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Concepts and environmental objectives of river's surface waters in the water cycle 2016-2021 for kujavian and pomeranian voivodeship

Abstract. Monitoring of river's water status in Kujavian and Pomeranian Voivodeship is carried out in the three programs: surveillance monitoring, operational monitoring and monitoring of protected areas. Surveillance monitoring is a main instrument to determine the classification of the status of water bodies, accordance with the requirements of the Water Framework Directive. Operational monitoring has a task of monitoring bodies at risk of failing to achieve environmental objectives. Monitoring on protected areas is carried out on areas exposed to pollution from municipal sources and nitrogen from agricultural sources, the areas of protection of species and habitats, water for public supply of drinking water and water for bathing purposes. This three types give an answer about classification of the status of water bodies – main purpose of Water Framework Directive. The last 6-years monitoring programme is finishing in 2015 and Inspectorate for Environmental Protection on territory of Poland must prepare new network of river's bodies of surface waters. Kujavian and Pomeranian Voivodeship Inspectorate for Environmental Protection prepared new monitoring network, which have 39 research profiles in surveillance monitoring, and 96 research profiles including operational and protected areas monitoring.

Key words: monitoring, water cycle, river's body of surface water, management plans

Introduction

The obligation of the monitoring of water status is imposed on Member States in Art. 8 of the Directive 2000/60/EC, the so-called Water Framework Directive (WFD), which was reflected in the Article 155a paragraph 2 of the Water Law Act of 18 July 2001 (Journal of Laws of 2005 No 239, item. 2019, as amended). At the same time, in accordance with Art. 113 paragraph 2 of the above-mentioned Act, programmes of monitoring of water status are one of the management plans prepared for management programmes.

Development of the state environmental monitoring programme is also one of the tasks of the Inspection for Environmental Protection. Monitoring of river's water status is carried out in the guidelines

contained in the Regulation of the Minister of the Environment of 15 November 2011 in the form and method of monitoring of body of surface water and groundwater (Journal of Laws of 2011, No 258, item. 1550). To execute the programme of monitoring of water status there has been created network of varying scope and frequency of measurements:

- Surveillance monitoring used to do comprehensive review of water status within river basins, identifying the types and amount of significant anthropogenic impacts and evaluating the long-term changes in water quality.
- Operational monitoring is conducted in river water bodies threatened to fail to meet the targets set in the Framework Directive.
- Monitoring of protected areas (areas exposed to pollution from municipal sources and nitrogen from agricultural sources, the areas of protection of species and habitats, water for public supply of drinking water and water for bathing purposes).

Research methods and data sources

The objectives of the monitoring of surface water

The objective of monitoring, as part of water management, is to provide the management with water quality data, to a certain extent, fixed format and at the right time to allow their usage in the future management plans. According to the provisions of the WFD, planned monitoring of river's surface water in the Kujavian and Pomeranian Voivodeship in the water cycle 2016 - 2021 is designed to provide information for (Report…, 2013):

- classification of the status of water bodies,
- complement and approval of risk assessment procedure for river's body of surface water which will fail to meet the targets set in the Framework Directive,
- efficient and effective creating of monitoring programs,
- evaluation of long-term changes in natural conditions,
- evaluation of long term changes resulting from anthropopressure,
- determining the cause of not achieving the targets set in the Framework Directive by river's water bodies, if they weren't previously identified,
- determining the magnitude and impact of accidental pollution,
- evaluation of fulfilment of the norms and targets of environmental objectives set for protected areas,
- providing of data, analysis, assessments on the needs the planned investments that may worsen the condition of the quality of the surface water status.

Monitoring of surface water in the planned water cycle covers the whole foundation of the WFD and is matched to the specific nature of the Kujavian and Pomeranian Voivodeship taking into account the results of the analysis of pressure.

