APPLICATION OF GIS IN THE WATER COMPANY "HIDRODRINI" - PEJË

Ferim Gashi1, Pal Nikolli2, Roland Merxha3, Ibrahim Ramadani4*

1Dr. Ferim GASHI , University of Prishtina, Faculty of Mathematics and Natural Sciences, Department of Geography Address: Mother Teresa Street,10 000 Prishtina Republic of Kosovo, Cell:+383 (0) 44 114 674; E-mail: ferim.gashi@uni-pr.edu,

2Dr. Pal NIKOLLI, Tirana University, Faculty of History and Philology, Department of Geography, Rruga e Elbasanit, Tirana, ALBANIA, E-mail: pal.nikolli@unitir.edu.al,

3MSc. Roland Merxha, Kolegji ESLG Veternik p.n, Te Genci Rol, 10000 Prishtina Republic of Kosovo, E-mail: rolandmerxha@gmail.com,

4Ibrahim RAMADANI, University of Prishtina, Faculty of Mathematics and Natural Sciences, Department of Geography Address: Mother Teresa Street,10 000 Prishtina Republic of Kosovo

*Corresponding author: ibrahimramadani@yahoo.com,

Abstract
The purpose of this paper is to show the importance and impact that the Geographic Information System has within an enterprise. As such, the Geographic Information System (GIS) can be used for multiple purposes. Most importantly, it is the help this system offers in making decisions and managing within an organization. Inside a Geographic Information System, geographic data, such as maps and attributes, can be treated. Attributes otherwise present tabular data associated with geometric features by describing what kind of function represents an object and object features. In most sectors of the society, the use of GIS is growing at very high speeds as the benefits and benefits of this system have improved the efficiency of many organizations. This rapid development of GIS has not left without touching our country, as many companies and enterprises have begun to apply the GIS system. Therefore, in this paper will be considered the case of the water utility company RUR "Hidrodrini" in Peja, which has applied the ArcGIS Geographic Information System since 2008. During the review of this case will be attempted to understand the impact that the application of the ArcGIS in the water company "Hidrodrini" in Peja.

Keywords: GIS, Water company, attributes, maps,

INTRODUCTION

Many of the world's developing countries are among the main problems they face is the supply of drinking water. Water losses that occur due to technical leaks, theft or misuse of water are usually of a high level. In such a situation was Kosovo, where due to the old system, especially the misuse of water, public water utilities have had major problems in offering their services. As a result of these problems for water utilities, there was a need to equip them with a geospatial information.

This platform provides easy access to maps and information on any on-field equipment or others who collaborate and communicate with it, such as contractors and clients. A platform that has vast use of the world to manage all services within a water supply system is known as the GIS or otherwise the Geographic Information System. Geographic Information Systems represent the most modern technology that has been found today in the most advanced Western countries and beyond. GIS as a science is multidisciplinary, as such is integrated into a wide range of highly delicate issues by the level of complexity. Experience shows that many countries already have integral and inseparable GIS systems in almost all information and communication sectors.

As many countries applied this system and from their practice saw that this was a successful and highly efficient system, water supply services in Kosovo began with the application of this platform or otherwise known as ArcGIS. This is known as the best geographic platform that enables these services to create, organize and share geographic information and tools with each person within the organization through a variety of office and field equipment.
One of the water utilities in Kosovo which has implemented this system since 2008 is also the Regional Water Company "Hidrodrini Sh. A "Peja, for which company will be based my work or exactly for the application of the GIS information system that is made by this company in order to understand the advantages and benefits that came from its use.

It can simply be said that GIS enables or represents the integration of cartography, statistical analysis and database technologies. A GIS can be thought of as a system that in a digital way creates and "edits" spatial areas that can be administrative, for a certain purpose or oriented to specific requirements. In general, a GIS system is viewed as a work platform developed for an organization as per their requirements. For this reason, a GIS system that is developed as an application for administration, enterprises, or for any other purpose may not necessarily be connected or compatible with another GIS system that has been developed for some other applications.

**Purpose of the research**

The primary purpose of this diploma work is to study the application of the geographic information system Arc GIS at the water company "Hidrodrini" in Peja. During this diploma work I will show you the advantages offered by the Arc GIS information system and how this platform helps to facilitate the everyday work being done in the water supply system.

