PROLINE-CE

WORKPACKAGE T1, ACTIVITY T1.1

PEER REVIEW OF LAND USE AND WATER MANAGEMENT PRACTICES

D.T1.1.1 Country Reports About the Implementation of Sustainable Land Use in Drinking Water Recharge Areas

POLAND

March 2017

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Date of last release	March 2017

Contents

1. Introduction

"The Concept of National Spatial Development Plan 2030" is the most important document regarding Polish spatial planning. The implementation of this document allows building an efficient and transparent system of spatial planning at every level of space management. In addition, NSDP formulates policies and measures for the prevention of conflicts in the management of space and assures the security, including the flood security.

The aim of the National Spatial Development Plan with regard to water is to improve the management of the limited surface water and groundwater resource, including preventing deficits of water for human and economic-development needs. Being an important part of the natural environment, water resource is a strategic development resource of the country and a major driver of regional and local development. Europe-wide, the water storage rate (6%) is alarmingly low, which calls for a greater effort to reduce the rate at which rainwater runs off. In order to maintain the appropriate amount and quality of this resource, integrated strategic planning documents at the national and regional levels provide for the possibility of coordinating measures under Poland's Water-Environment Programme. Spatial planning will place greater focus on the coexistence of various ways in which water resources are utilised and also on regulating how long water stays in the environment, with a view to reducing any risks to the quality and amount of this resource. National, regional and spatial planning also makes use of other water-management planning instruments, including those under the Water Framework Directive and the Floods Directive, river basin water management plans, flood risk management plans, drought mitigation plans and regulations governing the use of water in water regions and drainage basins (more information regarding the National Spatial Development Plan is included in Annex I).

2. Water supply resources, protection and management policy on national and regional level

2.1. Water management

Flowing surface water resources

In 2014, total flowing water resources in Poland amounted to 52,238,600,000 m^3 (including 6,620,400,000 m^3 flowing in from abroad, with the outflow from catchment areas in Poland at 45,618,200,000 m^3).

The average annual precipitation in Poland in the hydrological year 2014 was 639.5 mm (and including catchment areas which flow into rivers that run through Poland, the average annual precipitation was 644.3 mm). The run-off from the territory of Poland was 145.9 mm.

In the Vistula River basin, the total flowing water resources in 2014 were 30,944,500,000 m^3 (including 3,997,400,000 m^3 flowing in from abroad, and 26,947,100,000 m^3 flowing out from Poland). The average annual precipitation within the Vistula River basin in the hydrological year 2014 was 667.7 mm (and including catchment areas which flow into rivers that run through Poland, the average annual precipitation was also 667.7 mm). The run-off from the Vistula catchment area on the territory of Poland was 159.7 mm.

In the Oder River basin, the total flowing water resources in 2014 were 13,804,000,000 m^3 (including 2,623,000,000 m^3 flowing in from abroad, and 11,181,000,000 m^3 flowing out from Poland). The average annual precipitation in the Oder catchment area in the hydrological year 2014 was 619.6 mm (and including catchment areas that flow into rivers that run through Poland, the average annual precipitation was 629.0 mm). The run-off from the Oder catchment area on the territory of Poland was 105.4 mm.

In the drainage basin of the Baltic Sea (catchment areas of the Rega, the Wieprza, the Słupia and the Łeba Rivers), total flowing water resources amounted to 3,976,500,000 m^3. The average annual precipitation within the catchment areas of the Baltic drainage basin in the hydrological year 2014 was 614.7 mm, and the run-off from this area was 229.7 mm.

Between 1951 and 2014, the average total flowing water resource was 61,000,000,000 m^3. In this context, in the hydrological year 2014, the flowing water resource in Poland was smaller and constituted 85.5% of that average.

In Poland, there are 2,856 lakes with an area of more than 10 ha, and their capacity is 18,2 bn m^3. The total capacity of lakes in Poland is 18.6 bn m3.

As at the assessment date, groundwater resources available for use in the country as a whole are 37,720,000 m3/day, which is approx. 1.0 m^3 per citizen a day.

Water needs

The principal objective of water management is to use the available water resources as efficiently as possible to satisfy the water needs of the population, agriculture and industry, while also ensuring safety and protection against both flood and drought.

For water resources to be used as effectively as possible for the growth of the country and without damage to the environment, it is particularly important to take measures to protect them, increase the available water resources and improve their quality.

Water abstraction for the needs of the population and economy

In 2014, the abstraction of water (groundwater and surface water) was over 10,689,800,000 m^3, of which 84.3% was the abstraction of surface water, 15.1% groundwater, and 0.6% was water from the drainage of mining operations areas and civil structures, used for manufacturing purposes. The majority of water abstracted for the needs of the population and economy was used for manufacturing purposes (71.5%). Water abstracted for the operation of water supply networks (water supplied to the population) accounted for 18.6% of the total abstraction, and irrigation in agriculture and forestry for 9.9%. As much as 96.6% of the abstraction of water for manufacturing purposes was from surface water wells, with only approx. 2.6% of the abstraction being from groundwater, and about 0.8% from the drainage of mining operations and civil structures. When it comes to the abstraction of water for the operation of water supply networks, 71.2% of water was abstracted from groundwater wells, and 28.8% from surface water wells. The abstraction of water for the purposes of the national economy and the population is presented, by water source, in Table 1.

Table 1. The abstraction of water for the purposes of the national economy and the population, by source of abstraction, in areas under administration of Regional Water Management Boards in 2014, according to the data provided by the the CSO.

RZGW	Total		For (purpose)							
			production (excluding agriculture and forestry – from domestic water wells)				irrigation in agriculture and forestry, and filling up or make-up of fish ponds	water supply system operation		
			total	including				total	including	
				surface water	groundwater	from drainage of mining operations areas and civil structures			surface water	groundwater
	in million m3	per km2 in 1,000 m3	in million m3							
POLAND	**10689.8**	**34.2**	**7645.1**	**7382.8**	**203.4**	**59**	**1056.6**	**1988.1**	**572.2**	**1415.9**
Gdańsk	431.5	12.3	163.4	141.2	22.1	0.1	46	222.2	22.6	199.6
Gliwice	315.3	40.7	114	48.5	16.4	49.1	79.6	121.7	57.5	64.1
Kraków	2163.7	49.4	1637.4	1617.1	16.9	3.4	160.5	365.9	245.7	120.1
Poznań	2011	36.4	1520.2	1478.5	40.7	1	161.8	329	22.2	306.8
Szczecin	1447.3	70.1	1328.1	1320.1	8	0	31.8	87.4	20.3	67.1
Warszawa	3649	32.8	2754.3	2678.9	73.5	1.9	313.4	581.1	140	441.2
Wrocław	671.9	17.3	127.7	98.5	25.7	3.5	263.5	280.7	63.8	216.9

* Water abstraction at wells, before water supply to networks

At the national level, the greatest abstraction of water is found in the central and north-western regions (Mazowieckie, Wielkopolskie, Zachodniopomorskie and Świętokrzyskie Voivodeships). The greatest water demand, in relation to water abstraction, is observed in the energy sector, with abstraction for its purposes amounting to approx. 6,918,200,000 m^3 per year, which accounts for

more than 91.2% of the total water abstraction for industrial purposes and 64.7% of the total water abstraction nationwide.

According to the CSO data, in 2014, 1 056,600,000 m^3 of water was abstracted for irrigation purposes in agriculture and forestry and for the filling up of fish ponds, with 975,800,000 m^3 being used for the filling up of fish ponds (with an area below 10 ha) alone (the total area of fish ponds was 49,600 ha).

Currently, water management in agricultural areas should take into account especially the irrigation functions of farmland drainage systems and measures that improve water retention, to facilitate both an increase in agricultural productivity, and the protection of the natural values of the environment.

Potable water

The quality of water intended for human consumption is supervised by the State Sanitary Inspection pursuant to the State Sanitary Inspection Act of 14 March 1985 (Journal of Laws of 2015, item 1412), and on the basis of:

- the Act of 7 June 2001 on collective water supply and collective sewage disposal (Journal of Laws of 2015, item 139, as amended),
- the Regulation of the Minister of Health of 13 November 2015 on the quality of water intended for human consumption (Journal of Laws of 2015, item 1989), preceded by the Regulation of the Minister of Health of 29 March 2007 on the quality of water intended for human consumption (Journal of Laws No. 61, item 417, as amended)

Collective potable water supply is managed by water and sewerage companies. They are required by law to provide continuous supply of quality water. Water and sewerage companies are also required to regularly test water quality, including the assessment of its physical/chemical, bacteriological and organoleptic properties, at exit from the water supply company, within the water distribution network, and at customer locations.

