



DRINKING WATER MANAGEMENT IN THE REGIONS – MAIN CHALLENGES

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ABSTRACT

Purpose. Drinking water management is becoming a serious challenge for settlements and regions. The lack of water or its inefficient use can be a serious obstacle to social and economic development. The introduction of innovative tools and methodologies for intelligent water management is becoming a leading challenge for local authorities. **Methods.** The methodological part of the study presents the components of the author's methodology for improving drinking water management through digitalization. **Results.** The main results of the study are in the direction of analyzing data from the National Statistics regarding supplied, consumed water and the corresponding losses by region. **Conclusions.** In conclusion, conclusions are formulated regarding the application of the methodology and the possibilities for improving drinking water management.

Keywords: Drinking water in the regions, Drinking water management, Digitalization.

INTRODUCTION

Water is one of the main resources in nature, which is important for all living organisms. It is a key resource in the economy and an important factor for the existence of modern societies. The attitude of each individual and the entire social system towards resources shows the care of sustainable development, care for future generations and the normal course of processes in nature. Over the past few years, however, we have witnessed climate change, which has also changed the attitude of man towards resources. Water is becoming an increasingly scarce resource, and this also applies to that part of it that is used for drinking purposes. The introduction of water regimes in settlements creates a number of everyday problems for the population, increases the number of accidents in the water supply network and raises a very acute issue of the quality of the supplied drinking water. All these circumstances determine the need to search for and implement modern methods, technologies and innovative solutions

for the management of drinking water. In this way, a more rational use of this resource can be achieved, water losses can be reduced and the benefits for the whole society can be improved. This report attempts to focus attention on some new opportunities for improving management through digitalization. As a result of the development of this topic, technological approaches can be sought for the development and implementation of new information systems that can manage drinking water more effectively.

METHODS

Drinking water management is an important and much-discussed topic. In recent years, there has been an increased interest among various authors in finding new solutions to achieve higher efficiency of water supply and sustainability (1). In this regard, some of the sources studied indicate that “water resources should be used to enhance economic and social well-being, but without compromising the sustainability of vital ecosystems” (2). Achieving higher efficiency is not an easy task. Its solution involves a careful analysis of the parameters and characteristics of efficiency and the search for mechanisms, methods and approaches for the implementation of modern technological solutions. A number of authors in their studies seek a connection between the

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rational use of natural resources and the achievement of sustainability (3). When searching for modern approaches, it should be borne in mind that drinking water is quite scarce as a resource in nature. In this regard, according to some authors, “freshwater resources are very scarce, constituting only 3% of the total water on the Earth’s surface, most of which is in the form of ice caps and glaciers”(4). These and many other sources emphasize finding solutions that not only satisfy current drinking water needs, but also achieve a more rational consumption of valuable natural resources, as a basis for the sustainability of systems. The many problems in the water sector in recent years have necessitated and require the search for and testing of various scientific results, methods, innovative solutions and approaches to improve drinking water management. It should be borne in mind that the accelerated

processes of digitalization in all areas imply the adaptation of various solutions in this important area as well. Data on the consumption of this resource also has its sensitivity in terms of secure storage and use of this data (5) in various analyses.

In order to be able to develop a methodological toolkit for more effective drinking water management, it is necessary to set some initial conditions. Effective drinking water management can be achieved through a single methodological toolkit. It should include a set of interconnected methods that work together. The set of methods should not be limited, as achieving the final goals allows for the development of the methodology by dropping existing methods and adding new ones. For the purposes of this study, the following set of methods can be proposed (**Figure 1**):

