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Lodz - Jeziorsko case study

(Conflicts assessment of the artificial water reservoir on the rural area without a centralized waste water treatment plant)

Introduction

The area of Jeziorsko reservoir has been chosen for documentation due to the construction of an artificial storage reservoir, which affects the natural environmental and technical infrastructure as well as spatial management and social environment. In this study the present state of the natural environment and previous land function, management and use have been discussed. Natural environmental hazards resulting from natural susceptibility to pollution in connection with anthropogenic factors have been presented.

The aim of study

The aim of this study is to identify basic ecological problems mainly connected with water resources husbandry, on the rural area without a centralized waste water treatment plant, which influence balanced development of this region defined in the spatial planning. An important part of the study is presentation of natural environmental transformations and technical infrastructure with land management resulting from the construction of the Jeziorsko retention reservoir. Owing to a biological role of the reservoir and its effect on regional economy, of special importance is the care for a proper ecological state of this reservoir and identification of conflicts resulting from its different functions.

The problems encountered

The Jeziorsko reservoir, completed in 1986, was built as a multipurpose reservoir whose basic aims were:

- watering of arable lands and green crops on the surface of approximately 57 000 ha;
- flood protection of the Warta valley and towns in the valley
- supplying water for industry in coal-energy region Konin-Turek, Śrem and Poznań
- satisfying current and future water needs of Poznań based entirely on ground water intake infiltrating from the Warta
- increasing the river flow in low flow periods to improve sanitary and sailing conditions
- using the frontal dam for a road crossing on the route Kalisz-Rzymosko-Poddębice-Łódź
- production of electric energy in hydroelectric plant (power: 3.8 MW) located in the frontal stage of the reservoir
- conducting rational fish farming in the reservoir with the use of a fish stocking center
- creating sport and recreational conditions for the Lodz Industrial Region and Sieradz, Konin, Kalisz, Turek and Poddębice
- economy activation of underdeveloped neighboring regions

The area described is an agricultural land. Arable lands cover approximately 42% of the land surface, meadows and pastures approximately 14%. Agriculture on the area described has an unfavorable agricultural structure. There are mainly small farms, often of an area up to 5 ha. The second characteristic and important feature of agricultural production on the discussed area is the lack of modern infrastructure of the agriculture market: crops storing and food processing bases, production and distribution groups. It is connected with a low level of education of people employed in agriculture, significantly below the average level. The area is also underdeveloped as far as the technical infrastructure is concerned: there is a poor road system, a small number of public buildings, neither rural water mains nor land reclamation have been there for quite a long period of time, there is no centralized waste water treatment plant.

The area has regional and national natural and landscape amenities as well. The area of national natural significance is Jeziorsko bird sanctuary established by the government order on 23 Dec. 1998. It covers the area of 2350.6 ha and lies entirely in the cap of the Jeziorsko reservoir. The reserve protects among the others water-marsh birds sanctuary rarely found in Poland.

The impact matrix

In 2003 the Jeziorsko reservoir waters did not meet the requirements for the planned first class purity in any test. The waters were polluted mainly with fecal *coli*-form bacteria and biogens, which means that they were polluted by domestic sewage. Water quality in the reservoir does not fulfill the aims projected during its construction – the water cannot be used for recreational purposes and its usefulness for fish farming is limited.

Surface water pollution in Jeziorsko reservoir basin is caused mainly by:

a) point source pollution:

- § municipal sewage disposal (cleaned and unclean) from the towns of: Zduńska Wola, Szadek, Warta (Zduńska Wola, Szadek outside the borders of this report)
- § industrial sewage disposal discharged directly into surface waters (omitting urban drainage)
- § sewage disposal from villages where waterworks were built before a sewer system and sewage treatment plant (legal and illegal disposal)

b) large-scale pollution:

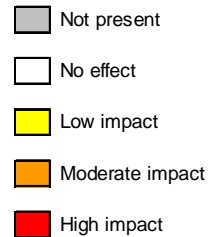
- § flows from agricultural lands where fertilizers, plant protection agents and manure (cow dung, liquid manure) are used
- § flows from urban areas by sewage disposal from combined sewerage system (organic compounds, biogens, suspension, heavy metals)
- § flows from traffic areas (intersections of roads and watercourses)

c) secondary pollution:

- § progressing eutrophication of the Jeziorsko reservoir causing secondary water pollution (toxic blue-green algae blooms which limit recreational prospects and depreciate tourist values of the region)
- § limitation of possibilities of water autopurification caused by acceleration of water circulation in the environment, elimination of wet grounds, ecotonic zones and regulations of the rivers.

