and/or geodetic products: topographic (vector) data, topographic maps in the scale of 1:25000 and orthophoto maps in the scale of 1:5000, etc. produced for the Croatian Government by private companies.

Introduction

After acquiring the independence and sovereignty at the beginning of the 1990s, there were significant and extensive activities initiated in the Republic of Croatia in the field of geodetic and surveying works, starting and initiating production of geographical (topographical) data and building of a Spatial Data Infrastructure at the national (state) level. The activities included wide range of working fields: reorganization of existing state bodies and institutions competent for carrying out geodetic and surveying work, foundation of new specialized government institution - Croatian Geodetic Institute, creating new and significantly improved laws and ordinance basis, evaluating, readjusting and using the inherited geodetic basis from the former state in new circumstances (fundamental state networks, geodetic datums, cartographic projection, etc.), carrying out new fundamental geodetic works at the state territory, organizing and motivating Croatian private companies to start producing the geodata and specific geodetic products for state needs, etc. Among all activities, special importance has been given to the development and renewal of the large program of production of the topographic map series and orthophoto maps simultaneously with new cadastral surveys, including solving complex problems connected with land registry inherited from the former state.

Mentioned activities have become very intensive especially after 1995 and they were carried out during the period from 1995 till today in organized and systematic way, in accordance with objective Croatian situation determined by internal and external conditions. The great influence

made on the whole process was and still is strongly connected with international and European globalization processes, democratization of the state and state administration, very fast and quite radical general and specific technological changes, restructuring, privatization, transition to the market economy and protection of private ownership, geodetic and surveying heritage from former state, level of organization and efficiency of Croatian administration and other professional institutions, economic and financial potential of the state, etc.

In accordance with all conditions which have some influence on the results of above-mentioned activities, their arrangement and organization, Croatia is trying to find its own way by following the international and European positive experiences with necessary tailoring to the specific Croatian situation and with the main intention to make transition period as short, efficient and productive as can be achieved. As usual, "Croatian model", if one can speak about a model regarding the production of geographical data, maps and some other products, is somewhere in the range between two extreme alternatives, i.e. between the national wide mapping and geographical data producing like obligatory task of the governmental bodies/organizations financed by government with taxpayers money and with the data kept as a state secret and the mapping left completely to the market and private enterprises where the government is only one of the potential customers in the market in accordance with the present and near future state needs.

Regarding setting and general frame of "Croatian model", three basic "players" or groups of "players" are in the game: State Geodetic Administration (SGA), Croatian Geodetic Institute (CGI) and private companies registered and licensed to work in the field of the state survey and real estate cadastre. Their competences and responsibilities, functions, fields of work and roles in joint and coordinated production of national geographic data and building of National Spatial Data Infrastructure are defined and determined precisely enough starting from visions and strategies, including planning, financing and organizing over to the execution and finally fulfilment of the user needs.

General basis for official geographic data production and quality control

Present situation in Croatia regarding general setting at the state level in respect with the official geographic data production and quality control is a significant consequence of the new Law of State Survey and Real Estate Cadastre (Official Newspaper 1999) proposed by the SGA and delivered by Croatian Parliament and started to be implemented from the beginning of 1999.

State Geodetic Administration

In accordance with the Law, the SGA being the basic state body responsible for geodetic and surveying works and spatial data infrastructure at the whole state territory is reorganized, or is better to say organized to be a unique and integral administration encompassing the Central Office in Zagreb and all branch offices adequately distributed throughout the entire territory of Croatia (at this moment SGA consists of about 110 branch offices with approximately 1100 employees). It has the authorities to do all administrative, normative, regulative and standardizing jobs in connection with the state survey and real estate cadastre. There has been a great change made in comparison with the previous period, i.e. before 1999. Namely, in the previous period the branch offices of SGA, i.e. former local cadastral offices, used to be under the competence of local self-government units. In this respect, SGA is constituted pursuant to the new Law as a unique and a coherent government body. It should also be emphasized that SGA branch offices are still primarily related to the cadastral activities while SGA central office in Zagreb is covering wide range of all other topics. In particular, especially great importance is given to the preparing of laws, bylaws and ordinance basis, technical geodetic and surveying standards, preparation of the annual or several years state survey and real estate programs and their realization and

implementation. In that respect, the internal structure and organization of SGA central office is adjusted to function efficiently.

