

## 23. Geoinformation aspect of planning of Belgrade

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Modern era is characterized by the amount and flow of data which is almost impossible to quantify. The significance of information and their effective changes represent one of the key developmental processes and one of the main characteristics of modern society.

It is clear that information represents important supposition of regular decision-making and, therefore, the need is being imposed that the means and sources of information are raised on the high level in the process of spatial planning. Those who are responsible for planning and programming the development of Belgrade, disregarding the segment for which they are competent, have managed clear, objective, qualitative and, if it is possible, concise information. If the information we have, satisfied the mentioned criteria, it could become "means by which we can influence the decision-making and directing certain events" (Marić, 1986). In accordance with modern, extremely dynamic, way of life and work in Belgrade, rapid technical and economic development in all spheres of human activities, the need for information becomes more and more obvious. The right information at the right moment can mean economic profit, prevent ecological problems, make life easier to residents of Belgrade and prevent ecological disaster. Such information becomes more and more necessary because managing the complex economic, legal, technical and social and other structures of the City cannot be imagined without them. According to Wahl (Wahl, 1971) "the success in managing depends to a great extent on the timely and qualitative information." The qualitative information is characterised by accessibility, completeness, exactness, clearness and flexibility, the possibility of check, objectivity and economy. Other authors explained the quality of information as "closeness of information on facts, real situation of a phenomenon or a process. If the information was more qualitative, it would be more true and real and, therefore, the possibility for making the right decision would be greater." It is often necessary to check many facts that spatial planners and city planners meet with every day, as well as many others who participate in the complex process of spatial planning of Belgrade, before they are accepted and implemented in planning solutions. An adequate and permanent check of planning solutions, the effective implementation of spatial and urban plans, as well as the permanent monitoring of changes in space and their (non) accordance with plans are only possible if we have qualitative information.

### 23.1. Geoinformatics in Belgrade spatial planning system

#### 23.1.1. Why do we use geoinformatics in spatial planning?

The overall technological progress brought to the complexity of previously relatively simple systems and it made them more dynamic. Therefore, the activities such as following the condition of the system, changes in the systems, their analysis, as well as managing

such systems have become too much demanding and exceeded the mental capacities of a man. On the other side, modern technology, progressive software and hardware, have enabled the effective manipulation of data and information.

Spatial and urban planning have demanded large, constantly growing amount of different data and information. The further planned development of Belgrade demands data and information on the basis of which the prompt and right decisions can be made on spatial planning and management. Many domestic and foreign researches have pointed that the quality of starting data and information about the space and the existing content and activities in it have a critical influence for decision-making by which the development of space, quality and appliance will be directed regularly.

Information is more valuable if it enables to users (planners, city planners, etc.) better decision-making, more realistic plans and more effective control of their carrying out, and if it is possible the control in "real time". The control in real time means the capability of those who manage the space to find out and correct the deviations of the plan, or removing from the set goal (before those deviations become so much significant that they disable the realization of given goals), disable the return on the previous condition, or as the worst scenario, endanger the existing situation of space. It is insisted on a timely control that would point to the deviations from the plan or wrong planned decision at the moment when it is still possible to make some corrections. In dependence on the nature of the activity that is being followed, the eventual corrections do not have to be instantaneous, while sometimes it is not possible to carry them out instantaneously due to complex procedures of change of planned solutions. On the other side, there are activities where it is insisted on instantaneous reactions if the system has pointed to certain irregularities. Managing the network infrastructure in Belgrade could be an example, where there is a frequent need for removing damages that can endanger the safety of residents and the function of the whole area almost at one moment.

As Marić stated, "the realization of the control in the real time considerably enlarges the value of information because it enables the realization of the plan which is based on information and which, at the moment it has been carried out, represented the best alternative" (Marić, 1986). Therefore, the risk from the cumulative deviation from the plan, to which it can come during the development of the process of its implementation, can be reduced. Accordingly, the timely pointing out to damage on sewerage system, with its precise localization, can prevent damages on water system, telecommunication network and other infrastructural systems, set linearly and parallel under the ground, one close to another. Beside the positive effects that are accomplished in managing the space in a sense of making an image of the effective and responsible administration and its services, the economic effects have also been important at the saving of time during which the damage is noted, located and repaired, i.e. the positive economic effects of the protection of other infrastructural and traffic systems.

### **23.1.2. Who can use GIS in spatial planning process - only spatial planners?**

Effective management of space of Belgrade as a complete system and all its subsystems through the process of spatial planning, has been caused by possessing the qualitative information as well as by the possibility of the rapid change of information between those who make decisions-make the spatial plans and those who carry out the decisions-

implement the solutions which are given in the spatial plans. Possessing the qualitative information makes the process of making the spatial plans more effective and reliable and, therefore, different planned solutions, i.e. the results of carrying out those solutions, define to which direction, in what way and by which dynamics the space of Belgrade is going to develop.

In different phases of making the spatial (and urban) plans, as well as the programmes of development of certain space, it is necessary to make different decisions (from the decisions in principle to the very precise ones). Whether planners, city planners, engineers, administrative organs and others who participate actively in forming the space of Belgrade will make decisions adequately, greatly depends on the quantity and quality of information they will possess, how they will apply the available information for formulating the suggestions and solutions and how they will explain their solutions based on the same information.