The State Sanitary Inspection reports to the Minister in charge of health. The State Sanitary Inspection is managed by the Chief Sanitary Inspector (GIS) as a central body of government administration, that achieves its objectives through the Chief Sanitary Inspectorate. Within individual voivodeships, the objectives of the Inspection are achieved by Voivodeship Sanitary Inspectors, who report directly to the Chief Sanitary Inspector, and they themselves are superior to District Sanitary Inspectors operating within the respective Voivodeships.

Water quality

Actions for the protection of water that have been taken for years now, have been observed to produce a gradual improvement in water quality. There has also been a decrease in contamination loads, and in particular heavy metals that reach the Baltic Sea through rivers. One of the surface water and groundwater polluters is agriculture. Major sources of nutrients (nitrogen, phosphorus) are animal husbandry (cattle, pigs, poultry) and incorrect storage of organic fertilisers, in addition to the often incorrect fertilisation based on mineral fertilisers. In

catchment areas of small rivers, the quality of water can be significantly affected also by discharges from fish ponds. Another potential threat for water quality is the gradual release of nitrogen and phosphorus as a result of progressing mineralisation of peat in drained peat bogs. Another major source of contamination is an uncontrolled discharge of domestic sewage from small settlements and individual residential properties (e.g. leaky cesspits, non-functioning hand-dug wells, used as receiving water bodies).

The fulfilment of the obligations assumed by the Government of the Republic of Poland in the Treaty of Accession of Poland to the European Union, in the part concerning the implementation of Directive 91/271/EEC concerning urban waste water treatment, required that, by 2015, measures be taken to provide agglomerations with combined sewer systems and municipal sewage treatment plants.

In line with the objectives specified in the Treaty of Accession, the Directive requirements have been gradually fulfilled from 2010:

- by 31 December 2010 compliance with the Directive was to be achieved in 1,069 agglomerations, in which the biodegradable contamination loads accounted for 86% of the total biodegradable contamination loads from the agglomeration,
- by 31 December 2013 compliance with the Directive was to be achieved in 1,165 agglomerations, in which the biodegradable contamination loads accounted for 91% of the total biodegradable contamination loads from the agglomeration,
- by 31 December 2015 compliance with the Directive was to be achieved in all agglomerations, in which the biodegradable contamination loads accounted for 100% of the total biodegradable contamination loads from the agglomeration.

In order to provide agglomerations with combined sewer systems and municipal sewage treatment plants, the National Municipal Sewage Treatment Programme (KPOŚK) was developed. The programme was approved by the Council of Ministers

on 16 December 2003. Therefore, KPOŚK governs and regulates the obligations assumed by Poland in the Accession Treaty with regard to Directive 91/271/EEC.

In line with the Law on Water Management, the Council of Ministers reviews KPOŚK at least once every 4 years. The first review took place in June 2005. (AKPOŚK 2005). Between

2008 and 2009 the Programme was subject to its second review (AKPOŚK 2009), approved on 2 March 2010; the third review of KPOŚK was approved by the Council of Ministers on 1 February 2011 (AKPOŚK 2010). The purpose of the review was to assess the progress of investments and analyse the reasons for any delays, and, consequently, to determine feasible deadlines for their completion. This concerned 126 agglomerations included in AKPOŚK 2009, which, due to investment delays, had not accomplished the scheduled objectives by the end of 2010. Other information and data remained consistent with AKPOŚK 2009.

In 2015, the fourth review of KPOŚK (IVAKPOŚK) was drafted and a corresponding Environmental Impact Assessment was prepared. These documents were subject to further legislation. IVAKPOŚK is to identify the most recent actions for the purpose of providing agglomerations where PE ≥ 2,000 with sewer systems and municipal sewage treatment plants, and managing sewage sediments. The review of the programme verified the areas and limits of agglomerations

in terms of their compliance with the Directive requirements. From 2003 to 2012, the implementation of Directive 91/271/EEC was based on its Article 5.4. The European Commission advised Poland that it had misinterpreted the provisions of the Treaty, which had led to the incorrect implementation of the Directive. Consequently, the Minister of the Environment recommended a number of legal amendments to ensure correct Directive implementation, based on Article 5.3 of Directive 91/271/EEC.

These legal amendments also concern the need to conduct a comprehensive verification of agglomerations' areas and borders. During its first stage, the verification required that commune heads (town and city mayors) provide their corresponding voivodeship assemblies with verified agglomeration proposals by the end of June 2014. This applied to the agglomerations that had not yet been defined or whose defined areas had to be adjusted to the new regulations. Agglomeration verification made it possible to review their investment needs related to addressing sewage management issues in the area. Therefore, work on the fourth review was suspended and was only continued after agglomeration areas had been verified, i.e. in Q3 2015.

For the purposes of activities associated with the new financial perspective under the Infrastructure and Environment Operational Programme, the European Commission requested that future investment needs related to waste management be reviewed. In December 2013, Poland provided the initial Master Plan for Directive 91/271/EEC. Following the verification of agglomeration areas and limits, the document was reviewed and provided to the EC in May 2015. Furthermore, now the Master Plan is the most up-to-date source of information on the investment needs of agglomerations included in KPOŚK.

Water retention

In 2014-2015, there was no significant increase in the retention basin capacity. It is estimated (on the basis of the Institute of Meteorology and Water Management (IMGW) data, 2012) that the total volume of water stored in retention basins is approx. 4 bn m^3, which is slightly more than 6.5% of the average annual run-off effluent from that period, and does not provide full protection against flood and drought, nor does it ensure appropriate water supply (physical/geographical conditions in Poland make it possible to store 15% of the average annual run-off effluent). Therefore, the capacity of artificial water bodies in Poland is small.

The majority of water is stored in water bodies with a capacity above 3 million m^3. The greatest number is represented by water bodies with a capacity above 100 million m^3 (10 water bodies), whose combined capacity is 2,184,400,000 m^3. Major artificial water bodies are presented in Table 2.

Table 2. Major artificial water bodies based on CSO data.

No.	Water bodies and barrages (name and location)	River	Put into operation in	Capacity (total at maximum damming level)	Surface area at maximum damming level	Damming level
				million m^3	km^2	m
1	Solina (Podkarpackie Voivodeship)	The San	1968	472.4	21.1	60.0
2	Włocławek* (Kujawsko-Pomorskie Voivodeship)	The Wisła (Vistula)	1970	453.6	75.0	13.9
3	Czorsztyn-Niedzica (Małopolskie Voivodeship)	The Dunajec (Danube)	1997	231.9	12.3	54.5
4	Jeziorsko (Łódzkie Voivodeship)	The Warta	1986	202.8	42.3	11.5
5	Goczałkowice (Śląskie Voivodeship)	The Mała Wisła (Small Vistula)	1956	161.3	32.0	13.0
6	Rożnów (Małopolskie Voivodeship)	The Dunajec (Danube)	1941	159.3	16.0	31.5
7	Dobczyce (Małopolskie Voivodeship)	The Raba	1986	141.7	10.7	27.9
8	Otmuchów (Opolskie Voivodeship)	The Nysa Kłodzka	1933	130.5	20.6	18.4
9	Nysa (Opolskie Voivodeship)	The Nysa Kłodzka	1971	124.7	20.7	13.3
10	Turawa (Opolskie Voivodeship)	The Mała Panew	1938/1948	106.2	20.8	13.6

* barrage

In 2014, according to CSO data, there were 31,334 water facilities, that stored water either continuously or periodically, including small-scale water retention facilities, with a total capacity of 804,400,000 m3, of which 7,665 were fish ponds with a capacity of 319,720,000 m^3, 385 were dammed lakes with a capacity of 277,100,000 m^3, and 3,966 were artificial water bodies with a capacity of 164,700,000 m^3. There are no detailed data that would make it possible to estimate the actual small-scale water retention level.

Surface water resources and their use for ensuring the appropriate amount of water for all users, both require adequate engineering structures that are the property of the Treasury. There are a few dozen thousand various hydro-engineering structures located along Polish rivers. The majority of those structures serve agricultural production and are managed by Voivodeship

Drainage, Irrigation and Water Facilities Boards, and some of them are registered as historic monuments. They include culverts and water gates, pump stations and water bodies.

Regional Water Management Boards are in charge of:

31 water bodies,

11 dry flood control reservoirs and a polder,

44 dammed lakes,

93 barrages,

68 weirs and 27 river locks **that do not operate as barrages**.