Reference layers and lists

The basis for the design network of measurements stations and research programs are (Guide…, 2013):

- provided by the National Water Management Authority:
  - list of water bodies,
  - verified by the Regional Water Management Boards and National Water Management Authority list of artificial water bodies and heavily modified water bodies,
  - a list of body of surface water which are at risk of failing to achieve environmental objectives,
  - lists of protected areas, referred to in Art. 113 of the Water Law,
  - environmental objectives for body of surface water.

Analysis of Pressures and impacts:

- Provided by the Chief Inspectorate for Environmental Protection:
  - Regulation of the Minister of the Environment,
  - existing in the previous water management cycle network of measurements stations subjected to surveillance monitoring,
  - guidelines from Chief Inspectorate for Environmental Protection.

As a reference layers for the planning and designing the network of measurements stations, National Geodetic and Cartographic Resource should be adapted:

- Orthophotomap,
- Database of Topographic Object,
- General Geographic Database.

Results

The planned network of surveillance monitoring in water cycle 2016-2021

The objectives of surveillance monitoring in the Kujavian and Pomeranian Voivodeship is to establish a coherent and comprehensive overview of water status within each river basin. As a result of which it will be possible to classify all body of surface water by assigning them to one of five classes of ecological status / potential, two classes of chemical status and two classes of state. This will complement the monitoring data for water bodies surveyed water from the previous water cycle 2010-2015.

In the voivodeship the 39 research profiles on the end of river's body of surface water has been created on 32 rivers within the surveillance monitoring. Each surveyed surface water body has its own individual abiotic type to which there is assigned biological element in accordance with the Regulation of the Minister of the Environment of 22 October 2014 on the classification of surface water status and environmental list of priority substances in the field of water policy so-called priority substances (Journal of Laws of 2014, pos. 1482).

Abiotic dominant type in the voivodeship in the surveillance monitoring is type 20 – gravel-bed river lowland covering 23.1% of all studied rivers. It is represented by the river: Drwęca, Prusina and

Chodeczka. Another abiotic type – 19 sand-clay lowland river covering 20.5% of the studied rivers. This type is assigned to rivers: Osa, Ruziec and Gardęga. Least frequently in the voivodeship occurs type 24 – 2.6% - organic rivers. It is represented by: Noteć from Bydgoszcz Canal to Kcynka.

