

Geomatics, Support for an Efficient Urban Planning

Anca-Maria Moscovici¹, Carmen Grecea¹

¹ Politehnica University Timisoara, Department of Overland Communication Ways, Foundations and Cadastral Survey, Traian Lalescu no.2, Timisoara, Romania

moscovicianca@gmail.com

Abstract. Geomatics represents a natural consequence of the accelerated development of information technology; it's a combination of the basic concepts of *Geodesy* and *Geoinformation* and encompasses a wide range of the fields, including tools and techniques used in surveying, mapping, remote sensing, Geographic information systems (GIS), global navigation systems by satellite (GPS), geography, planning and decision making in almost all areas: infrastructure, environment, demography, urbanism, health, sociology, economics, tourism, administration, transportation and many others. As a consequence of the population growth and industrialization, society has become more complex for government and other institutions, with the result that more complex and complicated tasks have to be performed. In order to solve these tasks properly, more and more information is required. Having passed through the stages of agricultural and industrial societies, we now live in an information society. Town planning cadastre defines itself as a particular cadastre, a part of the general one, which involves inventory and systematic evidence of the buildings, fields, networks and utilities inside towns. All these problems regard both technical and economic aspects. In order to automate cadastral activity, the first important procedure is to collect all physical information from a certain territory, which will supply later on the database for town cadastre. Geodetic activity for engineering projects is able to provide accurate solutions for positioning, setting out, control, mapping in order to cover basic needs of land administrative information and decision making for the local authorities. The paper points out the purpose and the importance of town planning cadastre for providing the exact data on the situation of the urban fond in order to identify its needs; it presents the case of Timisoara city located in the western side of Romania that has been chosen as the European Capital of Culture for 2021. As a national strategy, a key component in the policies of growth poles is promoting urban development as part of a long-term project with sustainable impact on economic, cultural and social development.

1. Introduction

Geomatics appeared like the need for modern and quality accomplishments in the field of research and knowledge of the land surface, defined as a new science, with objectives and domains of applicability well-defined.

Geomatics encompasses a wide range of fields, including tools and techniques used in surveying, mapping, remote sensing, Geographic Information Systems (GIS), global navigation systems by satellite (GPS), photogrammetric, geography and other forms related to the mapping of the Earth.



Geographic Information Systems (GIS) are among the most popular and powerful geomatics tools for decision-making in the world. The main characteristic of GIS is the use of information management tools in order to create smart maps.

Today, Geographical Informational Systems are used routinely for everything one can imagine, from the terrestrial surface mapping to natural and anthropic resource management, from simulation and forecasting of events and phenomena to planning and decision making in almost all areas: infrastructure, environment, demography, cadastre, urbanism, health, sociology, economics, tourism, administration, transportation, and many others, figure 1.

