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1. Rhynchosporetum albae
2. Eriophoro angustifolii – Sphagnetum recurvi
3. Utricularia vulgaris – Heleocharis acicularis
4. Caricetum davallianae
5. Menyanthes trifoliate – Comarum palustre
6. Vaccinio uliginosi – Pinetum
7. Betuletum palustris

The planned natural reserve is to be a shelter for protected species of animals. The most important groups are beetles (*Carabus*) and also bumblebees (*Bombus*). There were found there a very rare butterflies (*Papilio machaon*). Vertebrates (*Vertebrata*) are also represented by protected species. The hematothermal ones are represented by a group of birds in highest numerosity, especially *Gallinago gallinago*. One can meet there several of protected species of mammalians: *Mustela nivalis, Erinaceus europeus, Talpa europea, Meles meles.*

The area is a very unique ecological niche of dying out species in scale of the whole region. Its value is the bigger when considering its adjustment to very difficult conditions of environment. Continuous pollution of air, waste material of industry and hydrological relations a subject to frequent, unprofitable changes influence negatively not only the whole Silesia and Basin.

Such ecological niches often come into being near big industrial plants meaning there, where nobody would expect them. There comes out a question: is it well that those wild shelters are localised right over there? From certain reasons the answer is: yes. Natural ecosystems have the ability of filtering impurities of industrial and anthropogenic origin what makes their existence indispensable. On the other hand, continuously changing conditions that once could have influenced the natural ecosystems profitably may, under impact of transformations connected with industrial activity, surrender to change on less profitable, and even destructive for nature. Therefore it would be profitable to undertake ventures aiming to save the last chance of rebuilding of the natural environment in USIR (GOP) and on the whole Silesian Upland before it is completely destructed.

LITERATURE:

1. Żarnowiec J., Jędrzejko K., Węgierek P., 1993: *Dokumentacja dla projektowanego rezerwatu przyrody „Bagna" w Dąbrowie Górniczej – Antoniowie,* Fundacja dla Uniwersytetu Śląskiego, Katowice,
2. Jankowski A.T.,1998: *Antropogeniczne uwarunkowania obiegu wody terenie Górnośląskiego Zagłębia Węglowego,* [w:] *Hydrologia u progu XXI wieku,* red. Magnuszewski A., Soczyńska U., Komisja Hydrologii PTG, Warszawa,
3. Celiński F., Wika S.,1992: *Zagrożenia żywych zasobów przyrody województwa katowickiego,* Fundacja Ekologiczna „Silesia", tom V, Katowice,
4. Czylok A., Celiński F., Kubajak A.,1996: *Przewodnik przyrodniczy po Dąbrowie Górniczej,* Wydawnictwo „Planta", Dąbrowa Górnicza,
5. Klimaszewski M., 1972: *Geomorfologia ogylna,* PWN, Warszawa,
6. Kondracki J., 1994: *Regiony fizycznogeograficzne Polski,* PWN, Warszawa.

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Hydrological characteristics and changes in water quality in catchment area of the river Kłodnica

Розглядається вплив людської діяльності на системи і якість водних потоків у дренажному регіоні річки Клодніци. Автори досліджують негативні наслідки близького кореляційного співвідношення між промисловими процесами в межах дренажної території та рівнем трансформації водних умов.

Location

Due to the physic-geographic division by J. Kondracki (1994) the catchment area of the river Kłodnica is a part of two mesoregions: Katowice Upland (Wyżyna Katowicka) (341.13) and Racibórz Valley (Kotlina Raciborska) (318.59). The southernmost part of Silesian Plain (Nizina Śląska) is Racibórz Valley (Kotlina Raciborska), which spreads far into the valleys of the rivers Kłodnica, Bierawka and Ruda.

Within the area of Upper-Silesian Coal Basin (Górnośląskie Zagłębie Węglowe), coal-mining, heavy industry and urbanisation have been developed so intensively, that forms of terrain, water conditions, soils and flora have been entirely transformed.

Borders of the catchment area of Kłodnica are watersheds of 2nd order, and partly a watershed of 1st order in the east, but the water parting of 1st order is unclear in the terrain, as it crosses the highly urbanised area.

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Characteristic flows

The characteristics of flows in the catchment area of the river Kłodnica have been performed basing on measurement data of the Institute of Meteorology and Water Management (IMGW) in three hydrometric profiles: Lenartowice, Gliwice, Kłodnica on the river Kłodnica (fig. 1). Analysis of characteristic flows in the many-year period between 1961 and 1990 has been carried out in the chapter.

