

PROBLEMS OF WATER QUANTITY AND QUALITY MONITORING IN SMALL URBAN AND SUBURBAN BASINS IN THE CITY OF ŁÓDŹ AREA

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Contemporary hydrological research is more and more often based on data coming from constant monitoring of water quantity and quality in the drainage basin. Having such sequences at their disposal, the researchers can describe water circulation in the studied area more precisely. It is vital then, that the data from the monitoring system were of the highest quality and standard (with no interruptions in measuring and homogeneous). In connection with this issue, more and more attention should be paid not only to construction of a modern system, but also to problems concerning its current maintenance. Different problems concerning exploitation of automatic measuring equipment occur in urban basins than in suburban ones.

The Department of Hydrology and Water Management of the University of Lodz has been conducting the monitoring of water quantity and quality in suburban (Dzierzazna river) and urban (Sokolowka river) basins since 1997.

Dzierzazna is a 5th order stream belonging to Bzura basin (Figure 1). The area of its catchment is 42.9 km² and it is located in the edge zone of the Uplands of Lodz north of the city. The greatest heights can be found in the southern part of the catchment (in the region of Zgierz) and they exceed 210 m of absolute height. The land lowers in the direction of the North, however not evenly. One can distinguish three distinct levels separated from each other with high slope zones. Monitoring of water resources has been conducted in this basin since 1997. During that period there have been (in various years) 23 permanent measurement points of the meteorological, hydrological and hydrochemical characteristics. The research resulted in many scientific descriptions and was the basis of a few MSc theses and one PhD thesis. On the basis of the gathered data, there was a scientific project realized. The title of the project was: "Use perspectives and problems of protection of water objects and resources in suburban areas (Lodz key studies)". At the present, the team of researchers from the Department of Hydrology and Water Management of the University of Lodz concentrates on the problem of the influence of the A-2 motorway on the water cycle in Dzierzazna basin, working on the research project titled "Impact of the superhighway on the circulation and quality of water in the environment".

Since 2006, The Department of Hydrology and Water Management of the University of Lodz, has been cooperating with European Regional Center of Ecohydrology in Lodz in the sphere of assessment of transformed river functioning in urban conditions. The research is conducted within the SWITCH Project („Sustainable Water Management Improves Tomorrow’s Cities’ Health”). This project is a research partnership funded by the EC undertaking innovation in the area of integrated urban water management (IUWM). The project aims to carry out more demand-led, action-orientated research in its nine demonstration cities (Accra, Alexandria,

