

Detection and assessment of the emerging contaminants in the Ljubljana Basin, Slovenia

- preliminary report



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1. Introduction

Recent investigations show presence of anthropogenic substances in surface and groundwater at relatively low concentrations, which nevertheless represent a potential risk to our environment and health. These substances are emerging contaminants, which are synthetic or of natural origin and include: pharmaceuticals, pesticides, industrial chemicals, surfactants and personal care products. Emerging contaminants are currently very rarely or not at all included in regular monitoring of water bodies.

The boDEREC-CE project deals with the problem of the presence of modern pollutants with the aim of establishing a management strategy for waterworks that guarantees increased quality of drinking water. The project is exploring innovative approaches for monitoring emerging contaminants in 8 pilot action areas in 7 Central European countries. The Slovenian pilot action area is the Ljubljana Basin.

2. Ljubljana Basin

The Ljubljana Basin with an area of 815 km² lies in the upper Sava basin and is the largest closed plane in Slovenia (Figure 1). It is bordered on the north by the mountains; the Julian Alps, the Kamnik-Savinja Alps and the Karavanke, on the west by the Škofja Loka and Polhov Gradec hills, on the east by the Posavje hills and in the south by the Menišija and Krim hills. The altitude of the basin is between 250 m and 730 m.

The Ljubljana basin is divided into 6 subunits:

- Dežela and Blejski kot (NW region)
- Dobrave (NW region)
- Kranjsko-Sorško polje (central NW region)
- Kamniško-Bistriška ravan (N region)
- Ljubljansko polje (central part)
- Ljubljansko barje (southern part)