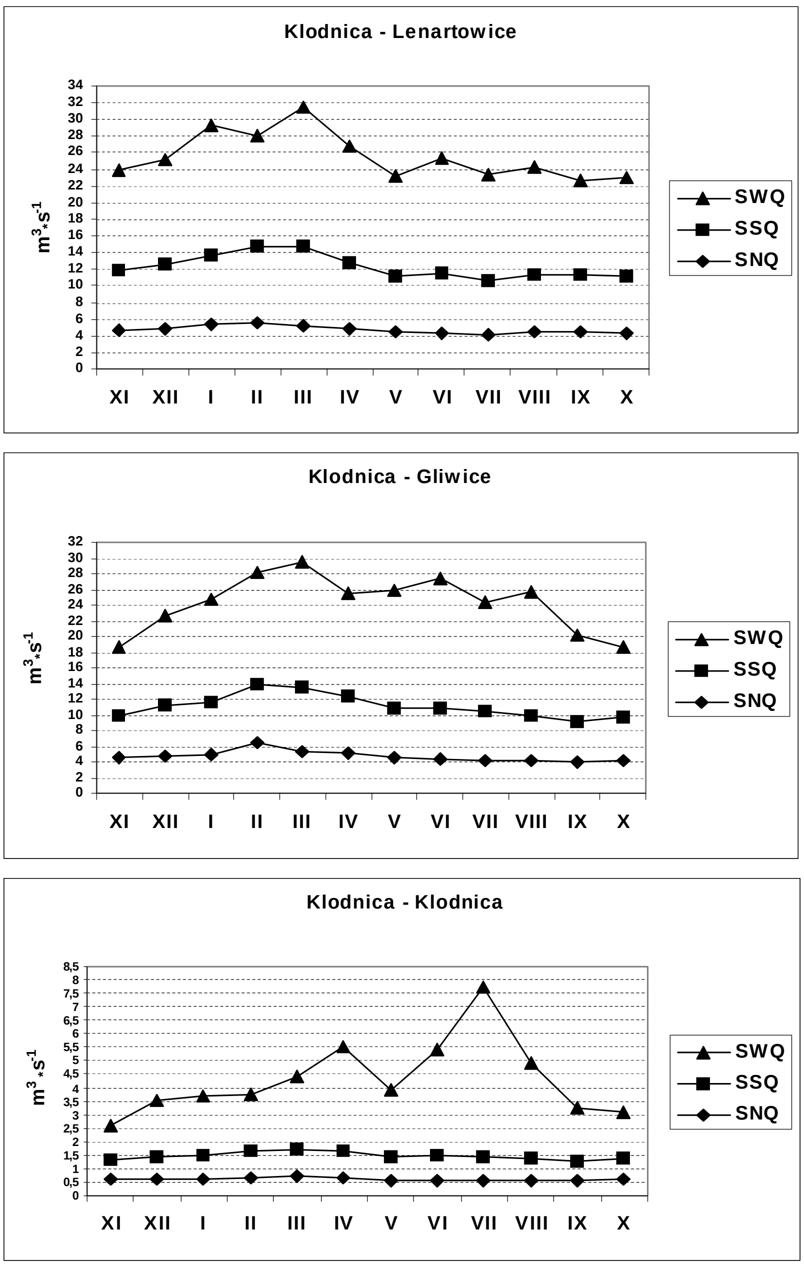

Fig. 1. Characteristic discharges in the water gauge stations studied in the period 1961-1990

Average summer precipitation in the analysed catchment area amount to 400-450 mm/year, while average winter precipitation is 200-300 mm/year. The level of precipitation is not reflected in minimal and average flows in analysed water gauge profiles. Average summer flows are lower than average yearly flow in all analysed profiles in spite of bigger precipitation in that period. On the other hand, average monthly flows exceed the value of yearly flow in a period when average total precipitation is the lowest, i.e. in February and March.

Changes in water quality

Amongst the most visible yet very disadvantageous aspects of man's impacts on hydrosphere, there are changes in water quality. Industry, urban economy and agriculture drain off specific substances to waters; presence of these substances results in restrictions in possibilities to use the waters (Absalon, 1998). In order to compare changes in water quality, six measurement profiles situated in key sites of the catchment area have been chosen, for which the most complete and comparable data is available (table 1).

