

NEW APPROACHES TO PROPOSALS OF DRINKING WATER RESERVOIRS PROTECTIVE ZONES: STUDY ON THE PROTECTIVE ZONES OF GERMAN WATER RESERVOIRS ON THE CZECH TERRITORY

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ABSTRACT

Upper reaches of watersheds drained into four German drinking-water reservoirs are located on the Czech territory. Extensive studies of geo-morphological, meteorological, climatic, hydrographical, hydrological, soil, geology and hydrogeology conditions together with risk analyses of water resources quality and quantity due to both land use and point and non-point pollution sources had been performed in 1998-2000 period leading to proposals of protective zones to be applied in accordance with amendments of the Czech Water Law reflecting recent implementation of the EU water legislation. General and special regulations and good management practices have been specified within the four-level protective sub-zoning together with proposed compensation rates due to limited usage of private property when land use restrictions are implemented. Some kind of co-operative agreements between the reservoir administrator/water producer, local farmers, settlement authorities and probably other parties is supposed to be necessary in order to strengthen mandatory regulations usually applied within drinking water reservoir watersheds.

KEYWORDS : *Watershed management planning, water reservoir protection zones, transboundary pollution, legislation enforcement, voluntary approaches*

INTRODUCTION

Upper reaches of watersheds drained into four German drinking water reservoirs Gottleuba, Klingenberg, Lehnemühle and Rauschenbach (see number 1, 4, 3 and 26 respectively on the following fig. 1) are found on the Czech territory.

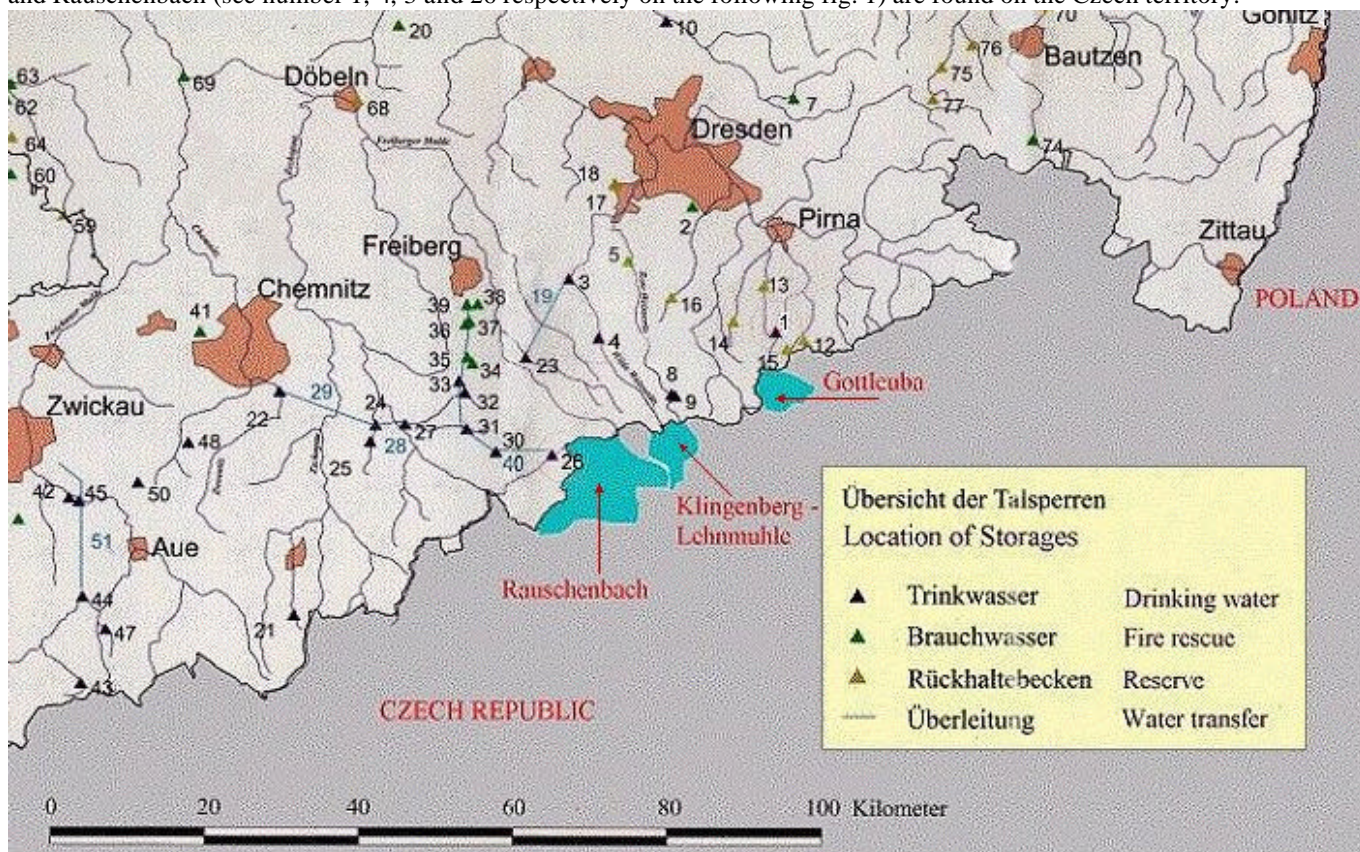


Fig.1 – Watersheds of four German water reservoirs on the Czech territory (blue colour).