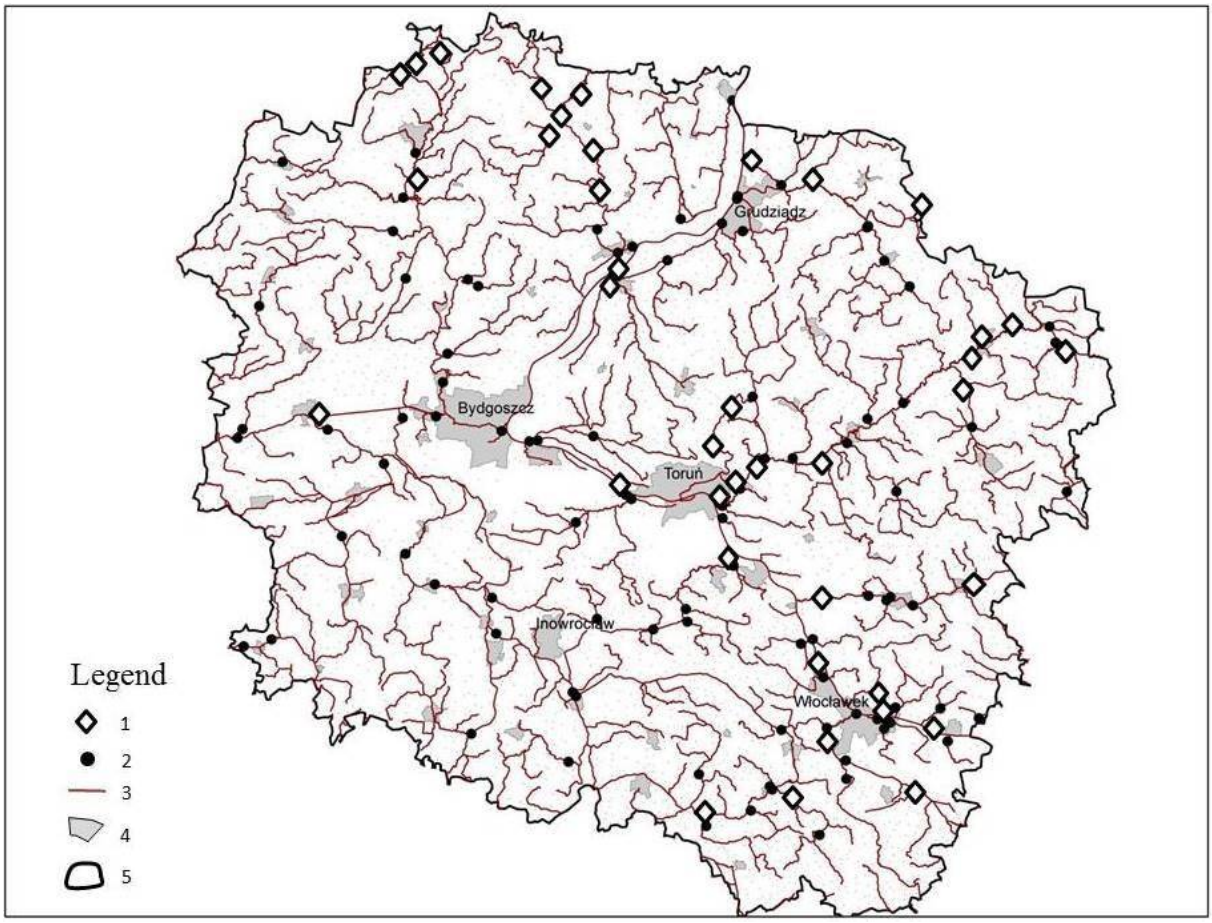

Figure 1. The network of measurements stations of surveillance (MS) and operational (MO) monitoring in the water cycle 2016 to 2021 in the Kujavian and Pomeranian Voivodeship.
Explanations: 1 – surveillance monitoring, 2 - operational monitoring, 3 - rivers, 4 – cities, 5 - Kujavian and Pomeranian Voivodeship.

Places designated for measurements stations of surveillance monitoring are a result of previous water cycle network. Their location is designed to demonstrate long-term changes resulting from anthropopressure. The research profile located on the Drwęca River - estuary to the Vistula Złotoria is an example of monitoring of the quality of water on the protected areas – Drweca Valley (PLH280001). This point is also monitored as a result of drainage of the municipal pollutants from wastewater treatment plant in Brodnica. Measurement station in Złotoryja also is monitoring water which is intended for human consumption for the city of Toruń. The water cycle 2016-2021 particular emphasis monitoring of protected areas: landscape parks, nature reserves and areas Natura 2000 Network. Within the implementation of

this task the following rivers entered the surveillance monitoring: Brodniczanka due to the SAC (Special Areas of Conservation) – Ostoja Brodnicka (PLH040036), Prusina - SPA (Special Protection Areas) - Bory Tucholskie (PLB220009), Szumionka – SAC – Brda Valley and Stążka River in Bory Tucholskie (PLH040023) and SPA Bory Tucholskie (PLB220009) and artificial water bodies which are Bydgoszcz Canal - SAC Noteć Valley (PLH300004) and SPA - The central Noteć Valley and Bydgoszcz Canal (PLB300001).

Another objective of the new water cycle is to exclude or to locate sources of pollution which drain the substances from group 4.1 of Priority substances and group 4.2 Hazardous substances into the waters.