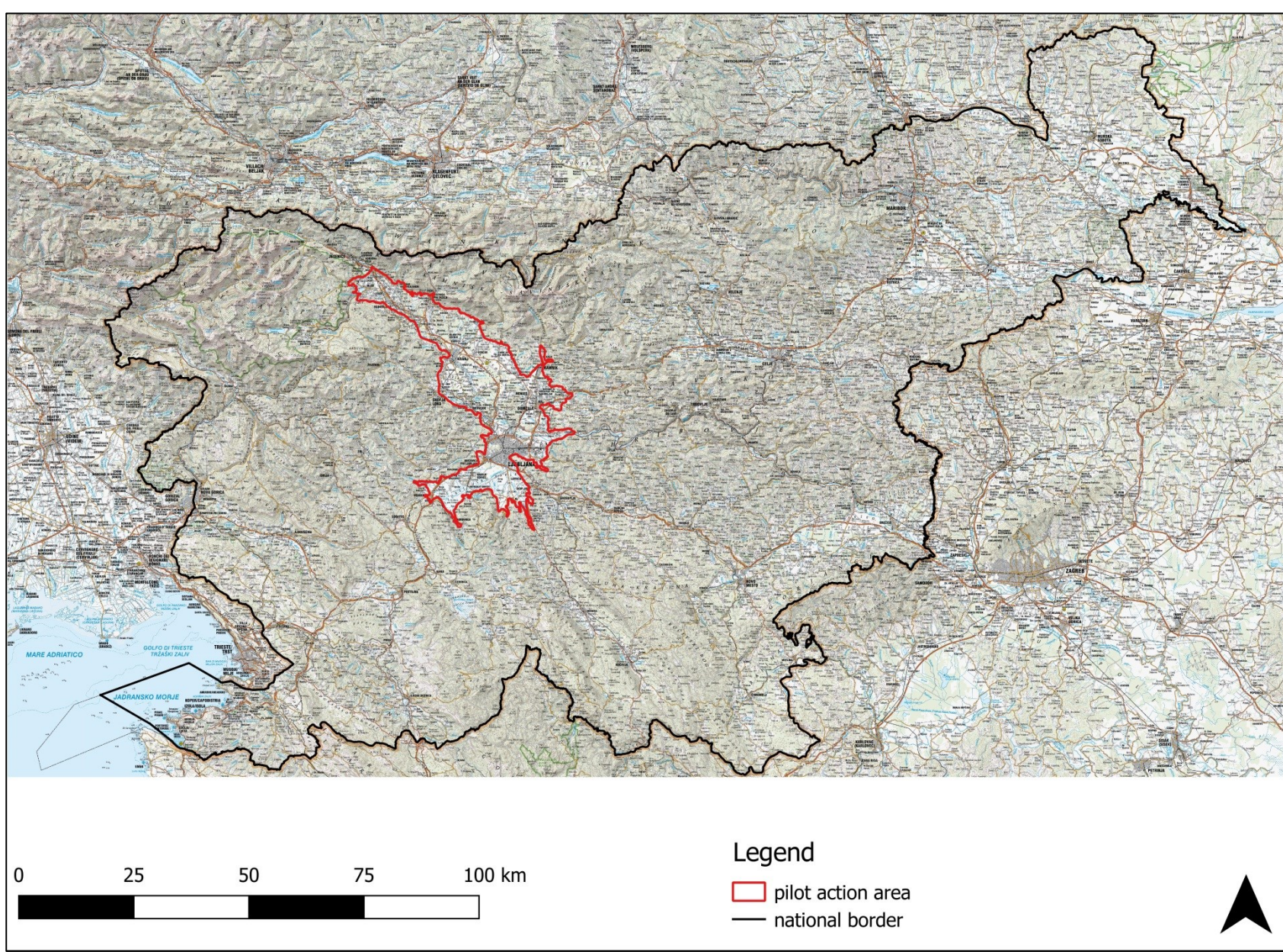


Figure 1: Position of pilot area Ljubljana basin in the territory of Republic of Slovenia

The basin with its central position represents the most important urban, economy and traffic area in Republic of Slovenia where the main roads and rail connection converge. A total of 40% of Slovenian population lives here.

In comparison to forest and semi natural areas, which cover 22% of the basin, the Ljubljana Basin is mostly covered by areas with activities that may introduce new pollutants into the environment, such as agricultural areas, which cover 55% and artificial surfaces, which cover 20% of the basin (Figure 2).



