Republic of Slovenia
MINISTRY OF AGRICULTURE AND ENVIRONMENT
SLOVENIAN ENVIRONMENT AGENCY

GROUNDWATER QUALITY OF SPRING KRKA IN GROUNDWATER BODY DOLENJSKI KRAS (SLOVENIA)

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Introduction

Groundwater quality in Slovenia is monitored within the framework of national monitoring system by the Slovenian Environment Agency. In past years, between 2007 and 2011 (Gacin et al., 2009, 2010; Gacin, Mihorko, 2011, 2012) bigger pollution was discovered in karst spring Krka inside the area of Dolenjski kras, which is situated south - east from town Grosuplje (Figure 1).

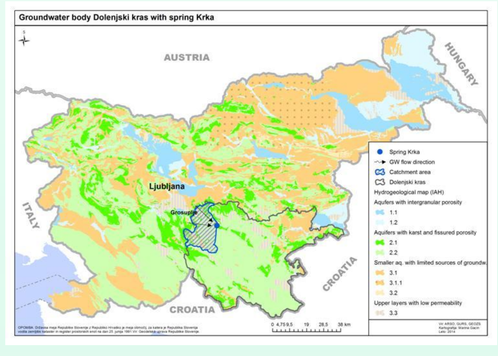

Figure 1. GW body Dolenjski kras with spring Krka in south - east part of Slovenia (From Prestor et al., 2005, 2006; from Petrič, 2007)

Pollution

High concentrations of different pesticides - metolachlor, atrazine, simazine, prometryn, terbutylazin, terbutryn, metamytron, diuron, metamytron, isoproturon and metazachlor, were detected. In Slovenia, terbutryn and diuron are registered as biocides and they are used in construction industry as additive in coats for wall protection. Biocides like diuron and terbutryn are conventionally used in paints to control fungi, algae, bacteria and other microorganisms that can colonize building facades. After discovering the pollution actions were taken to find a source of it.

Risk of input and pesticides leaching

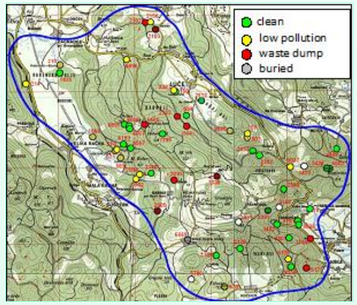

Figure 2. Catchment area of spring Krka with caves and shafts which are often waste dumps

Groundwater quality research monitoring

In 2011 and 2012 research monitoring programme was prepared with new monitoring points in the hydrological catchment area of spring Krka. Monitoring activities were taken in surface waters in the Grosuplje area. New measuring points on Podlomščica in Malo Mlačevo, Grosupeljščica in Veliko Mlačevo and ponors Dobravka and Šica were included. Samples were taken also in stream Bičje which is situated in the area of Grosuplje urban waste water treatment plant discharge (UWWP) (Figure 3, 4). Proper sampling frequency was taken according to different hydrological situation. Our research detected pollution in this area.

Investigation of caves

Catchment area of spring Krka is situated SE from Grosuplje (Petrič, 2007). It is forest area with many caves and shafts which are often used as illegal waste dumps (Fig. 2) (Čekada, 2011). Due to the suspicion of bigger pollution in this area Speleological Association of Slovenia was engaged to check and clean 53 caves.

Results

Sediment samples and groundwater samples were taken in 36 caves and they were analised for pesticides. All results were below the limit of quantification. There were no pesticides among the garbage in caves, just packages, domestic and animal wastes were found.

High concentrations of pesticides were discovered in ponor Dobravka (metolachlor, atrazine, terbutryn). In samples taken in stream Bičje below urban waste water treatment plant discharge at 23.2.2012, high concentrations of terbutryn, diuron and isoproturone were detected (3,6 µg/L, terbutryn, 7,9 µg/L - diuron, 6,4 µg/L - isoproturone). Upstream of the urban waste water treatment plant pollutants were below the limit of detection. The same pesticides and also other were detected in Podlomščica in Malo Mlačevo, about 1 km downstream from urban waste water treatment plant. In sample taken at 23.11.2011 higher concentrations of metolachlore (0,82 µg/L), atrazine (0,61 µg/L), terbutylazin (0,31 µg/L) and terbutryn (0,81 µg/L) were discovered at this location.

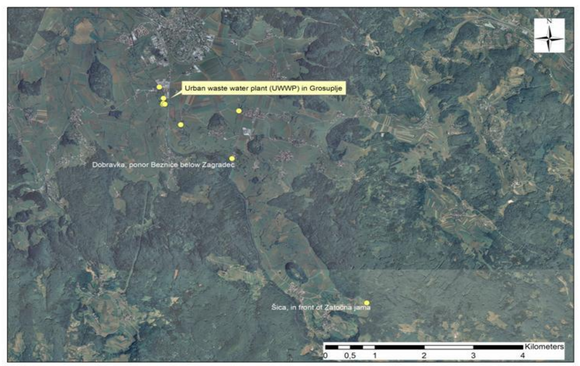

Figure 3. Surface waters in catchment area of spring Krka

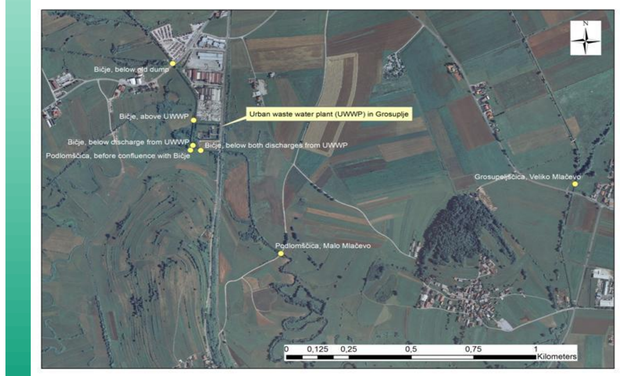

Figure 4. Monitoring points in the area of Grosuplje UWWP

Conclusions

Appearance of terbutryn and diuron downstream from Grosuplje led us to conclusions that a company exists working with that kind of substances which discharged its wastewater to urban waste water treatment plant. The competent authorities have confirmed our findings with supervisory reviews. They found construction company in Grosuplje which used biocides in manufacturing processes and discharged them with wastewaters to stream Bičje. Metolachlore, atrazine, terbutylazin, terbutryn also indicate non proper use in agriculture or other human activities.

References

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