Some rivers are completely or almost completely canalised, i.e. have damming structures. Such rivers include the Bóbr, the Nysa Łużycka, the Nysa Kłodzka, the Soła, the Radunia, the Gwda. On the Vistula there are 7 damming structures, of which 6 on the Wisła Górnicza (Mining Vistula), along the section from Oświęcim to Kraków, and a barrage in Włocławek on the Środkowa Wisła (Central Vistula). The Oder is canalised from Koźle to Brzeg Dolny, along a 183.5 km-long section. The majority of large rivers are partially regulated.

GROUNDWATER

WATER FOR DRINKING AND INDUSTRIAL PURPOSES

In 2014, exploitable normal groundwater resources were described in ground water documentation, approved by Voivodeship and District authorities. The size of exploitable normal groundwater resources, their increase and decrease in individual Voivodeships, including major aquifer systems, is presented in Table 3.

Table 3. Summary of identified exploitable normal groundwater resources in Poland in 2014.

No.	Voivodeship	Area in km^2	Exploitable resources						
			Total in m^3/h		Resource coefficient m^3/h/km^2	Exploitable resources in m^3/h from			
			As at 31 Dec 2014	Increase/decrease in 2014		quaternary aquifers	Neogene-Paleogene aquifers	Cretaceous aquifers	older aquifers
	Total	**312,685**	**2,008,986.44**	**10,934.09**	**6.42**	**1,326,482.36**	**210,363.27**	**276,888.62**	**195,252.19**
1	Dolnośląskie	19,948	91,172.38	413.14	4.57	61,594.57	20,805.13	3,407.40	5,365.28
2	Kujawsko-Pomorskie	17,970	171,425.65	1,951.40	9.54	133,151.76	28,544.69	7,885.10	1,844.10
3	Lubelskie	25,114	141,336,00	1,051,50	5.63	23,990.45	12,700.20	103,834.05	811.30
4	Lubuskie	13,984	94,092.36	61.70	6.73	87,381.72	6,696.64	14.00	0.00
5	Łódzkie	18,219	169,670.42	1,423.44	9.31	66,349.43	8,926.06	62,192.64	32,202.29
6	Małopolskie	15,144	73,980.09	382.55	4.89	40,950.82	9,226.37	12,946.45	10,856.45
7	Mazowieckie	35,598	251,076.65	3,052.69	7.05	198,031.00	17,448.27	25,431.43	10,165.95
8	Opolskie	9,412	56,689.74	26.40	6.02	24,656.55	15,295.25	1,916.00	14,821.94
9	Podkarpackie	17,926	58,033.34	201.08	3.24	51,684.41	4,762.85	1,551.08	35.00
10	Podlaskie	20,180	77,983.00	381.40	3.86	75,889.90	2,047.10	34.00	12.00
11	Pomorskie	18,293	163,909.19	303.56	8.96	135,913.15	15,988.44	11,963.60	44.00
12	Śląskie	12,294	107,881.42	701.19	8.78	23,930.61	2,498.63	4,550.34	76,901.84
13	Świętokrzyskie	11,672	60,549.89	306.55	5.19	6,917.73	4,743.60	14,393.90	34,494.66
14	Warmińsko-Mazurskie	24,203	130,667.11	-5.50	5.40	123,567.61	6,951.30	148.20	0.00
15	Wielkopolskie	29,826	188,238.77	951.58	6.31	113,778.91	46,316.14	25,131.93	3,011.79
16	Zachodniopomorskie	22,902	172,280.45	-268.59	7.52	158,693.75	7,412.60	1,488.50	4,685.60

Overall, exploitable normal groundwater resources as at 31 December 2014 were 2,008,986.44 m^3/h, and the increase in the resources in 2014, compared to the year before, was 10,934.09 m^3/h. Taking into account documented changes in, and revisions of, the identified available

resources between 1994 and 2013, in 2014 there was an increase, which amounted in total to 55,463.80 m^3/h. The sum of the identified available resources as at 31 December 2014 was 932,820.37 m^3/h.

Overall, in Poland, 66.0% of the identified exploitable normal groundwater resources are associated with quaternary aquifer systems, 10.5% with the Neogen-Paleogen aquifer systems, 13.8% with the Cretaceous aquifer systems, and 9.7% with aquifer systems older than the Cretaceous period, with a significant stratigraphical diversification of exploited aquifer systems across individual Voivodeships.

Water management and control

Water is the property of the Treasury and legal and natural persons. Groundwater, flowing surface water and territorial waters and inland marine waters, are all the property of the Treasury. Waters owned by the Treasury are administered (managed) by various authorities. For management purposes, the Act (Law on Water Management) appoints an institutional structure and delegates specific responsibilities to individual authorities.

The authorities in charge of water management include:

1) Minister in charge of water management;

2) President of the National Water Management Authority – as a central government authority, supervised by the Minister in charge of water management;

3) Head of the Regional Water Management Board – as a non-combined government administration authority, who reports to the President of the National Water Management Authority;

4) Voivodeship Governor;

5) local government authorities.

The management of water resources takes into account the division of the State into river catchment areas and water regions, and serves to satisfy the needs of the population and the economy, and to protect water and the associated environment. Instruments used for water management include water management plans, terms of use for river catchment waters, consents for water engineering works, fees and charges for the use of waters and water facilities, water cadastre, and water management inspections. The authority coordinating and responsible for the correct and appropriate water management is the President of the National Water Management Authority, who reports to the Minister in charge of water management. At the water region level, these activities are the responsibility of the Heads of seven Regional Water Management Boards.

At present, water management is considered an integrated field, which covers the use and protection of water resources. The management of water resources serves to satisfy the needs of the population and the economy, and to protect water and the associated environment, and in particular to:

1) ensure the appropriate amount and quality of water for the population;

2) protect water resources against contamination and inappropriate or excessive exploitation;

3) maintain or improve the state of water and water-dependent ecosystems;

4) provide protection against flood and drought;

5) provide water for agricultural and industrial purposes;

6) satisfy tourist, sport and recreation-related needs;

7) create conditions for the use of waters for energy, transport and fishing purposes.

Instruments of water resource management include:

1) water management planning;

2) consents for water engineering works;

3) water management fees and charges;

4) water cadastre;

5) water management inspections.

Responsibilities of the President of the National Water Management Authority

The President of the National Water Management Authority (KZGW) is a central government authority in charge of water management, in particular in relation to matters associated with water management and use (Article 89.1 of the Water Law). The President of KZGW is appointed in an open competitive process. The President is appointed and dismissed by the President of the Council of Minister at the request of the Minister in charge of water management.

The President of KZGW exercises proprietary rights in relation to public waters that are the property of the Treasury, and waters important for water resource management and flood protection, and especially groundwater and inland surface waters:

- in mountain streams and their sources,
- in natural watercourses, from their sources to their estuaries, with an average flow in a multi-annual period equal to, or higher than, 2.0 m^3/s in estuary-cross-section,
- in lakes and artificial water bodies, with watercourses described in point b flowing through them,
- in border regions,
- in inland waterways (Article 11.1.2 of the Law).

The President of KZGW is the superior of the Heads of Regional Water Management Boards (Article 4.1.3 of the Law). According to the Code of Administrative Procedure, the President of the National Water Management Authority is considered a higher administrative body in relation to voivodeship governors and directors of regional boards for water management that which can decide in matters defined by the Act (article 4 section 3 of the Act). The structure of a Regional Water Management Board is defined in the charter assigned to it by the Minister in charge of water management at the request of the President of the National Water Management Authority

(Article 92.7 of the Law). The Head of the Regional Water Management Board is appointed and dismissed by the Minister in charge of water management at the request of the President of the National Water Management Authority in consultation with the National Council for Water Management. The Deputy Heads of Regional Water Management Boards are appointed and dismissed at the request of the Heads of Regional Water Management Boards in consultation with the Water Management Council of the relevant water region (Article 93.1 and 93.2 of the Law). Heads of Regional Water Management Boards submit annual reports on the accomplishment of objectives defined in the Law to the President of the National Water Management Authority no later than by 31 March (Article 94 Law).

Water management has been based on the Law on Water Management, including:

- the refinement of the transposition of Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000), hereinafter "Water Framework Directive", to the Polish legal system,
- the implementation of Articles 4 and 11 of the Regulation (EEC) No 1108/70 of the Council of 4 June 1970 introducing an accounting system for expenditure on infrastructure in respect of transport by rail, road and inland waterway, and Regulation (EEC) No 2598/70 of the Commission of 18 December 1970 specifying the items to be included under the various headings in the forms of accounts shown in Annex I to Council Regulation (EEC) No 1108/70 of 4 June 1970,
- the transposition of Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks, hereinafter "Floods Directive".