It is not easy to discover simple relations while analysing given changes in water quality in the catchment area of Kłodnica in the analysed five-year period. Using the defined class of purity can be confusing, as more and more contamination indicators were introduced in subsequent years. Thus, the only method is analysis of changes in particular contamination indicators.

A synthetic indicator of organic impurity and some inorganic impurities is a value of five-day biochemical need for oxygen (BZT_5). Analogous changes of that indicator can be observed in the catchment area of Kłodnica during the research. The highest values of BZT_5 are up river. Alongside the downstream of the river, rapid decrease in the value of the indicator can be observed. One of the reasons for that is the fact that waters of Kłodnica mix with waters of the reservoir Dzierżno Duże, where they are purified.

Of the group of biogenic substances, the only indicator that could be used in comparative analysis was ammonium nitrogen. Nitrogen compounds can be

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Tabele 1. Water quality in the selected profiles of Kłodnica catchment

River [km]	Control point	Year	Contamination indicator [mg • dm^{-3}]					Class of purity
			BZT5	Ammonium	Chlorides	Sulphates	Suspended	
1	2	3	4	5	6	7	8	9
Kłodnica 75,3	In Brynyw	1994 1995 1996 1997	64,137 54,433 26,842 33,442	11,047 9,846 6,411 7,488	304,042 63,708 66,875 53,167	90,458 84,875 78,167 80,292	86,125 43,500 61,708 43,375	Not classified
Kłodnica 69,5	Above Jamna	1994 1995 1996 1997	19,196 16,104 19,958 9,800	7,865 8,785 9,163 5,914	1727 3882 1945 1305	245,375 335,833 276,833 206,167	26,417 25,042 76,375 21,917	Not classified
Kłodnica 38,6	Inlet into the reservoir Dzierzno Duże	1994 1995 1996 1997	25,621 30,638 26,079 23,433	9,536 9,624 9,027 8,097	1221 1338 1132 1201	413,125 474,625 408,708 493,708	293,750 54,125 166,125 407,833	Not classified
Kłodnica 32,0	The reservoir Dzierzno Duże – outlet into Kłodnica	1994 1995 1996 1997	5,974 5,879 5,065 3,783	10,143 8,470 9,100 8,862	938,696 1215 1071 1025	403,957 364,083 395,364 407,042	3,609 7,250 10,957 17,292	Not classified
Kłodnica 19,6	The mouth, Ujazd	1994 1995 1996 1997 1998	5,650 6,087 4,475 4,263 4,588	3,733 4,465 6,246 6,408 4,329	633,333 801,125 798,583 870,167 746,708	258,458 265,333 309,348 340,500 322,792	3,958 14,250 11,042 20,083 23,792	Not classified

Source: Mean values calculated from archival data of OBiKŚ in Katowice.

either of natural or anthropogenic origin – municipal sewage, industrial wastes, inflows from agricultural areas (Burhard, Hereźniak-Ciotowa, Kaca, 1990). In the upper current of the river Kłodnica high concentration of ammonium nitrogen can be observed, which results from inflow of municipal sewage from industrialised and urbanised regions. Such high concentration remains to the point where waters of Kłodnica flow into the reservoir Dzierżno Duże, where concentration of ammonium nitrogen is significantly thinned down. Inflows from agricultural areas contribute additionally to the concentration of ammonium nitrogen in waters of Kłodnica behind the reservoir Dzierżno Duże.

Mineral substances are represented by chlorides and sulphates. In the analysed period 1994-1998, no regularity can be found concerning level of concentration of these substances in surface waters of the catchment area of Kłodnica. This concentration remains at approximately the same level, which is relatively high. An analogy in variability of concentrations of chlorides and sulphates can be seen in quality analysis of waters of Kłodnica. Its spring waters have the lowest concentration of both chlorides and sulphates. Rapid growth of concentration of chlorides occurs at 69.5 km from the springs, which is related to waters of tributaries draining areas of mining exploitation. Gradual decrease of chloride concentration can be observed from this point to the place where Kłodnica flows into Odra. Sulphate concentration distributes in similar way; it rises to the place where Kłodnica flows into the reservoir Dzierżno Duże. Decrease in abundance of sulphates is recorded in subsequent profiles. A load of salts included in coal-mine waters, which are main source of these substances is also very important as far as quality of water is concerned.

