GROUNDWATER QUALITY IN MURA VALLEY (SLOVENIA)

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Introduction

Mura valley is one of two CC-WaterS project's test areas in Slovenia. It is situated in the NE part of the country **(Fig. 1)**, which is the western part of the Pannonian basin. It is an alluvial plain among hills with altitudes up to 400 m, stretching from NW to SE. In the southern part of the valley flows Mura river and in the northern part of the valley the Ledava river . The groundwater recharges from precipitation (80 %) and from Mura river (20 %). The porous aquifer in this area is unconfined with a mean thickness of 17 m. Mean depth to groundwater is 4 m. Most of the aquifer lies beneath agricultural area.

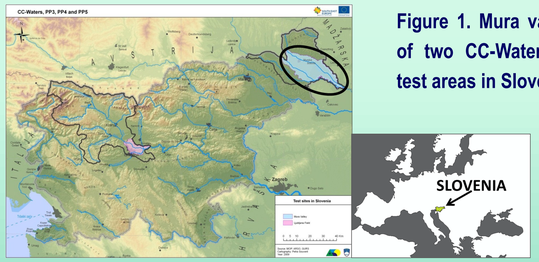

Figure 1. Mura valley is one of two CC-WaterS project's test areas in Slovenia

Groundwater quality monitoring

There are 9 groundwater quality monitoring stations in Mura valley **(Fig. 2)**. The national monitoring is performed by the Slovenian Environment Agency twice a year. The data's periods range from 1995 till 2010.