Here we will present the goals and the reasons that have led to the application of this platform that is done by the Department of GIS and Planning within the company Hidrodrini in Peja. According to this department, the implementation of the Geographic Information System (GIS) has been done to improve the following:

- Enhance data security,
- Simplification and improvement during the course of the work,
- Merging graphic data with alpha numeric data,
- Merging Financial Data,
- Supporting the identification of illegal connections

So, based on the data collected, the information and their analysis, the purpose of this material is to introduce the functioning of the GIS in K.U.R "Hidrodrini" Pejë. With special emphasis, We will try to understand whether the company "Hidrodrini" has been upgraded to improve the above mentioned points which have been their initial goal as well. To achieve this We will cooperate with the experts and the responsible persons that are part of K.U.R "Hidrodrini" and who have been part of this project since the beginning of its implementation to date.

**Methodology**

The realization of this study several methods have been used which will mainly be the theoretical method. The methods used in this study are:

- **Theoretical treatment method:** this is a method we will use to describe the definitions and to explain the Arc GIS information system and in particular to explain it for its application in K.U.R "Hidrodrini" Pejë.

- **Methods of analysis:** in this scientific paper, related to the application of the GIS information system to the regional water supply system in Peja, the method of analysis will be used to make an analysis of the work done before and after the installation of the GIS.

- **Qualitative Method:** or Qualitative Method will provide understanding and clarification of the case study by obtaining data on GIS working practices by interviewing responsible persons and experts from the Department of GIS and Planning who will be asked questions such as: What is the level of education? The positions they currently work on? Their role in installing and implementing this system? And the difference they notice in the work before and after the application of this platform? These were some of the questions that will be asked for the abovementioned persons, as other issues that can be evidenced during the course of the work will be realized.

- **Comparative Method:** For Comparative or Comparative Methods, it would use ArcGIS implementation in the water supply system for any of the countries in the region or any European country.
**Cartographic Method:** In this method, ArcGIS software will be used to present in compiled form, data, graphic design and other information, which will be realized in the regional water company Hidrodrini in Peja.

**Definition and understanding of the GIS information system**

Geographic information systems are one of the most powerful software tools in the world. A GIS uses computer technology to integrate, manipulate and display a wide range of information in order to create a geographic view. Starting with a computerized topographic mapping on the base of how much a GIS covers and integrates graphical and textual information from separate data.

The end result is a tailored and reliable tool so it can support decision-making and problem solving and provide almost instantaneous answers to complex questions. All of these definitions usually refer to a computer hardware, software system, and people who support capturing, managing, analyzing, and displaying spatial data [1].

For a Geographic Information System (GIS) we can say that it is a computer program that enables the management, processing, analysis and visualization of data that are referred to in the land space. GIS is a tool by which data can be divided into layers and at the same time present a basic map of the area where the data are located. The base map may consist of transport network, buildings, land plots, terrain image, rivers, etc. Data can be presented as individual layers, as individual objects, or may be combined with other layers for different presentation and analysis.

Another definition states that a Geographic Information System (GIS) is a computer-based computer system for analyzing virtually anything, moving or stationary maps. A GIS integrates common database operations, such as query and statistical analysis, with the ability to see how data is related to space and time. Maps produced with a GIS are useful to show locations and events taking place outside in nature. They are useful for analyzing and visualizing any spatial or temporary system that may also change over [2]. So GIS is a computer-based system that facilitates data retrieval, data analysis, and presentation, especially when it comes to geo-reference data.

From the definition it can be understood that a GIS system can be divided into four subsystems, which are [3]:

1. **Entry** - representing the receipt of data
2. **Before processing** - processes the data received
3. **Analysis** - performs analyzing processed data
4. **Exit** - or otherwise known as the presentation of data

Thus the arrival of free and powerful computers over the last few decades has allowed for the development of new software applications for storage, analysis, and display of geographic data. Many of these applications belong to a group of software known as GIS. Many definitions are proposed for what constitutes a GIS. Each of these definitions matches a particular task that is being performed.

Based on these definitions, GIS can be defined and demonstrated. Activities normally performed on a GIS include [4]. Measuring natural and human phenomena and processes from a spatial perspective. These measurements include three types of properties that are commonly associated with these types of systems: Elements, Attributes and, Connections.

Preserving digital measurements in a computer database. These measurements are often linked to features on a digital map. The feature can be of three types: points, lines and Polygons.

The description of the measured or analyzed data can be presented in these types of images: maps, graphics, list or summary statistics.