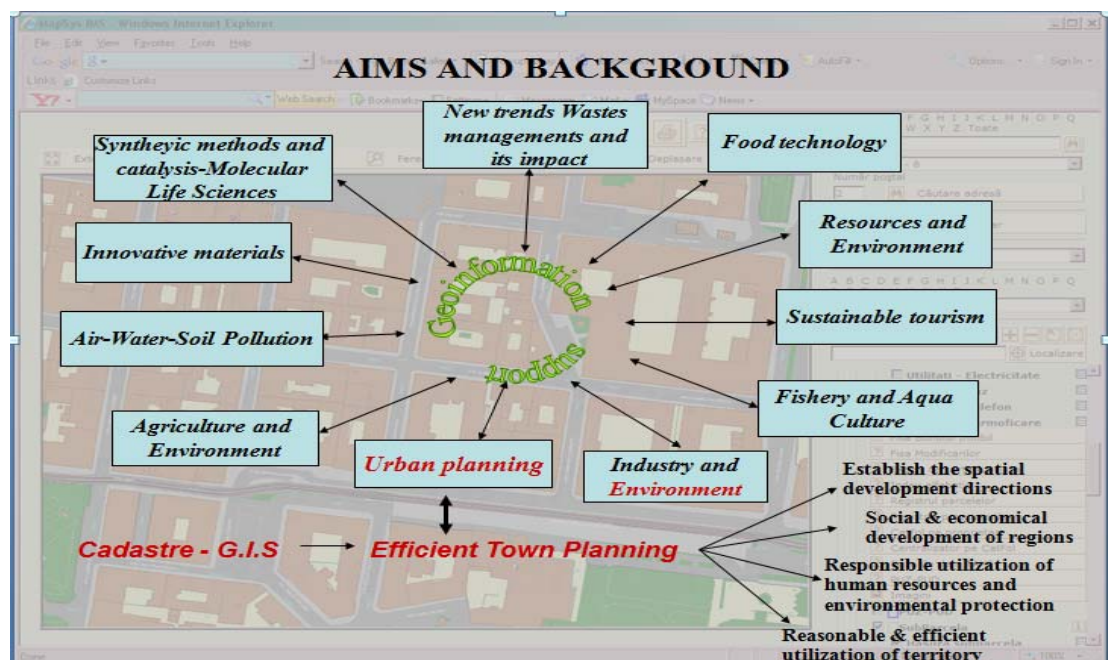


Figure 1 Geoinformation support - aims and background [1]

The Urban Planning Cadastre is a key element of a unified regulatory system which also includes adoption of special urban planning legislation on regional levels of management and development of modern zoning methodology and ordinances. An important role of the Cadastre is to build a legal and technological foundation for an enforcement system of land use regulations for all owners. [2]

The actuality of the paper is given by the fact that preserving land values represents an important issue that must be taken into account when urban planning projects are required for developing the model of urban growth. [3]

2. Study area

The Timisoara growing pole has always been manifested as a workforce attractor for other regions of the country, especially for northern Moldavia, north western Transylvania and Oltenia. At this time, the Timis county consists of: 35000 Hungarians, 15000 Bulgarians, a few thousands of Italians (which form a stable community in Timisoara), 500 - 600 Jews, almost 1000 Arabs (Syrians, Palestinians, Iraqis, Lebanese, Egyptians, Moroccans and Tunisians), hundreds of Chinese, over 6000 Ukrainians, over 11000 Serbians, a few thousands of Slovaks and a few hundreds of Turks and Russians. [4]

The Master Plan of Timisoara is part of a larger process implying the use of Geographic Information Systems in order to develop an urban quarter. In this sense, the Master Plan is much more than a document for spatial development orientation; it is, above all, *a strategic vision of the city* based on directive principles that make a coherent combination of respect for natural balances,

economic efficiency, market forces and social equity. This strategy will be now in accordance with the winning the cultural capital project for the year 2021.

The notion of GIS emerged in the early 90s, Timisoara City Hall is the first institution in Romania that which started work late 90s to achieve a GIS for urban purposes, currently this is one of the most advanced cities in this area with a system updated and managed daily, figure 2.



Figure 2 Urban GIS—districts of the city

A Geographic Information System (GIS) can be an important technological tool for making intelligent decisions regarding the sustainability of urban development in general and for our study, in Timisoara. The main reason for this project was to ensure the harmonious development of city with control over its expansion, [5].



Figure 3 Timisoara central zone- extract from Urban GIS

Timisoara represents an example in the process of automation of land registration for urban cadastre; Geomatics is regarded as a useful support for developing efficient urban planning, thus being able to provide accurate and efficient solutions for local authorities, in order to meet the needs of administrative information and decision making.

3. Results and discussions

The paper points out the purpose and the importance of town planning cadastre for providing the real-time data on the situation of the urban fond in order to identify its needs and presents the case of Timisoara city located in the western side of Romania that has been chosen as the European Capital of Culture 2021.

The need for local authorities is to build in the future a GIS for cultural heritage based on modern cadastre requirements. The historical sites should be promoted at a high level, especially because Timisoara has won the title of European Capital of Culture for 2021. An effective way of promotion would be to create a Geoportal that would allow us to view all the historical sites of the city on an interactive map. This can be done with the help of cadastral measurements as basis, as can be seen in figure 4.

