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MAPPING OF AQUATIC ECOSYSTEMS USING GEOGRAPHYC INFORMATIONS SYSTEMS

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Introduction

Aquatic ecosystems include freshwater habitats such as lakes, ponds, rivers and streams, wetlands, oceans, seas which accommodate water-dependent living species including animals, plants, microbes and provide multiple benefits to humans such as:

- provisioning services (e.g. food, water);
- regulating services (that affect climate, floods, disease, wastes and water quality);
- cultural services that provide recreational, aesthetic, and spiritual benefits
- supporting services such as soil formation, photosynthesis and nutrient cycling.

In the last decades, continuous anthropogenic pressures were exerted on aquatic ecosystems worldwide influencing the water quality and reshaping their natural paths and areas. Early identification of pressures and understanding of the relationship between them and aquatic system could help draw management measures to achieve a good ecological status which is the main target of Water Framework Directive. Thus, in the age of technology, different application tools were developed to rapidly identify target issues on aquatic ecosystems. It is the case of the geographic information system (GIS) which is a valuable spatial system that creates, manages, analyses and maps all types of data.

The main applications that GIS could be used related to aquatic ecosystems are:

- *water quality assessment* (it can be used to integrate data from various sources, including remote sensing and water sampling to assess water quality in lakes, rivers and coastal areas;
- *habitat mapping* (it can be used to map various aquatic habitats such as wetlands, seagrass beds, or aquatic vegetation, providing valuable information on species distribution and biodiversity);
- *hydrological modeling* (it can be used to create hydrological models, to understand flow patterns, flooding risk and erosion potential in aquatic ecosystems;
- *climate change impact assessment* (it can map out, model and predict the impacts of climate change on aquatic ecosystems, including changes in temperature, precipitation and sea-level rise).

Our study aims to apply the GIS tool for mapping two aquatic ecosystems in urban areas of Romania, namely Dambovita River and Bahlui River. The freshwater systems were digitally mapped by vectorising the level curves in order to calculate the altitudinal model and the reference surface.

Materials and methods

Studied areas. Bahlui River has a total length of 119 km, a basin area of 2,007 km² and an average annual flow of 4.88 m³/s. Dambovita River is a water course in Romania, a tributary of the Argeș River with a total length of 237 km, a basin area of 2837 km² and an average annual flow of 19.1 m³/s. The design of aquatic ecosystems digital maps was done using Quantum Gis, version 3.26, Buenos Aires by QGIS Development Team.