Because of these features and capabilities that GIS software provides is widely used and used in fields such as engineering, environmental science, land surveying, urban planning, emergency management, and Web mapping. Once GIS becomes more and more important day, more applications and uses are being introduced. Nowadays GIS and GIS applications have found their way to use smart phones, PC tablets, and other devices that can be connected via Wi-Fi.
Implementation of GIS technology

Numerous studies have addressed and conducted studies on the adoption and implementation of technological innovations in other areas of life. Historically, the concepts of dissemination and implementation have been derived and are independently defined by different sources. Thus, the term "spread" is usually referred to the acceptance and use of technological innovations by the population or by businesses. While the term "implementation" is usually referred to the acceptance of new models or techniques within organizations' processes [5]. So the concept of implementation within organizations can be seen as a "phenomenon of change" or a process for creating organizational.

Thus, even when implementing a GIS system, a company will be faced with many different things that the company needs to be ready to adapt. Starting from what has been seen and heard by other companies that have already implemented the GIS system, I can say that by implementing this technology an enterprise will only ease its daily work and at the same time make a difference What is most important, the biggest change can come and can be seen from increasing the efficiency in providing their services to their customers.

In its basic meaning, the implementation of GIS can be defined as the introduction of a new information system, program, or model that is accepted by organizational personnel. Successful implementation is determined by dramatic changes and improvements in the decision-making process of the staff. The concept of implementation within organizations and businesses can be seen as a different phenomenon in the process of creating organizational changes [6].

For a successful implementation of this technology according to Obermeyer and Pinto, three very valuable criteria must be considered, which are [7]:

- **Technical Adaptation** - Presents the belief that the system to be implemented will fit into the processes of the organization.

- **Organizational Adaptation** - this represents a measure of harmony between the organization and the system that will be implemented or different can be said, the organization's appropriateness to the organization and

- **Organizational Effectiveness** - represents an increase or improvement in decision-making.

Other GIS technology researchers have suggested that there are three necessary elements and generally three sufficient conditions for the effective implementation of systems based on the computer system [8].

1. Information management strategies that identify user needs and consider resources available to the organization.

2. Engage in the participation and implementation of any form of information technology by individuals at all levels of the organization.

3. A high degree of organizational and environmental stability

Clearly defined goals, sufficient resource allocation, management support, implementation timetables, competent technical support and adequate communication have generally been key points that are crucial to the implementation of a new system. So when an organization meets these conditions then it is ready to implement the GIS technology and use it to provide the best service to its customers first and to increase its organizational.

The implementation of GIS technology represents the whole process of technology transfer, which is the time since the beginning of the application of this technology until an organization approves it. Approval means that an organization has included a GIS in its operations and regularly uses it when needed in its day-to-day activities. Accordingly, usually GIS implementation can be a process that consists of six phases:

**Stage of Awareness.** At this stage, people within the organization understand and learn about GIS technology and the potential benefits to their organization. This really represents the stage of suggestion, discussion or stage for justification of the beginning of the implementation of this technology.

**Developing system requirements.** The idea that a GIS can benefit organizations is a formal acknowledgment while a more systematic and formal process is created to gather information about technology and identify potential users and their needs. So an analysis of formal needs is what is mainly done at this stage.
**System Assessment.** Alternative systems are proposed and evaluated. The evaluation process takes into account the analysis and the need of the previous stage. At the end of this phase, a formal decision should be made whether or not to proceed with the purchase of a GIS.

**Development of the implementation plan.** Once the decision has been made to continue purchasing a system, a plan has been developed to obtain the necessary equipment and staff, then make organizational changes and fund the process. The plan can be a formally accepted document or a rather informal series of actions.

**Buying the system and getting started.** When the system is purchased, installed and the staff is trained, then the creation of the database is started and it is time to establish the operational procedures. Creating a database is usually the most expensive part of the implementation process. Significant attention is needed to establish appropriate control data to ensure that the data entered meets the required standards and that appropriate refresh procedures are implemented to maintain database integrity.

**Operational Phase.** At this stage initial database automation is complete and operating procedures are developed to maintain the database and to provide the information services the organization requires. At this stage, procedures have been developed to maintain the GIS object and to improve services so that GIS continues to support the needs in organizational information changes.

**Evaluating the success of the implementation**

It is very necessary that after the implementation of this system, to evaluate whether the implementation has been successful, its evaluation should also be carried out. When assessing the success of the implemented GIS system, there are many factors involved in the game. For this we will first present an image (Fig.1) which represents the "time line for evaluation" of the success of the GIS system.

![Image](image.png)

*Figure. 2. System evaluation over time (source: Obermeyer, N. J. and Pinto, J.K., 2008)*

In the figure, the "time line" simply illustrates the temporary nature of many of the assessments that are made to measure the success of the implementation of the Geographic Information System. In the early stages of the implementation process, typical assessments of success tend to revolve around such issues as the use and quality of the system. So when installing GIS this system is used by organizational members who start making first evaluations of the quality of this system.