An extremely large amount of information, necessary for managing the space of Belgrade, has been located in different systems. Therefore, it is necessary to define which information we need, whether it is available and in which system, what is the format and quality and finally, when and how we can come to it. After gathering the information, it is necessary to systemize it and make further distribution. The way in which the distribution will be done, and also the form in which the information will be distributed, depends on whether the final user of information is one who makes the spatial or urban plan, the one who implements the planned solutions, or the one who follows their realization and controls the quality, deadlines, dynamics, etc.

The optimal solution means, on one side, the effective, qualitative GIS which is adapted to the characteristics of Belgrade space, but on the other side, it is adapted to the institutions, services and staff to which it remains for use and further advancement. Therefore, it has been pointed to two extremely significant characteristics of GIS that have to be esteemed at every moment of construction and implementation of information system, i.e. the need that GIS is optimized for the purpose and space to be used for and to be coordinated with the needs and knowledge of the final users.

### **23.1.3. Other users of GIS interested in problems of spatial development - citizens, politicians, local government?**

One of many tasks of the local government of Belgrade is to insure the stable and qualitative services, by which it will provide the conditions for high health level of population, high level of population safety and it will satisfy other aspects, providing the high level of life quality in the City. These tasks are realized through everyday work of a series of services and departments within the local government, and in accordance with the adopted policies and directives. In developed countries, a many-decade use of geographical information systems within the local governments proved clearly that the effective use of geospatial information is the critical element in the realization of the mentioned task due to fact that the addressing of different combinations of factors that influence health, safety and the whole quality of life of the local community population has been based on geography, i.e. location. Knowing and understanding the location, the competences over it, the natural and cultural resources of the location, knowing the traffic and transportation flows, communal infrastructure as well as factors that can influence each of the

mentioned subsystems of the location, make the basis for managing the space of the local community and effective and qualitative servicing to its residents.

The present situation of the development of geoinformatics in Serbia and in Belgrade for the needs of managing the space of the local communities has been characterized by the individual users and projects that maintain their data on desktop computers which, in most of the cases, leads to the increase of unneeded data and applications. The aim of the implementation of distributed GIS is to introduce the interoperable technologies, standards and methods in such a way that they would enable GIS data and services to be used more effectively, reliably and rapidly. If the activities on the construction and implementation of GIS are coordinated by the organisations, the users of the spatial data can devote more time to the analyses of data and the use of the analytical possibilities of GIS while making decisions, but less time in searching the data, their coordination, unification and integration into the system.

### **23.1.4. What is the purpose of GIS in spatial planning process?**

As Kenneth Boulding (1974) stated in his work *Reflections on Planning*, "the way world moves to the future is the result of some decisions, not plans. Plans are significant only as much as they influence those decisions. Therefore, planning can be defined as a part of the overall process of decision-making, but if it is not, then it becomes a bag filled with wind, a sheet of paper and a worthless diagram." Whether it is a process of decision-making about or a process of making planning documents or programmes of development for a certain space, there is a need for easily accessible and qualitative information. The use of geoinformatics can enable exactly such systematically defined and selected, precise information. In dependence on the complexity of the space to which the information system relates to, i.e. the complexity of demands of one who is using it for planning, the system itself will have different levels of complexity. Disregarding the degree of the information system complexity, the access to information and the quality of information it should insure have to be at equally high level.

The automation of data processing in the spatial and urban planning represents the turning point in the ways of managing the space. It is clear that it is not about a simple technical promotion of the process of planning and programming, but it is about the influence on the methods of making planning documents and decisions, first of all by improving the whole fund of information. As Marić stated, "a man is trying to achieve the optimum solution by solving some of the problems. While deciding, the suppositions should be the alternative ones. Where there are no alternatives, there are no possibilities of choice either. If there is no possibility of choice decisions are made under pressure" (Marić, 1986).

On the basis of the analysis of the previous methods in making planning documents on the territory of Belgrade, the following characteristic phases can be recognised:

1. gathering, systematization and classification of data;
2. analysis of situation;
3. programme of a plan on the basis of needs, as well as urban indexes from plans of higher rank;
4. making a draft of a plan on the basis of alternatives and variants;
5. consideration and adoption of a plan.

It is clearly noticed in which phases the use of the qualitative information system can give its significant contribution of objectivity, exactness and scholarship. The first phase - gathering, systematization and classification of data, in the case of the use of geoinformational technologies for a certain territory for which a planning document is being made, would be made in advance and the information would be prepared in a form which is favourable to be used for a planning document. Modern geographical information systems enable to a great extent that the second phase - analysis of situation, is significantly advanced and accelerated as well as that certain alternatives and variants, through the usage of simulations and models, are examined before their implementation into planning document.

The mentioned possibilities of the use of geographical information systems in the process of making the spatial and urban plans and programmes of development represent only a part of wide spectre of possibilities offered by a qualitative information system. Besides the significant saving of time, necessary to make planning document, the advantages of using GIS in the process of planning relate to raising the degree of objectivity and exactness of the planning solutions as well as the overall quality of the planning document.

