

## GIS ELEMENTS IN GROUND-WATER QUALITY MODELLING AND POLLUTION SOURCES MONITORING IN THE HYDROGRAPHIC AREA BANAT

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**Abstract:** GIS elements like a newly emerging method is bases by a good knowledge of the all sources of pollutions, which constitute the data base support in the Arc-View program, and it is use to create a lot of interpolation by different fields, and show all the real problems on the maps. In this way, we could be informing and monitoring rather, about manufacturing processes and materials which created the pollutions, about water quality modelling, about transport and transformations of pollutants and on the other hand, in final, decisions and remediation technologies for ground-water resource conservation and protection.

**Key words:** Arc-View, pollution, ground-water quality

### DIE VERWENDUNG VON GIS-ELEMENTE IN DIE MODELLIERUNG DER QUALITÄT VON UNTERGRUNDGEWÄSSER UND DIE BEOBACHTUNG DER VERPESTUNGSQUELLEN

**Zusammenfassung:** Die GIS-Elemente als eine neue Methode, baut sich auf gute Kenntnisse über die Verpestungsquellen auf, sie werden als Anfangspunkt im ARC-View-Programm benutzt, wie auch für die Erschaffung von vielen Einschaltungen zwischen verschiedene Felder so dass alle reelle Probleme auf die Karte gezeigt werden. Auf diese Art und Weise können wir uns informieren über Prozesse und Materialien die Verpestungen verursachen können, über die Wasserqualität, über den Transport und Veränderung des Verpestungsfaktor und letztendlich Technologien und Maßnahmen die genommen werden müssen um das Grundwasser zu reinigen und/oder zu konservieren.

**Schlüsselwörter:** Verpestung, Grundwasserqualität

The Hydrographic Area Banat administrating by Water Department Banat, is situated into the west side of Romania and cover the catchment of the rivers: Aranca ( patially), Bega Veche, Bega, Timis, Birzava, Moravita, Caras, Nera, Cerna and a part of Danube.

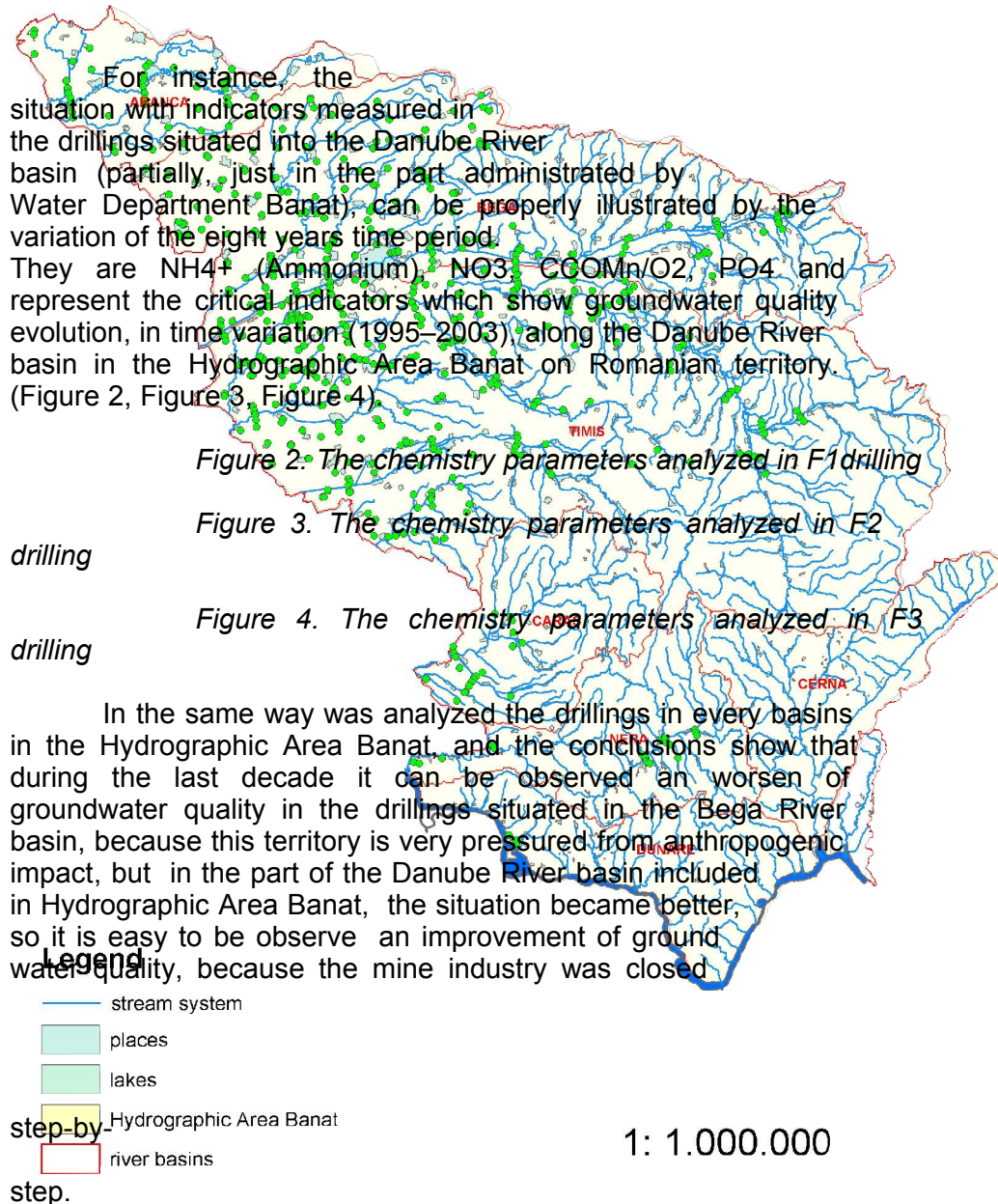
The objectives of this paper is to show how to promote the protection of ground water resources, using GIS elements like a newly emerging method. This method is bases by a good knowledge of all the drillings witch exist on the Banat Area, sources of pollutions, and all of this constitute the data base support in the Arc-View program. The program uses data bases created on different fields and the fields contain one by one information about the parameters: hydrodynamic level, water temperature, chemistry parameters, pumping experimental.