The Law on Water Management, including its secondary legislation, implements, to the extent it regulates, the following European Community Directives:

1) Directive 75/440/EEC of 16 June 1975 concerning the quality required of surface water intended for the abstraction of drinking water in the Member States (OJ L 194, 25.7.1975),

2) Directive 76/160/EEC of 8 December 1975 concerning the quality of bathing water (OJ L 031, 05.02.1976),

3) Directive 76/464/EEC of 4 May 1976 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (OJ L 129, 18.05.1976),

4) Directive 78/659/EEC of 18 July 1978 on the quality of fresh waters needing protection or improvement in order to support fish life (OJ L 222, 14.8.1978),

5) Directive 79/869/EEC of 9 October 1979 concerning the methods of measurement and frequencies of sampling and analysis of surface water intended for the abstraction of drinking water in the Member States (OJ L 271, 29.10.1979),

6) Directive 79/923/EEC of 30 October 1979 on the quality required of shellfish waters (OJ L 281, 10.11.1979),

7) Directive 80/68/EEC of 17 December 1979 on the protection of groundwater against pollution caused by certain dangerous substances (OJ L 20, 26.1.1980),

8) Directive 82/176/EEC of 22 March 1982 on limit values and quality objectives for mercury discharges by the chlor-alkali electrolysis industry (OJ L 81, 27.3.1982),

9) Directive 84/491/EEC of 9 October 1984 on limit values and quality objectives for discharges of hexachlorocyclohexane (OJ L 274, 17.10.1984),

10) Directive 83/513/EEC of 26 September 1983 on limit values and quality objectives for cadmium discharges (OJ L 291, 24.10.1983),

11) Directive 84/156/EEC of 8 March 1984 on limit values and quality objectives for mercury discharges by sectors other than the chlor-alkali electrolysis industry (OJ L 74, 17.3.1984),

12) Directive 86/280/EEC of 12 June 1986 on limit values and quality objectives for discharges of certain dangerous substances included in List I of the Annex to Directive 76/464/EEC (OJ L 181, 4.7.1986),

13) Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment (OJ L 135, 30.5.1991),

14) Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (OJ L 375, 31.12.1991),

15) Directive 2000/60/EC of 23 October 2000 establishing a framework for Community action in the field of water policy,

16) Directive 2006/118/EC of 12 December 2006 on the protection of groundwater against pollution and deterioration,

17) Directive 2007/60/EC of 23 October 2007 on the assessment and management of flood risks,

18) Directive 2008/56/EC of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).

Flood control regulations

http://www.powodz.gov.pl/www/

1. Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks, or Floods Directive
2. Law on Water Management of 18 July 2001 (Journal of Laws of 2015, item 469, as amended)
3. Regulation of the Minister of the Environment, Minister of Transport, Construction and Maritime Economy, Minister of Administration and Digitization, and the Minister of the Interior of 21 December 2012 on the preparation of flood hazard maps and flood risk maps (Journal of Laws of 2013, item 104)
4. Regulation of the Council of Ministers of 27 June 2006 on the boundaries of river catchment areas and water regions (Journal of Laws of 2006, No. 126, item 878)

5. Regulation of the Council of Ministers of 30 June 2010 amending the Regulation on the boundaries of river catchment areas and water regions (Journal of Laws of 2010, No. 130, item 874).
6. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, or Water Framework Directive
7. Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment
8. Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora
9. Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds
10. Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)
11. Commission Regulation (EC) No. 1205/2008 of 3 December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata
12. Regulation of the Council of Ministers of 14 November 2012 on the national spatial reference system (Journal of Laws of 2012, item 1247)
13. Regulation of the Minister of the Environment of 22 August 2007 on entities to which the hydrological and meteorological service and the Polish Hydrogeological Survey service are required to provide warnings, forecasts, reports and bulletins, and on the manner and frequency of such provision (Journal of Laws of 2007, No. 158, item 1114)
14. State of Emergency Act of 18 April 2002 (Journal of Laws of 2002, No. 62, item 558, as amended)
15. Crisis Management Act of 26 April 2007 (Journal of Laws of 2007, No. 89, item 590, as amended)
16. Act of 8 July 2010 on the special requirements concerning preparation for the implementation of flood control structures (Journal of Laws of 2010, No. 143, item 963, as amended)
17. Zoning Act of 27 March 2003 (Journal of Laws of 2003, No. 80, item 717, as amended)
18. Act of 3 October 2008 on the provision of information about the environment and its protection, contribution of society to environmental protection and environmental impact assessments (Journal of Laws of 2008, No. 199, item 1227, as amended)
19. Spatial Information Infrastructure Act of 4 March 2010 (Journal of Laws of 2010, No. 76, item 489, as amended)
20. Government Administration Departments Act of 4 September 1997 (Journal of Laws of 1997, No. 141, item 943, as amended)

21. Voivodeship Governor and Voivodeship Government Administration Act of 23 January 2009 (Journal of Laws of 2009, No. 31, item 206, as amended)
22. Voivodeship Local Government Act of 5 March 1998 (Journal of Laws of 1998, No. 91, item 576, as amended)
23. District Local Government Act of 5 June 1998 (Journal of Laws of 1998, No. 91, item 578, as amended)
24. Commune Local Government Act of 8 March 1990 (Journal of Laws of 1990, No. 16, item 95, as amended)

2.2. Drinking water protection zones

In Poland, the broadly understood "water management following the principle of sustainable development, and, in particular, the shaping and protection of water resources, water use and water-resources management" are regulated in the Act of 18 July 2001 Water Law (Journal of Laws, No. 115, item 1229).

The legislator noted the necessity and significance of using water to meet the needs of the population and the economy, which are regulated in Section II Water use (Art. 31 – Art. 37), the necessity and significance of water protection Section III Water protection, Chapter 1 Environmental objectives and water-protection rules (Art. 38 – Art. 50), Chapter 2 Protection zones and areas (Art. 51 – Art. 61).

The Act of 7 June 2001 on combined water supply and sewage collection (Journal of Laws, No. 72, item 747) specifies "the rules and conditions of combined water supply for human consumption and sewage collection, including the rules on the activities of water and sewerage companies, the rules for creating conditions for the uninterrupted supply and appropriate quality of water and reliable sewage collection and treatment, the requirements concerning the quality of water intended for human consumption, and also the rules of protecting the interests of service recipients, including the requirements of environmental protection and cost optimisation."

In accordance with Art. 11 of the Act, the Minister in charge of construction, local planning, spatial management and housing, in liaison with the Minister in charge of the environment, taking into account, i.a., "(4) the protection from pollution of water or land onto which municipal wastewater is discharged, in particular fulfilling the quality requirements for such wastewater" specified:

- The way in which industrial-waste dischargers fulfil their responsibilities,
- The conditions for discharging wastewater into sewage-system installations and the permissible levels of pollution indicators for pollutants discharged into sewage-system installations,
- The method of exercising control.

Joint actions led to the Regulation of the Minister of Construction of 14 July 2006 on the manner of performing the obligations of industrial-wastewater suppliers and the conditions for

discharging sewage into sewerage systems (Journal of Laws No. 136, item 964) and (Journal of Laws of 2015, item 1456), which follows from the provision of Art. 11 of the Act on combined water supply and sewage collection.

As stipulated in Art. 50 of the Water Law, the Ministers of the Environment, Water Management and Health in the Regulation of the Minister of the Environment of 27 November 2002 on the requirements to be met by surface water used for the public supply of water intended for human consumption (Journal of Laws No. 204, item 1728) jointly prepared the requirements for surface water used for the public supply of water intended for consumption.

The provisions of the Regulation shall not apply to:

- Spontaneous, natural and concentrated outflows of ground water to the surface,
- Infiltration water from the infiltration of meteoric and surface water into a rock mass,
- Sources feeding groundwater deposits, constituting a complex of groundwater, the extraction of which can yield economic benefits.

In terms of threshold water-quality indicators, surface waters used to supply the population with water intended for human consumption are divided into three quality categories requiring:

A1 – basic purification,

A2 – normal physical and chemical purification,

A3 – highly efficient physical and chemical purification.

The regulations relating to water intake protection zones are specified in Chapter 2 of the Act of 18 July 2001 – Water Law.

Pursuant to Art. 51 of the Water Law, in order to ensure the appropriate quality of water abstracted for the public supply of water for human consumption and supply water to industrial plants requiring high-quality water and also to protect water resources, it is possible to establish water intake protection zones and protected areas of inland water reservoirs.

Water intake protection zones

A water intake protection zone is an area covered by bans, orders and restrictions on land and water use. Water intake protection zones are divided into primary and secondary protection zones. It is also permitted to establish protection zones containing only a primary protection zone if it is justified by the local hydrogeological, hydrological and geomorphological conditions and ensures the necessary protection of the abstracted water (Art. 52 (3)).