Figure 3: Instalation of passive samplers

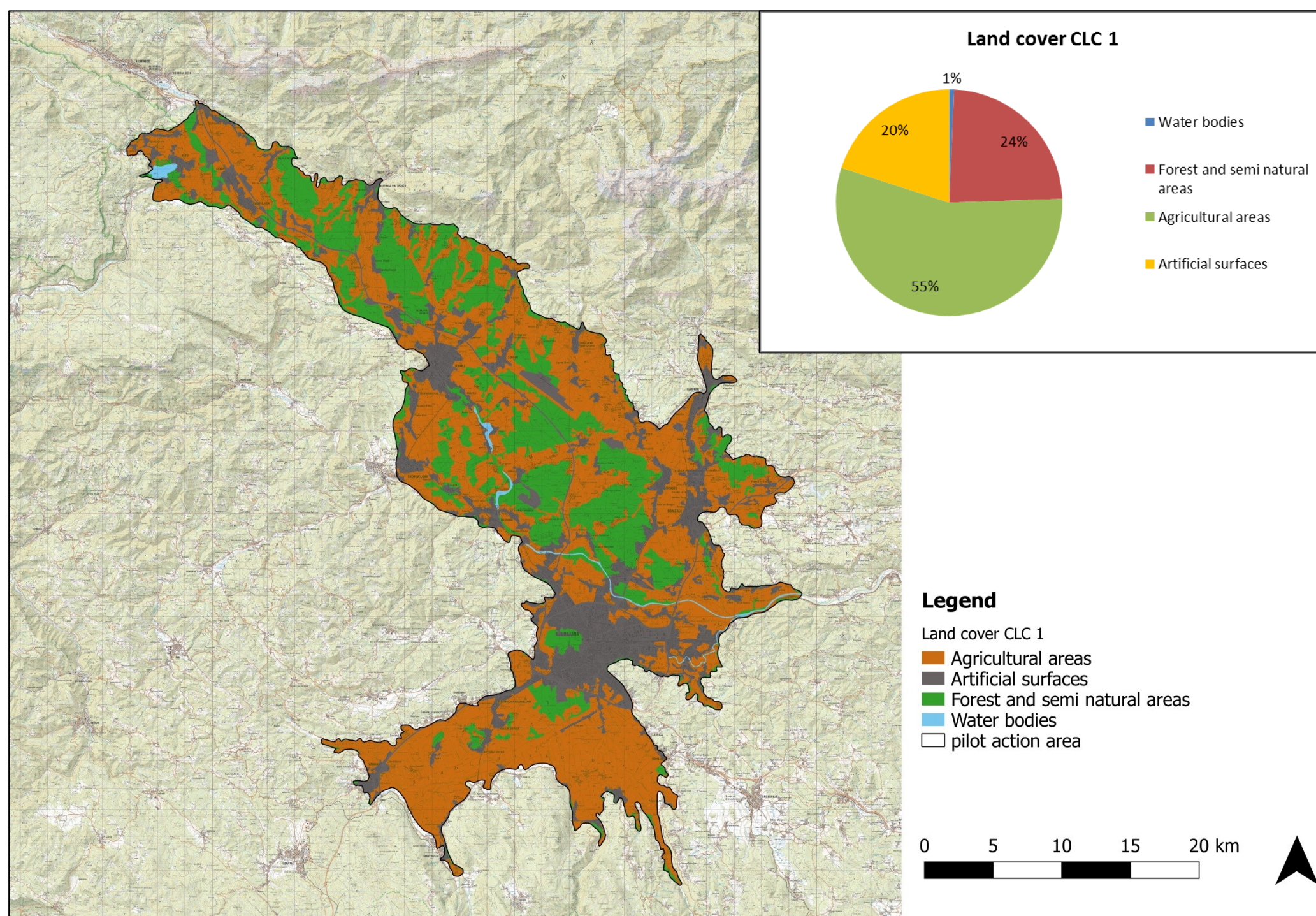


Figure 2: Land use in the pilot area according to CLC1 classification

Potential sources of emerging contaminants in the pilot action area are:

- sewage network
- emissions from industrial facilities
- wastewater treatment plants (Figure 4)
- landfills

The Ljubljana basin is an important drinking water resource for several cities and other settlements. Drinking water protection zones (Figure 7) that protect drinking water sources cover almost a quarter (24%) of the Ljubljana Basin.

