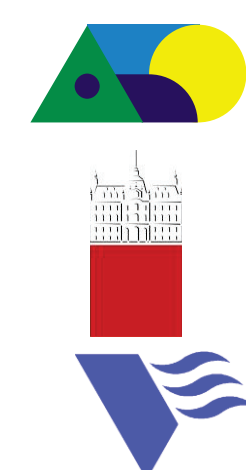




# GROUNDWATER QUALITY AS A VARIABLE IN TIME AND SPACE

P. Souvent <sup>1</sup>, B. Čenčur Curk <sup>2</sup>, B. Bračič Železnik <sup>3</sup>



<sup>1</sup> The Environment Agency of the Republic of Slovenia, Vojkova 1b, 1000 Ljubljana, [petra.souvent@gov.si](mailto:petra.souvent@gov.si)

<sup>2</sup> Faculty of Natural Sciences and Engineering, Aškerčeva 12, 1000 Ljubljana, [barbara.cencur@quest.arnes.si](mailto:barbara.cencur@quest.arnes.si)

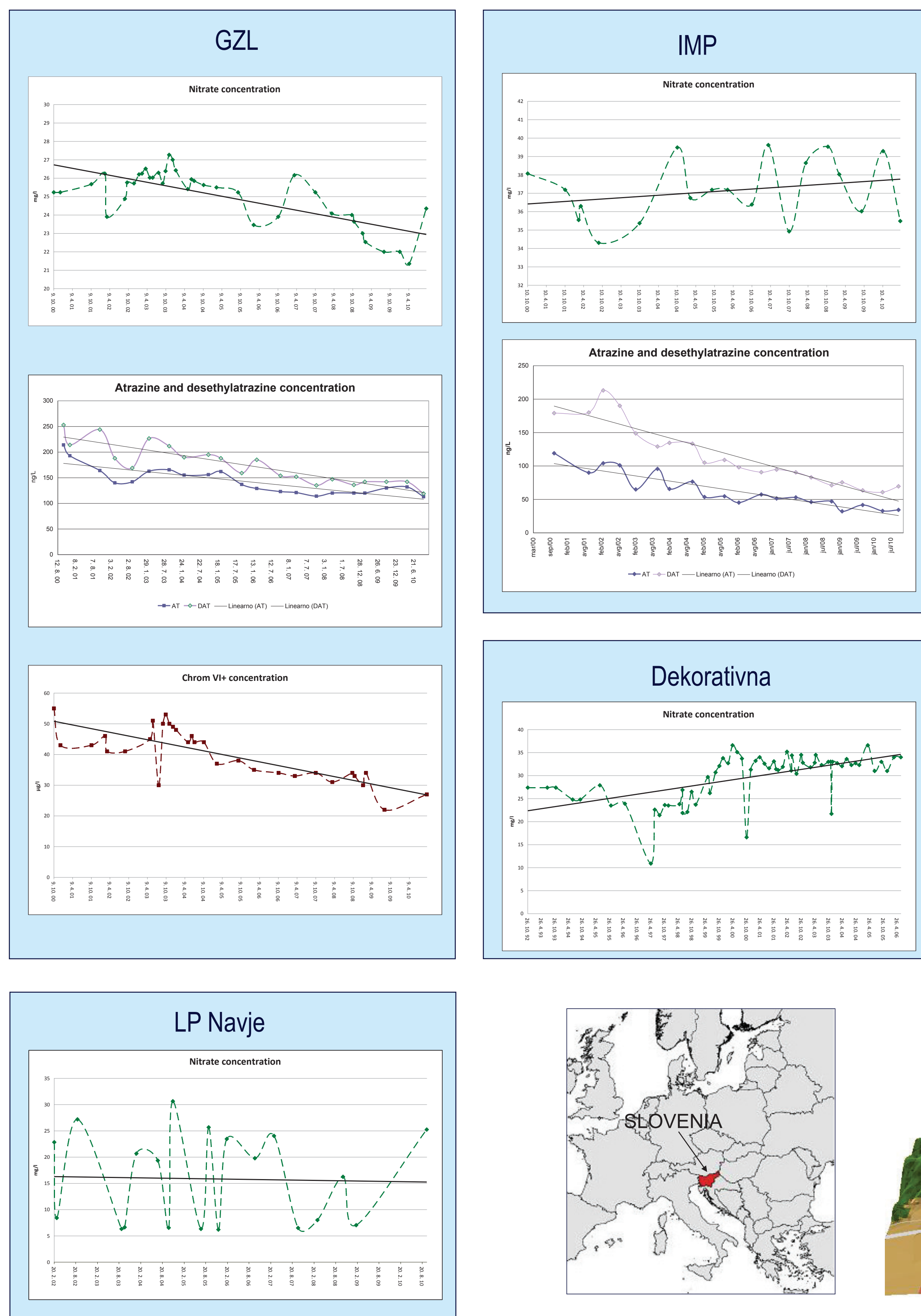
<sup>3</sup> Public Water Supply Company JP Vodovod-Kanalizacija d.o.o., Research Department, 1000 Ljubljana, [bzeleznik@vo-ka.si](mailto:bzeleznik@vo-ka.si)