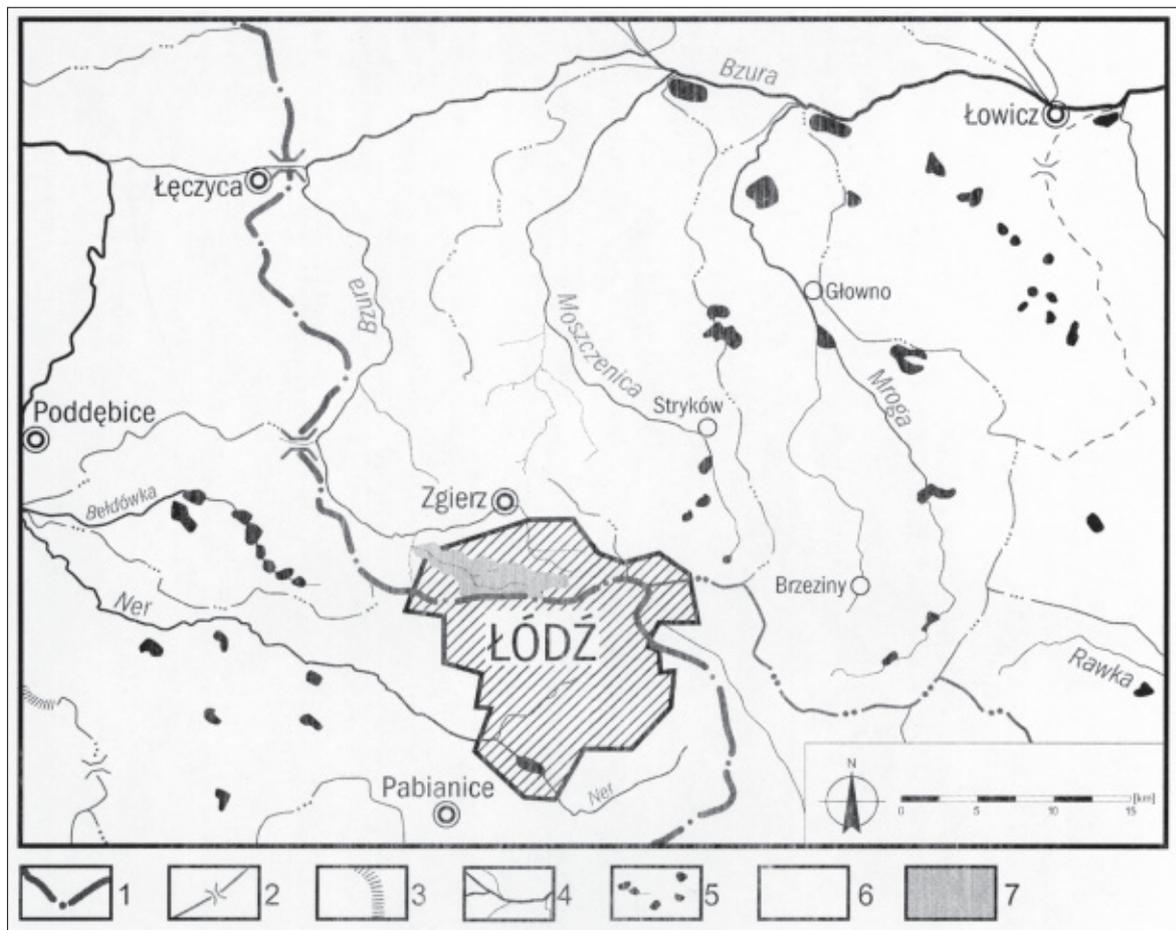


Figure 1. Location of examined basins: 1. First order watershed; 2. Bifurcation place; 3. Unreliable watershed; 4. Rivers; 5. Lakes and ponds; 6. Dzierzazna basin; 7. Sokolowka basin

Beijing, Belo Horizonte, Birmingham, Hamburg, Lodz, Tel Aviv and Zaragoza) and study sites, with a view of effecting greater integration of urban water management, and ultimately beneficial impacts. The Polish side of the project is to undertake and implement research in the fields of hydrology and ecohydrology in the river valleys of Sokolowka river.

The Sokolowka river (Figure 1), crossing the northern part of the city and representing a typical urban storm water receiver (catchment area = 19.2 km²). The river's natural flow gradually disappeared, being nowadays supplied mostly by around 50 storm water outlets. The basin of Sokolowka river is of temporary character. The large part is covered by impermeable surfaces. However, the western part is occupied by outskirts, where artificial surfaces are rather small. The most part of the main channel (especially in the upper part of basin) was regulated by concrete slabs, to straighten the course and deepen the bed for purpose of runoff detention. Nevertheless, the middle and lower sections of the river valley located in the outskirts of the city, has maintained semi natural character. Patches of meadows, wetlands and forests made this section appropriate as a pilot area for hydrological analyses of urbanized areas.

For two years many parameters of water quality and quantity have been measured in the Sokolowka river basin. There are 24 permanent measurement points of the meteorological, hydrological and hydrochemical characteristics.

While organising and functioning of the monitoring system one may face many problems. First is the location of measurement points. Apart from substantive issues one should take the safety of the equipment into consideration. Unfortunately, damaging of the equipment by people may happen. Another problem can occur with power supply as it is not always possible to gain direct connection to the energy distribution system and facilities.

It may occur that the measurement points have been determined correctly as far as substantive issues are concerned, however they cannot be accepted because of technical or safety aspects. In urban areas the construction of groundwater monitoring system also faces many obstacles. There are not many wells and the access to those already existing is usually difficult. Owners of the estates within the urban area are more distrustful and it is difficult to obtain consent to install the equipment. The only solution remaining is to install special piezometers in the public areas. However, there they are exposed to devastation.

While the system is working, there occur some problems, especially pertaining to monitoring of water quantity. Automatic flowmeters should be controlled by making discharge measurements at various water levels. However, it is difficult to foresee some of the high water levels, e.g. those caused by dumping water from ponds and sedimentation tanks or sudden impulses from the storm water receivers that are hard to explain.

In case of intense falls, especially in urban areas, in the lower course of the river local floods can occur, which makes it impossible to make flow measurement. Those floods are the result not only of intense falls, but above all of quick drainage of waters from isolated areas. This effect is also strengthened by blockage of sewage canals.

Water quality monitoring often faces different problems. One of the most important is illegal drop of sewage to surface or ground waters. Unfortunately, the cases of using wells contrary to their purposes, e.g. as sewage tanks, are not infrequent. Sometimes waste is pumped out on the streets during the rain, which causes that sewage reaches storm water receivers and later streams without being purified.

Cooperation with administrative agencies responsible for the given areas is of crucial importance while installing the environment monitoring system. Information and ideas distribution between those agencies and people supervising the functioning hydrological monitoring system is vital. However, contact is usually difficult because of diversity of interests and specific inertia of office functioning. In this context, proper cooperation between scientific and administrative units is crucial for efficient construction and functioning of monitoring system.