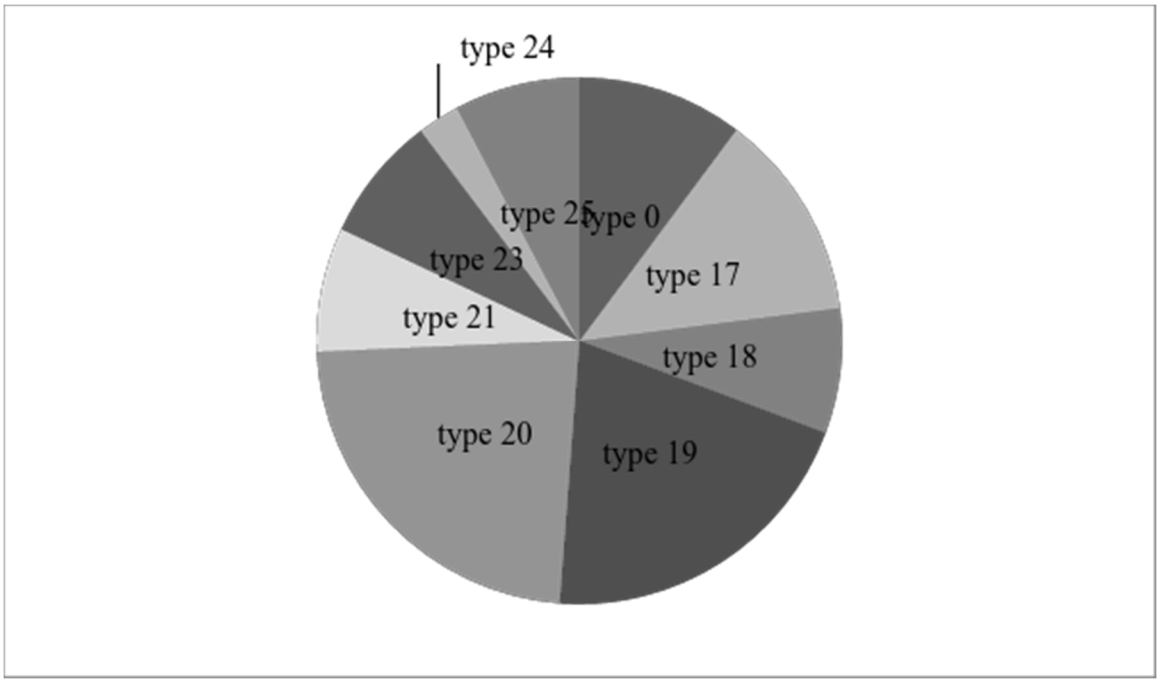

Figure 2. Percentage of abiotic type of rivers in surveillance monitoring in the water cycle 2016 -2021 in the Kujavian and Pomeranian Voivodeship

Table 1. The network of measurements stations of surveillance monitoring (MS) in the water cycle 2016 to 2021 in the Kujavian and Pomeranian Voivodeship.

No	Name of the river – measurements station	The objectives of surveillance monitoring			
		1	2	3	4
1	Bacha (Struga Toruńska) – estuary to Drwęca, Lubicz	x	x		
2	Brodniczka – estuary to Drwęca, Brodnica	x			
3	Skarlanka - estuary to Drwęca, Tama Brodzka	x			

4	Brynica - above Pissa, Bartniczka	x	x		
5	Drwęca - below Brodnica, Szabda	x	x		
6	Drwęca – estuary to Vistula, Złotoria	x	x	x	x
7	Ruziec – estuary to Drwęca, Dulnik	x	x		
8	Osa - below Płowęż Lake, Partęczyny		x		
9	Osa - estuary to Vistula, Zakurzewo	x	x		x
10	Lutryna - estuary to Osa, Swiecie n/Osą	x	x		
11	Gardęga - estuary to Osa, Rogóźno-Zamek	x			
12	Fryba – estuary to Vistula, Chełmno	x	x		
13	Chełmiczka - estuary to Vistula, Uniechowo	x	x		
14	Mień - above Skępe Lake, Skępe	x			
15	Mień - estuary to Vistula, Wąkole				x
16	Rypienica – estuary to Drwęca, Łapinóż				x
17	Tążyna – estuary to Vistula, Wołuszewo	x	x		
18	Wisła - below Włocławski Reservoir	x	x		x
19	Wisła – Gąbinek	x	x		
20	Chodeczka - estuary to Zgłowiączka, Osowo				x
21	Lubieńka - estuary to Zgłowiączka, Józefowo				x
22	Rakutówka - below Rakutowskie Lake, Dębniaki	x			
23	Zgłowiączka - below Głuszyńskie Lake, Rybiny				x
24	Zgłowiączka - estuary to Vistula, Włocławek	x	x		