The bans and orders in force in primary groundwater and surface water intake protection zones are listed in Art. 53, whereas the bans and orders or restrictions in force in secondary surface water and groundwater intake protection zones are listed in Art. 54 of the Act.

In **primary** surface water and groundwater intake protection zones it is forbidden to use land for purposes unrelated to using the water intake. In such areas:

1. Rainwater must be discharged in a way which prevents it from penetrating into water abstraction devices;

2. Land should be covered with greenery;

3. Wastewater from sanitary equipment intended for use by persons employed to operate water abstraction devices must be discharged outside the primary protection zone;

4. The presence of non-employees in the area of operation of water abstraction devices must be limited to situations in which it is absolutely necessary.

Primary protection zones must be enclosed and their borders along surface waters must be marked using permanent standing or floating signs located in visible places; the enclosures and signs must feature information boards containing information about the water intake and warning that entry by non-authorised persons is prohibited (Art. 53 (3)).

Secondary protection zones may impose a ban or restriction on works and other activities which could reduce the suitability of the abstracted water or water-intake efficiency, in particular:

1. Discharging wastewater into water or onto land;
2. Using wastewater for agricultural purposes;
3. Storing or landfilling of radioactive waste;
4. Using fertilisers and plant-protection products;
5. Constructing motorways, roads and rail tracks;
6. Conducting drainage and excavation works;
7. Locating industrial establishments and breeding farms;
8. Locating warehouses for petroleum products and other substances, and also pipelines for their transport;
9. Locating landfills for municipal, hazardous, non-hazardous and non-inert, and inert waste;
10. Washing motor vehicles;
11. Establishing car parks, camps and bathing sites;
12. Locating new water intakes;
13. Locating cemeteries and burying animal carcasses.
14. In secondary groundwater intake-protection zones, in addition to the said bans and restrictions, the following activities might be banned or restricted:
15. Extracting minerals;
16. Performing building or mining drainage works.
17. In secondary surface water intake protection zones, in addition to the said bans and restrictions listed in points 1 to 13, the following activities might be banned or restricted:
18. Locating residential and tourism-related buildings;
19. Using aircraft for agricultural operations;

20. Depositing silage heaps;
21. Fish farming, feeding or baiting;
22. Watering and grazing animals;
23. Extracting stone, gravel, sand and other materials, and cutting plants growing in the water or along its banks;
24. Doing water sports;
25. Using ships propelled by internal-combustion engines.
26. Additionally, the owners of land located in a secondary protection zone might be required to cultivate specific agricultural crops or trees (Art. 54 (4)). Determining the bans, orders and restrictions on land use in a secondary protection zone must take into account the conditions of pollutant infiltration to the aquifer from which water is abstracted (Art. 54 (5)).

The body responsible for granting the legal water permit may, at the request and cost of the water-intake owner, issue a decision to impose the obligation to eliminate any inactive wells on the owners of land located within a secondary protection area (Art. 54 (6)).

The body responsible for granting the legal water permit may also, at the request of the water intake owner, issue a decision to impose on the owners of land located within a secondary protection area the obligation to eliminate, at their cost, a source of water pollution (Art. 54 (7)). A secondary groundwater intake protection zone covers the recharge area of the water intake; if the time of water transit from the perimeter of the recharge area to the water intake is longer than 25 years, the protection zone should cover an area delimited by the 25-year time of water recharge in the aquifer (Art. 55 (1)).

A secondary groundwater intake protection zone is determined on the basis of the hydrogeological documentation of the intake (Art. 55 (2)) prepared in accordance with the guidelines specified in the Regulation of the Minister of the Environment of 8 May 2014 on hydrogeological documentation and geological-engineering documentation (Journal of Laws, item 596) issued on the basis of a delegation of the Act of 9 June 2011 Geological and Mining Law (Journal of Laws, No. 163, item 981).

A surface water intake protection zone is delimited in a way which ensures sustainable water quality in accordance with the provisions of the Regulation on the requirements for surface water used for the public supply of water for human consumption, the frequency of sampling water, analysis reference methods and the method of assessing, and facilitates the preservation of water intake efficiency (Art. 56 (1)).

A surface water intake protection zone is determined on the basis of the results of hydrogeological, hydrographic and geomorphological studies (Art. 56 (2)). A mountain stream or headwaters intake protection zone might cover the entire catchment area of a watercourse upstream of the water intake (Art. 56 (3)).

The perimeters of a water intake protection zone are marked by placing boards containing information on the zone at intersections with transport routes and at other landmarks (Art. 57 (1)). Information-board templates are specified by the Regulation of the Minister of the

Environment of 24 May 2004 on templates for information boards in water intake protection zones (Journal of Laws, No. 138, item 1457).

A protection zone is established, by way of an Act of local law, by the director of the regional water-management board at the request and cost of the water-intake owner, indicating the bans, orders and restrictions and the areas covered by them.

The application to establish a water intake protection zone should contain:

- A justification of the need to establish a protection zone, its suggested perimeters and site plan;
- The technical specifications of the water intake;
- Suggested bans, orders and restrictions on land and water use in secondary protection areas (Art. 58 (2)).

An application to establish a groundwater intake protection zone should contain hydrogeological documentation, and, in the case of surface water, it should contain the results of hydrological, hydrographic and geomorphological studies (Art. 58 (3) and (3a)).

Protected areas of inland water reservoirs

Protected areas of inland water reservoirs are areas covered by bans, orders and restrictions on land and water use to protect the water resources from degradation. These areas might be covered by a ban on constructing buildings and performing works or other activities which could result in permanent land or water pollution, and in particular locating investments classified as having a potential significant environmental impact (Art. 59).

A protection zone is established by way of a local legal Act by the director of the regional water management board on the basis of a water-management plan in a catchment area, indicating the bans, orders and restrictions and the areas covered by them.

Owners of land located within a protection zone are eligible for compensation for any damage incurred in connection with the establishment of bans, orders or restrictions on land and water use in the zone from the owner of the water intake under the terms and conditions specified in the Water Law (Art. 61 (1). The rules for the payment of compensation for restricting the ways of using land in connection with the establishment of inland water reservoir protection zones are specified by provisions on environmental protection (Art. 61 (2)).

Groundwater reservoir protection zones are determined by:

- Defining the perimeters of groundwater reservoir protection zones on the basis of hydrogeological documentation,
- Defining the perimeters of protection zones on the basis of hydrogeological conditions, the primary criterion being groundwater transit time,
- Specifying the perimeters of protection zones and subzones following an analysis of the current and planned land-development type, adjustment to easily identifiable terrain elements,

- Specifying the orders, bans and restrictions which should be presented in relation to the cartographic image,
- A resolution by the director of a regional water mannagement board and transferring the protection requirements to the land management plans and development strategy.
- The suggested measures in groundwater reservoir protection zones should be based on the current land-management type.
- Areas currently used in a way which does not pose any risk to groundwater, without plans to change the land-management type,
- Areas currently used in a way which does not pose any direct risk to groundwater, provided for in development plans (the approved spatial-development plans, development strategies etc.) for changing the land-management type,
- Areas currently used in a way which poses a real or potential danger to groundwater,
- The suggested actions should not significantly limit the development of land located within these areas – more emphasis should be put on measures to protect groundwater.

2.3. Floods/droughts management

Flood control

The Law on Water Management defines flood as "*the temporary covering by water of land not normally covered by water, and in particular caused by water rise in natural watercourses, water bodies, canals and from the sea, excluding any covering of land by water as a result of water rise in sewerage systems*" (Article 9.1.10, Water Law). Directive of the European Parliament and of the Council on the assessment and management of flood risks (2007/60/EC) provides an extended definition of the term "flood", defining it as the temporary covering by water of land not normally covered by water. This shall include floods from rivers, mountain torrents, Mediterranean ephemeral water courses, and floods from the sea in coastal areas, and may exclude floods from sewerage systems (Article 2.1, Floods Directive). The Floods Directive defines flood risk as the combination of the probability of a flood event and of the potential adverse consequences for human health, the environment, cultural heritage and economic activity associated with a flood event (Article 2.2).Therefore, flood risk is associated with the susceptibility of an area to flood damage and loss as a result of water rise and storms, as well as local flooding and sheet flow and the associated landslides. This susceptibility is determined on the basis of previous and potential events with a specific likelihood. In addition to natural causes, the increase in flood risk and in the size of flood losses results from:

- growing coverage of risk areas (increased value of existing property, developed infrastructure and dense permanent land development),
- sealed surface of river catchment areas as a result of land development and changes in land use, resulting in increased and accelerated surface discharge flow rate due to reduced infiltration and runoff retention capacity,
- rapid socio-economic development in coastal regions, exposed to storms.
- flood control is the responsibility of government and local-government authorities. Flood control is managed on the basis of flood hazard maps and flood risk maps, and flood risk management plans.