It should also be emphasized that SGA is not directly involved in production of geographic (topographic) data and products based on these data internally. Production is planned and financed by SGA but outsourced to the private sector, i.e. private companies licensed for production in accordance with SGA product specifications. Planning and financing is based on adequate one year or several years programs, at the present moment Program of State Survey and Real Estate Cadastre for the period 2001-2005 is just being carried out, proposed by SGA and approved by Croatian Parliament (Official newspaper 2001). The example of some very important products in the field of responsibility of SGA, according to the SGA official catalogue of products (State Geodetic Administration 2001), can be presented as follows:

- Aerial photographs in the scale of 1:20000 from systematic cyclical photo shooting of the state territory.
- Orthophoto maps in the scale of 1:5000.
- Croatian base maps in the scale of 1:5000.
- Topographic maps in the scales of 1:25000, 1:100000, 1:200000, etc.
- Cadastral maps in the scales 1:1000, 1:2000, 1:2880, etc.

Croatian Geodetic Institute

In addition to all structural, functional and other changes regarding SGA, one of very important changes in terms of modernizing and reorganizing geodetic and surveying activities in Croatia is the foundation of a separate and specialized public institution intended for performing scientific and highly professional geodetic works at the state level. This new institution, founded by the same Law, is Croatian Geodetic Institute. Founder of the CGI is the Republic of Croatia and rights of founder are implemented by the Government. In the Republic of Croatia there has never been such an institution. During the long period of time, from the end of World War II till the moment of CGI foundation, the practical realization of high professional geodetic and surveying works (for example: state control networks of higher orders, map series in the scale 1:25000, etc.) had been always under the competence of Military and Geographic Institutes of the former states. As Law became operative, during 2000, concrete activities were initiated in connection with the formation and establishment of CGI and have been continuously performed ever since. With foundation of the CGI for the first time in the Republic of Croatia, administrative, normative and regulative jobs in the field of geodesy at the state level are started to be separated from professional jobs. CGI should be responsible for professional jobs and SGA should take care of the administrative and normative jobs. CGI is formed as a specialized institution but without the rights to be profitable or to compete with private companies at market. The work of CGI is regulated by the Law of State Survey and Real Estate Cadastre, by the Law of Institutions and other positive laws and regulations of the Republic of Croatia. Within its activity CGI should perform the following jobs:

- Conduct fundamental geodetic works
- Constitute topographic, cartographic and land registry databases
- Conduct topographic survey
- Constitute and keep geographic names register
- Conduct survey and marking of state border
- Conduct development and research projects
- Standardization of geodetic works and procedures

Internal constitution of the CGI is based on the planned type and volume of geodetic works that it should perform. The internal constitution is defined with four departments:

- Department for mutual jobs
- Department for fundamental geodetic works
- Department for topographic survey and supervising
- Department for geoinformation systems and databases

Apart from the fact that CGI is constituted as an independent and specialized professional institution for performing mentioned specific works, CGI is strongly connected with SGA and obliged to jointly perform geodetic works and activities in accordance with the annual working programs harmonized with the working programs of SGA at state level. In explained setting, accordingly to the relations established between SGA and CGI, one very important function is directed to the CGI. That is quality control function with the main purpose to provide and assure the quality and homogeneity of geodetic products, i.e. official geographic (topographic) data produced for SGA (Croatian government) by private companies. It should be pointed out that providing and approving the quality of the official geographic data produced for the state has never been solved at the territory of Croatia in that way. Additionally, it must be said that CGI's work on providing and controlling the quality has started to be realized simultaneously with the foundation and building of CGI's overall infrastructure and capacities for undertaking that work (equipment, education and specialization of personnel, defining of procedures and methods, etc.). CGI's quality control function is strongly related and harmonized with the realization of the Program of State Survey and Real Estate Cadastre for the period 2001-2005 (Official newspaper 2001). Further more, in the same time the whole activity is strongly overlapping with quite recent activities of implementation and realization of the important GI project prepared and organized in the frame of technical and financial help given to the Republic Croatia by the Kingdom of Norway - Croatian-Norwegian GeoInformation Project.