At this early stage, "success” often lies in its acceptance by organizational members and in their security and readiness to use the new system in their activities. So by going from the right-to-side line, other aspects of the system's success assessment are noted, which can make an accurate and very important assessment. One of these appraisers is the clients who always give estimates that are of great importance to their organization and their new systems.

Thus the success of an organization in the implementation of the GIS system can be assessed in this flow [9]:

**System features**

1. System Quality: The system adheres to satisfactory standards in terms of its operational characteristics.

2. Quality information: The material provided by the system is reliable, accurate, timely, user-friendly, and unique.
Characteristics of data usage

3. Use: The material provided by the GIS should be easily and smoothly employed by the organization so as to fulfill its operations.

4. User Satisfaction: This is achieved when customers using the system will be satisfied with the way in which the system affects their jobs through the nature of data delivery.

Impact Assessment

5. Individual Impact: Members of departments using GIS should be satisfied with how the system helps them perform their jobs through positively influencing their efficiency and effectiveness.

6. Organizational Impact: The organization as a whole will receive and earn a positive income from GIS, by making the best decisions and/or reducing costs in its operations.

Thus, the periodic assessment of the GIS system after its application to an enterprise or organization is a process that is done either inadvertently, as the results are the ones that show the efficiency and success of this system in the organization. Results that come from the organization itself but also from outside.

ARCGIS PLATFORM AND ITS DEVELOPMENT IN WATER SERVICES

Services all over the world are facing unprecedented changes. Nowadays service providers like those of water or energy need increased efficiency for network protection and self-customers. To achieve this, new tools and strategies are needed for companies and enterprises to provide quality customer services. Thus spatial data usage is one of the major focus areas for many services such as water, electricity and gas.

Improving hardware, software and networking technologies have created opportunities for the service industry to build and benefit from the sophisticated GIS system. GIS applications have evolved and have been developed a lot since their establishment since the creation of maps up to the advanced tools of analysis for operation and planning. GIS products are usually used by marketing services, production facilities, and engineering services [10].

The advantages of using GIS in the service business are great, as 80-90% of their data is linked to any geographic location. This is very important for businesses themselves as they need to know where their pipes, valves, pumps, meters and other facilities are located on the ground are located. They also need to know the location of water usage and customers, where their teams are working and what facilities need maintenance. The facts mentioned so far are just some of the many advantages that may come from the application of a geographic information system.

GIS evolution in services

The main purpose of each enterprise is to plan and manage equipment so as to provide its services to their customers in the best possible form. The service industry has always been based on paper-based maps through which its executives have managed their own equipment. So starting from this it was very natural that water companies or electricity companies be among the first users of the software that offers the creation of digital maps.

The first automation efforts during the 1970s and early 1980s were mainly focused on creating digital maps. Once graphic design was needed for the realization of this task, most companies choose design using Computer Aided Design (CAD) software as a basis for systems called Automated Mapping / Facilities Management or Automated Design / Device Management [11].

Among the systems in use during this time period, a central processing and memory unit (mainframe-based) has been developed. This was a computer system that focused on problem-mapped data modeling. Called the Geo-Facilities Information System (GFIS), this technology built an elegant and comprehensive model for networking devices, using IBM IMS database technology to store the data model. Despite the expensive nature of the solution, it was popularized by some major services in North America and Europe. IBM's first model was used and used for tracking and locating electrical circuits, gas, water networks, and network performance model analysis [12].

After a while, mini-computer systems became very popular and replaced mainframe-based technology, hence the Automatic Design / Device Management systems, which for a time relied on the data model network for displaying and storing objects of data began to utilize this new platform. Data linking technology came sometime in the mid-1980s.
While in a particular field of effort, GIS was popular in the early 1980s, mainly GIS had its own scope of management of lands and natural resources [13].

By the late 1980s, many AutoComplete / Device Management users began to embrace GIS ideas, using geo-link technology of models and maps of equipment and land. In this model, spatial definitions of land and objects are preserved in terms of their coordinates in binary file format, while the attributes about those entities are stored in the database management system. Thus, customer connectivity and computing systems with spatial presentations of facilities in the service area transformed the compilation system into an information system [14].

The GIS organizes geographic data in order to create the opportunity for anyone who is consulting a map to obtain the information needed for a particular project or task. A thematic map has a summary table that allows its reader to add information or data to a reference map of the actual situation in the country. So a GIS program is able to process geographic data from a variety of sources of information and integrate them into a map. Different countries have different types of geographic data for analysis and Governments almost constantly invest in the realization of GIS in different fields with a view to making them available.

