THE MANAGEMENT OF WATER SUPPLY SYSTEM USING GIS APLICATION

Iustina LATEŞ, PhD student Eng., „Gheorghe Asachi"Technical University of Iasi, Faculty of Hydrotechnical Engineering, Geodesy and Environmental Engineering, e-mail lates.iustina90@gmail.com,
Mihail LUCA, Professor Dr. Eng., Gheorghe Asachi"Technical University of Iasi, Faculty of Hydrotechnical Engineering, Geodesy and Environmental Engineering, e-mail mluca2004@yahoo.com,

Abstract: *The issue of the management for water supply systems is increasingly important considering the continuous evolution of settlements. Water supply networks must be in line with requirements of consumer. The quality of services must be monitored using GIS applications. This applications must be effective, rapid and updated. Programs like Autocad and ArcMap follow to realize thematic maps of specific areas. By using these programs GIS applications are effective if you are working on layers of custom work on areas of structure and operation. Layers requires the attachment of databank with different characteristics parameters. Management of water supply networks is effective by integrating of all information relating to it in GIS applications. They are able to accomplish thematic maps, reports and mathematical models in a short time.*

Keywords: *water supply network, databank, GIS model, parameters, layers;*

1. Introduction

The management within the different areas of activity is represented by the ensemble of management activities, organization and lead of different organizations. Management of water supply networks is important in urban or rural settlements development framework by the fact that water is one of the main factors influencing this.

The water supply networks must follow with various parameters concerning the quality and quantity of water provided to consumers. Consumers should benefit from certain characteristic flow, pressure, water quality prescribed by the normative in force.

Management of water supply networks is monitored by specialized programs, Autocad, ArcMap and with the help of this shall be made reports through GIS models.

GIS models store, transform, analyze and visualize spatial data of the real world (Burrough, 1986). So if water supply networks, stored data (flow rates, pressures, materials, placement year, etc.) they are transformed through programs in GIS thematic maps and graphs which are then analyzed by experts in the field.

Distribution systems of the network water supply faced more and more often with issues related to water management, rehabilitation and repairs, because the information attached to them are minimal, most of them have their overdue operation . The lack of this information makes it necessary to implement a system of close monitoring for the water supply networks.

2. Research methods

Research is carried out in several stages conducted out in the field and office. Research is continuing and is enriched through data downloads from different areas of activity. The main areas in which needed data is collect to develop a GIS system for monitoring water networks are represented by real estate cadastre, hydro-urbansitic cadastre, water supply, geotechnical, climate, seismicity, execution technologies etc.

Cadastre provides data on the location of the water supply network through topographical plans, cadastral plans and ortophotoplans.

The urban cadastre is regulated Law cadastre and real estate advertising no. 7/1996, as well as the normative of Methodology for execution of introducing urban cadastre in municipalities in 1997. But hydro-urbansitic casatre is at an incipient stage. There isn't a unique platform where hydro-urbanistic elements to be recorded or do not know their routes and execution materials. Each branch of utility networks (water network, sewerage network, telephone network, gas network) involves a number of design problems of interpretation and lack of information.

A first step in the research is the topographic measurements for lifting the details needed for analysis through implementation of plans suggested by the situation. They provide route, location of the water supply network, elevation, land property boundaries of the buildings etc. Raising topographic details supposed to transfer data stored in computer memory to achieve the automated graphical representation of land measured and processed using Autocad LT and Topo**.**

As a case study it chose a place with a lower extension to model primary analysis. Avantu town is in the Romanian village in the county of Iaşi. For the delimitation of the study area was done on cadastral plans georeferencing, by adapting them to the corresponding orthophotomap by Avantu village, combining plotting the contours and the digitization of cadastral measurements. The data are important in any GIS application and any resulting product depends on the existence, accuracy and their homogeneity (A. Badea, Badea Gh., 2013).