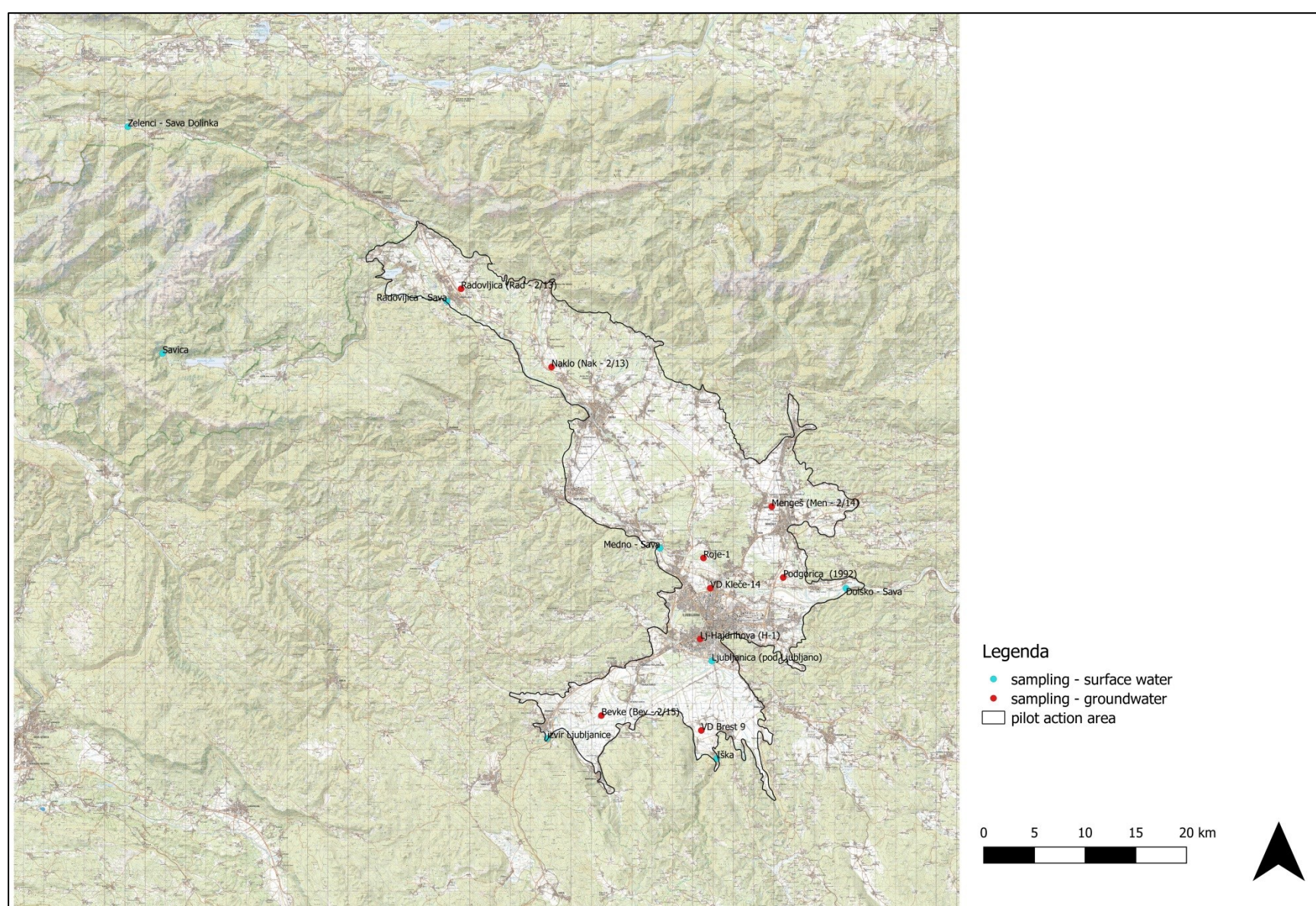


Figure 5: Sampling points of surface and groundwater



Figure 6: Determination of the presence of compounds that catch on active carbon before installation