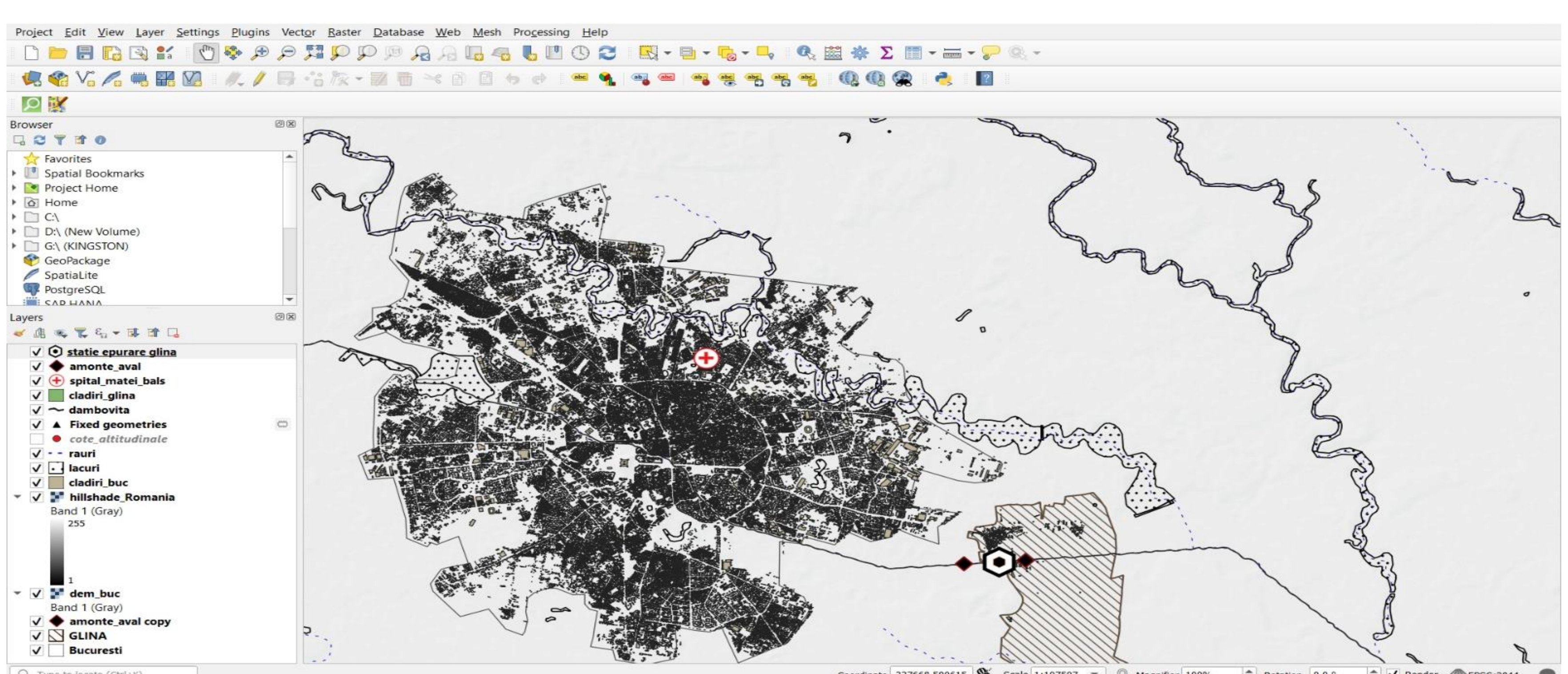

Fig. 1. Quantum Gis, version 3.26 platform used in this study

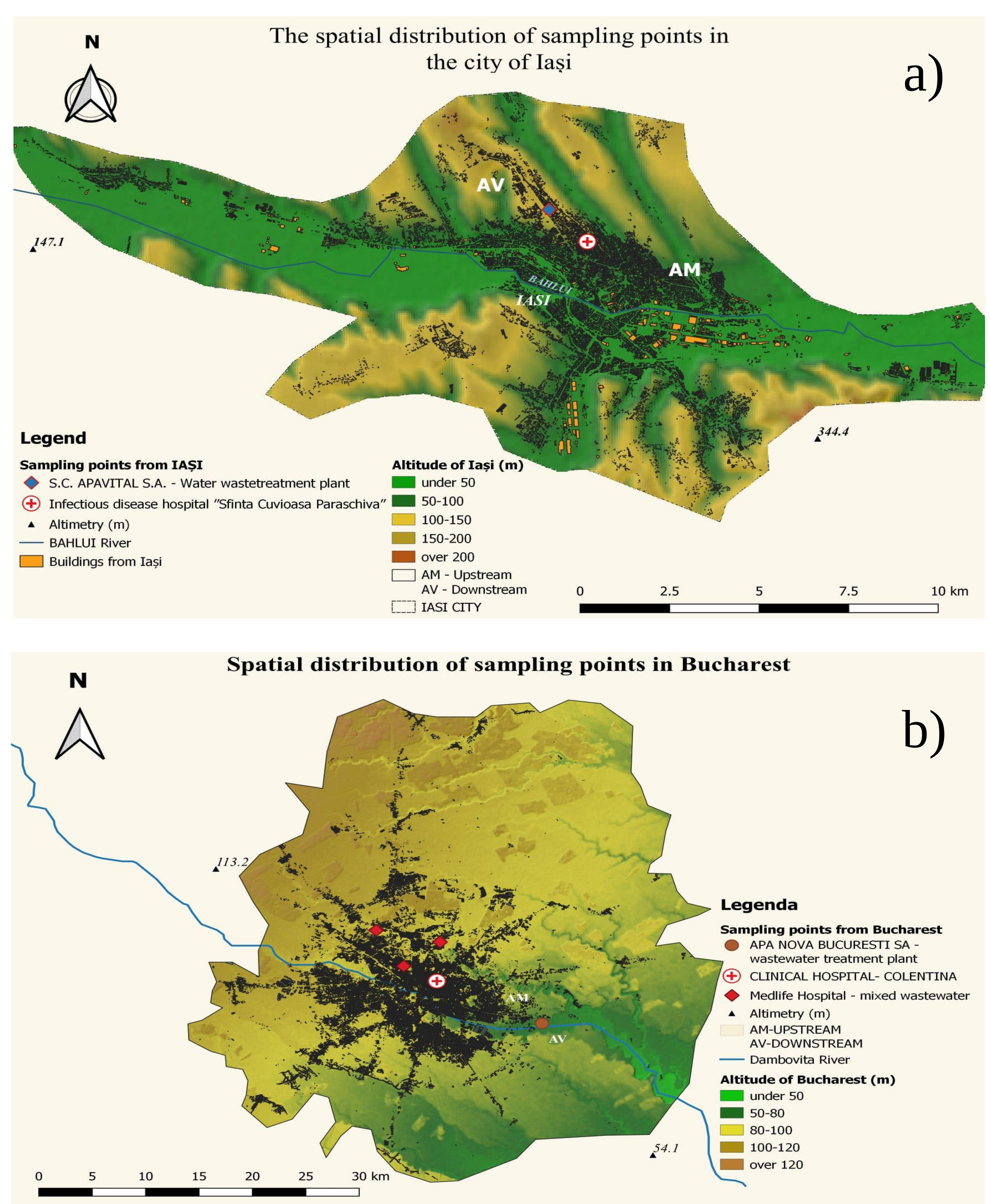

Fig. 3. Spatial distribution of sampling points using GIS in **a)** Iasi (Bahlui River) and **b)** Bucharest (Dambovita River)