Preliminary flood risk assessment

In line with Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks (i.e. Floods Directive), and the Law on Water Management of 18 July 2001 (Journal of Laws of 2015, item 469, as amended), by 22 December 2011, the President of the National Water Management Authority had prepared and published the Preliminary Flood Risk Assessment (WORP), the first of the required planning documents.

The purpose of this preliminary flood risk assessment is to identify risk hazard areas, i.e., areas which face significant flood risks, or where significant flood risk is likely, and to identify previous and potential future floods (likely floods). Flood risk areas were identified for two types of floods, namely river floods and coastal floods. In total, 253 rivers, with a total length of 14,481 km, were identified for flood risk areas. Results of the assessment are presented below.

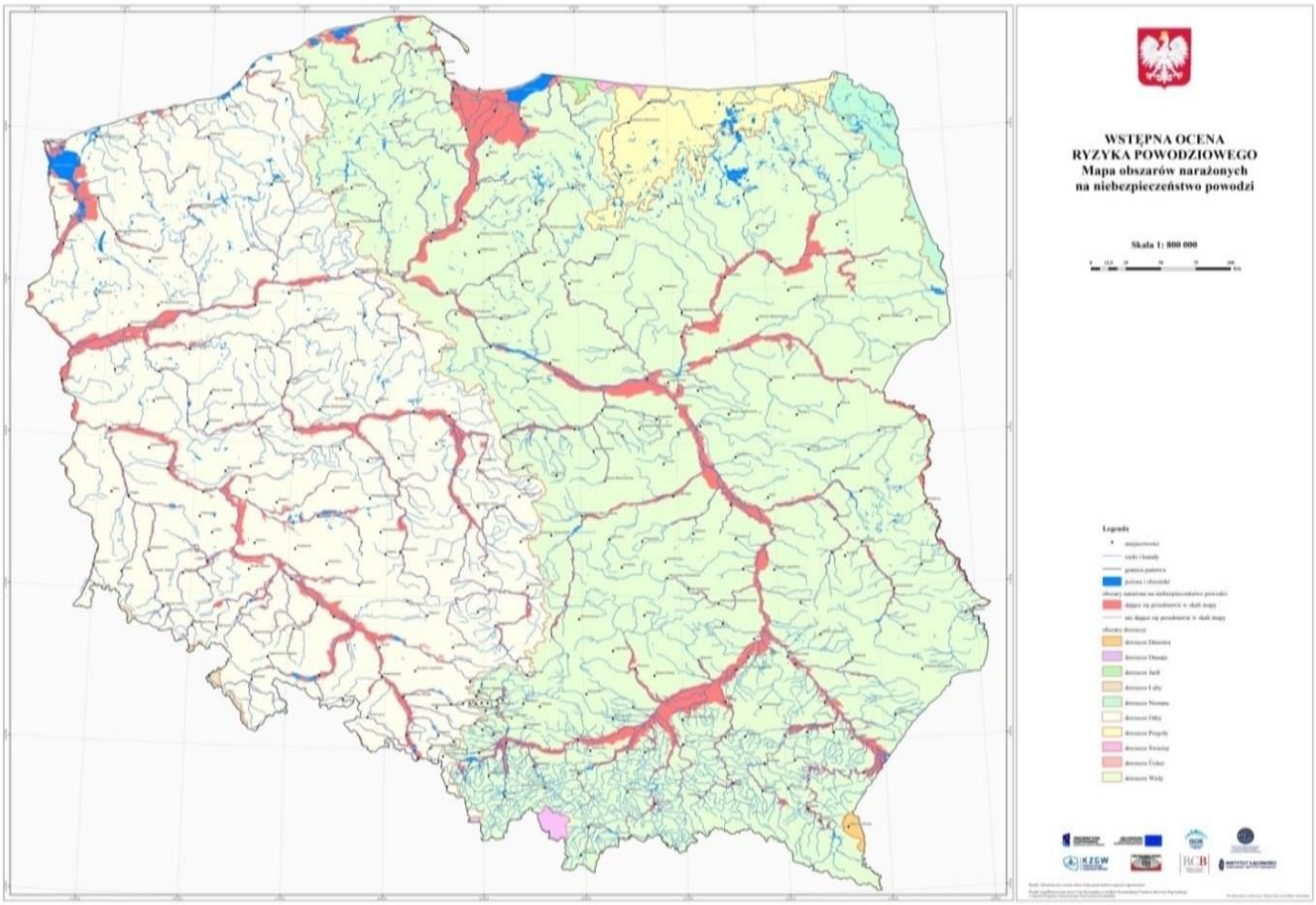

Figure 1. The map of areas at risk of flooding.

Table 4. Translation of Polish terms

Wstępna Ocena Ryzyka Przeciwpowodziowego	Preliminary Flood Risk Assessment
Mapa obszarów narażonych na niebezpieczeństwo powodzi	Map of flood risk areas
Skala 1:800 000	Drawn to scale 1:800 000
Legenda	Key
miejscowości	city/town
rzeki i kanały	river/canal
granica państwa	State border
jeziora i zbiorniki	lakes and reservoirs
obszary narażone na niebezpieczeństwo powodzi	flood risk areas
dające się przedstawić w skali mapy	that can be drawn to this map scale
nie dające się przedstawić w skali mapy	that cannot be drawn to this map scale
obszary dorzeczy	river catchment areas

dorzecze Dniestru	Dniestr (Dniester) River catchment area
dorzecze Dunaju	Dunaj (Danube) River catchment area
dorzecze Jarft	Jarft River catchment area
dorzecze Łaby	Łaba (Elbe) River catchment area
dorzecze Niemna	Niemen (Neman) River catchment area
dorzecze Odry	Odra (Oder) River catchment area
dorzecze Pregoły	Pregoła (Pregolya) River catchment area
dorzecze Świeżej	Świeża (Prokhladnaya) River catchment area
dorzecze Ücker	Ücker (Uecker) River catchment area
dorzecze Wisły	Wisła (Vistula) River catchment area
Innowacyjna Gospodarka	Innovative Economy
Narodowa Strategia Spójności	National Cohesion Strategy
Unia Europejska	European Union
Europejski Fundusz Rozwoju Regionalnego	European Regional Development Fund
Informatyczny System Osłony Kraju (ISOK)	IT system for the protection of the country (ISOK)
Instytut Meteorologii i Gospodarki Wodnej	Institute of Meteorology and Water Management
Państwowy Instytut Badawczy	National Research Institute
Krajowy Zarząd Gospodarki Wodnej (KZGW)	National Water Management Authority (KZGW)
Główny Urząd Geodezji i Kartografii	Head Office of Land Surveying and Cartography (GUGiK)
Rządowe Centrum Bezpieczeństwa (RCB)	Government Centre for Security (RCB)
Instytut Łączności	National Institute of Telecommunications (IŁ-PIB)
Projekt: Informatyczny system osłony kraju przed nadzwyczajnymi zagrożeniami	Project: IT system for the protection of the country against extraordinary threats
Projekt współfinansowany przez Unię Europejską ze środków Europejskiego Funduszu Rozwoju Regionalnego w ramach Programu Operacyjnego Innowacyjna Gospodarka	Project supported by the European Union from the European Regional Development Fund under the Innovative Economy Operational Programme
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This preliminary flood risk assessment was conducted under the project “IT system for the protection of the country against extraordinary threats” (ISOK), by the Institute of Meteorology and Water Management – National Research Institute, Flood and Drought Modelling Centres in Gdynia, Poznań, Kraków and Wrocław (centres are the part of the Institute of Meteorology and Water Management), in consultation with the National Water Management Authority.

As part of the ISOK project, we also conducted an assessment of coastal flood risk, which is the responsibility of the Minister in charge of maritime economy.

Flood hazard maps and flood risk maps

In line with the Floods Directive and the Law on Water Management, it is necessary to prepare flood hazard maps (MZP) and flood risk maps (MRP) for the areas at risk of floods identified during the preliminary flood risk assessment, by 22 December 2013. For a detailed list of maps and guidelines concerning their preparation, see the Regulation of the Minister of the Environment, Minister of Transport, Construction and Maritime Economy, Minister of Administration and Digitization, and the Minister of the Interior of 21 December 2012 on the preparation of flood hazard maps and flood risk maps (Journal of Laws of 2013, item 104).

In line with Article 88f.1 of the Law on Water Management, MZP and MRP are prepared by the President of the National Water Management Authority. The preparation of coastal flood risk maps and flood hazard maps, including internal sea waters, is the responsibility of Heads of Maritime Offices.