Notice: Colours are to be seen on the digital CD file, while the hardcopy in the Proceedings is presented in a grey-colour scale.

MATERIAL, METHODS AND BASIC RESULTS OF PREVIOUS STUDIES

Extensive studies of geo-morphological, meteorological, climatic, hydrographical, hydrological, soil, geology and hydrogeology conditions together with risk analyses of water resources quality and quantity due to both land use and point & non-point pollution sources had been performed in 1998-2000 period. Based on detail terrain surveys and available maps, the following three basic land-use categories had been identified within the watersheds to serve for further protective measures zoning (no industry exists within the watersheds studied):

- Urbanized land and separated settlements
- Agricultural land (both arable and grassland)
- Forests and plots devoted to perform of forest functions according to the Czech Forest Protection Law

Taking into considerations overall water quality and/or quantity related risks and the required level of water resource protection, each of these categories was divided into three zones that can be characterised as follows:

- 1st Zone:** Minimum risk for the water reservoir. Mainly level land in sufficient distance from surface water recipients. Land and assets owners, farmers, etc. have to comply with minimum legal rules specified by the Czech legislation. Preventive measures going beyond legal requirements are not considered as necessary.
- 2nd Zone:** Medium risk for the water reservoir. Mainly sloped land not so far from surface water recipients. Beside minimum legal requirements some specific measures might be required going beyond legal requirements, e.g. specific treatment of produced wastewater, slightly modified agricultural and forest management practices. Eventual specific commitments might be requested from the water reservoir owner and/or the water supplier, however, these have to be connected with arelevant compensation of the concerned asset-owner economical loss.
- 3rd Zone:** Maximum risk for the water reservoir. More or less wide strips located along the existing brooks and rivers. Beside minimum legal requirements, site-conditions relevant specific measures are required going beyond legal requirements. Land-use regulations are to be defined for the 3rd zone that have to be complied due to legal public interest on water supply, however the concerned asset-owner is obliged to receive full compensation for the relevant economical loss.

Table 1 gives an overview of the proposed zones within the whole watershed while Figure 2 shows spatial zoning based on the above principles for of one of the studied reservoirs, the Gottleuba.

Table 1. – Proposed zones of the Gottleuba watershed based on water reservoir quality/quantity risk assessment

Zone	Land-use category	Area (hec)	Percent of total
III.	Urbanized land	45.3	2.8
III.	Agricultural land	72.7	4.5
III.	Forest	24.1	1.5
II.	Urbanized land	0.6	0.0
II.	Agricultural land	341.7	21.3
II.	Forest	92.1	5.7
I.	Urbanized land	8.2	0.5
I.	Agricultural land	882.4	55.0
I.	Forest	138.6	8.6
Total	---	1605.7	100.0

Table 2 presents a more accurate division of the 3rd Zone formed by buffer strips of different width along the main brooks found on the watershed:

Table 2 – Specification of buffer strips along main brooks

Water body	Bank length		Area (ha)				
	right	left	Urbanized land		Agriculture*		Forest
	m	m	Strip width up to 5 m	Strip width 5 to 20 m	Strip width up to 20 m	Strip width 20 to 30 m	Strip width up to 20 m
RYBNY BROOK WATERSHED							
Rybny brook	2 806	2 406	2.606	7.818			
	3 850	4 250			16.200	8.100	
Hranicni brook	4 214	0					8.428
	86	0	0.043	0.129			
Vetrovsky brook	2 957	2 957			11.828	5.914	
Lisci brook	1 691	1 691			6.764	3.382	
Watershed total	15 604	11 304	2.649	7.947	34.792	17.396	8.428