25	Włocławek Reservoir - station 03	x	x		
26	Brda - Piła Młyn	x	x		
27	Czerska Struga - estuary to Brda, Lutomski Młyn	x	x		
28	Bydgoski Canal - estuary to Noteć, Występ	x			x
29	Noteć – Gromadno	x			
30	Prusina - below Śliwice	x	x		
31	Prusina - estuary to Wda, Tleń	x			
32	Raciąska Struga - estuary to Brda, Nadolnik	x			
33	Ryszka - estuary to Wda	x			
34	Sobińska Struga - estuary to Wda, Żur	x			
35	Szumionka - Piła Młyn	x			
36	Wda - Stara Rzeka	x			
37	Wda – Gródek	x	x		
38	Wieki Kanał Brdy - Legbąd	x	x		
39	Wisła – Przechowo	x	x		x

Explanations: 1 - monitoring of river's body on protected areas, 2 - monitoring of river's body sensitive to eutrophication caused by point sources of pollution from municipal and industrial sources, 3 - monitoring of river's body of surface water for public supply of drinking water, 4 - significant anthropogenic impacts and evaluating the long-term changes in water quality.

The planned network of operational monitoring in water cycle 2016-2021

Operational monitoring is designed to verify the effectiveness of the corrective action plan. It is run in at least two annual cycles of measurement within the 6-year period covered by the Water Management Plans. One of this cycles should occur within the first three years period and the second in the next three. Operational monitoring is implemented in representative and reper measurement station. They are located on river's body of surface water and are qualified for operational monitoring and they are also located on river's body of surface water dedicated to protect

habitats and species. In this monitoring there are studied biological and hydromorphological elements which are the most sensitive to the river's body of surface water pressure and physico-chemical elements. Operational monitoring also covers the research of priority substances and other hazardous substances (group of indicators 3.6, 4.1 and 4.2), which are drained into the catchment area or on which the results of surveillance monitoring in the previous water cycle have shown that they exceed the allowable concentrations. The program of operational monitoring can also be verified in the middle of the water cycle due to an update of the analysis of pressure and impacts and date of realized surveillance monitoring. In particular, the program may be a change in reducing the frequency (to not less than 4 sampling per year), if the detected impact is not significant.

In the voivodeship in the context of operational monitoring there has been created 96 research profiles on the ends of river's body of surface water. Similarly to the surveillance monitoring every surveyed river has its own individual abiotic type which is associated with the biological element.

