USING GIS TECHNOLOGY IN URBAN AREAS IN THE CONTEXT OF DURABLE DEVELOPMENT

Mihaela STURZA, Viorica DAVID

University "Politehnica" of Timişoara, Faculty of Civil Engineering,
Speciality Land Measurements and Cadastre,
No. 2A Traian Lalescu, Timişoara, Romania
Corresponding author: msturza2001@yahoo.com

Abstract: *The purpose of this paper is to highlight the importance of using GIS technologies in most urban activities. The need for information is so great that urban areas can be considered at the same time not only as big consumers but also as big producers of territorial information. At the present stage, obtaining information about a territorial unit considered above, on and below the land surface has become a major requirement for organizations of planning and forecasting in all economy sectors. Data collecting and processing as well as storage of information are made in the so-called territorial information systems, each of them covering part of the territorial information. These systems are essentially similar to urban activities related to territory. Geographic Information Systems (GIS) is a technique increasingly used in the contemporary world, both in theoretical research and in many practical activities. Currently, the main GIS applications are used in local administrations, in utilities concerning water, gas or electricity and in postal and telecommunication services. Many GIS technologies have played an important role in the private sector in areas such as marketing, retail industry, transport, real estate, property development. The large volume of information contained in the plans and documentation existing at local administration offices, the damage caused by time and the difficult handling, the problems of interpretation and analysis, determine public institutions to allocate substantial financial resources for executing the applications in an Urban Geographic Information System. The performance limits of an Urban Information System are only of human and financial nature. Achieving such a system would reduce the time of analysis and would allow multiple users access a larger volume of information. The originality of the work is the authors' vision on the realization and implementation of a project of this scale. Approaching an issue which refers to the use of GIS technology in urban areas is important both for the variety of information, based on different types of data and the fact that it offers advanced instruments for various analyses.*

Key words**:** *Urban Geographic Information System, urban areas, information*

INTRODUCTION

In city administration there are several institutions that use the same type of data, in addition to those specific to their own activity. For example, data regarding real assets and owners, are necessary to cadastral operators, local taxes directions, urban services, public utilities, etc. Data on traffic arteries are required by companies of transporting passengers and cargo, postal services, fire departments, traffic police etc.

This situation calls for the development of embedded systems through collaboration of all users, first to avoid redundant data and secondly to use the same geographical reference, namely the same main *digital map* which can be filled by each user with specific data in their field of activity.

The applications of an ***Urban Geographic Information System*** have two main purposes:

- ✓ managing and monitoring of localities territory;

- ✓ urban development planning.

To achieve both goals, a database operated using different functions will be designed and executed.

For example, to achieve the objectives aimed at managing and monitoring localities one will mainly use functions of database interrogation dominated by attributes such as *owner*, *parcel*, *buildings*, *postal address*, etc. In this case permanent update of database is very important.

Moreover, in applications destined for planning, analysis and modelling functions prevail (optimal road, time for intervention, affected area, etc.).

MATERIAL AND METHODS

Territorial information is required for most urban areas. The need for information is so pressing; that cities can be considered at the same time not only large territorial information consumers, but also major producers.

At present, when all activities related to land and buildings are increasing, obtaining information on a territorial unit considered above, on and below the land surface, has become a major requirement for organizations of planning and forecasting in all sectors of national economy.

This requirement of diverse information can only be satisfied by a complex, multifunctional cadastre, based on geographic information systems technology.

Collection and processing data, as well as storage of information, is made in so-called territorial information systems, each covering part of the territorial information. These systems are essentially similar to urban activities related to territory.

To establish an Urban Geographic Information System, it is necessary that an inventory should be done that would clarify the following issues:

- what kind of information is required by different institutions or departments;
- how the data collected are obtained, stored and processed in the present;
- how information is delivered and how it is held today;
- what information systems already exist in various institutions or departments and their content, in order to eliminate duplications, gaps and deficiencies;
- how the information is stored;
- opportunities to exchange and couple systems;

On this basis will be established:

- a data acquisition strategy;
- laying the foundations for a central system to automatically provide common cadastral information, remaining that institutions and departments to submit changes for keeping information up to date;

The proposed central system will have to contain information common to several users, and they will add to basic data any other information necessary to each of them. Therefore there will be benefits of financial, organizational and commercial nature, because the system avoids double data acquisition, lack of data, lack of interaction between data and not-central automation.

