

# Contamination and protection of water sources - practical cases in the Czech Republic

Petra Opletová

Mendel university in Brno, Czech Republic

Zemědělská 1, Brno, 613 00, e-mail: [oppeltova@mendelu.cz](mailto:oppeltova@mendelu.cz)

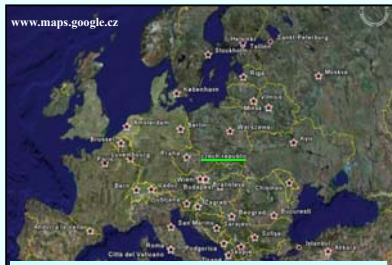


Fig. 1: Czech Republic situation in Europe

## INTRODUCTION

The areas of interest are located in CR in the South Moravia Region (Fig.2).

**IVANČICE SPRING AREA** comprises a series of 9 hydrologic boreholes and provides water for 30 000 inhabitants.

In 1985-86 hygienic protection zones (HPZ) were established. Level 1 HPZ is common for all 9 hydrologic boreholes (13,5 ha) and Level 2 HPZ is divided into outer (827 ha) and inner protection zone (57,8 ha).

The whole Level 1 HPZ is fenced and there are permanent grasslands. The area of Level 2 HPZ is agricultural and forestry used and there are municipalities although.

The spring area is situated in nitrate vulnerable zones.

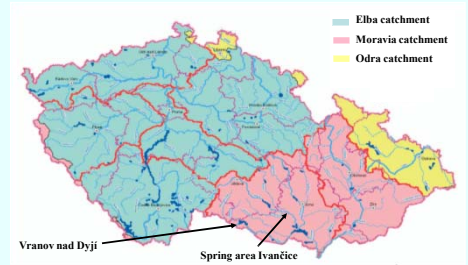


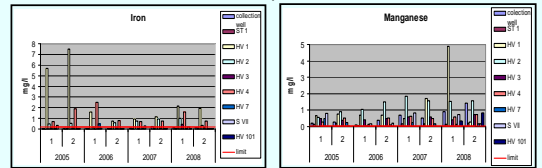
Fig. 2. Spring area Ivančice and Vranov n. Dyjí basin - localization in Czech Rep.

## Water quality evaluation - Ivančice

Raw water complies with requirements for drinking water quality in most chemical, physical, microbiological, biological and radiological indicators. Between problematic indicators belongs manganese and iron (Fig.3,4).

The concentration limit of manganese and iron was exceeded in most boreholes at each analysis. Hydrogeological assessments confirm the natural origin of manganese and iron pollution.

The manganese and iron concentration is reduced in water treatment plant and after the treatment the values already comply Regulation No. 252/2004 Coll. for drinking water, as amended.



In 2006 temporarily increased Cl, SO<sub>4</sub><sup>2-</sup> and COD concentrations. This could be the floods consequence that had been there in March 2006. The agriculture in arable land surround the spring area could be an important source of the diffuse pollution. The processed results of drinking water samples show that in the last five years the maximum nitrate limit has not been exceeded. At present, agricultural management relies on the Nitrates Directive and it is necessary to respect the Action Programme principles of this Directive.

Former black dump consisted of building debris and excavated soil could be the potential source of drinking water contamination. There may be indefinite amounts of unknown harmful substances. Currently, the dump is covered and the old grass covers its surface. For now, the influence of the dump on the water quality in the spring area has not been found. Due to ignorance of the exact dump composition, in order to protect the water sources it is necessary to include the dump in to the proposed protection zone of second level. In the future, it is possible to build several monitoring boreholes in the direction of groundwater flow.

## Protection zones propose

Original HPZ were cancelled and new protection zones (PZ) were established. Level 1 PZ extension is the same like original level 1 HPZ (13,5ha) and forms the immediate surroundings of collecting boreholes (Fig. 5). The extension of level 2 PZ will be significantly reduced compared with the original level 2 HPZ (Fig. 1). The area of interest is located in nitrate vulnerable zones and the farmers must comply the regime according to the Nitrates Directive and good agricultural practice. In the case of observe all conditions in nitrate vulnerable zones it isn't necessary to include such a large territory to the level 2 protection zones and propose other special regime.