The water supply is simulated by a model hydraulic-mathematical equations which is based on water transport and distribution of pressure nodes in the pipeline. The basic data (flow rates, pressures, volumes of water, etc.) are correlated with the provisions imposed by standards that describe the design, manufacture and operation of water supply. For the development model was necessary to determine the operational parameters and constructive system's water supply serving the Avantu village (water demand, flow sizing and verification flows fire, volumes characteristic tanks, pressure service. Based on these data basic components were sized water supply system (transmission, tanks, wastewater treatment, pumping stations, distribution network, etc.).

3. Results – Case study

The case study was conducted in the Avantu village, Romanesti. The Romanesti locality is placed in the center of Iasi County. The water supply system is realized from the headrace pipe Timişeşti – Iaşi.

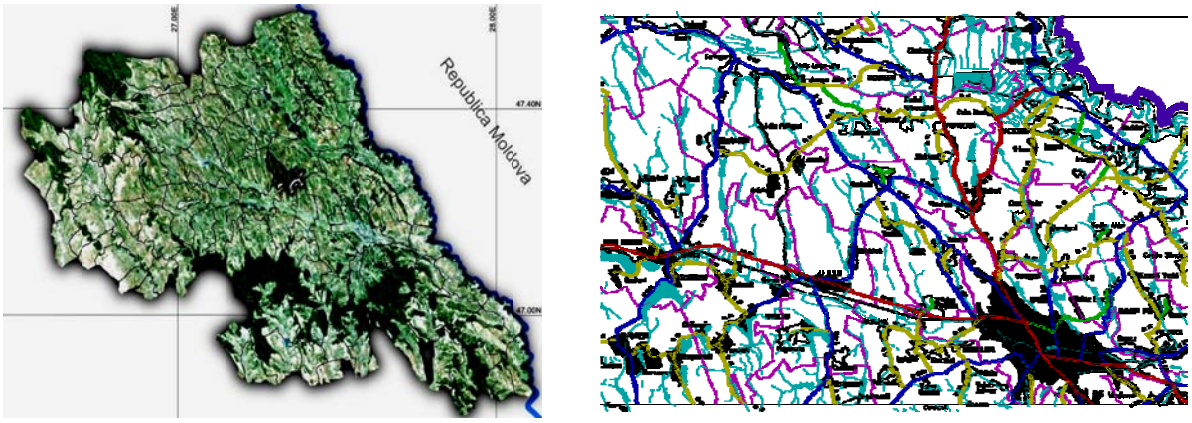


Fig.1. The location of Românești in Iași county

Implementing a GIS system for water supply network of an settlements involves working on several layers

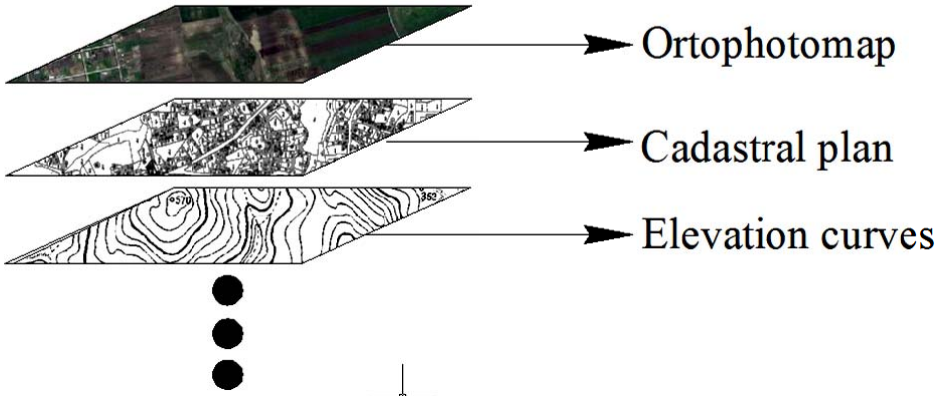


Fig.2 Presentation of work layers

The working layers are in turn attached to various substrates and there is a attached information needed for the management of urban cadastre that ensures authenticity, timeliness and objectivity in substantiating assessments, formulation and implementation of urban control decisions (A. Badea, Badea Gh., 2013).