* Out of which arable estimated to 40 %, grasslands 60 %

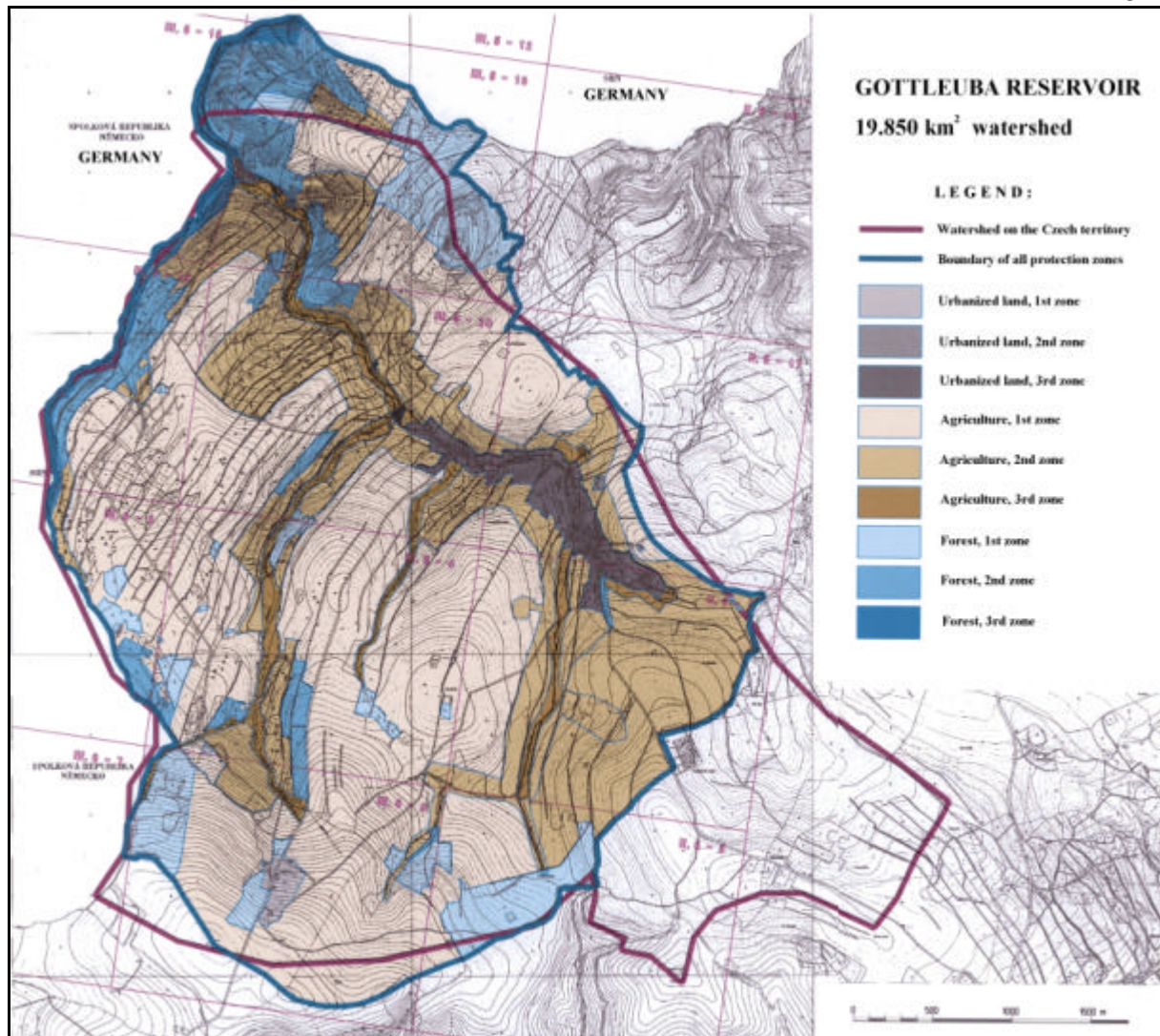


Fig. 2 – Spatial zoning of the Gottleuba watershed

Note: Total area of all zones specified in table 1 is smaller than total orographic watershed equal to 1985.0 hectares do to existing water transfers.

The above zoning was presented on several public hearings onto which all asset-owners were invited and their comments were recorded for the further preparation of documentation required by the State Water Authority responsible for official proclamation of protection zones. In 2003 this documentation is to be prepared for the first of studies reservoirs, the Gottleuba and it concerns in total 100 asset-owners and 2130 land plots recorded by the Czech Cadastral Authority. (Consequently it is supposed, that some more information might be available for oral presentation of the paper in August 2003).

DISCUSSION

All studies as shortly presented above were prepared by specialists widely experienced in preparation of protective zones in past times, when command-and-control principle was an exclusive approach both to protection zones proclamation, and mandatory commitments enforcement. Nearly without any exceptions, and whatever internally differentiated, the protected zones of reservoirs storing raw water intended for drinking water supply (about 80 percent of drinking water supplies in the Czech Republic is covered from this water source type) always included the whole watershed. This approach resulted both in pure reservoir-protection level, and – after state economy changes in 1989 – in controversies between water suppliers and assets-owners concerning level of financial compensations.

