International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: 6.614
Available Online at www.journalijcar.org
Volume 11; Issue 02 (A); February 2022; Page No.196-198
DOI: http://dx.doi.org/10.24327/ijcar.2022.198.0044

Review Article

USING GEOGRAPHIC INFORMATION SYSTEM (G.I.S.) IN WATER MANAGEMENT

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A R T I C L E I N F O

Article History:
Received 24th November, 2021
Received in revised form 19th December, 2021
Accepted 25th January, 2022
Published online 28th February, 2022

Key words:

water framework directive 2000/60/EC, Geographic Information Systems, Nestos river, electronic database, drillings, ground water

A B S T R A C T

The two major innovations of Directive 2000/60 / EC are that it now examines a water system at the catchment level and the fact that in addition to the physicochemical and hydro morphological parameters, biological parameters are also examined to assess the ecological quality of water. Pursuant to article 6 of Directive 2000/60 / EC, Member States are required to establish a register of areas in river basin districts under specific provisions of Community legislation on surface and groundwater protection and on the conservation of habitats and dependent species directly from the water. These registers include all water systems used or to be used for pumping for human consumption (Article 7). In this study, an electronic database (EDB) is created to record water drillings to meet water supply needs under Directive 2000/60 / EC and a pilot application to the Nestos river basin using the Geographic Information Systems.

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INTRODUCTION

The purpose of water framework directive 2000/60 is to establish a framework for the protection of inland surface waters, transitional waters, coastal waters, and groundwater.

The revolutionary point of the WFD is the fact that the quality of the surface water is measured not only by chemical elements but also by ecological quality values.

The WFD 2000/60 aims to the protection of every surface and underground water supplies and the critical point is to achieve "good" water status applying effective management plans in terms of the water basin, which should be updated every 6 years.

The "good" water status shall be established representing the hydro-morphological, physicochemical, and biological values. These characteristics are named descriptors and they are differentiated according to the system which they are applied. (System A or B, WFD 2000/60).

For each surface water category, the relevant surface water bodies within the river basin district shall be differentiated according to type. These types are those defined using either system A or system B[1].

The purpose of this study is to highlight the importance of Geographic Information Systems (G.I.S.) in water resources management. As a case study will be analyzed the usefulness of the G.I.S. in the catchment area of the river Nestos in the water drillings. An electronic database will be created that will utilize in real time the needs of each drilling.

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G.I.S

Geographic information system (GIS) is a system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data[2]. GIS allows us to view, understand, question, interpret, and visualize data in many ways that reveal relationships, patterns, and trends in the form of maps, globes, reports, and charts. GIS benefits organizations of all sizes and in almost every industry. There is a growing awareness of the economic and strategic value of GIS. The benefits of GIS generally fall into five basic categories[3]:

- Cost Savings and Increased Efficiency
- Better Decision Making
- Improved Communication
- Better Recordkeeping
- Managing Geographically

G.I.S gives us a new way to look at the world around us. With GIS you can[4]:

- Map Where Things Are
- Map Quantities
- Map Densities
- Find What's Inside
- Find What's Nearby
- Map Change

Study Area, Data and Method

The river Nestos (Mesta) originates on Mount Rila in Bulgaria and flows into the Thracian Sea opposite the island of Thasos[5].

The total length of the river is 243 Km, of which 103 Km are located in Greece. The total area of the river basin is 5,479 Km^2, of which 2000 belong to Greece (approximately 36%) (figure 1).

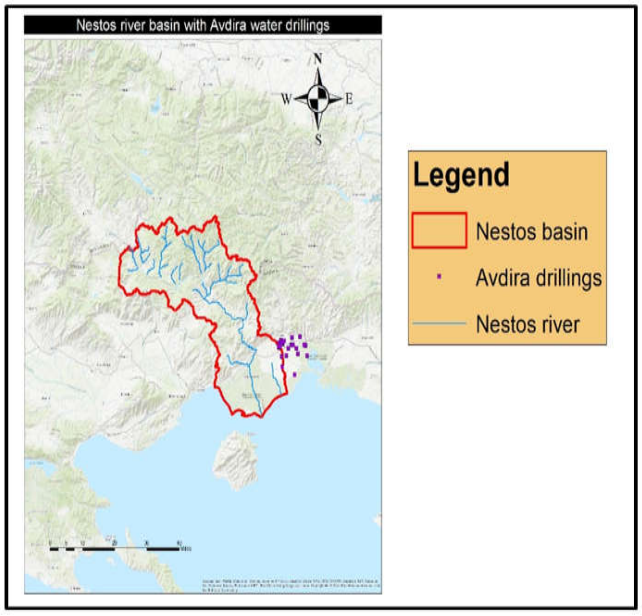

Figure 1 Nestos river basin

The Municipality of Abdera is a Municipality of the Region of Eastern Macedonia and Thrace. The total population of the Municipality amounts to 17137 people. For the needs of this population in drinking water, there are 35 water wells. The 3 boreholes of these are located in the catchment area of the river Nestos while the rest are outside[6] (figure 2). The following chemical parameters were evaluated to create the electronic database to meet the water needs:

- pH
- conductivity
- dissolved oxygen
- temperature
- turbidity
- total organic carbon

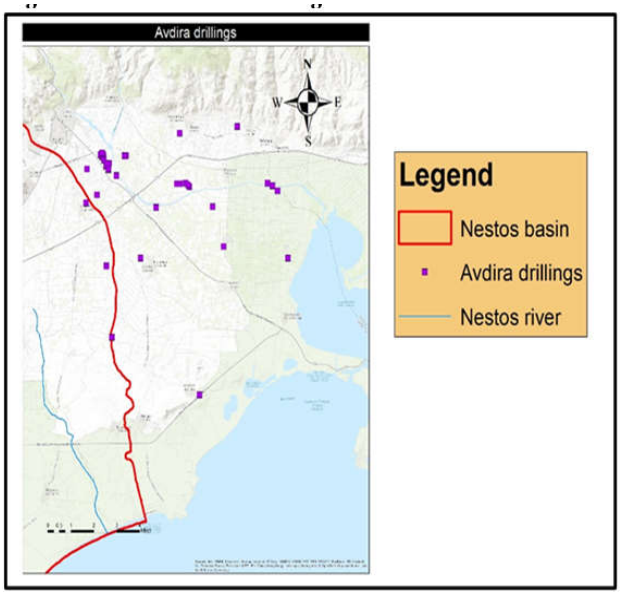

Figure 2 A*b*dera water drillings

The steps for creating and using the database are:

Step 1: Open the ArcGIS program
Step 2: Load the shapefiles folder and open ArcMap.
Step 3: Click the "add data" button and upload the shapefiles of the Nestos river basin. Then click the "add data" to load a background (Add a base map).
Step 4: Upload the excel file that contains the water wells of the Municipality of Abdera. Click the file → add data → add XY data. Load the file you want in "choose a table from the map or browser from another table" which in this case is "Drill Abdera" and select the first gender. In the field X we put X and in the field Y we put Y. Then we press ok. This way we have uploaded our data to the program.
Step 5: The electronic database is ready and with the Identify command we can check it.

RESULTS AND DISCUSSION

The Electronic Database will be the place of collection of all spatial and descriptive data. The data entry was done according to the international standards (INSPIRE directive)[7] thus supporting the homogenization, usability, and reuse of the data. ESRI's GIS (Geographical Information System) software was used which offers many advantages[8]:

- Ability to manage large volumes of data
- Interoperability
- Ability to utilize data in web applications
- Data security
- Simple data structures
- The reliability of the system
- Good presentation of the entities of the modeled elements
- Unified and coherent data structure
- Accurate cartographic performance for all scales
- Ability to update and generalize graphic and quality features
- Data can be displayed in its original detail and format without generalization
- Allows efficient way of organizing large quantities without many repetitions
- Greater accuracy in calculating spatial properties and managing cartographic data
- Cheap and fast-growing technology.

At the same time, it is possible to access and utilize data from compatible applications that are installed on local computers, but also the possibility of confidential access to the internet using commercial software, as well as personalized applications.

With the electronic database we can have immediate information about the basic elements of drilling and in case there is any difference from the instructions and laws to make immediate corrective intervention. For example, if there is a significant change in the pH, there will be immediate information and intervention to restore it to the correct values.

CONCLUSION

Prevention and immediate remedial intervention in water wells can be a powerful element in avoiding public health mistakes as well as reducing drilling maintenance costs. G.IS. can prove to be a useful tool in this direction.

References

1. Directive 2000/60/EC of the European parliament and of the council of 23 October 2000 establishing a framework for Community action in the field of water policy.
2. Burrough, P.A., 1992. Principles of Geographical Information Systems for Land Resources assessment. Clarendon Press. Oxford. pp. 194
3. Burrough, P.A., McDonnell, A., 2000. Principles of Geographical Information Systems. Oxford University Press. New York. pp. 333
4. www.esri.com
5. Boskidis, I., Gikas, G. D., Sylaios, G. K., & Tsihrintzis, V. A. (2012). Hydrologic and water quality modeling of lower Nestos River basin. Water resources management, 26(10), 3023-3051.
6. Fytilis, K. S. (2014). Creation of an Electronic Database (HDB) for recording water drillings: Pilot implementation in the Nestos River Basin (No. GRI-2015-14044). Aristotle University of Thessaloniki.
7. Bartha, G., & Kocsis, S. (2011). Standardization of geographic data: The european inspire directive. European Journal of Geography, 2(2), 79-89.
8. Mitchel, A. (2005). The ESRI Guide to GIS analysis, Volume 2: Spartial measurements and statistics. ESRI Guide to GIS analysis.

How to cite this article:

Fytilis Konstantinos (2022) 'Using Geographic Information System (G.I.S.) In Water Management', *International Journal of Current Advanced Research,* 11(02), pp. 196-198. DOI: http://dx.doi.org/10.24327/ijcar.2022.198.0044

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