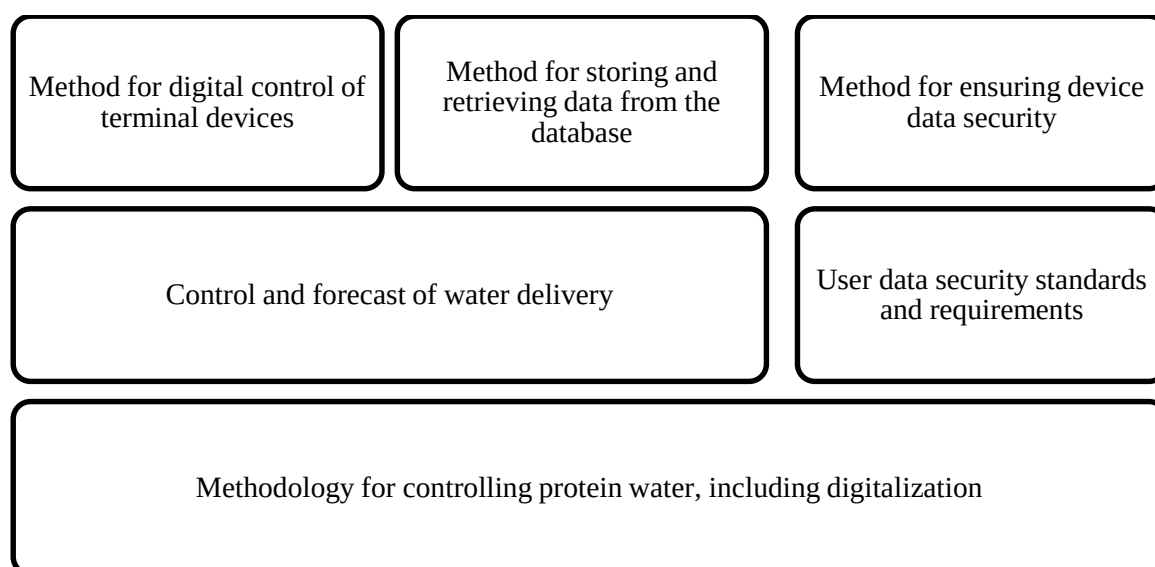


Figure 1. Structure of the drinking water management methodology

The main methods are:

- A method for digitally controlling flow meters by reading consumption data in real time. The read data should be stored in a specialized big data repository, including the relevant data mining algorithms.
- A method for storing and retrieving data from end-use devices in a specially built database. The data retrieval components are key for managing and forecasting drinking water consumption in settlements. The method includes both software components and evaluation components to achieve high efficiency of the stored, retrieved and transformed data.
- A method for ensuring the security of data from end devices. This method also includes the procedures and rules for building a big

data repository, recording data in it, and cybersecurity methods (6).

The benefits of the detailed development of the proposed methodology, as well as the specific methods, can be sought in the following several directions:

- Planning water supplies in settlements.
- Reducing losses through more detailed analysis of consumed quantities.
- Providing real-time data related to the use of drinking water.
- Reducing the harmful impact on nature.
- Caring for sustainable development.

The main benefit of introducing accelerated digitalization in drinking water management processes is related to the reduction of losses.

This report further analyzes real data on losses from different regions.

RESULTS

The National Statistical Institute maintains up-to-date data on water use by different regions and geographical units. From the perspective of this study, the analysis of water supplied by public water supply in the country, by statistical

regions and basin management regions (7), is of interest. The latter is related to the specific zoning in the Republic of Bulgaria, which is applied to waters and rivers. The proposed methodology places emphasis on reducing water losses. As can be seen from the presented processed statistical data in the four basin regions of Bulgaria, this is a serious problem (**Figure 2**).