RESULTS AND DISCUSSIONS

A geographic information system for an urban area should contain a wide range of information both topographic and from the social area.

Due to modern means of calculation and data storage, developing cartographic documents is no longer an issue, but that of databases performance for rendering theme graphic

documents and texts with solutions to problems that the user must solve.

This way, one can create many queries on different topics, to generate reports and statistics that may be useful in the user's work, such as:

✓ Creating theme layers

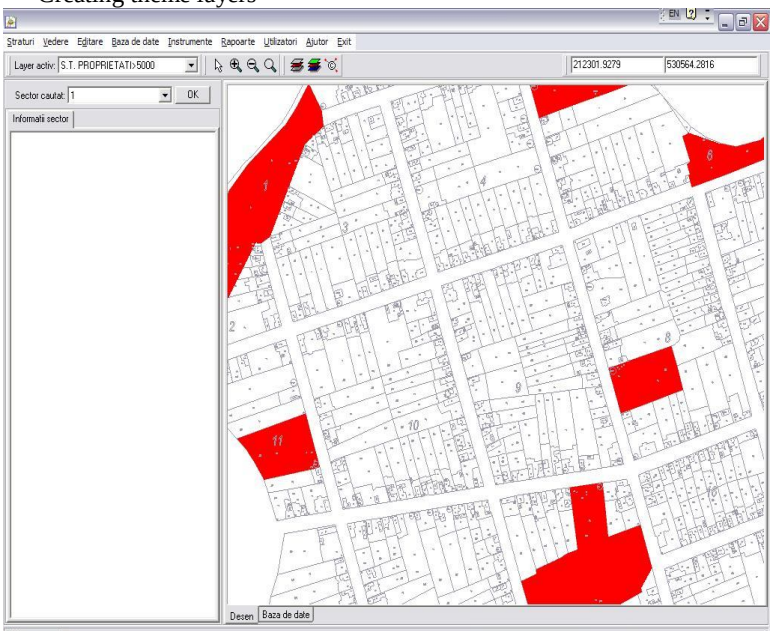

Figure 1: Theme layers

✓ Search by address

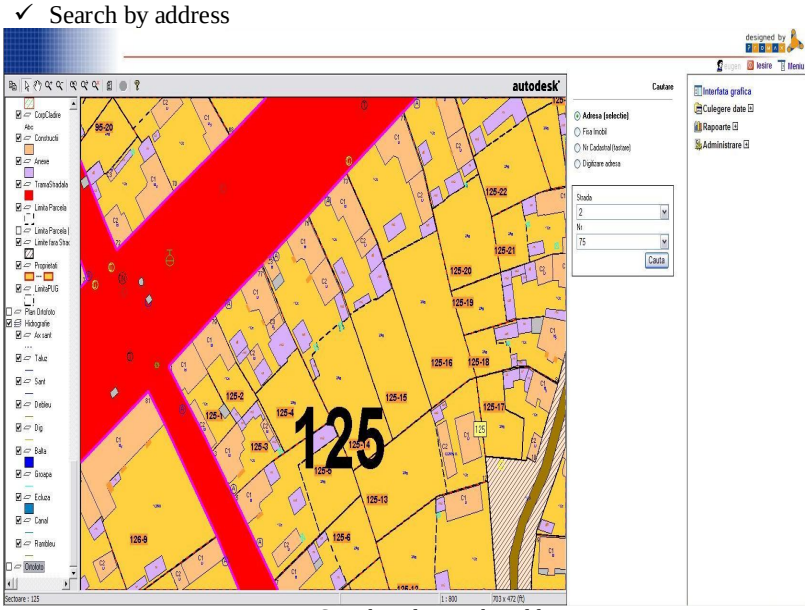

Figure 2: Search real estate by address

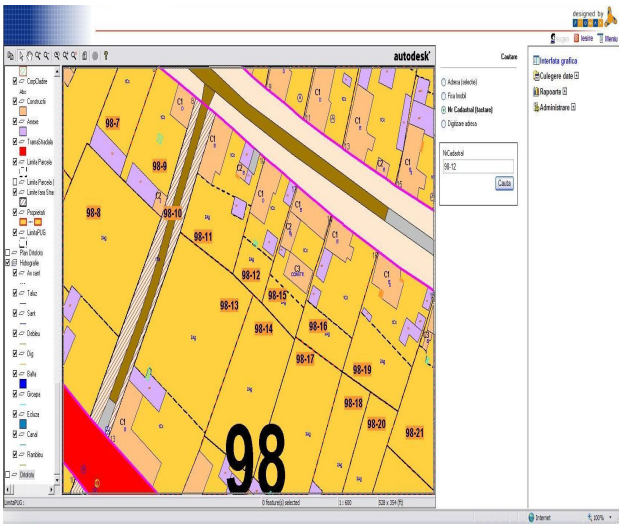