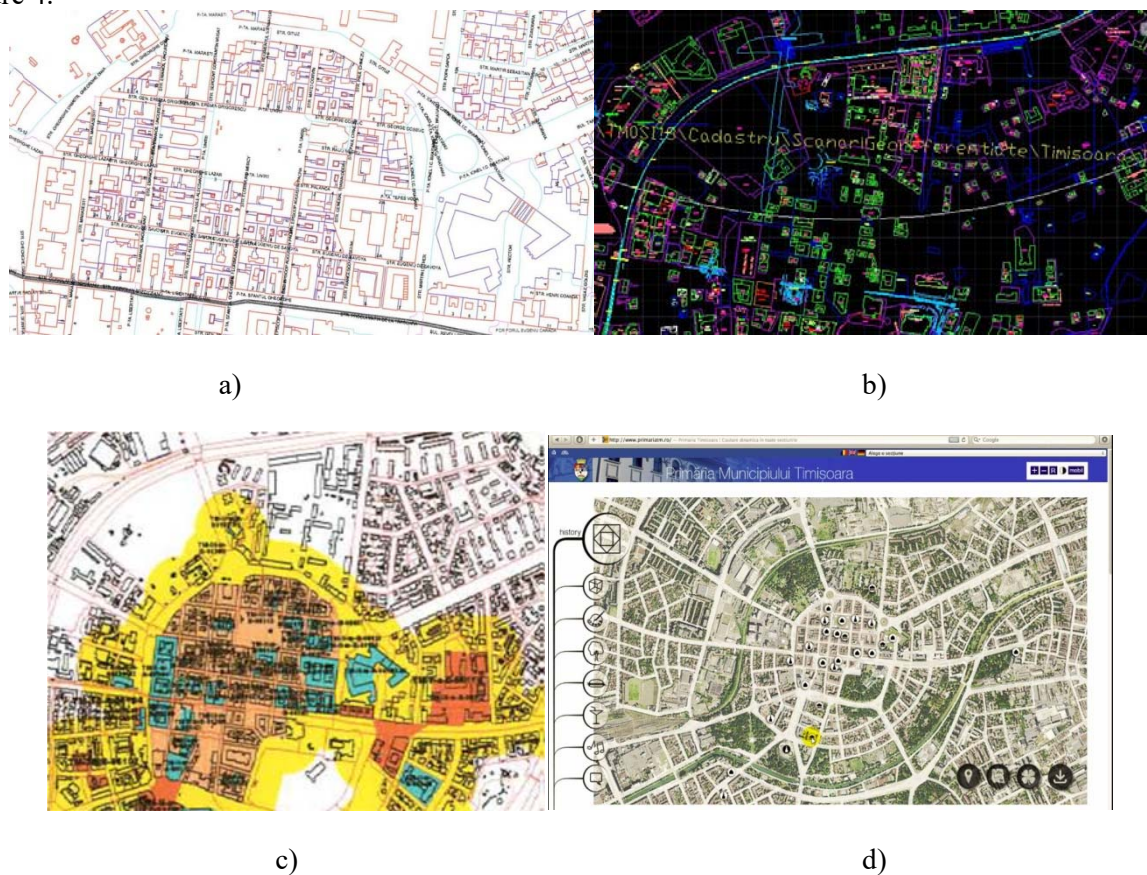


Figure 4. a) Central zone-Urban GIS streets and buildings, b) central zone-cadastre 2017, c) historical area, d) possible virtual tour-geoportal extract [7]

Usually, people use the map to identify different areas of interest within their city, but it is important that they can also contribute to complete or update the map directly by themselves, submitting photos or information about the sites from the map, or by adding new sites that are not currently included.

We think that is also very relevant and efficient for touristic purposes to use different colours in order to indicate some main functions and attributes associated to the historical objective.

Another section marked on this map is the 'Venues' one; spaces hosting cultural activity relevant to the tourists, cafes & restaurants, pubs & bars, shopping, and public spaces in promotional and cultural policy – all of these are of great importance for sustainable city tourism and must be also visible on the map.

It is important to introduce the 3D visualization which has a variety of applications in urban studies. Accurate cartographic feature extraction, map updating, digital city models and 3D city models in urban areas which are essential for many applications, simulations and keeping cadastral databases up to date as virtual reality.

In these cases, building models, urban features, terrain surface and vegetation are the primary data of interest collected with surveying procedures. This data, when combined with satellite and aerial imagery can be used to create highly detailed Digital Surface Models (DSMs) and eventually Digital City Models.

3D models are designed as a user-friendly interface for querying the urban environment as a Geographical Information System (GIS) for Web-based information, for visualizing model results and for accessing functional simulation models.

4. Conclusions

This concept implies the elaboration of an information system integrated at the level of all Town Halls - as components of the Metropolitan area important for local authorities, for citizens and tourists.

An advanced GIS consists in an efficient support for urban planning as it offers the possibility to maintain community services at a high level and stimulate change and development despite the difficulties by means of its capacity to integrate the dynamic quality of the information, thus reflecting the internal city life of everyday. (SGEM 2012)

Starting from the idea of including GIS, cadastral and urban planning in Geomatics domain, we intend to create the links between the technical support, local authorities, local community and different other beneficiaries.

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