In view of data attached to street network for Avantu village it can see that the main road is covered with asphalt DCL 495 and secondary roads are gravel. Avantu village is a village with a compact linear road network which facilitates traffic in the area.

Data collected both on land and on land plans, orthophotos, feasibility study are structured in tables and attached in specialized programs to be used to achieve queries and thematic maps

Tab.1-Data structure attached to pipes

No	Length	Material	Diameter	Installation year	Pipe cod	Pressure
1	27.667	PEHD	110	2008	CD 1-1	6
2	152.083	PEHD	110	2008	CD 1-2	6
3	92.447	PEHD	40	2008	CD 1-4	6
4	161.119	PEHD	50	2008	CD 1-5	6

Tab.2-Data structure attached to hydro construction

No	Area	Construction ID	Installation year	Construction type
1	1.436079	CV 2	2014	Cămin vane
2	1.436079	CV 5	2014	Cămin vane
2	1.436079	CV 4	2014	Cămin vane
3	1.436079	CV 7G	2014	Cămin vane de golire
4	1.436079	CV	2014	Cămin vane

The water supply system of Avantu village is located on the verge of roads,

Fig.3 The route of water supply network of Avântu village

In the water supply network are several types of pipe distribution, the predominate pipes are the distribution pipelines followed by the main pipelines, in this system there works undercrossing and the whole village is fed by headrace SPB Henci - Ursoaia.

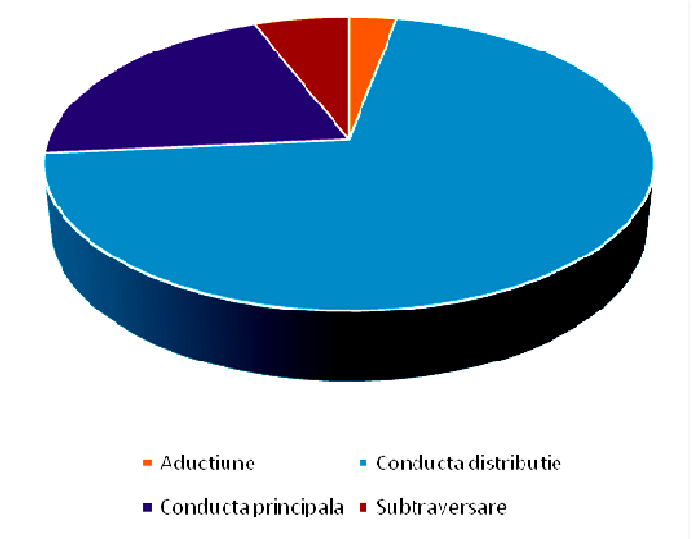
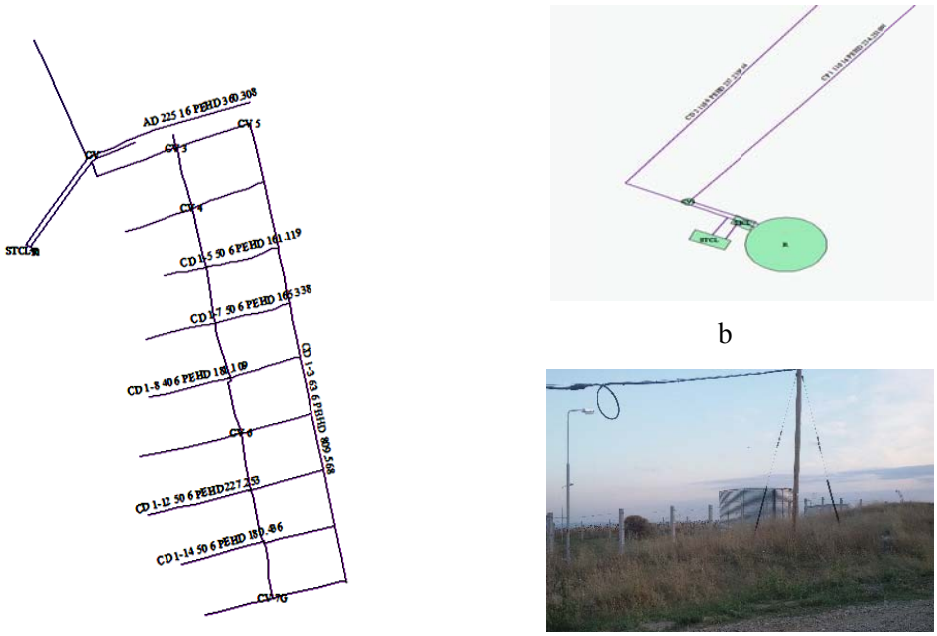