As to suspended matter carried by waters of the river, the place where Kłodnica flows into the reservoir Dzierżno Duże, stands out plainly. This is the point of the highest concentration of suspended matter throughout the whole river. It probably comes from coal processing factories (sorting and washing plants) that carry out the load of suspended matter directly to the river in many cases. In the remaining profiles abundance of suspended matter that is transported depends on both natural and anthropogenic conditions and that is why it is difficult to define regularities concerning courses of changes of its concentration in water.

Conclusions

Human activities are an important factor modifying magnitude, system and quality of river outflow in the catchment area of Kłodnica. Close correlation between the course of industrial processes within the catchment area and level of transformation of water conditions can be observed.

A clear aspect of anthropogenic changes in river outflow in the catchment area of the river Kłodnica is poor quality of surface waters. The river Kłodnica is highly contaminated. It carries waters that are out of any class of purity over its length. Main impurities that cause such poor quality of waters in this river are: biogenic substances, mineral substances (represented by chlorides and sulphates coming from coal-mine waters drained to Kłodnica and its tributaries) and heavy metal (like lead). The source of contamination of waters in Kłodnica are loads of municipal sewage and industrial wastes coming from industrialised and urbanised areas of western part of Katowice Upland (Wyżyna Katowicka) (e.g. Katowice, Zabrze, Bytom, Gliwice). Salted coal-mine waters are very dangerous for environment. The process of utilisation of such waters is complex and costly. Poor quality of waters in the catchment area of Kłodnica imposes considerations concerning chances of its improvement. Quality of waters in the catchment area of Kłodnica could be improved by reducing amount of loads of wastes drained to the river. Suggested operational rules of the salted water drainage system would be propitious. The system is based on catching particular loads with collectors and transporting them outside the most endangered area thus increasing efficiency of protecting local water intakes. The system of hydrotechnical protection would be based on (Absalon, 1993a): main collectors of salted waters, terminals for each coal-mine and retaining-dosing reservoirs. Other methods of salted water utilisation, i.e. deep or shallow pressing from the surface into the orogen, shallow pressing from exploitation flats or desalinisation are not used or used on small scale in Poland (Jankowski, 1997).

Literature:

1. Absalon D., 1998: Antropogeniczne zmiany odpływu rzecznego w zlewni Rudy. Wyd. Uniw. Śląskiego. Katowice.
2. Absalon D., 1993a: Elementy gospodarki wodnej w zlewni górnej Odry po wodowskaz Koźle. W: Zmeny geografickeho prostredi v pohranicnich oklastech ostravskeho a hornoslezskeho regionu. Ostravska Uniwerzita, Prirodovedecka Fakulta. Uniw. Śląski, Wydz. Nauk o Ziemi. Ostrawa.
3. Burhard J., Hereźniak-Ciotowa U., Kaca W., 1990: Metody badań i ocena jakości wód powierzchniowych i podziemnych. Wyd. Uniw. Łódzkiego, Łódź.
4. Kondracki J, 1994: Regiony fizycznogeograficzne Polski, PWN, Warszawa.
5. Jankowski A. T., 1997: The influence of waters from hard-coal mines on the hydrochemical relations of Upper Silesian Coal Basin (USCB) rivers. Geogr. Polonica, 68. IGiPZ PAN, Warszawa.

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Artificial water reservoirs in Rawa catchment - qualitative and quantitative changes

Аналізується довготерміновий вплив промислового використання компонентів географічного середовища, яке призвело до його деградації. Головна увага приділяється змінам гідрологічних систем на прикладі річки Равви, де відбулася значна зміна не тільки форми водних резервуарів, а й їх хімічного складу, що викликало формування антропогенного озерного регіону в басейні річки Равва.

Silesian Upland is a part of Silesian & Cracow's Upland (Kondracki, 1994). Within its precincts there is separated a number of mesoregions with the most transformed Katowice Upland. Long economic utilization of components of geographical environment led to its degradation. The most strongly transformed were surface relieves and water relations.

The river basin of Rawa is situated in central part of Katowice Upland in the depression of the erosion gutter cut into Carboniferous rocks stuffed with Pleistocene sediments coming from before Quaternary (Karaś-Brzozowska, 1960). The Rawa lies in the river basin of the Vistula and is a water-race of IV order. The Rawa flows at the heights of 285 m over sea level out of the Marcin pond in Ruda Śląska. The area of the whole river basin equals 89,8 km^2 (Podziai hydrologiczny Polski 1983). The length of watercourse is 19,4 km (Jankowski, 1987).


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