Following a development or evolution of the Geographic Information System, many companies and individuals today use the term GIS in the broad sense, including the whole system, starting from hardware, software, data, and even staff and not seeing the GIS system just as a special technology for building a digital map.

**ArcGIS platform**

ArcGIS software is a geographic platform that enables water utilities to create, organize, and share geographic information and tools with everyone in the organization in a variety of on-site or off-site equipment. ArcGIS applications can operate or work almost anywhere on a local network and are accessible from a desktop, web, smartphone, or tablet. The ArcGIS platform itself includes maps on the internet and geographic analysis of an enterprise portal and geo-spatial content management, allowing organizations to easily manage and manage content, share maps and collaborate [15].

ArcGIS is the geo-spatial platform that can provide these opportunities for water utilities to support business needs for critical missions. This software supports all business models of water, sewage and utilities.

Other assistance or facilitations that may come from ArcGIS for these businesses or companies that provide water services are [16]:

- Sustainable water management and sanitation infrastructure.
- Cost control for cases such as water loss control, rate stabilization and development fees.
- Readiness for emergency response.
- Planning and financing capital improvements.
- Communication and transparency in relation to clients.
- Administration of facilities, such as water supply, protection of catchment basins and conservation.

In the following I will present ArcGIS platform for water services (Fig.2)
As shown in Figure 2, the infrastructure platform is based on the hardware platform and operating system. With content and capabilities or capabilities, refer to GIS servers and their functionality, as well as referring to databases and filing system where content is stored. API (Application Programming Interfaces) and Software Development Kits offer interfaces for ArcGIS options or options and are used to build elements of subsequent levels (eg web). Content management and applications are further featured. This consists of an ArcGIS portal including ArcGIS Online and an ArcGIS for additional servers. The portal for ArcGIS only serves to govern access to content, web links, and identity management skills.

**ArcGIS in Water Services**

Water is an essential part of our daily life. In the background there are many people working to ensure that we have clean water and reliable water supply. Originally starting around the time of the industrial revolution, with the arrival of standards for water, wastewater and management of effluent water services, it started to establish and build standardized water management practices. This has resulted in the ability to supply millions of people in urban centers without any pollution, poisoning or other complications at the time of the pre-industrial society [17]. While today, in many countries around the world, these systems that were built long ago have started to be spent, have lost and their lifespan is decreasing every day. Therefore, the assessment, planning and management of these systems is something very crucial and important.

Assessment of drinking water supply in urban and suburban areas is one of the key issues for sustainable economic development. Many of the urban services including the main water supply pipelines were planned and built on the basis of population distribution and economic development at the time of establishment. Consequently, water infrastructure and services could face stress and problems due to the impact of spatial patterns, as the population distribution and economic development changed over time.

The water supply system is a complex system that integrates some spatial features. Therefore, it is necessary to use the information support system in many aspects and also have the ability to maintain and manage and analyze the data. Designing the surface of the water supply system has to do with the sites and capacities of diversity and storage works as well as their operations to accomplish many goals and goals. Thus, in order to ensure sufficient quantity and good water quality, the planning and construction of appropriate water supply schemes has become almost indispensable in a modern society.

Thus, after the arrival of the Geographic Information Systems (GIS), it is possible to visualize and design the entire water supply cycle from its source to the customer. This is accomplished as the Geographic Information System provides some of the most comprehensive tools for storing, manipulating and analyzing data. GIS implementation can not only reduce the time it takes to analyze the information, but it can also provide more efficient use of resources with high flexibility. It enables the user to save and display large amounts of graphical data to greatly enhance interpretation and analysis. An important GIS capability is the support of digital spatial characteristics and attribute data attributes for map features [18].
ArcGIS for Water Supply Companies is a configured platform that means that it includes, desktop configuration, mobile applications, web services, ArcGIS publishing services for Server and ArcGIS Online, and creation, management and distribution of geo content space. ArcGIS's mission for water utilities is to increase the value of geographic information about water, making it easier to deploy to ArcGIS and quickly delivering or disseminating GIS content across the organization. Also in ArcGIS for Water Services maps and applications are designed as configurable and expandable to meet the unique needs of individual water supply services and as such are available to put these enterprises on the platform their ESRI licensing.

**ArcGIS models in water services**

From the ones that appear above we can say that ArcGIS software is software from the use of each and every company or organization, whether public or private, can benefit greatly. This system facilitates task performance and enables a lot of work to be done remotely (e.g., work such as controlling and managing network infrastructure in an organization). For organizations that provide water services, ArcGIS is the right solution as it offers increased efficiency, both for its customers as well as for the company itself.