Fig.4. The chart query for the composition of water supply network of Avântu village

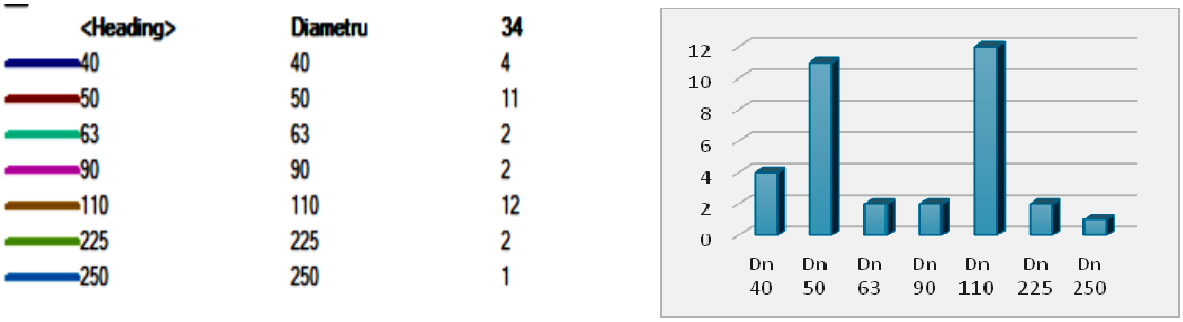
The water supply network of Avantu village is divided into several layers depending on the interest and necessity. One of the layers is composed of hydraulic pipes carrying water and associated hydraulic structures. The main parameters that define the characteristics of the water supply network of Avantu village are the diameters of the pipes, their materials, pipe length, pressure pipes, pipe type.



a b c

Fig.5. The map of hydraulic installation: a – The scheme of hydraulic installation in ArcMap b – details of hydraulic installation; c - Reservoir Avântu

The supply network consists of pipes of different diameters, the most important are the pipes with 110 diameter followed by those with 50 diameter.



a b

Fig.6 The diameter suitable of water network for study area: a – query after diameter for water network b - The chart query for diameter suitable of water network

Through the GIS application are correlative different sources of information coming from different sources, stored in different forms depending on the institution they provide. Spatial databases are used and maintained in specialized departments within public companies and public administrations and should not be limited to simple cadastral applications. This

information attached GIS application can provide information on public or private property, building permits, regulatory restrictions, tools for disaster management and emergency plans urban networks, systematization and management planning (SERCAIANU M., 2011).