Croatian private companies

In accordance with all transition changes that have happened in Croatia from 1990 until today, all geodetic and surveying companies have become private companies (private ownership). Some of them which existed in period before 1990 were privatized but at the same time some companies were initially founded after 1990.It should be said that several bigger companies with significant professional potential and infrastructure for production of geographic (topographic) data have remarkable tradition and experience because they were founded immediately after World War II and they had been developed during the period of almost 50 years. It is interesting that these companies are not exclusively concentrated in Zagreb (capital of the Republic of Croatia) but they are dispersed to the most bigger Croatian cities spread over the country, for example: Split, Rijeka, Osijek, etc. Several bigger companies were newly founded as well, after 1990, on the basis of the possibilities and conditions to develop private enterprises. Some of them were founded by Croatian experts with work experience from abroad and they were developed in quite fast and efficient way. It is important to point out that all those companies, privatized old ones and new ones, have very solid and recent technological infrastructure and level of technical knowledge with experienced people involved in the production processes. They are fully capable to produce specific products and geographical data for government needs in accordance with SGA product specifications. In accordance with their development and continuous technological modernization during last 10 years they gave a strong contribution to upgrading and improving of specialized geodetic works at state level on the basis of appropriate coordination and collaboration with SGA.

At this moment, for example production infrastructure for producing of Topographic maps in the scale of 1:25000 has already been developed and usable in at least 6 private companies and all these companies were actively included in their production during the last 6 years. Those companies are competitors in public procurement procedures organized by SGA, regarding possibility of choosing the best and most efficient (cost/benefit) production. Simultaneously with the mentioned production for government needs, the private companies are completely free to produce other kinds of data or products for other investors in accordance to their needs and apart from predefined product specifications maid by SGA.

Apart from those bigger and "infrastructurally developed" private companies, there are at the state level also several hundreds (more than 400) of quite small private companies licensed to work in the field of state survey and real estate cadastre. But all those companies (some of them are functioning only with one or maybe two experts), founded practically after 1990, are related first of all to cadastre and real state work or other specific kinds of work. Their production infrastructure, knowledge and production potentials are not appropriate for the production of, for example, topographic maps, etc.

Strategy

As already mentioned in the introduction, two extreme alternatives (models) are possible if one consider production of the geographical (topographic) data at the national (state) level, i.e:

- National wide mapping like strict obligation of the responsible governmental administration organization financed by the government from the state budget and with data kept as a state secret and
- Mapping left completely to the market and private enterprises where government is only one of the potential customers in the market in accordance to the present and near future state needs.

As usual, these extreme alternatives are not strictly implementable because of several reasons and because each of them has important and significant disadvantages. Implementable "model" for each country or state is somewhere in between of these extreme alternatives where some pragmatic reasons must have influence on their mutual balance and adjustment to the general and specific state setting and local conditions. Croatian answer to mentioned alternatives is a "model" defined on few following main elements:

- Specific and standardized geodetic products (geographical data and information's), their definition, specification, planning of production, financing, distribution to users (customers), etc. are the responsibility of the appropriate state civil administration body, i.e. SGA. Produced data or products have got no status of state secret data but copyright belongs to the state. Different users, from private persons or companies to other government institutions have the possibility to use and pay the usage of data or products for declared purpose in accordance with transparent and acceptable SGA price list. Production is financed partly from the state budget (taxpayer's money), partly by local municipalities or some other investors interested in specific product, for example: Croatian Waters, Croatian Forests, etc. Main orientation in planning of production is defined by user needs and SGA capability to achieve actuality and availability of products with appropriate delivery time (that can be achieved in the frame of objective present Croatian conditions).
- Production of previously mentioned specific and standardized products is completely directed to the private companies specialized and infrastructurally capable for organizing and executing efficient production with appropriate level of quality and homogeneity of products in accordance with SGA product specifications. Production is connected with public and transparent procurement procedures organized and conducted by SGA with main purpose to achieve most efficient and productive results – guaranteed quality of products in accordance with product specifications produced for less money.

- Quality assurance and quality control of products produced by private companies is main responsibility of CGI. In principle CGI is, apart a fact that is connected in work with SGA on same programs, stand alone (independent) professional institution specialized for undertaking quality control activities to assure quality and homogeneity of products. Line of responsibility between SGA and CGI is very clear due to fact that SGA is administrative government body with administrative and normative responsibilities and functions and CGI is professional one. Quality control system is based on transparency, taking into account fact that best controllers of products quality should be producers themselves, e.g. private companies.

Described "Croatian model" is a quite young model and its implementation is not completely finished yet. Lots of activities are in realization simultaneously, first of all activities regarding building up CGI's capacities and infrastructure to undertake QC work, coordination between SGA, CGI and private companies, improvement of production regarding product specifications, procedures and methods, introduction of new products, etc. So far achieved results are satisfactory and all recent activities are showing that in Croatian circumstances and conditions "model" is giving expected benefits.

Quality control

Recognizing the most important elements of "Croatian model" and high motivation to improve geodetic and surveying fields of work, especially with respect to Quality Control, the Kingdom of Norway decided to give Croatia support and assistance for consulting services, efficient recent technologies transfer, specialization, education and training of Croatian professionals and capacity building of CGI to be able to significantly improve and implement QC work. In the mentioned setting, direct technical and financial support, and assistance in planning, development and realization of a very important, significant and complex project named Croatian-Norwegian GeoInformation Project - CRONO GIP, is given at the end of 2001. CRONO GIP realization started in June 2002 and the expected end of project is December 2003.

Within the frame of CRONO GIP, objectives, expected results and planned activities are in accordance with fundamental strategic decision that CGI should be the main independent quality controller of "geodetic products" produced by private geodetic and surveying companies at the state level. In that sense, one should consider that the project activities at the moment are related to the three main geodetic products, i.e. digital topographic (vector) data, TK25 and DOF.

The main objective:

- CGI shall be able to control the quality of geographic data (geodetic products) produced by private companies for the Croatian Government.

Expected results:

- CGI shall be able to perform satisfactory controlling of the quality of topographic (vector) data, TK25 and DOF produced by private companies.
- CGI shall be able to prepare draft regulations and standards in line with internationally accepted standards, to be applied by private companies for assuring and documenting the production quality.

Planned activities:

- Specification and verification of controlling procedures and related methods to be applied by CGI taking due notice of internationally accepted standards and methods.

- Verifying existing regulations and standards for quality assurance in production of geographic data by comparing these to internationally accepted regulations and standards (ISO, CEN, etc.).
- Drafting new and improved regulations and standards (if found appropriate).
- Specification of the requirements concerning technical equipment, instruments and software needed at CGI to be able to make relevant quality controls.
- Procurement, installation and testing of instruments, hardware and software needed for quality control.
- Education, specialization and training in the use of the equipment and software.
- Practical execution of controls on final products and relevant intermediate data resulting from various steps within the production of TK25 and DOF.
- Informing relevant users, private companies and public institutions about development of regulations and standards and enhancing the awareness of international standards.