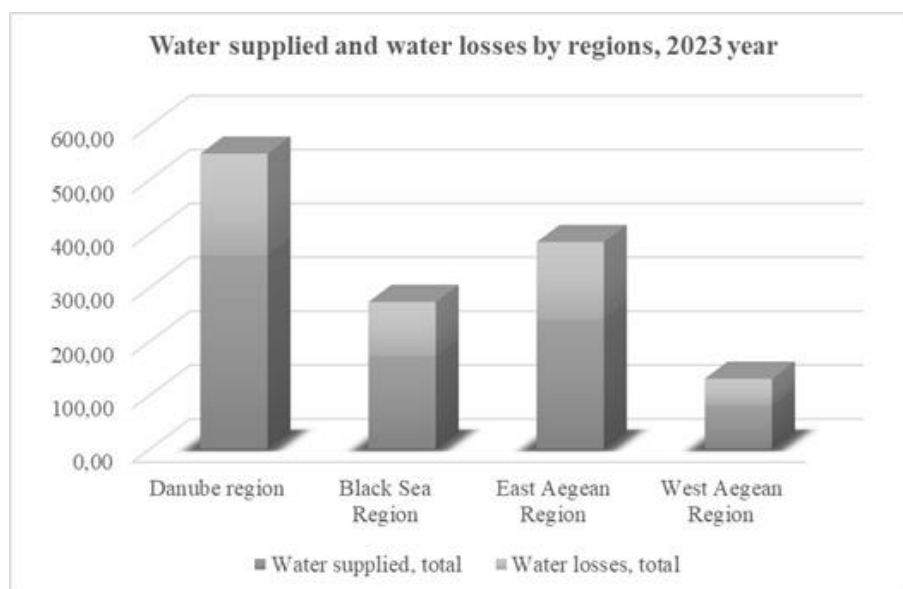


Figure 2. Water supplied and water losses by regions, 2023 year, source: author's analysis based on data from the National Statistical Institute

As can be seen from the presented data, significant water losses are observed in each of the regions. In the Danube region, the losses are on average 52%. In the Black Sea region, the losses are 58%. The largest average water losses are in the East Aegean and West Aegean

regions, which are over 60%. Another serious problem of drinking water management is the high importance of this resource for households. The percentages vary in different regions. In the Danube region, about 75% of the water serves households (**Figure 3**).

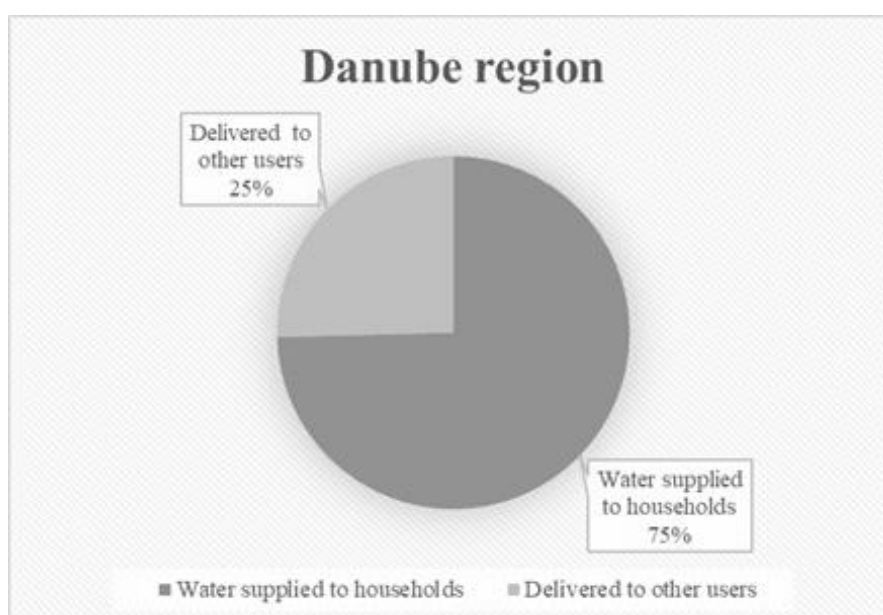


Figure 3. Water supplied in the Danube region, 2023 year, source: author's analysis based on data from the National Statistical Institute

This high percentage indicates that if there is a reduced efficiency of drinking water management, this will have the greatest impact on households and will cause problems of a socio-economic nature. In the Black Sea region,

water supply to households is only 66% (**Figure 4**), which is due to the developed tourist infrastructure. Water losses in this region are about 58%.