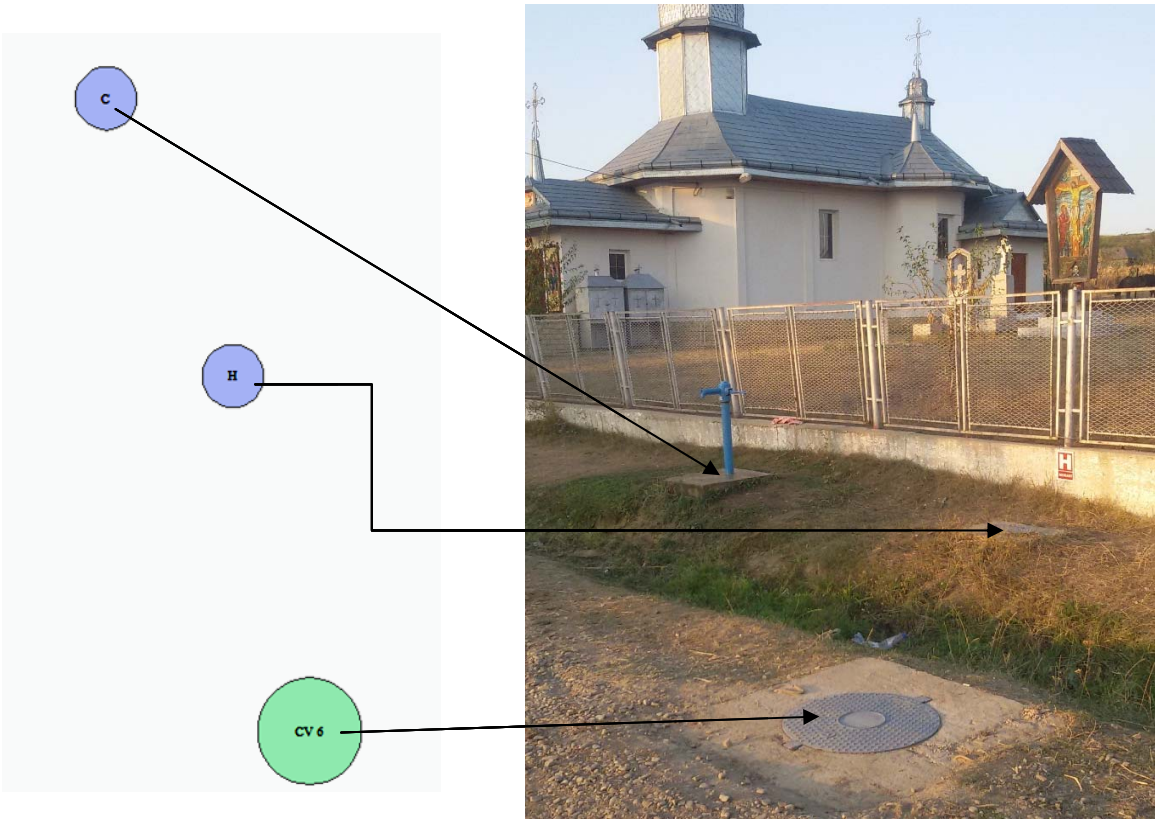


Fig.7 The visualization of study area in Arc Map and in reality

In the event of realization of connections in the study area is necessary to know the owners, property papers, address, so by implementing a GIS applications such easy making such queries, and the results are quickly accessed.