The subjects who participate in spatial planning are not always timely, enough and adequately informed on the issues on which the decisions are made, which reflects negatively on conceiving the planned solutions. Therefore, the solutions given in the plan have often been the result of intuition and experience of a methodologist and a planner, the so-called best-expert opinion. In the time of the 1990s, different changes in space of Belgrade (and Serbia as a whole) developed by various speed. Illegal changes developed extremely dynamically, but they were not treated by the planned solutions, while the legal ones, processed by planning documents, have been usually left unrealized. In such a chaotic and (un)organised space, there was no need to follow and analyse the changes every day, almost instantaneously. There were no official changes or they were very few, while the unofficial ones were neglected. Approaching to organised, legally structured society in Serbia, which directs its spatial development consciously, systematically and continuously, the need arises for permanent monitoring of the situation of different structures of space. Each of the actors in the process of managing, planning and programming of the spatial development faced with a bad condition of documentation on space. Most of the information was paper documents, unselected, unclassified and imprecise and it was often difficult to find them. Moreover, the information was not usually in accordance with the actual regulations and was never organised as a modern data base. The quality of such information was on very low level. The institutions did not have electronic equipment, especially computers and the result of such condition was irrational use of human and technical resources that cannot response adequately to the increased demands and needs (administration, investors, citizens, services, etc.) for information in accordance with the changes of system and organisation of the society. The equipment was acquired elementally and unplanned and it was not used adequately (often it was not used for purposes it had been acquired for).

The possibilities of information systems in planning and programming the development of space and its structures can lead planners, city planners and other actors who participate in that work to wrong conclusions concerning the role of geoinformatics in the whole process. Most often, the ignorance of its possibilities has been the reason for misunderstanding of its role. On one side, there is an unjustified fear that the automation of

data processing will limit or even stop completely the radius of activities, creativity and freedom of decision-making in the process of planning. On the other side, there are unreal expectations that by making the information system, an easygoing period will begin for those who are in planning and programming of the development of space and, therefore, the computers will make decisions and plans instead of themselves.

The qualitative information system will demand permanent and great work on gathering, classifying, processing and analysing the information, as well as on selecting and placing at disposal. The work will be facilitated by the automation of the procedure and less effort and time will be needed (less engagement of human resources). Moreover, it will enable the consideration of large number of alternatives and the decision-making on the basis of the qualitative information. It will also enable better insight and estimation of problems, prerequisites and possible consequences of some or collective decisions. Disregarding the possibilities that geoinformatics offer, a man will make a decision and he will be responsible for it. The necessity of constant interaction among information system, team that works on its maintaining and final users is clear.

### **23.1.5. What is the purpose of GIS in process of spatial plan implementation and process of monitoring of spatial changes?**

Spatial planning on different levels should insure to modern society the coordinated ecological, economic and social development of space. The realization of planned solutions is enabled by different sorts of measures and instruments that can be called the segment of implementation. It is necessary to mention that the information system can show the equal value and all its appropriateness during the implementation of the planned solutions, i.e. the operationalisation of aims, ideas and visions, disregarding whether the plan is considered as something that have to be realized to the end or as the prognosis of something that can occur.

The problem of ineffective carrying out of the planned solutions the planners have faced with for many years can be approached from two angles. As observed from the angle of the plan making and defining the planned solutions, there is a question whether the solutions and plans are made adequately. Not going into the analysis of the methodology of plan making, the question is whether it was possible to make qualitative plans without adequate data and information, i.e. whether the applied methodologies could be sustained in further phases of working on the plan when the problem of lacking the updated cartographic bases, cadastre bases, various statistical indexes, lack of spatial entries for the whole series of available data and huge differences in de facto and de jure situation on the terrain has been well known. In other words, a large number of available data could not be spatially located neither precisely, nor even with large mistakes.

On the other side, there is a question of justification of great expectations from the process of implementation. Similarly as with the phase of making the planned documents, due to lack of the operative indexes and disability of monitoring the realization of the plan as a prerequisite for the analysis of the degree of realization, as well as due to non existence of competences to have that done, it has not been justified to expect that the decisions are made permanently by which the eventual deviations from the planned solutions will be corrected on time. Following the realization of plans, if it was done under that title at all, has related on establishing the existing situation without precise defining

the speed of realization and synchronisation in the realization of planned solutions. The new situation often related to newly built structures or changes in the purposes of areas, while the processes of the reconstruction and restoration of space were omitted or mentioned without evidence on the dynamics of the mentioned processes. Total reconstructions were the exception and their effects on space were equal to newly built structures. The processes of analysing the existing situation would start from the beginning in most of the cases, spending irrational time and money, while the analyses would often be incomplete due to limited budget. The use of updated geographical information system would enable the permanent insight in the changes in space and the realization of the planned solutions.