In the period from June 2002 till May 2003, intensive activities on the realization of CRONO GIP have been carried out. Simultaneously with procurement of equipment for quality control, training of CGI employees and verification of existing Croatian regulations, products specifications and standards, crucial activity is connected with the development and defining of the CGI Quality System based on internationally accepted standards adapted to the Croatian situation. The Quality System should be based (Program Management and Mapping, 2002) on transparent set of documentation consisting of:

- General quality guidelines.
- Producers (private companies) quality plan requirements.
- Products specifications.
- Control methods descriptions.
- Specifications of sampling and tolerances for rejection and re-work of specific geodetic product.

and should be developed and implemented in three hierarchical levels:

- I Level – Base documents describing overall principles of CGI's quality control work.
- II Level – Base documents defining the products to be controlled, referring to the three basic products: digital topographic (vector) data, TK25 (digital raster and paper form) and DOF.
- III Level – Procedures and checklists necessary for undertaking all control work.

In addition to the three basic products involved in CGI's quality control activities, additional products (sub-products) are also included having in mind important intermediate steps in the production processes: Aerial photo and ground control, Aerotriangulation, Scanned photo and Digital Terrain Model (DTM). Important attention in realization of CGI's quality control system is given to the development of new and the improvement of existing Product Specifications to insure appropriate and transparent quality of production of the Topographic Data mapped and produced from aerial photos in the scale of 1:20000 including quality elements and sub-elements and tolerances like fundamental basis for quality control. Precise and detailed Product Specifications are of great importance not only for CGI's control work but for producers, users and government institutions as well.

Development and implementation of CGI's Quality System is still, till the end of May 2003, an ongoing process with a lot of results and significant enhancements of existing CGI's capacities to undertake very important activities regarding geodetic products quality control.

Till the moment of completing the work on this paper, all CRONO GIP activities have not been concluded yet. In accordance with the general project setting they are in simultaneous realization with specification and documentation development, trainings on job, definition of practical procedures and methods for quality control are overlapping each other.

It should be emphasized that excellent collaboration of responsible institutions, companies and people involved in the project realization exists at all levels, beginning with formal level of coordination between SK, SGA and CGI to the level of professional work and collaboration between Norwegian and Croatian consultants with SGA and CGI employees.

On the basis of so far achieved results it is realistic to expect that the capacities and capabilities of CGI will be significantly enhanced and improved in a very limited time frame and that CGI will be able to maintain and undertake all quality control works in the future with appropriate transparency and efficiency for the benefit of all involved parties.

Conclusion

Implementation of the "Croatian model" regarding strategy and quality control of official geographic data production is one of the examples how each country or state by following international and European experiences tailored and customized to specific national conditions can build their own specific solutions. That solution is still under development regarding implementation on practical every day work level, connected with technology and knowledge transfer, education, training and specialization, documentation development, coordination of involved parties, etc. It can be expected that many of already unsolved or at least not efficiently solved elements will be improved in future period on the basis of defined strategy and on the basis of clear and transparent policies.

References

OFFICIAL NEWSPAPER, 1999. The Law of State survey and Real Estate Cadastre. The Republic of Croatia, No. 128/99, Zagreb, Croatia.

OFFICIAL NEWSPAPER, 2001. Program of State Survey and Real Estate Cadastre for the Period 2001-2005. The Republic of Croatia, No. 64/01, Zagreb, Croatia.

PROGRAM MANAGEMENT AND MAPPING, 2002. CRONO GIP Croatian Norwegian GeoInformation Project - Inception study report, Croatian Geodetic Institute, September 2002, Zagreb, Croatia.

STATE GEODETIC ADMINISTRATION, 2001. Catalogue of products. Zagreb, Croatia.

STATENS KARTVERK, 2001. Terms of reference for the implementation of component b) and c) of the Norwegian assisted Project in Croatia for enhancing the capabilities of the Croatian Government to build a National Spatial Data Infrastructure. Appendix A to the Contract, Oslo, December 2001, Norway.

STATENS KARTVERK, 2002. Agreement for improving real estate information and geographic data infrastructure in Croatia, Zagreb, December 2002, Croatia.