Using this software enables increased transparency to regular customers and on the other hand detects and prohibits illegal interventions and misuse of water by irresponsible customers. So from the models of this software, the winners are not only the organization but also its customers. In general, five common GIS models are known which form a framework to harmonize the needs of water utility businesses with an ArcGIS platform. Each model represents a functional GIS element in an enterprise. These models are (Fig.3) [18]:

1. Asset Management
2. Planning and analysis
3. Mobility on the ground
4. Operational awareness and
5. Constitutive engagement

These models are intertwined. In some enterprises the workflow may be supported by two or more GIS models.

![Figure. 3. Models of GIS Solution for Water Utilities](image)

**Asset management**

GIS asset management solutions in the organization include the process of storing, managing, and accessing spatial data. For water services, this is an authorized depot for asset data such as pipes, valves, meters and other network features, as well as operational data such as pressure areas, workstations, main disruptions, and locations of inspection. Asset management highlights ArcGIS for desktop and continuous data in geo database and requires work streams to maintain current data and maintain data integrity.

This workflow includes [19]:

- Procedures for adding, modifying and deleting system assets based on data validation rules.
- Procedures to carry out quality and quality checks
- Procedures to manage editing by many users.

Sound asset management practices can provide sustainable foundations for an enterprise that deals with the management of potable water, sewage, and surface water infrastructure with abnormal or large quantities (with a large drop).

**Planning and analysis**

GIS planning and analysis solutions include transforming raw data into actionable information through the application of analytical techniques. The ArcGIS Framework for Geo-Processes provides a full set of spatial analytic functions and tools including layer, solution and modeling functions. Technically, there are many ways to use a Geo-Process function, but the two most common are through scripts and templates [20]. For example, the main mapping or waterway finding function is commonly used to assist field teams to identify which drainage system should be closed to isolate a system segment in both scenarios and emergency situations and maintenance. So network tracking is a complex analysis through geo-processing models. The ArcGIS platform allows action intelligence that is divided into the integrated and visual.

**Willingness / Organization on the Ground**

GIS is a software that enables field staff to view, capture, save, refresh, manipulate, and analyze their network, equipment, and operational data (job orders, complaints of customers and inspections). Field personnel require a simple solution for visualizing, exchanging, collecting, and updating them. This GIS solution model is made possible by the availability of information that is stored and optimized for the mobile environment. The requirements for this model are to improve the visibility or visibility of an organization's operational aspects, to increase workforce planning, to facilitate the use of data, is no longer a problem and empowering field staff with relevant information necessary for their duties outside the office.

**Operational awareness**

Accurate painting of organizational activities and projects is a critical component to understanding the current operational situation. Operational awareness applications are sometimes referred to as a shared operating picture, operational visualization, or executive visualization, and all provide a "window" to the relevant support information for making intelligent and appropriate decisions. This information becomes clear through planning and analysis of the appropriate techniques, partially collected from field-based devices or created and stored in the Geo database.

From a technology perspective, this model involves combining data and an analytical layer organized into a map and published on the web / web for use of applications. This model is often the entry point for using ArcGIS technology for new adopters (for non-GIS domain owners) but is often the latest model implemented by GIS domain owners.

**Constitutive engagement**

Information received by citizens, existing potential customers or interest groups may have a dramatic impact on operational activities, products and services provided. The generated component data can be transformed into valuable information through planning and analysis techniques and then integrated into the organizational work streams in support of the appropriate and more responsive operations. This model promotes a constant relationship with clients or interest groups and the organization will help promote transparency and external and internal accountability [21].
APPLYING THE GEOGRAPHIC INFORMATION SYSTEM ARCGIS TO THE WATER COMPANY "HIDRODRINI" – PEJA

The Regional Water and Sewerage Company Hidrodrini was established in October 2004 on the basis of a joint agreement between the Kosovo Trust Agency (KTA) and five municipalities, Peja, Deçan, Istog, Kline and Junik (Fig.4).

Figure. 4. Extension of the water supply network in the municipality of Peja (Source: K.U.R Hidrodrini - Pejë)

K.U.R "Hidrodrini" Sh. A. is a public professional institution licensed by the Water and Waste Regulatory Office for providing basic services, drinking water supply and sewage services. The number of the population that the Regional Company "HIDRODRINI" carried out drinking water services is estimated to be about 185,000 people and sewage services for 60,000 thousand inhabitants. The current production capacity is 27,000,000 m³/year.