The aforementioned facts, as well as a series of other circumstances brought the process of planning and programming of the development of space into the condition it was found - unfounded planning and unrealizable process of implementation. It is clear that all problems can be removed by the use of geoinformatics, but with the construction of the qualitative information system, some of the problems of the process of making the planned documents and their operationalisation can be removed, so that planning stops being "the process that lasts too long, with too much paper and very few results, having as a consequence the inflation of planning papers, while the problems in space remain unsolved."<sup>92</sup> Geoinformatics could be one of the strong connections between the planned solutions and the realization of the spatial and urban plans, enabling on one side, greater reality (objectivity and foundation on qualitative information) of planned solutions, i.e. change of the approach in making the planned documents, and on the other side, greater effectiveness of applying the instruments in the realization of the plan.

## 23.2. Organizational resources and importance of permanent education

How large the possibilities of modern information systems are and what is their significance in the process of managing the space and decision-making can be seen in the changes of organizational structures of some enterprises, changes in the organization of administrative organs, etc. Today, many state and some private organisations (as well as non-governmental sector) have organisational units (departments, sectors, etc.), the task of which is to change the previous traditional approach of data manipulation with the modern approach and to influence significantly the quality and speed of carrying out the tasks that are set in front of them through the use of geoinformatics. The process of transition from 'paper' managing to modern 'e-managing' along with a complete support of geoinformatics cannot be instantaneous and it is not deprived of technical, organisational and financial difficulties. Therefore, it is necessary to insist that the process develops gradually and it is most often insisted, in the transitional period, on the computer mapping and later automated mapping as the initial points of introducing the GIS technology. The extenuating circumstance at modernizing the process of drawing maps and plans is keeping the existing procedures, policies and programmes, because the already existing and developed processes and procedures have been automated.

<sup>92</sup> According to conclusions of 30. congress of IsoRP, 1994.

It is clear that there must be changes in the way of the formation of (spatial) data bases, in the production of maps and plans as well as in the procedures of issuing the reports, obtained on corresponding inquiries. Beside the changes in the way of managing, it is necessary to begin with training of employed that has to be permanent task.

H. Prinz (Prinz, 1974) described concisely the aforementioned facts: "The introduction of data processing is not much technical-organisational task, as it is organisational-socio-psychological one. Without change of the way of behaviour of members of the system, the effective use of data processing system would not be possible, while changing the way of behaviour is the primary task of management."

The building and implementation of the information systems for the needs of planning and programming the development of Belgrade has to be followed by active participation of those who manage the urban subsystems-the management of public communal services, agencies, secretariats, etc. As Bulatović stated: "informing the management with the problem and significance of the spatial data on time means better perception and specification of users' demands for IS planner and better understanding of the significance of the system and results that can originate as a consequence, for management" (Bulatović, 2006). The same author pointed to the necessity of engaging all communal services which use spatial data in their activities (public communal enterprises, land development agencies, institutes of urbanism, city agencies, real estate cadastre centre, city authority, etc), in order that the whole system of the city authority evolves through the effective system of connection and distribution of information into a modern one from which the users of space can have benefits.

Users are especially significant element of GIS, i.e. those who work on the building of the information system (projecting and programming), those who implement GIS and those who use it. Without adequately educated work force, without a vision which level certain GIS has to reach and without great effort, work and devotion, only a small part of the potentials that GIS offers will be used. The question arises as to the justification of investments in such a project. The last phase would be programming and testing the system and staff training. The staff training is considered as especially significant for stable, successful and useful operation of the system. Otherwise, without adequate and permanent staff training, the information system will become useless very soon.

Živković also had similar views about users: "GIS technology has limited value without people who manage the system and improve and develop plans for its use in solving the problems of the real world. All staffs (professions) are the GIS users, starting from technical specialists who project and maintain the system to those who use it in their everyday work. The identification of corresponding GIS specialists in relation to the final users is often of the crucial significance for an adequate implementation of GIS technology" (Živković, 2001).



## 23.3. Recognition of stakeholders and best practice examples

### 23.3.1. Elaboration of important institutions on different levels (both city and state level)

While considering the key institutions, significant for the use of geoinformation technologies in the process of the spatial and urban planning of the territory of Belgrade, beside the leading spatial-planning and urban institutions, all those institutions that support the process of the use of geoinformation technologies in spatial planning by their activities, have to be taken into consideration. Therefore, the following institutions are the key ones for the use of geoinformation technologies in the planning of Belgrade:

- Belgrade Land Development Public Agency,
- City Authority,
  - Secretariat for Urban Planning and Construction,
  - Secretariat for Communal and Housing Services,
  - Secretariat for Traffic,
  - Secretariat for Protection of Environment,
- Institute of Informatics and Statistics,
- Institute of Urbanism Belgrade,
- Republic Geodetic Authority – Real Estate Cadastre Centre Belgrade,
- Military-Geographical Institute,
- Republic Agency of Spatial Planning.

#### Belgrade Land Development Public Agency

This Agency provides proposals of Programme for land development and construction of communal infrastructure facilities with financial plan, makes studies and analyses on economic justification, provides communal facilities and land development, makes all necessary bases and elaborates for land holding, forms the initial prices of land which is rented out, carries out the procedure of land holding and signs contracts with investors on the regulation of mutual laws and obligations, takes care on the protection, rational and restricted land use, manages the information basis on land, provides services of engineering, consulting and management within land development and construction of public facilities, works on the preparation and construction of Belgrade underground and all major facilities significant for the City, buys, sells and rents real-estates for the needs of land development.

