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Pilot Action: Bokanjac-Zadar Functional Urban Area

Version 1
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1. Pilot Action FUA Bokanjac-Zadar

Zadar is the oldest continuously inhabited city in Croatia. It is situated on the Adriatic Sea, at the northwestern part of Ravni Kotari region. Zadar serves as the seat of Zadar Country and the wider northern Dalmatian region. The city covers 194 km2 with a population of 75,082 in 2011, making it the fifth largest city in the country. It is known for the Roman and Venetian ruins of its peninsular Old Town.

Zadar is a historical center of Dalmatia, Zadar County's principal political, cultural, commercial, industrial, educational and transportation centre. Because of its rich heritage, Zadar is today one of the most popular Croatian tourist destinations, named "entertainment center of the Adriatic" by the The Times and "Croatia's new capital of cool" by the Guardian. In 2016, Zadar was named "Best European Destination" by the Belgian portal Europe's Best Destination.com after a three-week period of online voting and more than 288,000 cast votes.

In the hinterland of Zadar there is an intensive agricultural activities and some farms. Villages in the hinterland are not equipped with appropriate sewerage system. The water supply in town of Zadar and its neighbourhood is based on groundwater which is very vulnerable. Water resources in Zadar Country are scarce.

Figure 1 City of Zadar

Fig. 2 Zadar and its hinterland

In the hinterland of Zadar there are some villages without sewage system (brown areas on Fig.2) and without landfills. Only 43% of the population is connected to the sewage system. Other households use septic tanks that are mostly permeable and leak directly into the karst underground. Using the content of septic tanks as manure is a rare practice. Several municipalities have already used IPARD funds to improve waste water treatment and for improvement and development of rural infrastructure.

Pollution from this areas can infiltrate quickly in the groundwater according absence of confining layer.

The levels of nitrogen in groundwater are below the limiting values (nutrient management plans have been introduced in the EU accession process).

Between the villages there is some agriculture area where farmers use fertilizers and pesticides. So far, no significant pollution caused by agricultural activities has been registered. The pesticide levels in the groundwater are below the limiting values due to relatively low use.

Several business zones have been established in rural areas, mostly without proper treatment of waste water which is leaking into the karst terrain and groundwater.

Groundwater flows from east to west, and during the rainy season the pollution can reach pumping wells (yellow dots on Fig 2) very fast. Most of the medium-scale and large producers have their own wells using groundwater for drip irrigation. Several large-scale irrigation systems are being planned and likely to be funded from Rural Development Programme.

According to the hydrogeological classification Bokanjac-Poličnik aquifer is defined as karst aquifer, built of karstified carbonate rocks (typical Dinaric karst environment). This hydrogeological system is a complex karst system that consists of a few subcatchments which cannot be precisely delineated according to current knowledge.