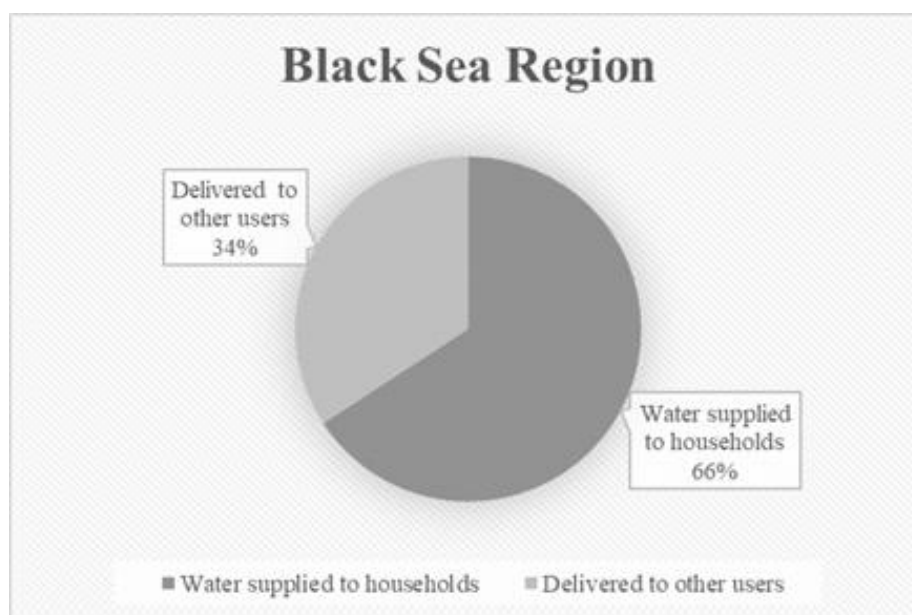


Figure 4. Water supplied in the Black Sea region, 2023 year, source: author's analysis based on data from the National Statistical Institute

In the East Aegean and West Aegean regions, the loss rates are over 60%. This is due to the outdated water supply network, frequent water

regimes, as well as other reasons. In the East Aegean region, the water supplied to households is about 76% (**Figure 5**).

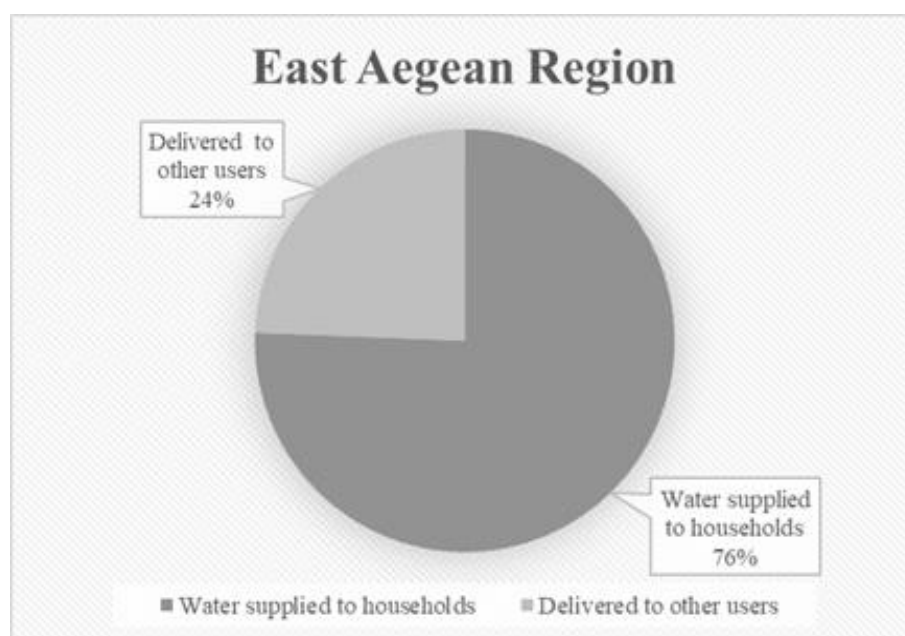


Figure 5. Water supplied in the East Aegean region, 2023 year, source: author's analysis based on data from the National Statistical Institute

In the West Aegean region, water supplies are mainly for households with a 77% share of total supplies (**Figure 6**).

The analyzed data show that households are the main consumer of the drinking water supplied

by the operators. There is also a very high percentage of losses, which are due to various reasons. All this shows the practical field for the application of methodologies for improving drinking water management through

digitalization. Regular reporting in real time can allow for extensive analyses, as well as the

implementation of various measures to increase the efficiency of processes.