During the actual preparation phase of the German reservoirs protection zones it has become necessary to respect the EU legislation recently implemented in accordance with anticipated entry of the Czech Republic into the EU in 2004. Besides Water Framework Directive it concerns namely Nitrate directive 91/676/EEC (in the Government decree No. 103/2003 Coll. vulnerable areas and Plan of actions were already set), Communal wastewater directive 91/271/EEC (the whole Czech Republic territory was assigned as sensitive area in the frames of pre-access negotiations and agreement signed between the European Council and candidate states in Copenhagen on 12th and 13th December), Dangerous substances directive 76/464/EEC (already fully implemented in the Czech legislation) and Directive concerning surface water intended for the production of drinking water 75/440/EEC (already fully implemented in the Czech legislation).

Consequently, improved approaches to the water reservoir protection has become even more obvious than any time before namely towards pollution caused by agricultural land uses specifically addressed by the Nitrate directive.

The main reason of difficulties encountering implementation of the Nitrate directive can be generally found in mostly diffuse character of agricultural pollution tackled (Novotny, 2003), in strong dependence of its nitrate component on various natural phenomena and, namely that its abatement requires to undertake simultaneous actions in socio-economic sector of the concerned society. EU-wide research project showed (Heinz 2002 and 2003, Anonym 2001), that “command-and-order” policies to tackle with the water problems caused by agriculture brings to the limited effectiveness, and direct negotiations of all involved parties (water suppliers, farmers, authorities, nature protection agencies etc.) on a voluntary basis is more and more preferred.

As basic tools for the Nitrate directive implementation in the Czech Republic, Codes of good agricultural practice and the First Action Programme were launched by governmental regulation Nr. 103/2003 Coll. on vulnerable zones designation, on fertilizers and manure use and storage, on crop rotation and on erosion control measures, with validity since 1 January 2004 (Klir 2003). Comparison of the Action Programme with both, the above European Parliament resolution, and available local practical experience (Holás and Korab 2003) several weak points of the Programme have been recognized. For example it was decided to exclude existing water protection zones from the above proposal of vulnerable zones supposing that new protecting zones will be soon prepared and the problem of agricultural pollution will be solved therein.

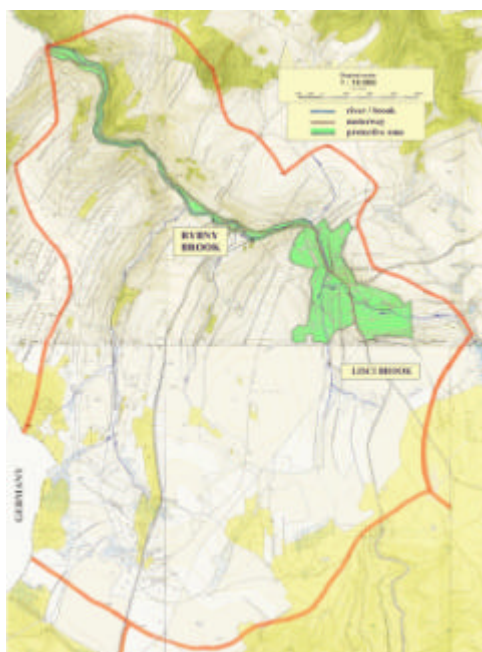


Fig. 3 (left)– Minimum extent of the Gottleuba reservoir protective zone proposed by the water supplier

In practice it is already recognized that preparation and proclamation of new protection zones will be administratively difficult and very expensive. Owners (state administrators) of drinking water reservoirs from the above reasons either do not plan any modification of already proclaimed protection zones (it is allowed by actual Water Law No. 254/2001 Coll.) or tend to minimise them as much as possible. For example the German reservoir administrator/water producer and his Czech partner administrating the concerned watershed - taking into account recent depression of the local agriculture leading to actual negligible application doses of agricultural chemicals - proposed to reduce the reservoir protection zone as seen on the precedent fig.3. While the reservoir watershed area is not included in vulnerable zones set in the government regulation, a great part of prevailing agricultural land would not be covered by any serious protection. This problem is to be solved within the next preparation phase of the reservoir protection zones here it is presented only as an illustrative example.

Some kind of co-operative agreements between the reservoir administrator/water producer, local farmers, settlement authorities and probably other parties (Heinz 2002 and 2003) is supposed to be necessary namely within the 3rd zones – buffer strips along the brooks in order to strengthen mandatory regulations usually applied within drinking water reservoir watersheds.

CONCLUSIONS

Tackling of diffuse pollution caused by agriculture will most probably become a mayor problem when preparing new protections zones for water reservoirs intended for public drinking water supply. Experiences gained after 10 years of the nitrate directive in the EU Member states should have been widely used in order to assure the required level of the

reservoir and nature protection without too strict mandatory regulations that might prevent any sustainable development of the area economy and/or appropriate use of existing agricultural land. In addition to minimum mandatory regulations, some kind of co-operative agreements between water producers, local farmers, settlement authorities and probably other parties properly fitted to local conditions should have certainly been chosen and realized in practice.

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