Results and Conclusions

The digital representations of Bahlui and Dambovita Rivers showed the spatial distribution of the studied areas and leading us to identify *i)* possible pressure point sources such as hospitals and urban wastewater treatment plants (WWTPs), as well as *ii)* the sampling points upstream and downstream pressure point sources along the rivers length. The wastewater discharge into the river may influence river water quality and implicitly, the biological communities and the stability of the system as a whole.

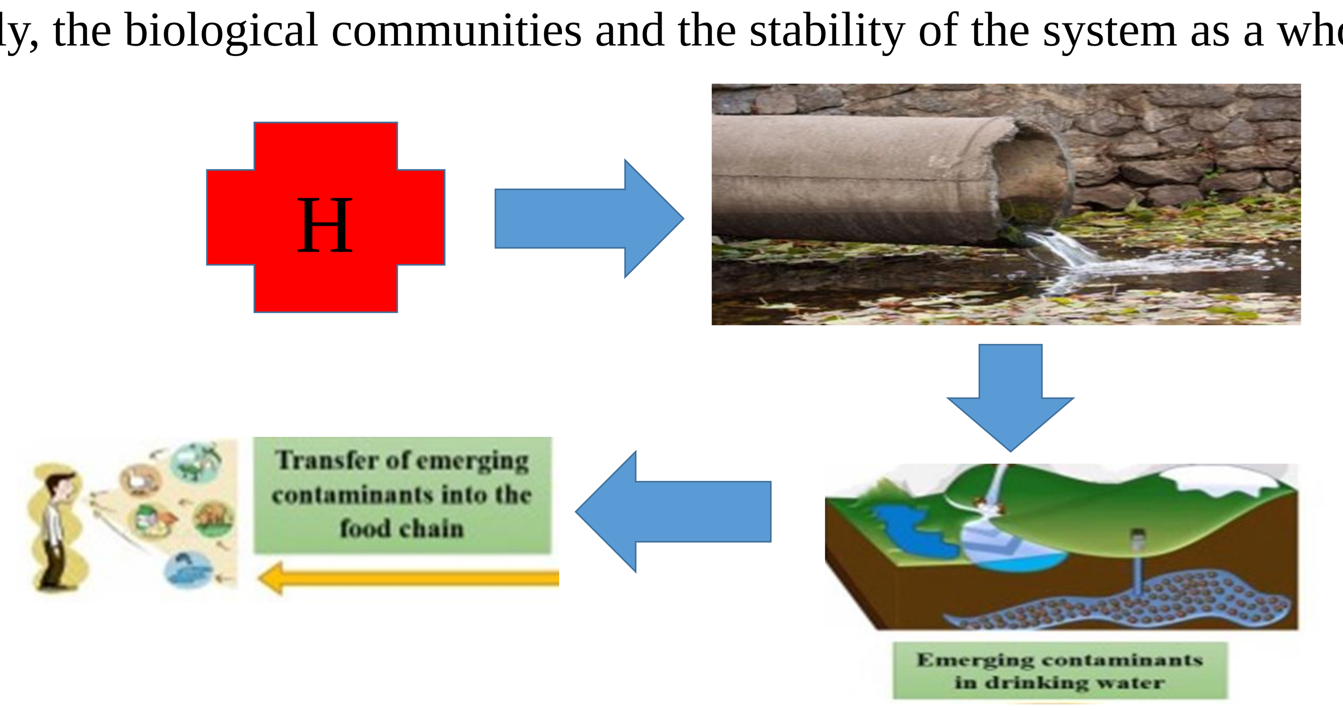

Fig. 2. Possible access path of contaminant in freshwater systems

Although in this study only graphical representation of sampling points and the main possible pressure points were represented, the water quality results were correlated at this point only with high loading of pharmaceutical substances (PhC). Thus, we consider that the general use of pharmaceuticals compounds by urban population associated with the wastewater evacuated from hospitals alongside the lack of technologies for removal of PhC from WWTPs could be correlated with a water quality decrease. Overall, further researches need to be carried out using GIS as a warning tool, for real-time monitoring and response during floods, droughts, as well as other hydrological events.

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