Figure 3: Search real estate by cadastral number

Depending on the user's option, the requirements of various services within an institution, in particular the town halls, who need this information to solve problems like: contributions and taxes, urban planning, urban networks, cadastre, various queries can be created as follows:

- Automatic view of buildings that are part of the public or private state heritage.

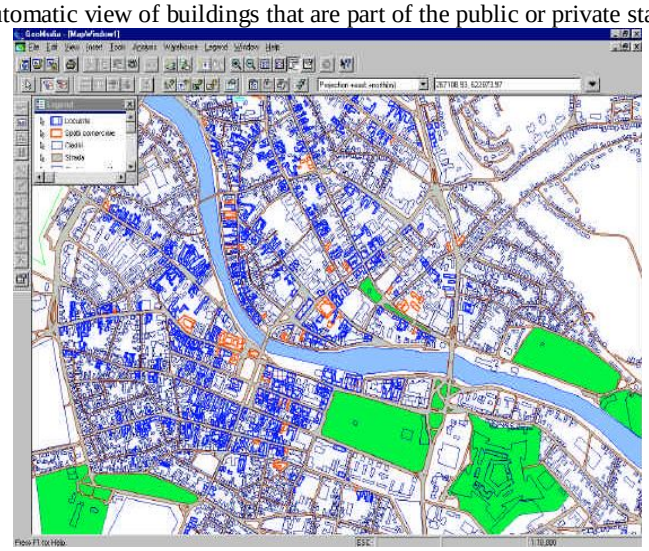

Figure 4: Buildings that are part of the public or private state heritage

- Automatic view of architectural monuments that are in the institution's administration.

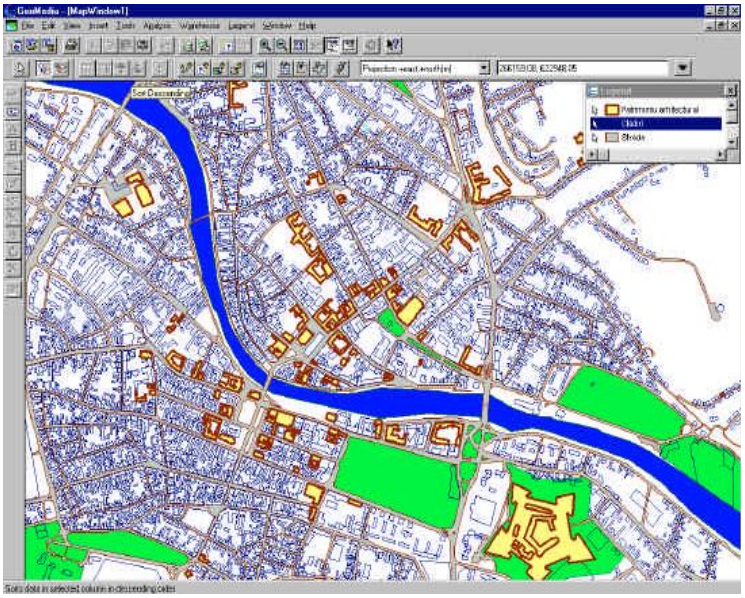

Figure 5: Historical and architectural monuments

- Tax zoning of a locality.