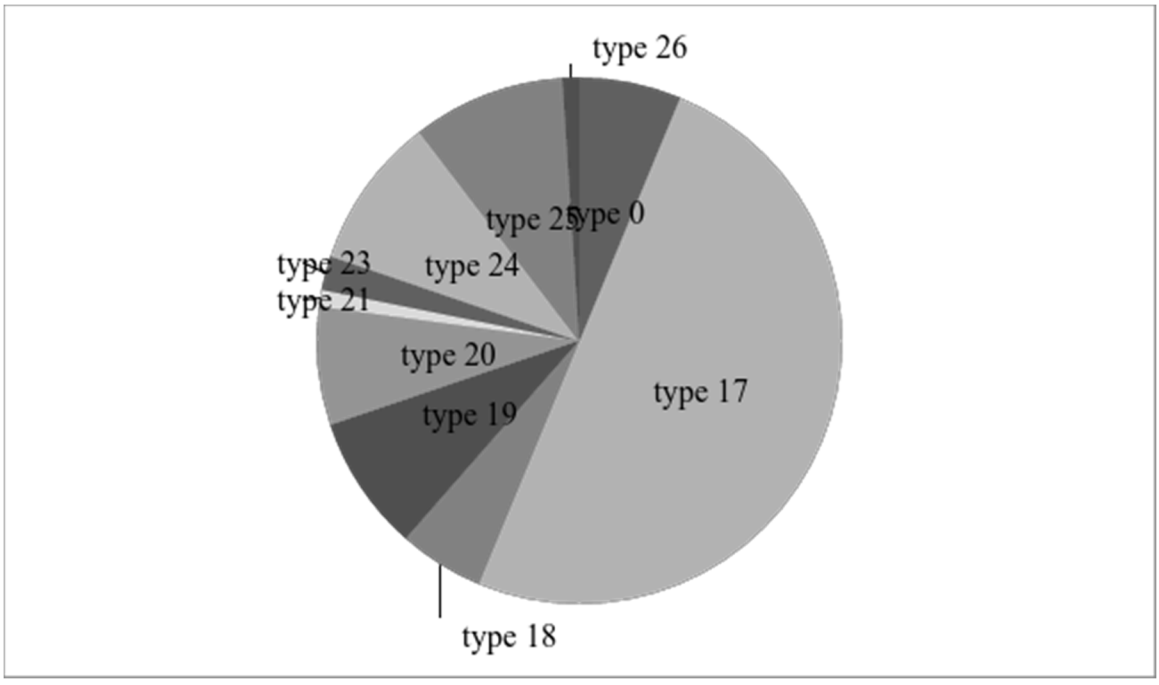

Figure 3. Percentage of abiotic type of rivers in operational monitoring in the water cycle 2016 -2021 in the Kujavian and Pomeranian Voivodeship

The dominant abiotic type in the operational monitoring in the voivodeship is the type 17 - sandy lowland stream covering 50.0% of all surveyed river's body of surface water. It is represented by the river: Kcynka, Kicz, Kotomierzyca, Lubianka and Ruda. Type 24 - organic rivers is represented by: Wełna from Lutomnia to tributary below Łęgowo Lake or Brynica from Pisa to the estuary. Type 25 - rivers connecting lakes are: Gąsawka from Sobiejuskie Lake to estuary to Noteć and Wełna to Lutomnia. Type 24 and 25 together accounted for 18.7% of all surveyed.

The planned monitoring network of protected areas in the water cycle 2016-2021

(areas exposed to pollution from municipal sources and nitrogen from agricultural sources, the areas of protection of species and habitats, water for public supply of drinking water and water for bathing purposes)

Monitoring of river's body of surface water for public supply of drinking water

Monitoring of river's body of surface water for public supply of drinking water will be conducted at two points located in two river's body of surface water: Drwęca River from Brodniczka to the estuary and Brda River from Koronowski Reservoir to Smukała Reservoir. The range and frequency of the tests are determined in the Regulation of the Minister of the Environment of 27.11.2002 r. on the requirements that should be met by surface waters used to supply people with drinking water (Journal of Laws No. 204, item. 1728). Priority substances and other Hazardous substances must meet the requirements of a good chemical status referred to in Annex No 9 to the Regulation of the Minister of the Environment of 9.11.2011 (Journal of Laws of 2011, No 257, item. 1545).

Monitoring of river's body of surface water particular for recreation and water sports

Monitoring is located in profiles of river's body of surface water used for recreational purposes. Sampling is done on an annual basis carried out every 3 years. The range of research and frequency are the same as in the operational monitoring, whereby if measurement station is located on the bathing, the range of the study must be completed with the microbiological indicators. In the new water cycle Trynka river in profile: the estuary to the Vistula River (Grudziądz) was designated for research.

Monitoring of river's body of surface water in the areas of protection of habitats or species

Monitoring stations on protected areas of species or habitats are carring out surveillance monitoring. In determining programs and the range of researches for protected areas there should be examined the previous date and evaluation results, because on this basis a decision is made about operational monitoring and the range of it. Possible operational monitoring in the areas of protection of habitats or species is conducted when the area is considered at risk of not achieving the environmental objectives or when the environmental objectives are not in good status. Operational monitoring is also carried out when to the rivers body of surface water there are drained priority substances or other hazardous substances from group 3.6 and 4.2 and if the results of surveillance monitoring exceed the limits for good status with regard to these substances.