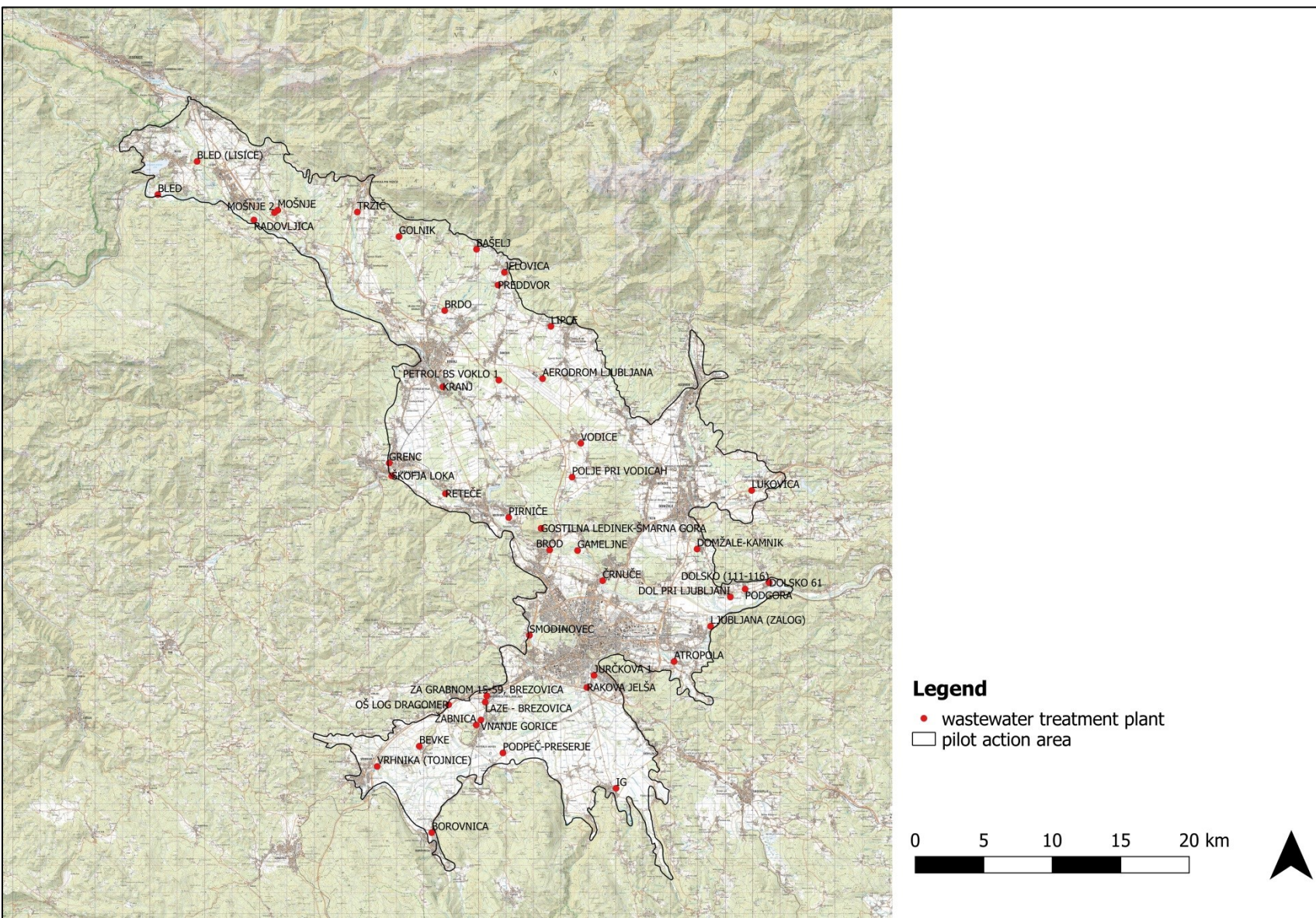


Figure 4: Position of waste water treatment plants

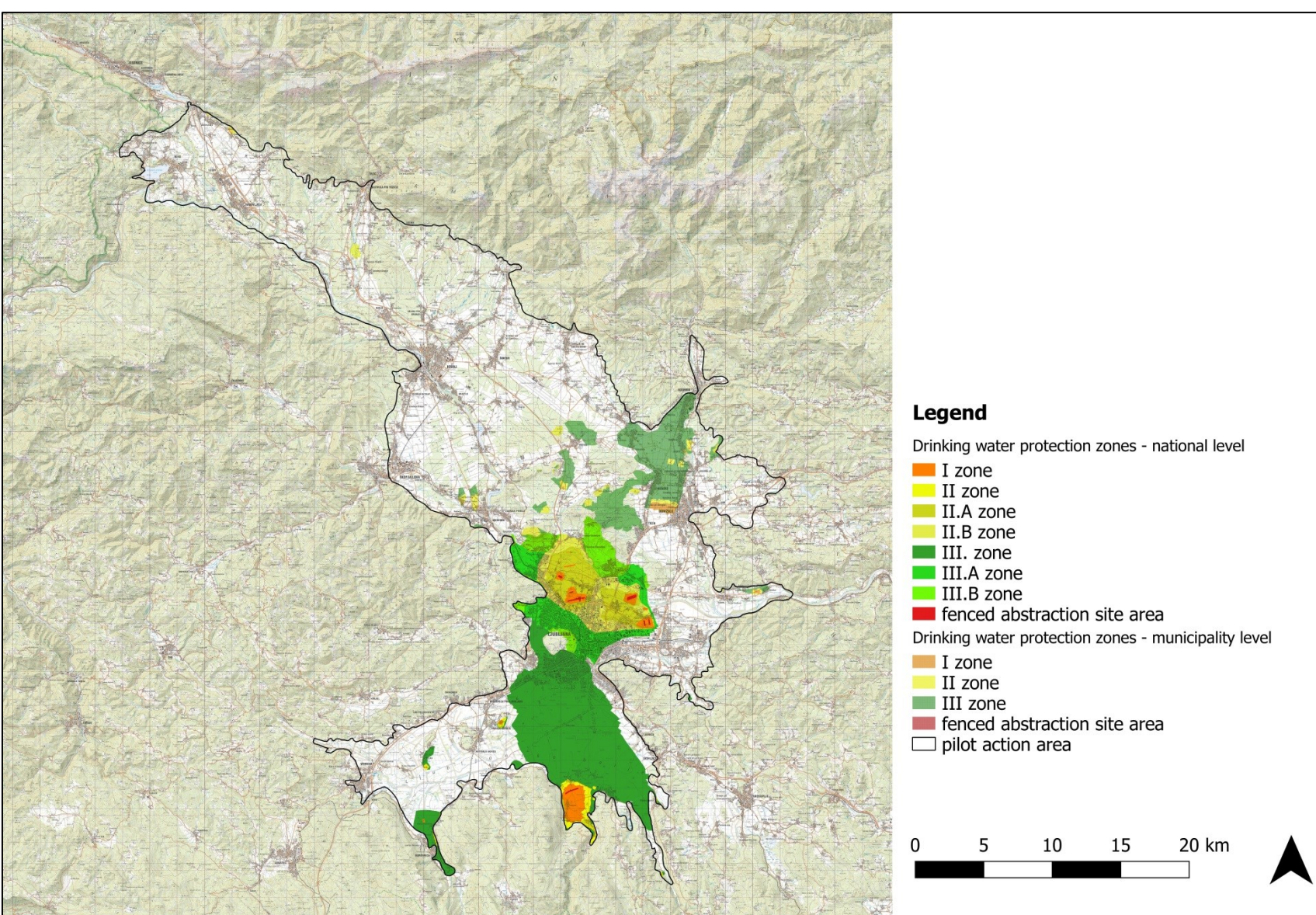


Figure 7: Drinking water protection zones

3. Sampling

In order to develop an innovative approach for monitoring such pollutants in the pilot action area, sampling of surface water (8 sampling points) and groundwater (9 sampling points) is carried out in two phases (Figure 5). In the first phase, passive sampling is carried out with active carbon inserted into a stainless steel mesh, which is installed in a location for approximately 3 months (Figure 3, 6, 8, 9, 10, 11). After collecting the passive samplers, active carbon is dried and the pollutants adsorbed are eluted with dichloromethane. Passive sampling is an analytical method for the qualitative determination of organic pollutants and serves as a preliminary step for the second phase - quantitative determination, which represent active sampling by grab samples of surface and groundwater.



Figure 8, 9, 10, 11: Instalation of passive samplers on surface and groundwater

4. Conclusion

The boDEREC-CE project is not only focusing on the direct study of the behavior of emerging contaminants in the aquatic environment, but also on assessing the effectiveness of reducing the pollution. In addition, activities to inform the public about measures to reduce waste of emerging contaminants will be organized.