Within the organisational structure of Belgrade Land Development Public Agency, there is a sector for marketing and informatics, where the departments of informatics and monitoring of the city planning projects and cataloguing are of the special significance. All sectors are mutually connected horizontally and the sector of marketing and informatics supports other sectors.

Geographical Information System of Belgrade represents especially significant activity from the aspect of use of geoinformational technologies in the process of planning and managing the space of Belgrade. The presentation of urban plans on the Internet page of the Agency has been one of the basic modules of using the established information system. Therefore, the easier insight in the planned urban and infrastructural contents within the scope of certain plan has been enabled to expert and broader public. Governed by an idea to present the current urban plans, the Agency is supplementing and improving the map of Belgrade continuously. By the most recent changes in the interactive map of Belgrade, the Agency has enabled users the easier searching and finding the urban plans on the basis of several parameters, such as the number of the official register, part of the name of certain plan or the name of municipality. Within the user interface, a new option, called "Plan searching" is added, where it is possible to enter certain criteria on the basis of which the search will be done and the list of plans will be acquired. By choosing a certain plan, one can acquire the data on the plan, while choosing the "zoom" option the user gets the enlarged survey of the chosen plan on the interactive map.

All plans of detailed regulation (over 80 plans), adopted and published in Belgrade Official Register after 2003, can be seen on the clear map of Belgrade. The plans are presented through different options of searching, while the insight in the contents of the plan is given in the PDF document. The complete interactive use of maps will be possible in the following period, considering that this form of giving information needs a constant improvement of the system. A detailed instruction on use is within the application.

All plans that were adopted before 2003 (i.e. before Law on planning and construction was in effect), but which have still been in effect as a whole or a part, will be available successively on the Internet page of the Agency.

The interactive map of the city of Belgrade is the map which enables all wanted structures of the city to be found. The plan contains all spatial units, streets with home numbers, important public services, etc.

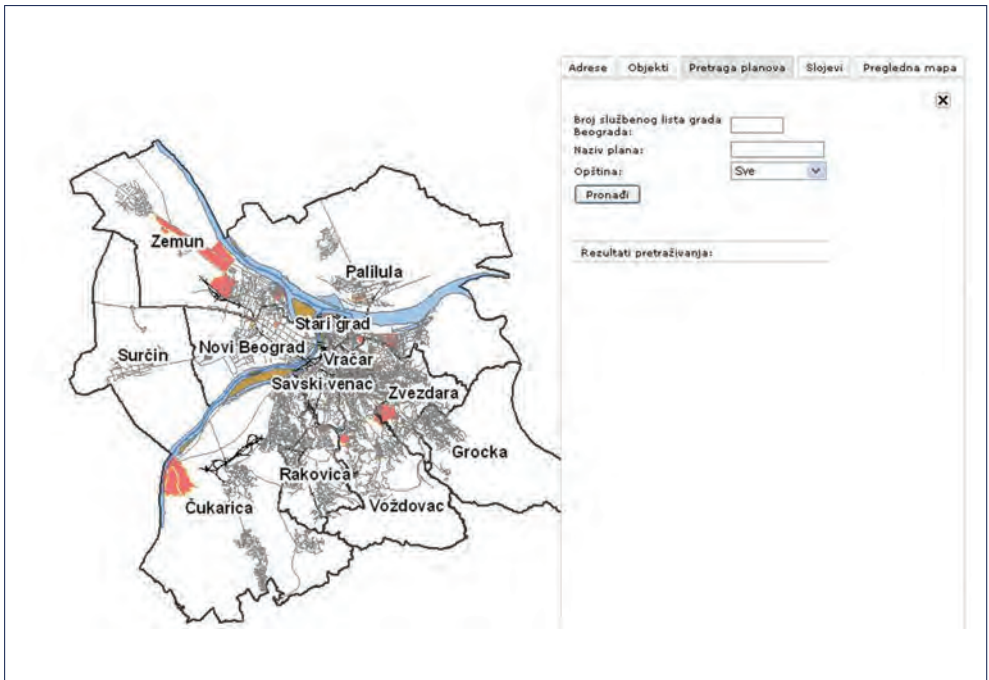
Since November 2007, when the Agency began the Internet presentation of the Interactive map with urban plans of Belgrade, some improvements have been made which, along with the changed user interface, enable the survey of the 2001, 2003 and 2007 orthophoto images, while the server platform has been modernized, which enables faster and more effective work.

Moreover, new tools for measuring distance and area are inserted in the graphical interface of the Interactive map, which makes the obtaining of necessary information easier. By choosing one of the tools ("measure distance" or "measure area") and by marking the wanted distances or areas on the map, the desired information is given in options window.

Examples of the user interface of the Interactive map with urban plans of Belgrade are presented in the Figure 86.