K.U.R "Hidrodrini" Sh. Is reformed institution according to European Union standards, a model-based regionalization process, and successful international corporate governance practices. The company is and will remain a professional provider of high quality drinking water supply and sewerage services. Production, sales of water, sewage services and other services are the main tasks of the company. The center of the company is in Peja, its structure has 4 business units in Peja, Istog, Kline.

Within the supply or production of potable water at the Hidrodrini Regional Company are the following assets [22]:

**Operational Unit Peja** - this unit supplies drinking water to the city of Peja and about 30 villages around and water dissipation. Within this unit are:

- Two main production facilities, black water with two pumping and gravity systems, and the White Drin with gravity.
- The Peja Operational Unit has a main pumping station and three other small capacity stations for supplying the Ward of Ashtan Qesme and Black Maya.
- A drinking water storage tank of about 1500m³ and 3000m³.
- 185 km water network with pipes of different profiles.
- 75 km sewerage network.
- 12 km of atmospheric water network and
Two chlorination

Operational Unit Istog - In Istog this unit has five sources, the water supply system is a mixed gravity system and a pumping system. Within this unit are also:

- Eight water storage facilities with a capacity of 700m³, 4x400m³, 800m³, 500m³, 200m³.
- Four pumping stations.
- Five chlorination stations.
- 289 km of piped water pipes of dimensions from Dn50 to Dn500 and
- 25 km sewerage network.

Operational Unit Deçan - in this operating unit the water supply system is with the gravity system. In addition to the main system in this unit are the Strellcit, Isniq system and also the irrigation system for five other villages. Part of this unit is also:

- Five warehouses with a capacity of: 530 m³, 508 m³, 720 m³, 500 m³, and 8120 m³.
- A chlorination station and
- 124 km water supply network.

Operational Unit Klina - in Klina there are two systems for drinking water supply. One is that old, three wells, which is out of function, and the other is the new system that is in operation. According to the new source data are around 300l / sec. Parts of this unit are also:

- A chlorination station.
- Four water storage facilities with capacity, 1000 m³, 800 m³, 2X400 m³, 50 m³.
- A 40 km water supply network.
- Two main pumping stations.
- Two drinking water treatment plants.

Junik Operational Unit - the water supply system is a gravity system and is a source with a capacity of 20-25 l / s. This unit also includes:

- In a water tank with a capacity of 600 m³ and
- Network of 34 km.

As We mentioned above, the company "Hidrodrini" Sh. A. It is a public institution for the provision of water, waste and sewerage services. Thus, knowing the importance of the work and services that this company offers to a region of 5 municipalities, there was a need to make changes that would have an impact on improving the quality of their work and increasing security for services which this company offers (Fig.5).
Based on many studies and evaluations, Hidrodrini decided to implement the ArcGIS Geographic Information System, a platform that has proven to be very successful in various parts of the world in the management of water and sanitation services.

And the implementation of the ArcGIS system by K.U.R "Hidrodrini" aims to improve the following points.

- Increased data security
- Simplifying and improving workflow
- Merging graphic data with alpha-numeric data
- Merging financial data
- Supporting the identification of illegal connections

Prior to the implementation of ArcGIS, K.U.R Hidrodrini had major difficulties throughout the workflow. Water leaks and illegal connections were present all the time and this represented challenges and difficulties for the technical staff of this company, as evidencing illegal connections and breakdowns was not easy.

In the following figure (Fig.6) we are presenting a map showing the water connections, supply network, main line, street names, parcels, etc., a map which is created by ArcInfo. First we have said that ArcInfo allows users more flexibility in all aspects of data building, modeling, analysis and mapping, as well as enhancing the ability in spatial analysis, geo-processing and data management etc.
Following are some concrete examples of the work done by the Department for GIS and Planning within the K. Hidrodrini HPP in Peja. The following figure shows graphical data (Fig.7) on ArcMap and their alphanumeric data (Fig.8).

Figure 6. Local water supply - ArcMap-ArcInfo (Source: K.U.R Hidrodrini)

Figure 7. Graphical data on water connections (Source: K.U.R Hidrodrini)
In Fig. 9 a view of a zoned water meter and its data that emerge after selection of such water meter.

After their registration, the division of the network into zones of zoned water meters has been done (Fig. 10). This has helped the Department of GIS and Planning to find areas that have a high percentage of water losses. Thus, with a touch of the button, the program will track and select the home water meters supplied by the designated zone water meter.
There is also a built-in feature within the program to support the water supply system to identify illegal connections or errors while reading water meters (Fig.11). This function compares a billed monthly consumption of a customer with an estimated calculation. Thus all water meters that do not meet the criteria will be marked on the map.