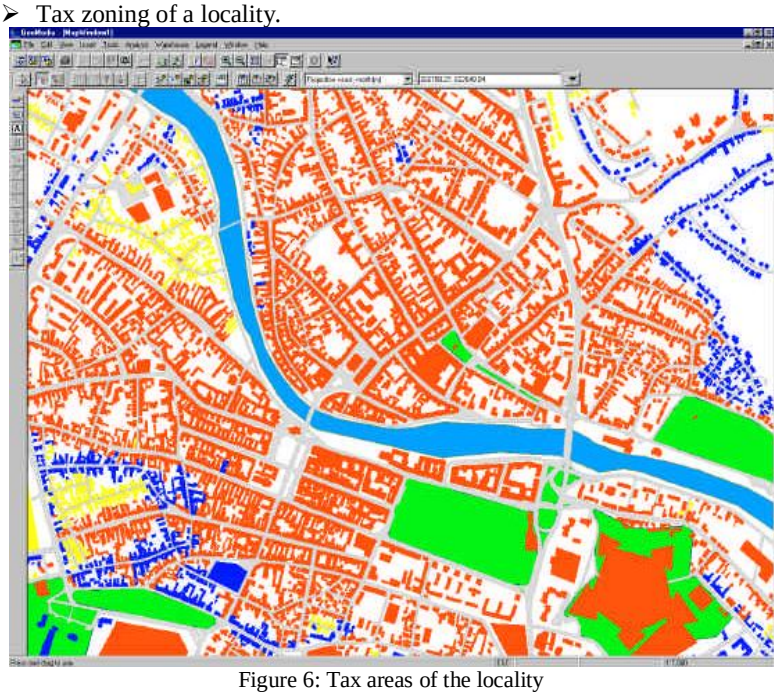

Figure 6: Tax areas of the locality

- To issue the operation authorisations, areas of functionalities can be generated.

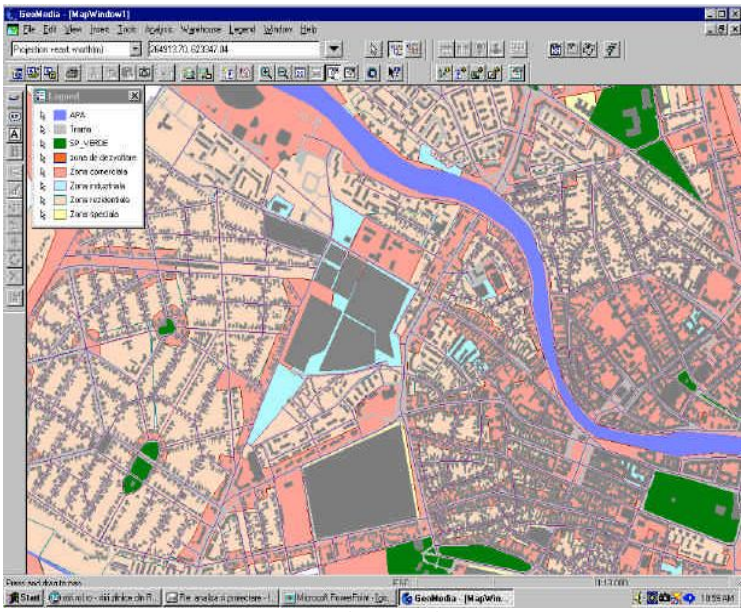

Figure 7: Types of locality functionalities

- Automatic view of city networks.

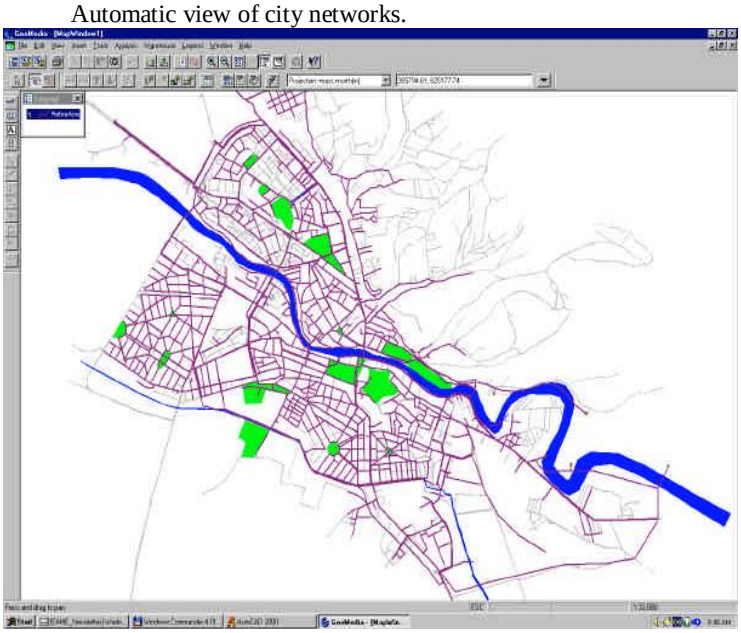

Figure 8: Drinkable water

- Projects for which building permits were issued or are pending approval.