Figure 86: The user interface of Interactive map of Belgrade Land Development Public Agency.

a)



b)

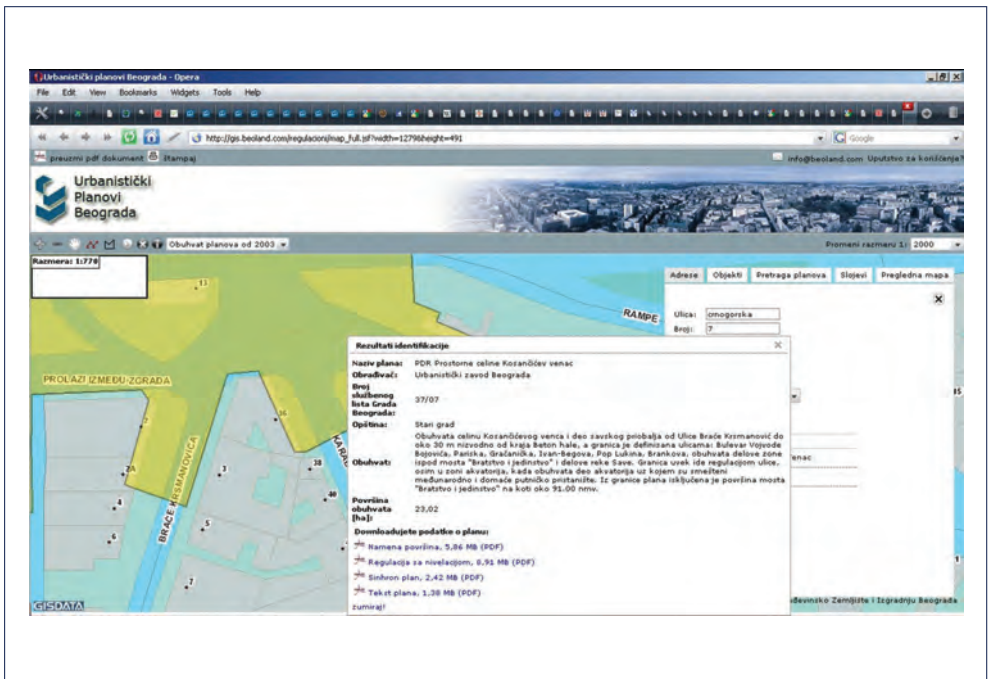
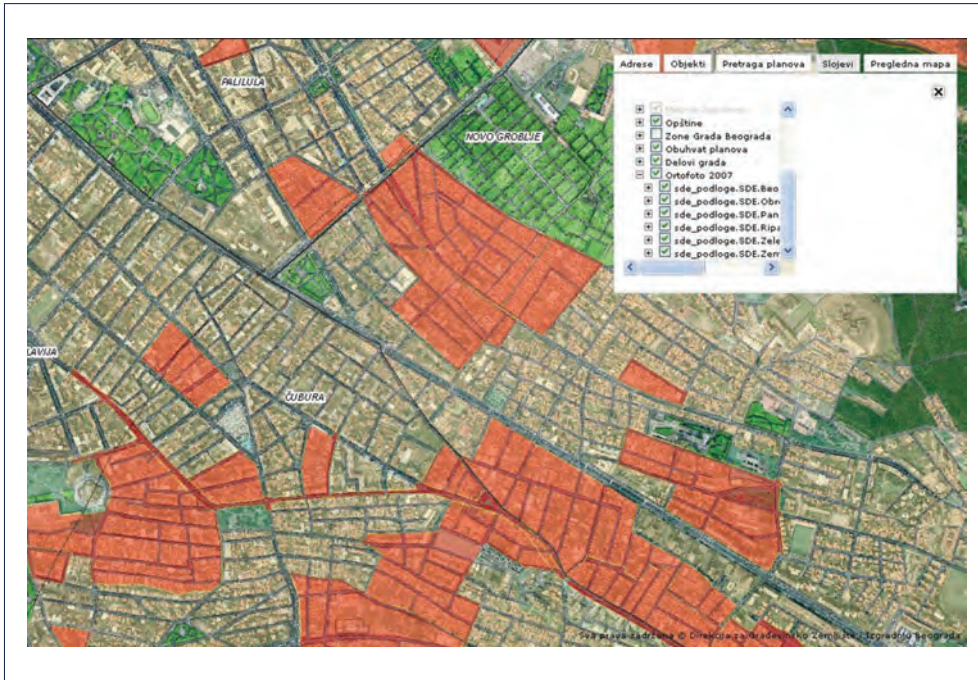
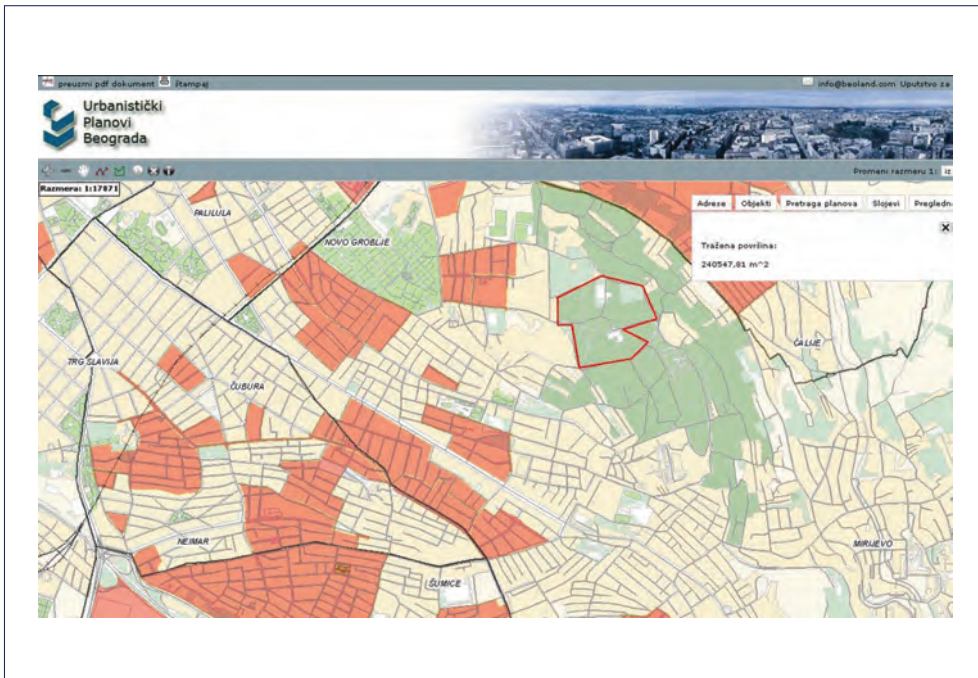