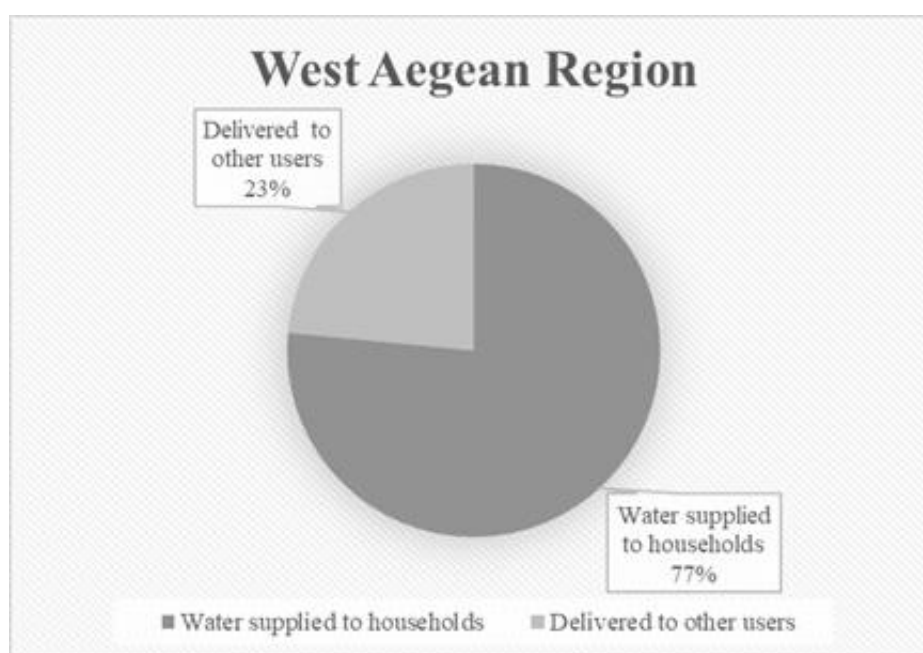


Figure 6. Water supplied in the West Aegean region, 2023 year, source: author's analysis based on data from the National Statistical Institute

CONCLUSION

In conclusion, it is important to emphasize the major challenges facing the public system in terms of effective management of drinking water. This issue is related not only to everyday issues of human existence, but also to the sustainability and preservation of natural features. The lack of water can cause major crises and even migration processes. The lack of drinking water is due to both natural features and large losses in its supply. For these reasons, the issue of finding modern and innovative solutions to improve the efficiency of supplies and reduce losses is increasingly serious. These processes require and require both financial resources to achieve the set goals and the development of a serious methodological toolkit. Its application can create conditions for better process management, reducing losses and increasing the efficiency of drinking water supplies. In this regard, this study proposes a methodology for improved drinking water management through digitalization. The scope of application of this methodology is quite wide, and there are many opportunities for development.

REFERENCES

1. <https://www.europarl.europa.eu/factsheets/bg/sheet/74/schutz-und-bewirtschaftung-von-gewassern>
2. <https://www.gwp.org/globalassets/global/toolbox/publications/background-papers/09-water-management-and-eco-systems.-living-with-change-2003-english.pdf>
3. Stoyanova, Z., (2021) Sustainable Development and Conservation of Natural Resources, Publishing Complex - UNWE, Sofia 2021, ISBN978-619-232-407-0.
4. <https://www.eolss.net/sample-chapters/c10/e5-15-02-02.pdf>
5. Kirilova, K.E. Analysis of Cybersecurity Competencies as A Factor for Organizations' Cyber Defense. 2024 12th International Scientific Conference on Computer Science, COMSCI 2024 – Proceedings, 1-4. DOI: <https://doi.org/10.1109/COMSCI63166.2024.10778520>.
6. Kirilov, R. DEVELOPMENT OF A METHODOLOGY FOR THE IMPLEMENTATION OF SECURE WEB APPLICATIONS IN BUSINESS ORGANIZATIONS, *Business Management* (4), 38-50, 2024 DOI: <https://doi.org/10.58861/tae.bm.2024.4.03>.
7. <https://www.nsi.bg/statistical-data/65/252>