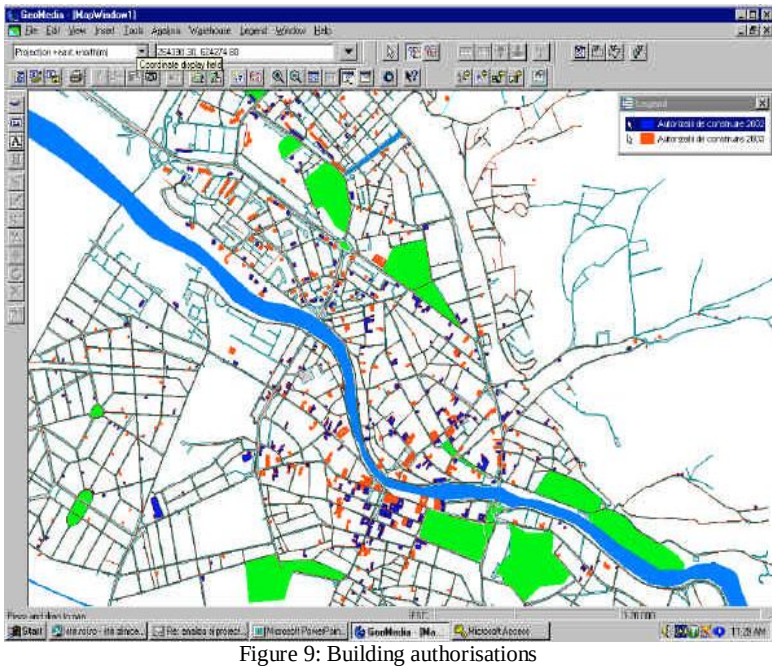

Figure 9: Building authorisations

- Various queries important for road administration.