Figure 86: Continued

c)



d)



## City Authority

Within Secretariat for Urban Planning and Construction of City Authority, there is a Department of urban plans development which is divided into Sections of 10 urban municipalities. This secretariat prepares, makes, files and saves planned documents and urban plans; issues certificates on reconciliation of urban projects and urban plans; issues urban plan certificates and acts on urban conditions; provides plans for setting the provisional structures on public areas and establishes type, size and look of those structures and structures of urban design; introduces the information and communication technologies in the sphere of activity of the Secretariat and provides other activities in accordance with law, statute of the city and other regulations.

The activities of the Department for documentation and informatics are gathering, filing and permanent saving of urban plans and documents, copying and issuing the copies of urban plans and introducing the information and communication technology in the sphere of activity of the Secretariat (ICT, GIS).

Within the Secretariat for communal and housing services which is significant participant in the process of implementation of the spatial and urban plans, but also the significant actor in gathering an extremely large number of data on the spatial situation of the City, there is a Sector for Informatics and Public Relations performing the following activities: organisation and activities on introducing and using the information technology in the interest of the Secretariat and the City; formation, maintenance and use of the specific data bases and information; data change and cooperation in the field of informatics with public communal services, administrative organs and other organs with an aim of forming the unique information system; making the expert-analytical material.

Secretariat for traffic represents the significant part of the City Authority as from the aspect of functioning so from the aspect of planning the development of the city. Department of information technologies operates within this sector, providing the activities of planning and developing geographical information system (GIS); activities of implementation of GIS in modelling the traffic system; activities on gathering, data processing and forming data bases for the needs of the Secretariat; providing and giving information to the media.

Department of informatics and public relations is within the Secretariat for Protection of Environment. Among many activities of this department, the following ones stand out: processing, systematization, data storing, quality control and other measures of the protection of the environment, public informing and giving data and information, publishing "Ecological bulletin" and other skilled activities in the jurisdiction of the Secretariat.

Institute of Informatics and Statistics has been especially significant part of the City Authority in the process of development and implementation of geoinformation technologies. The Institute is carrying out the following activities: enabling the conditions for more effective way of work of the City Authority and providing rights to citizens and economic subjects, uniting with the information system of the Republic, making plan and programme of development of the Unique information system for the City and urban municipalities, introduction, development and use of information technologies for the needs of the City, establishing the methodology, organisation and standards of the Unique information system of Belgrade, making the ideological, major and contractual

projects of the interest for the City, projecting, programming, maintaining and exploitation of data bases, etc. The institute also provides a series of other activities referring to plan and programme of development of the unique information system of interest for the Republic, expert coordination and collaboration, coordination and activity on introducing, developing and using the information technology for subjects of interest for the City, making, maintaining and use of common and specific data bases for the needs of the City and urban municipality, providing a range of public services, computer and communication equipment, establishing the development of methodological solutions in statistical researches of a special interest for the City, development of the statistical information base, organisation and carrying out the statistical researches on the area of the City, statistical analyses, information processing and announcing the results of the statistical researches, etc. The Institute represents the logistic basis for the implementation of geoinformation technologies and it can be considered as the bearer of the development of geoinformatics in the City of Belgrade.

Concerning the information-technical support to the City Authority, the Institute provides activities for using and maintaining means of automatic data processing for organisational units, creating the user profiles and defining rights of data accessing, setting and maintaining computer network, keeping evidence of information equipment with service interventions and other activities.

The unique information system of the city of Belgrade (UISB) includes all city administrative organs and all organs of 17 Belgrade municipalities. The rights on using direct access are strictly defined and controlled on the level of users (city organs, municipalities, public services, etc.).