Within the implementation of this task in the areas of protected habitat (SAC) the monitoring included the following rivers: Szumionka, Brda Valley and Stążka in Bory Tucholskie (PLH040023), Ostoja Brodnicka (PLH040036) and artifical rivers: Bydgoszcz Canal – Noteć Valley (PLH300004) and Upper Noteć Canal – plain Szubińsko-Łabiszyńska (PLH300004), Noteć Valley (PLH300004). Within the implementation of this task in the areas of protected species (SPA)

the monitoring included the following rivers: Zielona Struda Canal and Nieszawski Canal – Lower Vistula Valley (PLB040003), Czerska Struga – Bory Tucholskie (PLB220009) and Bydgoszcz Canal – Middle Noteć Valley and Bydgoszcz Canal (PLB300001).

Monitoring of river's body of surface water sensitive to eutrophication caused by point sources of pollution from municipal and industrial sources.

The increasing level of eutrophication of surface waters has been recognized as one of the main threats to the quality of surface waters. The superior objective of the Water Framework Directive is to achieve the good status of water by 2015. The classification of eutrophication of inland waters was carried out at all measurement station because the whole area of Poland was considered to be threatened by municipal eutrophication. To classify the municipal eutrophication there will be used the following parameters: phytoplankton index, diastoms index, Macrophyte Index, oxygen conditions, BOD5, total organic carbon, ammonium nitrogen, Kjeldahl nitrogen, total nitrogen, phosphates and total phosphorus. Sampling is done on an annual basis carried out every 3 years.

Monitoring of river's body of surface water in areas exposed to pollution of nitrogen from agricultural sources

In measurement stations on the areas exposed to pollution of nitrogen from agricultural sources the sampling is done on an annual basis carried out at least every 3 years. It is recommended the monthly indicators sampling characterizing nutrient conditions. Monitoring cycles are adapted to the timetable specified for the areas exposed to pollution of nitrogen from agricultural sources in the regulation of Directors of the Regional Water Management Boards in Gdansk, Poznan and Warsaw. The legal basis for the designation of these areas was the Water Law of 18.07.2001. (Journal of Laws No. 115, item. 1229, as amended) and the implementing regulation to this Act - of the Minister of the Environment 23.12.2002 concerning the criteria to determine the waters vulnerable to pollution with nitrogen compounds from agricultural sources (Journal of Laws No. 241, item. 2093).

Planned research in the waters vulnerable waters pollution with nitrogen compounds from agricultural sources in the new water cycle will be performed on the following river's body of surface water:

- Bacha from Zgniłka with Zgniłka,
- Bacha from Zgniłka do estuary,
- Tributary from Żółnowo,
- Parchański Canal from tributary from Błoto Ostrowskie to tributary from Nowy Dwór,
- Tążyna with Parchańskim Canal to tributary from Nowy Dwór,
- Tążyna from Parchański Canal to estuary.

Conclusion

The overriding objective of river's body of surface water in the water cycle 2016-2021 is establish a coherent and comprehensive overview of water status for each river basin. It allows to classify all river's body of surface water by assigning them one of five classes of ecological state / potential, one of two classes of chemical status and one of two classes of state. Established monitoring network completed with new

measurement stations, provide data in the specified range, prescribed form and in sufficient time, to use in the subsequent preparation of planning. It also complement the monitoring data for river's body of surface water in the Kujavian and Pomeranian Voivodeship from the previous water cycle 2010-2015. Particular emphasis in the water cycle 2016 - 2021 is put on location of the research profiles on the rivers on the protected areas, including: Natura 2000, landscaped park and nature reserve. In addition, the monitoring is provide on the: areas exposed to pollution from municipal sources and nitrogen from agricultural sources, water for public supply of drinking water and water for bathing purposes

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