Thus, to view the data for the customers and the water meters, it is necessary that the graphical data (Fig.12) be combined with alpha numeral data (Fig.13) after the customer registration and the field meters. If you select or click a watermeter on the map, the relevant data on the alpha numeric table (Fig.14) will also be displayed. The data that can be seen in this case are those of the meter and the costs that are made by the respective customer (Fig.15).
In the graphical map, except that a water meter can be selected, a larger space can be selected (Fig.14). In our case, a whole neighborhood is selected in order to see the consumption in m³ (Fig.15). So by this selection you can easily find areas with high water consumption or areas with low payments.
Also, through ArcGIS it is possible to make different classifications of customers or other equipment that are part of the network on the ground. For example, for customers, this classification can be made on the basis of debts or type of users (households, businesses, etc.). In order to be clearer, we will present some data or records for customers.
Figure 16. Households with over 10 residents

In this ortofot with the sign (Fig.16) are presented only consumers who use water for household purposes and that are more than 10 inhabitants.

In the following sub-photos the customers are classified according to their debts towards K.U.R Hidrodini. In the first orthophoto (Fig.17), the classification of consumers whose debts amount to 200 euros is made. These customers are presented with the symbol.

Figure 17. Consumers with debt up to 200 euros

Whereas the classification of customers who have debts over 5000 is shown in the following figure (Fig.18). These customers are presented with the symbol.
As can be seen, these classifications are a great help to the responsible persons so they can have a realistic picture of the debts and know exactly who they are.

After the registration of the pipes of the water supply network were analyzed and evaluated for these pipes. In the following figure I will show the cases where the pipes are estimated for their remaining lifespan and their sensitivity (Fig.19).

ArcInfo / ArcScene can also perform other analysis by means of three-dimensional images (Fig.20), as the layers placed on top of each other also help to analyze the surface of interest. Layers can play different roles through 3D imagery, as it can be easily transferred from layer to layer and thus obtaining different layer information, analyzes that are in the company’s interest.
Figure 20. 3D Layout
CONCLUSION

The concept of GIS is not something new. It has been applied for the first time conceptually when maps on the same subject are realized in different times and dates and then compared to each other to see and identify changes. So the history of GIS dates back many or many years ago but in time this concept began to be supplemented and developed even more. Initially all this came with the advancement of computer technology that enabled the digitization of GIS and manipulation of information, interpretation and creation of maps through a GIS become much quicker and almost real-time.

As mentioned in this paper, a GIS is a computer system that is designed to work with reference data or based on spatial / geographic coordinates. This system is often considered high-end cartography. GIS technology integrates basic data functions like “query” and statistical analysis with unique visualization and geographic analysis benefits provided by maps. These features distinguish GIS from other systems and make it available to a wide range of professionals to explain events, forecast outcomes, and planning strategies.

Nowadays the growth of the population and their needs has brought about the need to create sustainable practices. Implementing these practices often requires collaboration between different organizations and also the GIS application manufacturing companies. GIS applications enable different users around the world to exchange ideas on meeting resource needs and planning for a more efficient use of GIS for various services in the society.

For this reason, today, the Geographic Information System has been applied in almost every industry and has been used in different ways in different organizations, ranging from land use planning, urbanism, to water management and sanitation. GIS has been found to contribute significantly to planning and decision-making processes, which is also one of the main reasons that triggers the implementation and application of a GIS system in each organization.

Due to the development of technology and the vast use of internet across the globe, GIS integration with the Internet is a rapidly growing and inevitable trend in the future. It is important for the GIS monitoring community to determine the course of this development. In addition, Internet capability to include a wide audience will have significant impacts on users and developers of GIS.

By means of these opportunities, organizations that provide services and implement the GIS system as part of it will be able to increase its efficiency in all aspects within the organization and also increase transparency for its customers and collaborators. Increasing transparency for interest groups comes from access to different data and information using one of the platforms above.

Our goal in this paper was to study the implementation of ArcGIS, and we can draw different conclusions. With the implementation of ArcGIS in RWC Hidrodrini, there have been major positive changes such as increased data security, simplification and improvement during workflow, merging of graphical data with alpha numeric, merging of financial data and support in the identification of illegal connections, and we can freely say that the first hypothesis of our work is fulfilled that the application of the Geographic Geographic Information System has a positive impact on the work of the water supply system.
REFERENCES


BIOGRAPHY

The text of the biography should be 150 words maximum for every author. Times New Roman, 10 pt. Upper and lower case letters. Justified. Single line spacing. Single column format. The author(s) can include a photo in size 3 x 2 cm. Please, use the simple table structure for your photo, detailed affiliation and the biography.