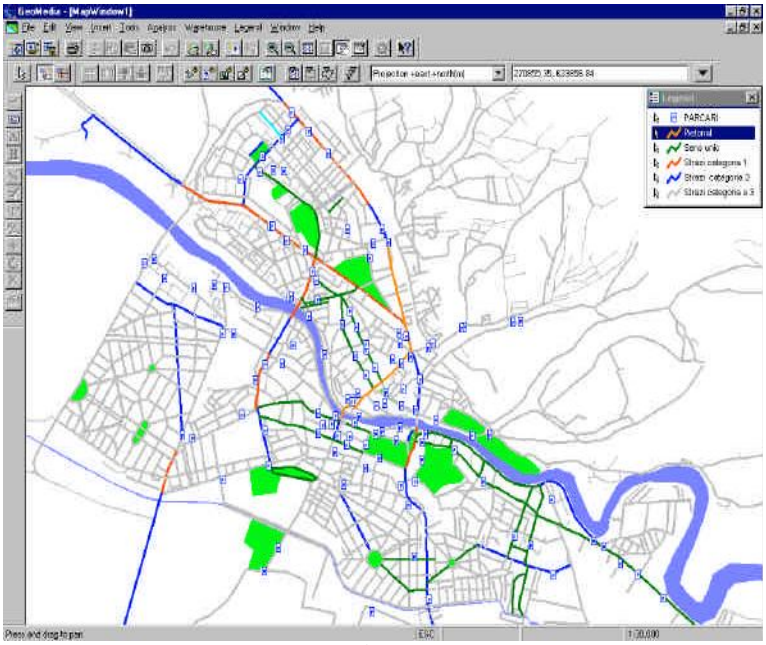

Figure 10: Representation of streets according to importance

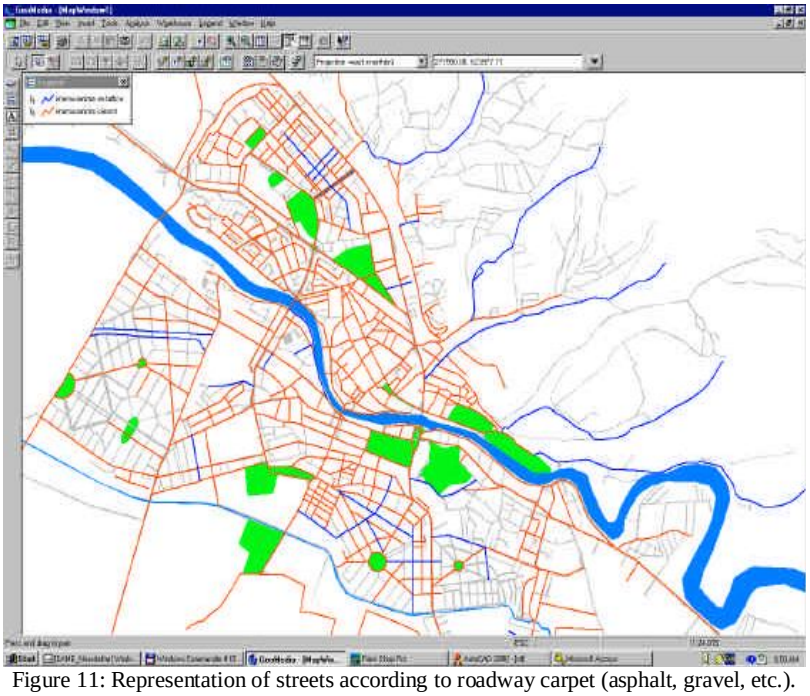

Figure 11: Representation of streets according to roadway carpet (asphalt, gravel, etc.).