MZP and MRP were developed under the project "IT system for the protection of the country against extraordinary threats" (ISOK), by the Institute of Meteorology and Water Management – National Research Institute, Flood and Drought Modelling Centres in Gdynia, Poznań, Kraków and Wrocław. The ISOK project also produced coastal flood risk maps and flood hazard maps.

On 22 December 2013, flood hazard maps and flood risk maps, provided by the map contractor, were published online in the form of PDF files, and are available at http://mapy.isok.gov.pl.

In 2014, the maps were subject to verification due to comments provided by administrative bodies about such issues as the failure of the maps to account for investment projects completed after the digital elevation model had been obtained. Those comments were considered and, if reasonable, taken into account.

On the basis of Article 88f.3 of the Law on Water Management, on 15 April 2015, the President of the National Water Management Authority provided the maps to:

- Heads of regional Water Management Boards,
- Surveyor General of Poland,
- Chief Inspector of Environmental Protection,
- Head of the Government Centre for Security

And published them in Public Information Bulletin of KZGW. Subsequently, in line with Article 88f.4, the Heads of regional Water Management Boards provided the maps to:

- the appropriate Heads of Inland Waterways Authorities,
- appropriate Voivodeship Governors,
- appropriate Voivodeship Marshals,
- appropriate Heads of District Offices,
- appropriate Commune Heads (mayors),
- appropriate Voivodeship and District (municipal) Fire Service Chiefs.

Flood hazard maps and flood risk maps were prepared to scale 1:10 000, in digital form, and include spatial data and cartographic visualisations.

Flood hazard maps show areas where the likelihood of flood is low (Q0.2% – once every 500 years), moderate (Q1% – once every 100 years) and high (Q10% – once every 10 years), and areas at risk of flooding as a result of destruction of, or damage to, a flood bank or a storm dyke. Furthermore, flood hazard maps present the depth, speed and directions of water flow – for capitals of voivodeships and cities with district rights, and other cities with population of more than 100,000. The flood hazard areas presented on the maps were identified through hydraulic mathematical modelling. The modelling was based on a high-accuracy (10-15 cm) digital elevation model, obtained using airborne laser scanning between 2011 and 2013. The preparation of the maps was an extremely complicated and time-consuming process, given the total length of rivers for which these had to be prepared in the first planning cycle, i.e. 253 rivers with a total length of 14 481 km.

Flood hazard maps are complemented by flood risk maps. They identify potential flood loss, presenting estimated number of residents and buildings at risk of flooding in the event of a flood with a specific likelihood of occurrence, and buildings that pose a potential threat to the environment and human health. These elements make it possible to assess flood risk to human health and life, the environment, cultural heritage and business activity, i.e., areas which need to be protected from the negative consequences of floods, in line with water risk management objectives.

The amendment of the Law on Water Management of 16 December 2015 changed the regulations concerning the inclusion of water hazard maps and water risk maps in zoning plans. In line with Article 88f.5 of the Law on Water Management, the area borders presented on the maps, can be included in national zoning plans, voivodeship zoning plans, local zoning plans and decisions on the location of public investments, and zoning approvals. From the date flood hazard maps and flood risk maps are provided to local government units, decisions on the location of public utility projects, and zoning approvals for areas identified on flood hazard maps, can take into account the flood hazard level resulting

from such identification. Article 88f.7, concerning the deadline for including the maps in zoning plans, was repealed. In addition, the amendment made it possible to review, by 22 December 2019, the flood hazard maps and flood risk maps, in order to reflect any significant changes in the flood hazard levels, resulting from the identification of the areas referred to in Article 88d.2.

Flood risk management plans

In line with national and European law, in 2014 and 2015, the President of the National Water Management Authority worked on the preparation of flood risk management plans (PZRP). Planning documents that had been developed prior to plan preparation included a preliminary flood risk assessment and flood hazard maps and flood risk maps.

The purpose of this strategic document on flood control is to limit flood risks (potential losses) for human health and life, the environment, cultural heritage and business activity. In line with the Law on Water Management, the document was prepared from two perspectives, namely river catchment areas and water regions. In terms of scope, PZRP covered areas where, based on the preliminary flood risk assessment, there was a significant flood risk (flood risk areas). First

PZRP were prepared for 3 river catchment areas, namely the Wisła (the Vistula), the Odra (the Oder) and the Pregoła, and for 9 water regions, namely the Dolna Odra and Przymorze Zachodnie, the Warta, the Środkowa Odra, the Górna Odra, the Łyna and the Węgorapa (Angrapa), the Dolna Wisła (Lower Vistula), the Środkowa Wisła (the Middle Vistula), the Mała Wisła (the Small Vistula), the Górna Wisła (the Upper Vistula).

Under the Law on Water Management, the preparation of PZRP for river catchment areas is the responsibility of the President of KZGW, and the preparation of PZRP for water regions – the Heads of individual Regional Water Management Boards (RZGW), and for the preparation of coastal PZRP, including internal sea waters, the Minister in charge of maritime economy.

Flood risk management plans for river catchment areas and water regions were prepared with support from the European Regional Development Fund under the Technical Assistance Operational Programme 2007-2013.

Over a dozen major problems associated with flood risk management were identified for river catchment areas and water regions. Generally, they involve increasing flood hazard, insufficient scope and frequency of maintenance works, insufficient coast protection, insufficient retention capacity of individual catchment areas, increased risk of ice-jam floods and difficulties in icebreaking operations.

A number of assessments were carried out to identify a list of priority measures to significantly reduce the existing flood risk across regions. Based on the spatial analysis of flood hazard and risk, and the assessment of the current flood control system, we diagnosed problems and identified areas that were the most problematic at the water region level, where floods could cause the most severe damage to human health and life, the environment, cultural heritage and business activity. We specified scenarios for those problem areas to reduce the identified risks and, as a result, facilitate the accomplishment of flood risk management objectives.

Major objectives include:

- to stop the increase in flood risks,
- to reduce the existing flood risks, and
- to improve the flood risk management system.

Both technical and non-technical measures were prioritised depending on the nature of the identified problems across catchment areas. Based on those measures, we developed planning options for each problem area. These options were later assessed and analysed in detail. Planning options are scenarios of individual or interrelated measures that lead to the achievement of specific objectives, while ensuring a certain level of flood safety and flood risk management. In order to determine the efficacy and effectiveness of the proposed scenarios in reducing flood risks, we used hydraulic modelling. The options were analysed and assessed against their compliance with legal and environmental requirements, including the requirements of the Water Framework Directive.

On the basis of a cost-benefit analysis (CBA) and a multi-benefits analysis (MBA), we selected the optimum option.

In total, in strategic lists for the Vistula river catchment area, PZRP identified 1262 technical measures and 169 non-technical measures, amounting in total to PLN 5.4 bn; for the Odra river catchment area – 96 technical measures and 46 non-technical measures, amounting in total to PLN 6.24 bn; for the Pregoła river catchment area – 4 non-technical measures (assessments), amounting in total to PLN 1.75 million.

Furthermore, a list of "intermediate measures" has been drawn up, assessed as justified, but, due to the adopted financial limits, their implementation should depend on how many of the strategic measures from the list are successfully implemented, and on the amount of available funds. In total, we identified intermediate measures for PLN 3.4 bn for the Vistula river catchment area, and PLN 3.4 bn for the Odra river catchment area.

Between 22 December 2014 and 22 June 2015, draft flood risk management plans for river catchment areas and water regions were subject to social consultations. The purpose of social consultations was to open a social dialogue with water risk management stakeholders, and to verify whether the problems, objectives and measures identified by experts and included in the developed draft PZRP are accepted by the representatives of various social groups.

Whenever justified, conclusions from social consultations and follow-up recommendations were used to complement or review the draft PZRP, as developed by the National Water Management Authority and Regional Water Management Boards, to ensure their fullest possible acceptance among society, stakeholders and executive bodies responsible for the future implementation of, and compliance with, PZRP.

During social consultations about flood risk management plans, administrative bodies received comments concerning the failure of the maps to take into account investment projects that affect flood hazards (implemented when data for map development are obtained) and methodological solutions used for map development (including for coastal maps for the reduction of wave motion coefficient). In order to meet the expectations and needs of stakeholders, efforts on the development of flood risk management plans resulted in the development of the so-called Option Zero, which includes updated flood hazard area coverage in relation to the areas included on flood risk maps (provided to administrative bodies in April 2015). Consequently, the assessment of planning options was based on Option Zero, which includes flood hazard areas updated on the basis of comments made during social consultations of draft flood risk management plans.