### **Institute of Urbanism Belgrade**

Institute of Urbanism Belgrade takes a significant place in the process of planned organisation of Belgrade. Even though it does not have the dominant role in the use of geoinformation technologies in the process of planning, the Institute makes a significant link in the process of improving planning, implementation and monitoring of the realization of planned documents by forming the methodological frameworks for the making of planned documents and leaning towards the institutions, mentioned as the leaders in the implementation of geoinformatics in the process of planning in Belgrade.

### **Republic Geodetic Authority**

The analysis of the institutions which are of the significance for the use of geoinformation technologies in the process of spatial planning of Belgrade has to include some institutions of the significance for the Republic. The work of the Republic Geodetic Authority has been extremely important for further development of geoinformatics in Serbia, and in Belgrade. Simultaneously, RGA has been an important partner in the process of spatial planning. By establishing the GPS referent network, the RGA enables unique and homogeneous mathematical basis for all geodetic, navigation and other activities on the whole territory of the Republic of Serbia by which the use of modern geoinformation technologies has been enabled. By a series of activities such as the processing of analogue cadastre and geodetic plans; the making of digital cadastre and geodetic plans; aerial-photogrammetry; the processing of satellite images, the making of orthophoto

plans; the making of basic state map on a scale of 1 : 5000 and 1 : 10.000; the making of topographic and thematic maps, cartographic data processing of surveys, etc., the Republic Geodetic Authority has enabled considerable amount of data, significant for the process of spatial planning of Belgrade.

### **Military Geographical Institute**

Military Geographical Institute (MGI) is the institution of the Ministry of Defence Serbia, engaged in research-developmental and productive activity in the field of geodesy, photogrammetry, cartography, geographical information systems, cartographic reproduction, metrology and other geo-disciplines. It operates within the Department of logistics of the Ministry of Defence. The significance of MGI in the process of spatial planning has been characterized by the production of different sorts of maps, plans, photo documents, astronomic-geodetic, geophysical, alphanumeric, statistical and other data, etc. Most frequently used products of MGI are: scanned and geo-referenced maps of scaled series (Gauss-Kruger coordinate system and UTM), scanned and geo-referenced maps according to elements (hydrology, relief, communications, etc.), scanned and geo-referenced aerial images, digital model of heights (dmh), digital geographic map on a scale of 1 : 1.000.000 (dgm 1000), digital topographic map on a scale of 1 : 300.000 (dtm 300). The digital topographic maps on scales of 1 : 250.000 (dtm 250) and 1 : 25.000 (dtm 25) are in the phase of making.

### **Republic Agency of Spatial Planning**

Even though the Republic Agency of Spatial planning does not have developed and continual usage of geoinformation technologies, it has taken an obligation to develop the information system on the spatial situation of Serbia with the collaboration with other relevant participants of NSDI in Serbia and in accordance with INSPIRE directive. Certain already established methodological models in the process of making the spatial plans would be in that case supported by possibilities that geoinformatics offer.

#### **23.3.2 Mutual Connections**

The challenge of mutual collaboration of mentioned services, organs and organisations, their coordination in different forms and on different levels draw a special attention as the supposition of the unique geoinformation system functioning. In that way, the following phenomena would be avoided:

- the reuses of the existing and to a certain degree stored data;
- the phenomena of ignorance of the existing data fund;
- multiplication of gathered information;
- storage of identical information on different places;
- the phenomenon of different information on the same entities;
- non adjustment of form and scope of information to users' needs;
- complication and inaccessibility of analytic information and
- making (bad) decisions on basis of low quality information.

## 23.4. Conclusion

The previous analyses have pointed that geoinformatics is taking the significant place in the system of the spatial planning of Belgrade. Considering hardware and software components, it can be concluded that they do not represent the obstacle in further development and implementation of geoinformatics. The ways of data gathering, the organisation on the Republic and local level, as well as the quantity and quality of available data have made the qualitative basis for further development of geoinformatics and enabled its usage in the way that could in most recent times give adequate results. The circle of actual users is large enough, especially if the significance of users has been taken into consideration in the process of the spatial planning of Belgrade. The circle of potential users has clearly been recognized and it is necessary to make an adequate model of networking the functions of all relevant participants in the process as on the level of the City of Belgrade so on the level of the Republic. The necessary changes in the organisational structures of institutions, which are the key ones in the process of spatial management, have already begun, but the insufficient use of the staff-organizational structures can still be seen. Insufficient knowledge on the possibilities of usage of geoinformatics in the process of spatial planning, insufficient knowledge of GIS applications as well as the ways of making the planned documents, their implementation and monitoring on, today old, ways, represent the greatest obstacle in reaching the desired level in the use of geoinformatics. The change of the way of behaviour, i.e. the changes of the procedures of work of the participants in that process can be considered as the key moment for further development of spatial planning, supported by geoinformatics.

If suggested changes are implemented completely in the way of decision - making, geoinformatics can become the means with the help of which we can influence the decision-making and aiming at certain events. Moreover, they will enable an adequate check of planned solutions, effective implementation of spatial and urban plans as well as permanent monitoring of spatial changes and their (un)accordance with plans. Otherwise, they will make a series of incoherent components of certain system, acting uncoordinated. Hardware and software will become old, there will be a decline in quality of data due to tardiness, the potential users will not have sufficient knowledge and skills, and all will be surrounded by money spent irrationally.