## INTRODUCTION

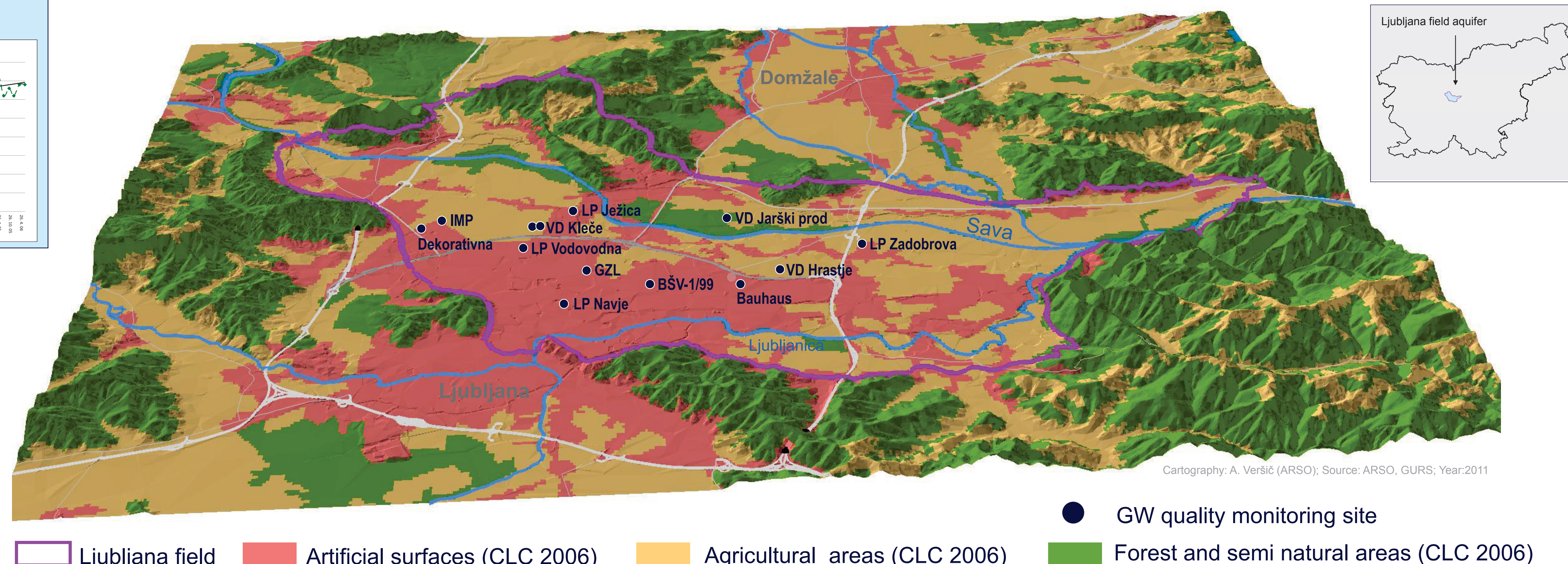
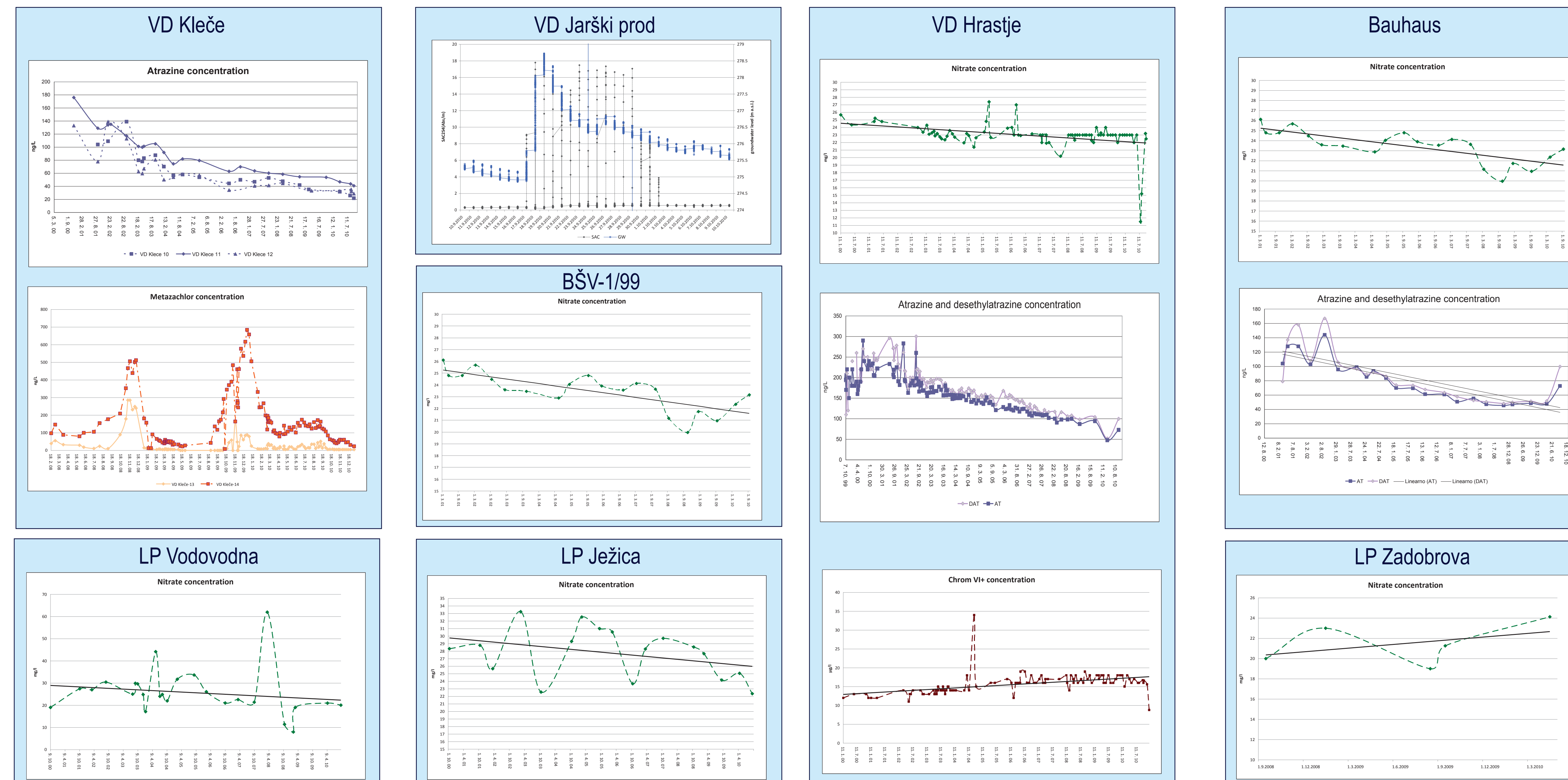
Groundwater quality is one of the most important parameters in drinking water supply management. For safe drinking water supply, we have to control the quality of groundwater in the water wells recharge area. The frequency of sampling should take into consideration the patterns of existing time series that inform us when, where and why the pollutions appear.