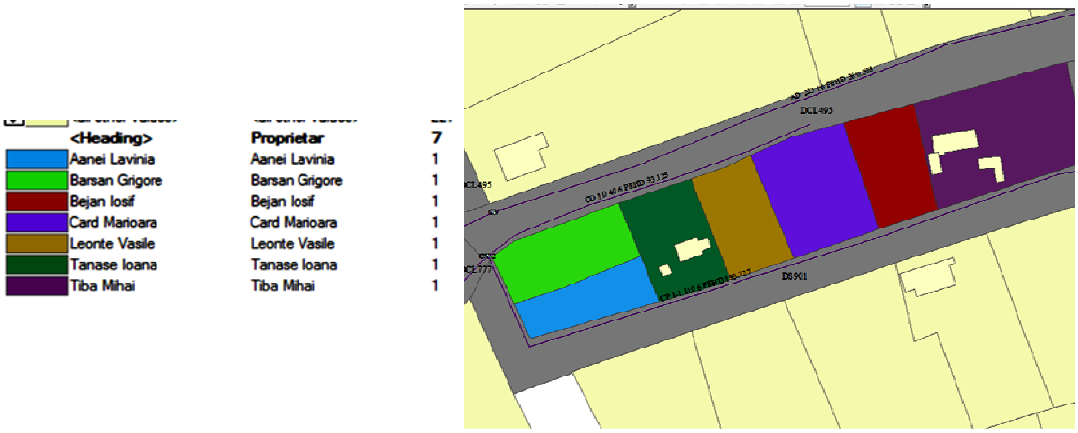


Fig.8 Queries by owners criterion

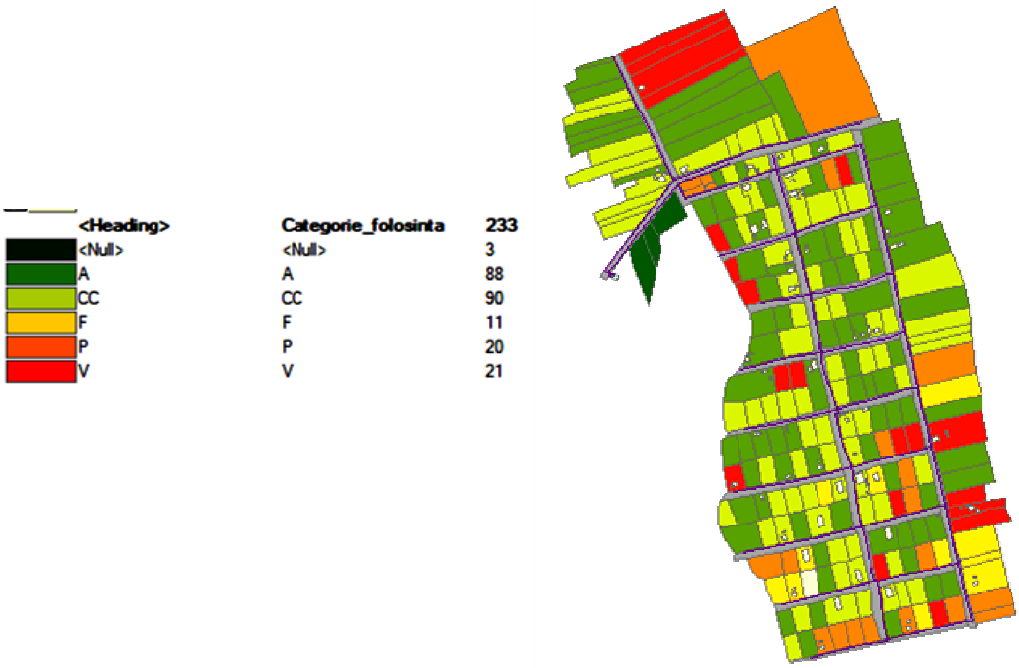


Fig.9 Queries following criteria category of use

4. Conclusions

A system of water works becomes effective through monitoring, modernization, rehabilitation, development and automation, routing water from source to consumer arduous one that involves a multitude of technologies that are in a constant evolution.

Effective monitoring of water systems is facilitated by creating a database that facilitate the design and management of water, and using models GIS analysis functions, and facilitates the process of inspection, maintenance thereof. Creating a GIS system of water supply networks ensures more efficient management and operation potential of the area, based on technical, economic and legal. Water supply systems modeling through GIS data facilitates the interrogation process, shortens working time, reduce the cost of the maintenance, upgrading and rehabilitation by combining textual data with graphs.

GIS models that create queries using digital maps and reports that facilitate communication with authorities and customers.

Today's technology evolving so there is a need to improve to models by interconnecting various GIS databases and updating work programs to raise consumer requirements

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