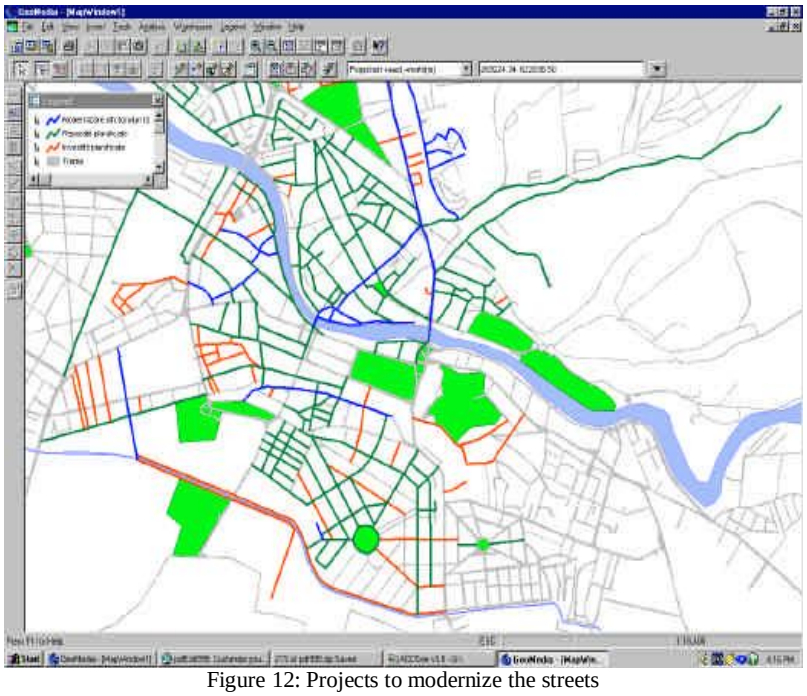

Figure 12: Projects to modernize the streets

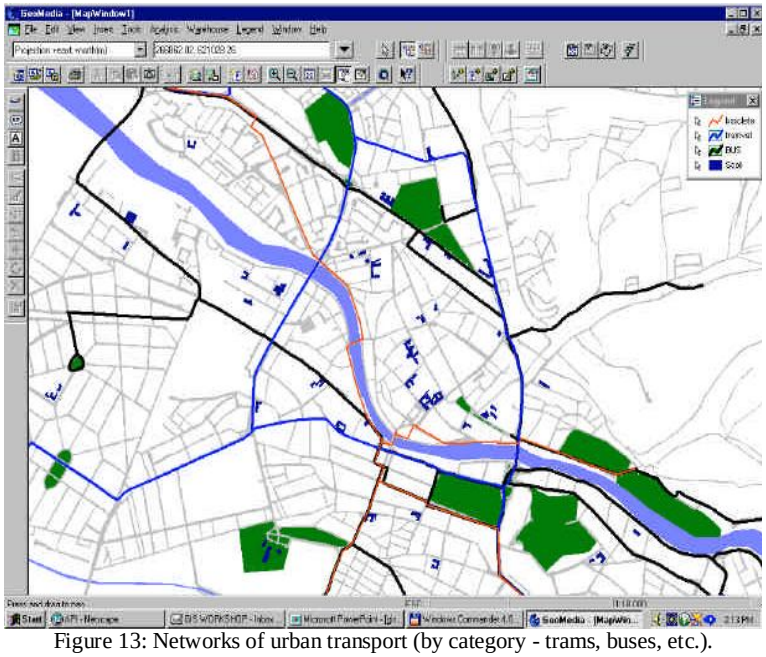

Figure 13: Networks of urban transport (by category - trams, buses, etc.).

✓ Queries used in environmental protection (to be noticed pollution sources and the most polluted areas)

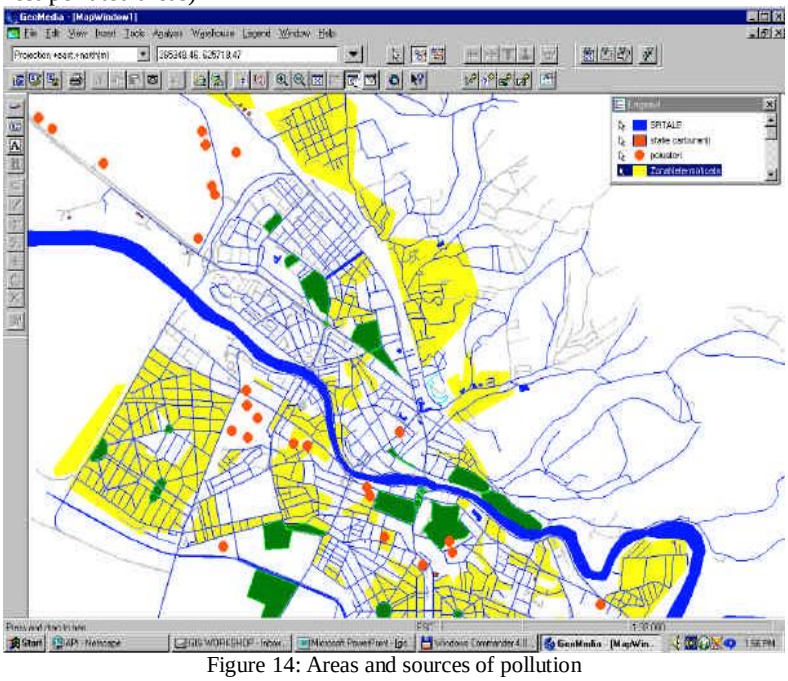

Figure 14: Areas and sources of pollution

CONCLUSIONS

In Romania there are several public or private institutions that have completed or are under development of geographical information systems.

Currently, the main GIS applications are used in local administrations, in utilities concerning water, gas or electricity and in postal and telecommunication services. Many GIS technologies have played an important role in the private sector in areas such as marketing, retail industry, transportation, real estate, property development.

There are a number of advantages and disadvantages of using such systems.

Advantages of using an Urban Geographic Information System:

- Better organisation of data;
- Elimination of redundant data storage;
- Facility of updates;
- Easier analyses, statistics and new searches;
- More productive users.

Risks in using geographic information system:

- Complexity;
- High costs;
- Changes in land;
- Difficulty in staff training.

The large volume of information contained in the plans and documentation existing at local administration offices, the damage caused by time and the difficult handling, the problems of

interpretation and analysis, determine public institutions to allocate substantial financial resources for executing the application in an Urban Geographic Information System. The performance limits of an Urban Information System are only of human and financial nature.

Achieving such a system would reduce the time of analysis and would allow multiple users access to larger volumes of information.

BIBLIOGRAPHY

1. STURZA M., Complemente de Măsurători terestre – Sisteme Informatice Geografice , Vol 2, Editura Politehnica, Timisoara, 2009
2. DIMITRIU G., Sisteme Informatice Geografice, Editura Albastră, Cluj-Napoca, 2001
3. http://arhitectsef.oradea.ro/gis_prez.html
4. http://www.primariatm.ro/monitorul/index