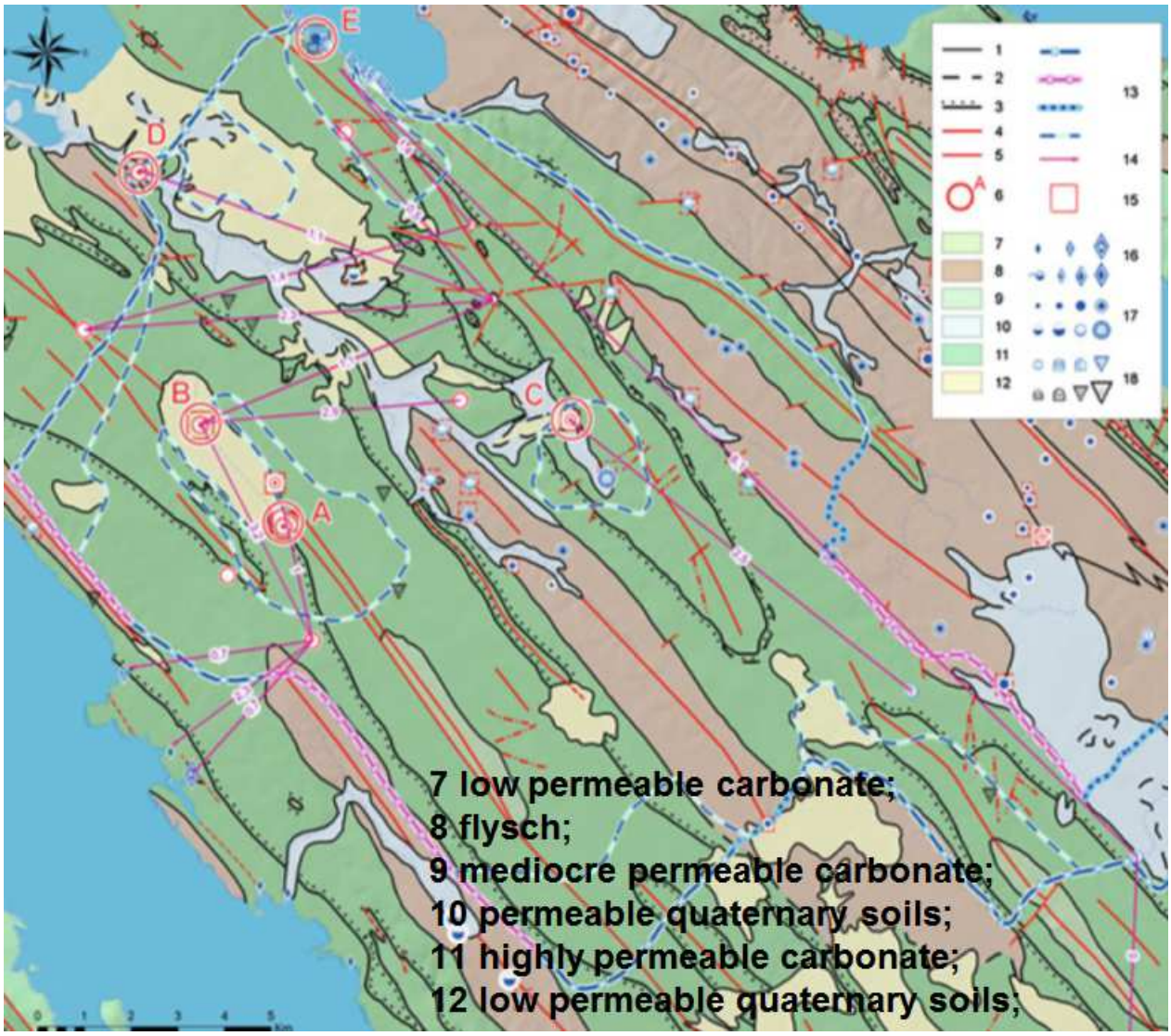

Fig 3. Geological structure of Bokanjac-Poličnik Aquifer

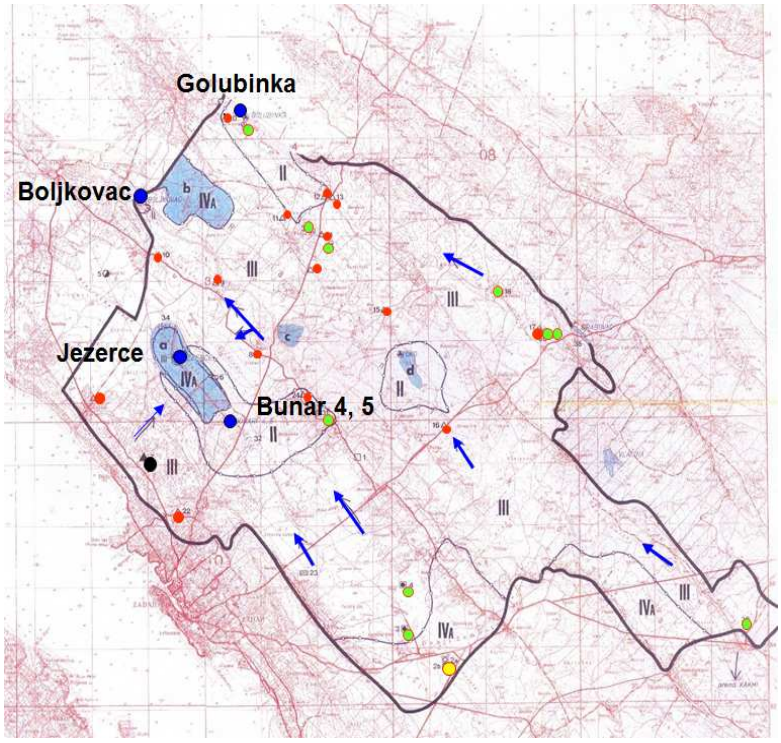

Fig 4. Groundwater flow direction and pumping wells

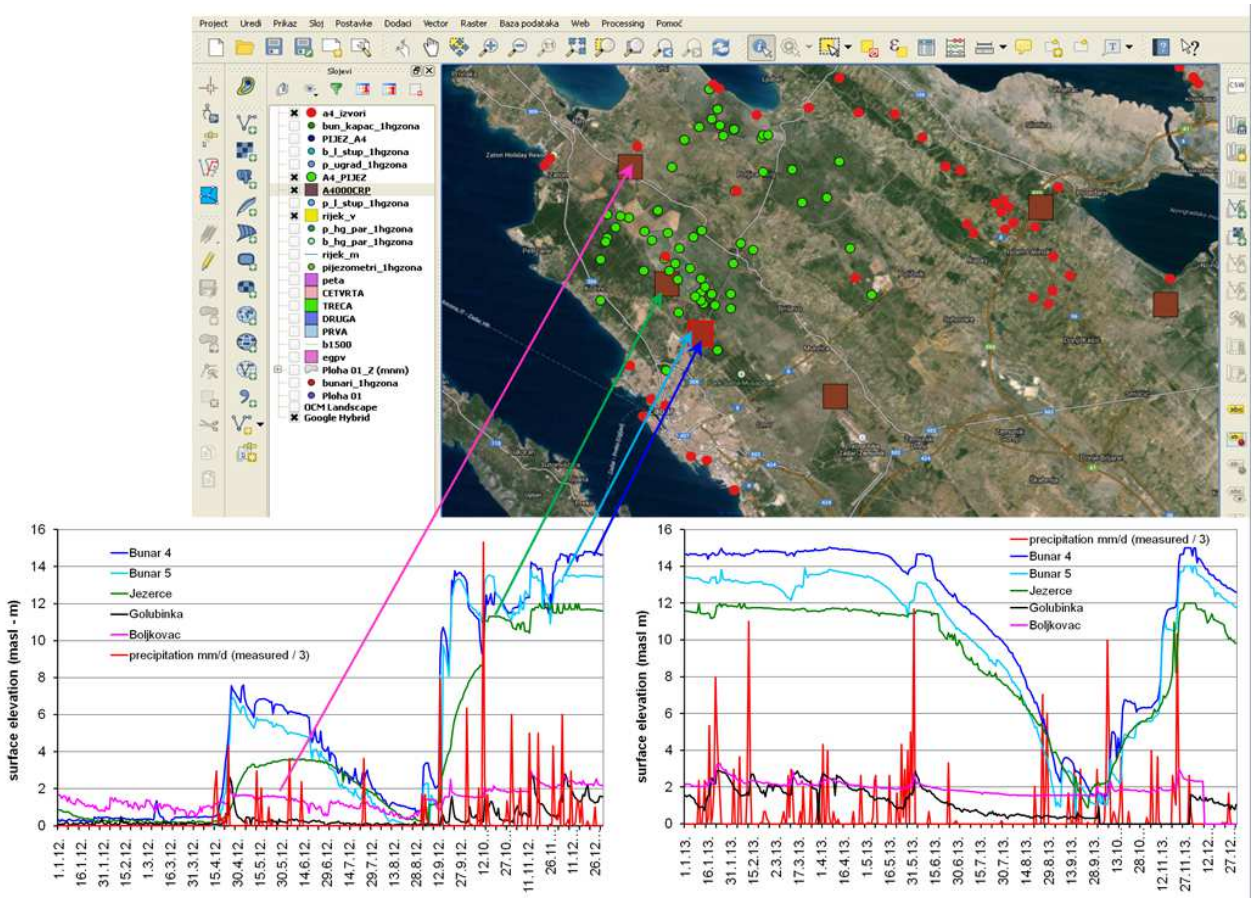

Fig 5. Monitoring of the groundwater level and quality is only on the pumping wells

Investigation approach should allow an effective implementation of the operative technical measures in order to fulfil the strategic task:

- **Record of groundwater quantity and its quality**: recording and description of the groundwater status in terms of quantitative and qualitative aspects;
- **Identification of the sources of pollution**: possible influence of agriculture, sewage system and dump sites;
- **Prioritisation**: Ranking of the pollutant impacts to prioritise the particularly relevant sources of pollution on which remedial actions should be concentrated and for the exclusion of irrelevant subordinate sources of pollution from the further treatment.