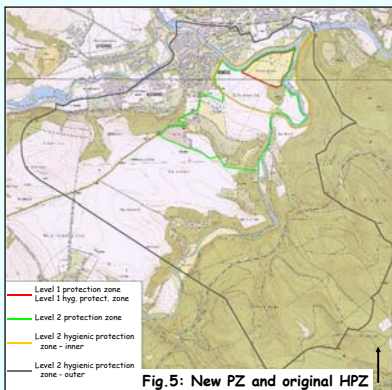


Fig. 5: New PZ and original HPZ

## Spring area intensification

In the future, the development and construction of residences is expected in the area of interest. At present, this trend is limited by the deficiency of water sources. The permitted ground water intake from the spring area is 30,9 l.s<sup>-1</sup>. Another proposed project which deals with the intensification of spring area Ivančice is proposed. The owner and the operator of the water supply deal with this project. The project substance is continue to use perspective intake objects (HV 3, HV 7, St 1, S VII, HV 101) and their yield increase by managed and unmanaged infiltration of surface water.



Fig. 6 : Level 2 HPZ - outer



Fig. 7: Former black dump



Fig. 8 : Old cow house in Level 2 HPZ

**VRANOV NAD DYJÍ RESERVOIR** is not part of waterworks reservoirs, however it is very important source of a drinking water (for 200 000 inhabitants). The hydrology catchment is very extensive - 2211,8 km<sup>2</sup> (47% in Austria). It become a drinking water resource in 1982 and the water from this source supplies 85 000 habitants. The intake object is located 3,5 km from the dam of the reservoir on a floating pontoon (Fig. 9) in Jeleni zátoka (Bay of Deers). The stream width is about 250 m at this point. Banks are very steep and rocky, without the possibility to access water from the bank - out of reach of the intake object facility. Landed estate situated in the catchment area in the Czech Republic are used as agricultural land 60,2 %, forests 31 %, water areas (including reservoirs) 2,5 %, build up areas 0,9 % and others 5,4 %.



Fig. 9: Floating pontoon

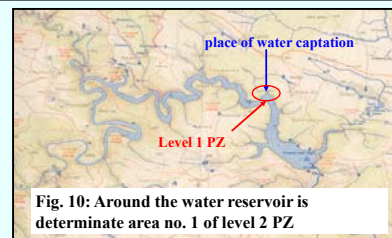


Fig. 10: Around the water reservoir is determinate area no. 1 of level 2 PZ

## Protection zones

Borders and regime of the PZ around Vranov reservoir have changed several times during last 30 years. Originally HPZ (level 1, 2 and 3) were established in 1984 by previous legislation and included all the catchment in the Czech Republic (1159 km<sup>2</sup>). PZ revision took place in 2001. Under the current legislation exists level 1 PZ around the point of intake, and area no. 1 of level 2 PZ surrounding the whole reservoir (protection stripe around the water reservoir) (Fig. 10).

It is difficult to determine all risk factors on their basis to establish other necessary level 2 PZ, because the reservoir basin is very wide. The reservoir is used as a multifunctional system including tourism, which is the most problematic matter for waterworks interest.

It is important to undertake detailed risk analysis in the river basin above the water intake to establish other level 2 PZ. The most important sources of pollution in the basin include wastewater and agriculture. Currently, the water quality monitoring of tributaries to the reservoirs is carried out.

## CONCLUSIONS

Agriculture and water supply belongs to the important landscape functions and during protection zones revision it was necessary to work closely together and create a compromise solution. The cooperation between water managers, farmers and government control authorities is the current tendency when the protection zones are proposing. Protection zones represent the preventive measures of water protection. It is necessary to improve the processes used in agriculture. Hand in hand with this, pollution of surface and ground waters will decrease. This assumption is based on the fact that the agricultural subsidies will be increasingly linked with the ways agricultural land management is performed, i.e., new conditions, controls of "cross-compliance" will be introduced and tightened.

Water supply operators must regularly monitor the physico-chemical and microbiological parameters in all boreholes in the spring area of Ivančice and in Vranov nad Dyjí reservoir and its tributaries although.



**Acknowledgement:** This work was created in the project CZ.1.07/2.2.00/28.0302 - Inovace studijních programů AF a ZF MENDELU směřující k vytvoření mezioborové integrace. This project is financed by the European Social Fund and Czech state budget.