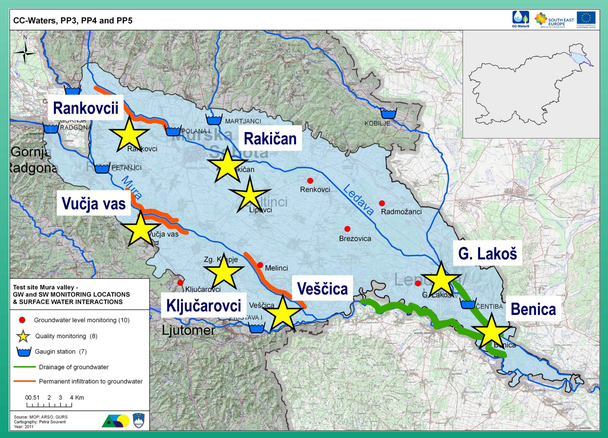

Figure 2. Groundwater monitoring stations in Mura valley

Groundwater quality trends

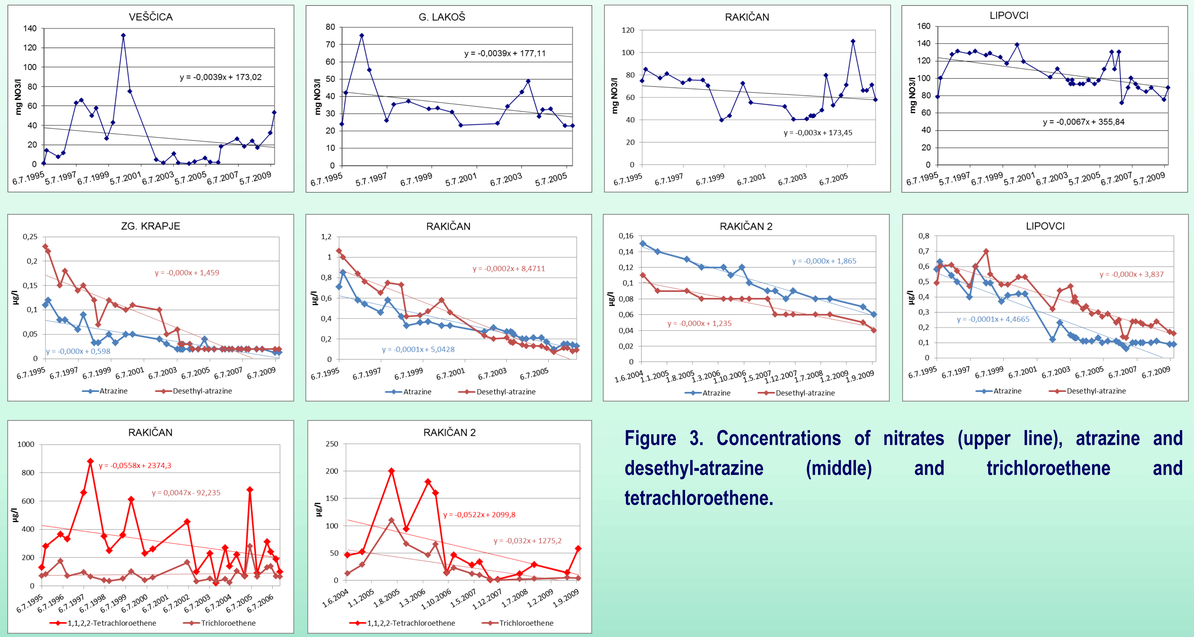

Figure 3. Concentrations of nitrates (upper line), atrazine and desethyl-atrazine (middle) and trichloroethene and tetrachloroethene.

Risk of N input and pesticides leaching

Based on number of animals and fertilization practices a consumption of mineral nitrogen (N) from fertilizers and organic nitrogen from manure on agricultural land were estimated and therefore the risk of N leaching to groundwater. The risk is high when the N input is larger than 250 kg/ha. Vulnerability of the area to the pesticides that are mobile enough to endanger the groundwater was also determined. **(Fig. 4)**

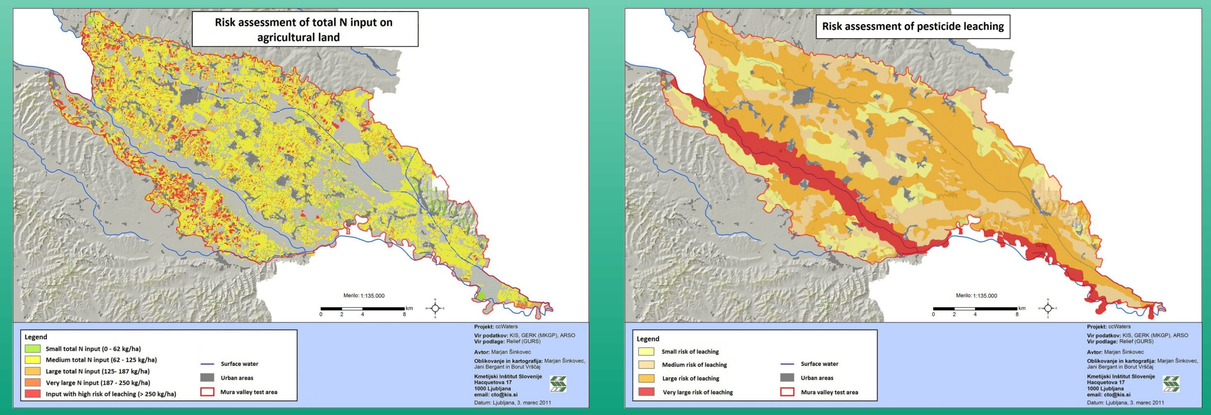

Figure 4. Risk assessment of total N input (left) and pesticides leaching on agricultural land of Mura valley test area

Results

The major groundwater pollutants in the Mura valley are nitrates, atrazine, desethyl-atrazine, trichloroethane and tetrachloroethene. National groundwater quality monitoring is carried out twice a year, so some polluting events could be missed. The nitrate concentrations in the past were up to 140 mg/l. Concentration trends are decreasing and are now below 60 mg/l. Concentrations of atrazine and desethyl-atrazine, are decreasing as well and are below 0,1 µg/l. Trichloroethene and tetrachloroethene were detected downstream of main city in Mura valley, in the maximum concentrations of 280 µg/l in June 2005 (trichloroethene) and 880 µg/l in October 1997 (tetrachloroethene). **(Fig. 3)**

Input estimation of the total nitrogen (N) (mineral and organic fertilizers) in the Mura valley shows, that the risk of leaching is enlarged in the areas, where the N input is larger than 250 kg/ha, this is at 6,3 % of all agricultural areas. Prediction for the period 2021-2050 indicates that the leaching of N could increase, but no more that 5 %. The high risk of leaching of pesticides can be expected on 60 % of the Mura valley area. According to expert judgment, the climate conditions during 2021-2050 (increase of mean annual T for more than 0,5 °C and increase of precipitation) will lead to a faster degradation of pesticides and therefore smaller chance for pesticide residuum to reach the groundwater.

Conclusions

It can be summarized that the trends for most pollutants in Mura valley are decreasing, what is a good prediction for the future. It can be concluded that the climate change will slightly reduce the danger of leaching into groundwater but the extent of it will nevertheless stay comparable to the present condition.

Aknowledgement

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