For instance, the chemistry parameters analyzed are: pH, dissolved oxygen, NH<sub>4</sub><sup>+</sup> (Ammonium), NO<sub>3</sub> (nitrate), directional hydraulic conductivity.

Starting from 1950 periodically analyses were done over the quality of ground water resources; this analyses have become permanently since that time. The total number of drillings in the Banat Area is 630, but only 350 are under observation and the analyses are done in 150 drillings in every year, but using different drillings in each year. This is the best way for a good knowledge for all area, because the ground water quality is changing slowly . For the first, the data base with the drillings in the Banat Areas, could be showed on the following map (Figure 1):

Figure 1. The drillings in Hydrographic Area Banat

## The drillings in Hydrographic Area Banat



Some causes of groundwater pollution were influenced by infiltration, groundwater flow and they depends by:

- industrial wastewater from Timisoara's big factories that registers pollutants like:  $\text{NO}_2$ , Ca, Fe, Mg,  $\text{SO}_4$ ,  $\text{NH}_4^+$ , phenols, organic matter.
- Old technologies used in the wastewater treatment process, some indicators surpass the accepted limits ( $\text{NH}_4^+$  and organic matter)

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- partially treated wastewater from the urban areas on this territory.

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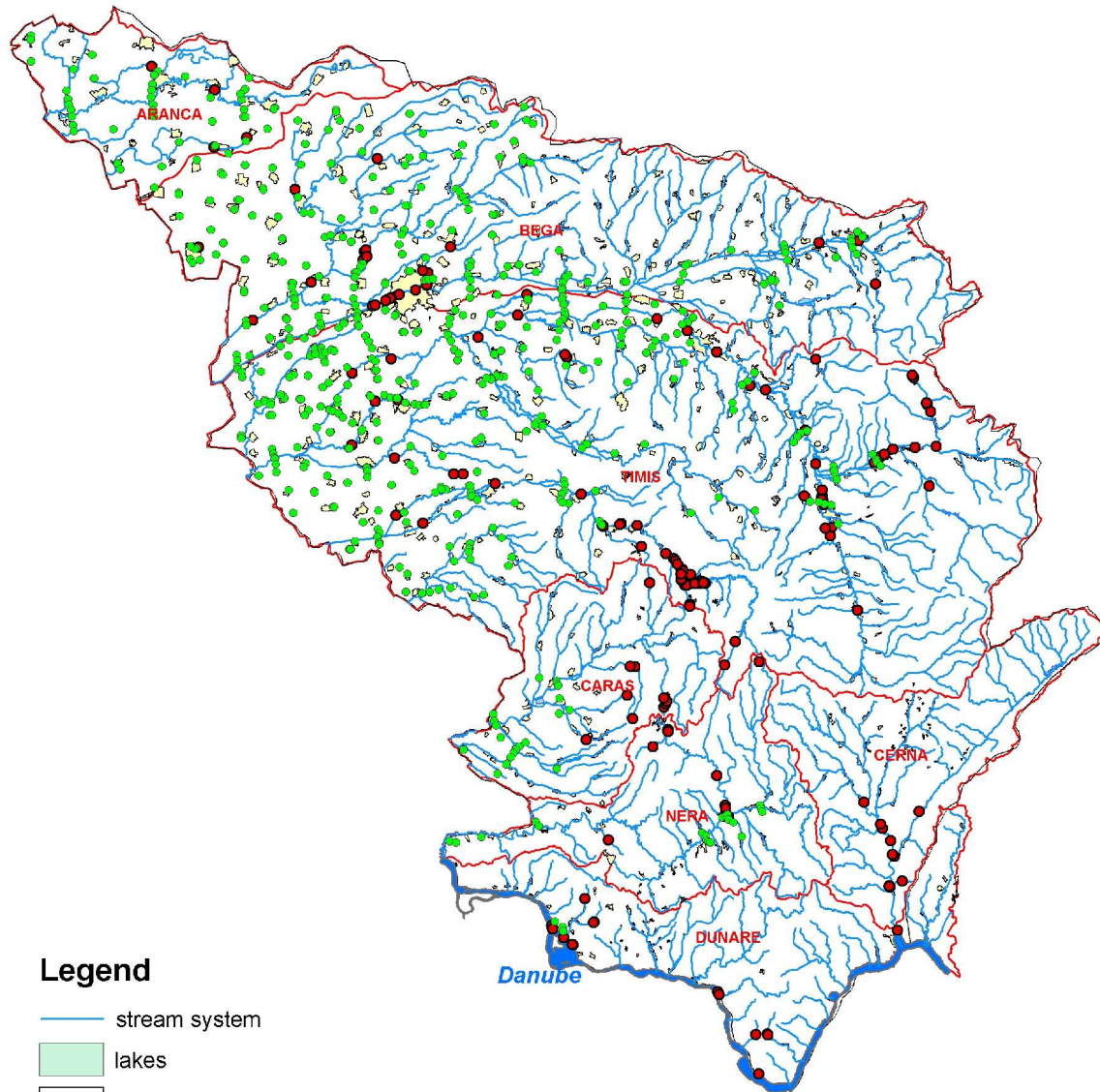
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Another important causes of punctual pollution is the main punctual pollutants sources of Banat Rivers, showed in geographical order, from springs to confluence; they could have a negative influence for the quality and quantity groundwater evolution. They must be treat like an worse factor influence in groundwater monitoring and it could be interpret like a potential risk factor (Figure 5.)

The query building in the Arc-View program, using different fields or some “shapes” of interest, shows they together on the maps (layout), the real situation for a time period which was studied; so using the several layers which must contain one by one, the groundwater (and all the interest information), the soils, the substances, materials and pollution sources, we could be informing and monitoring rather, about manufacturing processes (fields of activity) and materials which created the pollutions, about water quality modeling, about transport and transformations of pollutants and on the other hand, in final, decisions and remediation technologies for ground-water resource conservation and protection, in correlation with the EU Water Framework Directive (2000/60/EC).

## The discharges of water - pollution points in groundwater



### Legend

- stream system
- lakes
- Hydrographic Area Banat
- river basins
- discharges of water
- drillings
- places

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Conclusions: ■

The knowledge of the pollution points (punctual pollution and diffuse pollution) and using the shape with drillings, we could estimate where are the problem areas and how many drillings have to realize for a better observations for all the areas. In this way, the monitoring network of groundwater could be operationally and it will improve significantly the water quality.

**References:**

Water Framework Directive – Development of a Geographical Information System  
Implementing the GIS Elements of the WFD  
Methodology of River Management Plan - 2003