Analyzing long time series of groundwater quality data give us the information that groundwater quality vary during time and space. In the time, the critical pollutants change, as well as the source of pollution may change and as a consequence, the detection time change.



## LJUBLJANA FIELD AQUIFER

is an unconfined intergranular aquifer. The phreatic groundwater is recharging from rainfall and from the river Sava. The three quarters of aquifer lies beneath the urbanised and agricultural area. The anthropogenic activities modify the entire aquifer area, impact the hydrological balance, reduce the aquifer recharge, influence the groundwater flow characteristics, change the water source availability and restoration and influence the quality of groundwater.



## CONCLUSIONS

Graphical presentations of long time groundwater quality series confirm the influence of past and present land use on groundwater quality. In the north western part of Ljubljana field aquifer the agriculture is prevailing land use and the pesticides distribution can be followed along the groundwater flow lines; the groundwater flow direction is from NW to SE of the Ljubljana field. The most pollutants in higher concentration are detected in the central part of the aquifer, where the industry and urbanisation occur. Chromium VI+ is a historical pollutant from 70-ties and has the origin in industry in the western part of the aquifer. The cloud of chromium VI+ pollution came after 30 years to the water field Hrastje, where slightly increased concentration regarding previous years are detected in the last ten years.

Hydrological and meteorological conditions in combination with land use have important influence on pollutants concentration during the year. This can be clearly seen in the case of metazachlor pollution in water field Kleče.

Pollution in Ljubljana field aquifer can be divided to long term pollution (e.g. pesticides) and to extreme events and accidents (e.g. microbiological pollution).

The trends for most pollutants are decreasing, what is a good prediction for the future. Ljubljansko polje aquifer will remain a source of a good drinking water that doesn't need any cleaning and treatment.



## AKNOWLEDGEMENT

Research work within CC-WaterS project is supported by means of the European Regional Development Fund.