If all these factors and conditions are taken into account, the matrix of impacts and pressures for the Jeziorsko reservoir can be presented as follows:

| Jeziorsko Reservoir | | Physico-chemical quality elements | | | | | | | | Biological quality elements | | | | | Hydromorphological quality elements | | | | | |
|------------------------------|-------------------------|-----------------------------------|-------------|-------------------|--------------|----------|-----------------|----------------------|---------------------|-----------------------------|-------------|---------------|-------------------|-----------------------|-------------------------------------|----------------|---------------------|------------|------------------|--------------|
| | | Transparency | Temperature | Oxygen conditions | Conductivity | Salinity | Nutrient status | Acidification status | Priority substances | Other pollutants | Macrophytes | Phytoplankton | Planctonic blooms | Benthic invertebrates | Eutrophication | Coliform index | Hydrological regime | Morphology | River continuity | Tidal regime |
| Diffuse sources | Urban drainage | | | | | | | | | | | | | | | | | | | |
| | Agriculture diffuse | | | | | | | | | | | | | | | | | | | |
| | Forestry | | | | | | | | | | | | | | | | | | | |
| | Other (birds habitat) | | | | | | | | | | | | | | | | | | | |
| Point sources | Waste waters | | | | | | | | | | | | | | | | | | | |
| | Industry | | | | | | | | | | | | | | | | | | | |
| | Mining | | | | | | | | | | | | | | | | | | | |
| | Contaminated lands | | | | | | | | | | | | | | | | | | | |
| | Agriculture point | | | | | | | | | | | | | | | | | | | |
| | Waste management | | | | | | | | | | | | | | | | | | | |
| | Aquaculture | | | | | | | | | | | | | | | | | | | |
| | Manufacture | | | | | | | | | | | | | | | | | | | |
| Abstraction | Potable supply | | | | | | | | | | | | | | | | | | | |
| | Agriculture | | | | | | | | | | | | | | | | | | | |
| | Industry | | | | | | | | | | | | | | | | | | | |
| | Fish farming | | | | | | | | | | | | | | | | | | | |
| | Hydro-energy | | | | | | | | | | | | | | | | | | | |
| | Open cast coal sites | | | | | | | | | | | | | | | | | | | |
| Morphological pressures | Flow regulation | | | | | | | | | | | | | | | | | | | |
| | River management | | | | | | | | | | | | | | | | | | | |
| | Coastal management | | | | | | | | | | | | | | | | | | | |
| | Other | | | | | | | | | | | | | | | | | | | |
| Other anthropogenic pressure | Recreation | | | | | | | | | | | | | | | | | | | |
| | Fishing/angling | | | | | | | | | | | | | | | | | | | |
| | Climate changes | | | | | | | | | | | | | | | | | | | |
| | Land drainage | | | | | | | | | | | | | | | | | | | |
| | Exploitation of animals | | | | | | | | | | | | | | | | | | | |
| | Introduced species | | | | | | | | | | | | | | | | | | | |
| | Introduced diseases | | | | | | | | | | | | | | | | | | | |



Main hazards for water quality in the Jeziorsko reservoir include:

1. Inflow of polluted waters from the Warta and the Pichna
2. Surface water flow from fields and roads (direct and by drainage ditches)
3. Domestic sewage infiltration from leaking septic reservoirs (cesspools)
4. Sewage disposal from the purification plant, illegal sewage disposal from villages near the reservoir
5. Inflow of biogenic substances connected with numerous bird settlements in the area of the reservoir

Natural landscape hazards are also dispersed holiday houses and buildings not connected with the tradition and culture of the region. The most serious threat to the environment is the

lack of organized sewage disposal (lack of sewerage system) and lack of organized waste disposal.

Conclusions

The degree of hazard results from the environment natural liability to pollution and the character of land management. Hazards resulting from the character of land management are connected with the forms of its use. In the documented area, agricultural land exploitation (arable lands, meadows, pastures) and homestead buildings dominate. Due to an important role of agriculture in land exploitation and underdevelopment of technical and municipal infrastructure, individual farms are treated in the study as economic objects which are real and potential pollution sources (domestic sewage, process wastes, e.g. packaging of plant protection chemicals).