Social consultations, carried out as part of strategic environmental impact assessment, took place in July 2015.

On 2 October 2015, draft PZRP in the form of draft regulations were provided for inter-department negotiations, consultations and assessment, and on 18 October 2015 were accepted by the Council of Ministers. The legislative procedure for the approval of flood risk management plans for river catchment areas and water regions has not been completed yet.

Flood risk management plans, and the measures they provide for, are the basis for the European Commission for the verification of flood control projects. All investment projects should comply with the measures proposed in PZRP, and with waste management plans (PGW). The requirement for compliance of measures with the Water Framework Directive follows directly from the Floods Directive.

In line with the Law on Water Management and Floods Directive, preliminary flood risk assessment, flood hazard maps, flood risk maps, and flood risk management plans are to be reviewed, and, if necessary, updated, every six years. The amendment of the Law on Water Management of 16 December 2015 provided an additional possibility of updating flood hazard maps and flood risk maps by 22 December 2019 to ensure that the maps account for any significant changes in the flood hazard levels resulting from the identification of areas, as referred to in Article 88d.2.

River basin management plans

The main purpose of planning in water management is to ensure the balanced development of the 10 river's basins, while securing the needs for water management. One of the priority issues in the planning of investments related to water management is implemention of the objectives of the Water Framework Directive 2000/60/WE (WFD) of 23 October 2000. In order to ensure the protection of natural resources, as well as non-deterioration of their condition. The duty of drawing up river basin management plans (RBMP) is based on article 13 of the directive 2000/60/WE of 23 October 2000 establishing a framework for Community action in the field of water policy - the so-called The Water Framework Directive (WFD). In accordance with the above mentioned article each Member States shall ensure that a river basin management plan is produced for each river basin district lying entirely within their territory. The requirement to prepare river basin management plans has been transposed into Polish law by art. 90 paragraph. 1 point 1a of the act of 18 July 2001of the Water Law (consolidated text: Journal of Laws 2015 item 469), hereinafter the Water Law. For the first time river basin management plans were developed in 2009, and then on 22 February 2011 approved by the Council of Ministers. In October, 2016. Council of Ministers approved the updated river basin management plans. After approval by the Council of Ministers, the above mentioned document, as strategy document will be a basis for making decisions affecting the status of water resources, streamlining the process of achieving or maintaining good water status and associated ecosystems, as well as pointing to the need for rational water management policies in the future.

The "IT system for the protection of the country against extraordinary threats" (ISOK) project.

General information about the project

The ISOK project is supported from the European Regional Development Fund under Priority Axis 7 "Information Society – development of electronic administration", within the Innovative Economy Operational Programme 2007-2013. The total cost of the project is PLN 299,976,767.03, including eligible costs of PLN 236,209,692.90. Due to the complexity of the Project, it is implemented by a consortium of government and scientific institutions, including the National Water Management Authority (KZGW) (since 13 September 2012 as Project Leader), the Institute of Meteorology and Water Management – National Research Institute (IMGW-PIB), the Head Office of Land Surveying and Cartography (GUGiK), the National Institute of Telecommunications (IŁ-PIB) and the Government Centre for Security (RCB) (Project Partners). The ISOK Project involves the establishment of a comprehensive, integrated IT system, including

any necessary reference registers (geo-referenced databases) for the effective notification and warning of the appropriate institutions and the general public about threats. The purpose of the project is to improve the safety of citizens and to reduce losses caused by natural, technological and synergistic threats. The project has a number of stakeholders, such as citizens, crisis management services and institutions, and water management authorities. Information generated by the ISOK system will also be available for use by NGOs, business entities and organisations who plan construction/business investment projects, including investors. The project will contribute to the increase in knowledge and awareness of society, and its products will provide new instruments to streamline the work of institutions responsible for flood control and management of other threats, and emergency responses. Project implementation supports compliance with major requirements of the Floods Directive by providing a preliminary flood risk assessment, flood threat maps and flood risk maps.

The ISOK project was submitted as a non-functioning project.

Flood damage estimation

Information about potential flood losses is included on flood risk maps.

Drought control

Poland is a country with limited water resources, whose significant variability over time and space makes it necessary to manage water rationally to reduce and minimise the effects of droughts. In Poland, droughts occur periodically, during different seasons, and sometimes cause some serious economic damage.

Drought is controlled in line with drought mitigation plans for river catchment areas and drought mitigation plans for water regions.

Drought mitigation plans include:

1) assessment of opportunities for increasing the available water resources;

2) proposals for the construction, extension or redevelopment of water facilities;

3) proposed necessary changes in the use of water resources and changes in the natural and artificial water retention systems.

The occurrence of drought is associated not only with climatic conditions. The problem of water shortage in soil is also the result of inappropriate drainage, irrigation, or forestation, or the lack of a comprehensive hydro-engineering and agricultural programmes.

Areas that are the most likely to experience drought include Wielkopolska Lowland (Nizina Wielkopolska), Wielkopolskie Lakeland (Pojezierze Wielkopolskie), Mazowiecka Lowland (Nizina Mazowiecka), Podlaska Lowland (Nizina Podlaska), and eastern borders of Lubelska Upland (Wyżyna Lubelska).

The Law on Water Management, which governs drought control, entrusts this task to government and local-government authorities. Efforts of KZGW and RZGW in this area have focused on the development of drought mitigation plans in river catchment areas and in water regions, which,

in addition to water management plans for river catchment areas, the national water environment programme, flood risk management plans, terms of use for water regions, and terms of use for catchment area water, prepared on an ad-hoc basis, constitute an essential planning documentation for water management. In line with the Law, drought mitigation plans should include information about the assessment of opportunities for the increase in the available water resources, proposed construction, extension or redevelopment of water facilities, and proposed necessary changes in the use of water resources and changes in the natural and artificial water retention systems. Another important component of such plans is the list of measures designed to mitigate the consequences of drought.

As part of efforts to prepare drought mitigation plans, in 2013 KZGW commissioned a study entitled "Drought control in water management planning – recommended procedures".

In 2014-2015, individual Regional Water Management Boards started preparing drought mitigation plans for water regions. Depending on RZGW, those plans are scheduled to be ready in 2016 or 2017. The Regional Water Management Boards in Szczecin and Wrocław are reviewing their Plans, prepared in previous years, to adjust them to "Drought control in water management planning – recommended procedures", a study commissioned by KZGW in 2013. The reviews are scheduled to be completed by the end of 2016 or 2017, respectively.

Drought mitigation efforts of relevant authorities also focus on monitoring drought and the development of drought warning systems to mitigate its consequences. Atmospheric and hydrological drought monitoring information is provided by the Institute of Meteorology and Water Management – National Research Institute (IMGW-PIB), and hydro-geological drought information is provided by the Polish Geological Institute – National Research Institute (PIG-PIB). Observations made within the observation and measurement networks of those services provide input data for forecasts, warnings and reports in emergency situations.

Information about the current meteorological and hydrological situation, and about the risk of drought, is available on IMGW-PIB's website (http://www.imgw.pl) and on http://posucha.imgw.pl, a dedicated website on drought. Information on the current hydro-geological situation is available from the website of the Polish Hydrogeological Survey service (http://www.psh.gov.pl), which is represented by PIG-PIB, pursuant to the Law on Water Management. Agricultural drought is monitored by the Institute of Soil Science and Plant Cultivation – State Research Institute in Puławy, to identify areas where drought could cause losses in crops included in the Crop and Livestock Insurance Support Act. Monitoring data are published online on http://www.susza.iung.pulawy.pl.

The State Hydrological and Meteorological Service (PSHM)

The State Hydrological and Meteorological Service (PSHM) and the Polish Hydrogeological Survey service (PSH) play an extremely important role in in protecting the population and property against flood and drought.

The State Hydrological and Meteorological Service (PSHM), which, in line with the Law on Water Management is operated by the Institute of Meteorology and Water Management – National Research Institute, achieves national objectives related to the hydrological and meteorological protection of society and the economy, and to the identification, management, and protection

of national water resources. Its principal objectives include: to make hydrological and meteorological measurements and observations, to carry out the analysis and assessment of the current hydrological and meteorological situation, and to provide corresponding forecasts, to prepare and provide warnings about any dangerous phenomena occurring in the atmosphere and hydrosphere to the government authorities.

As part of its objectives related to the primary hydrological and meteorological protection of the country, the State Hydrological and Meteorological Service has and maintains such systems as the primary measurement and observation network, data collection, processing and exchange system, meteorological forecast offices, hydrological forecast offices, flood modelling centres, and organisational units that set up, supervise and operate the primary measurement and observation network, prepare analyses and assessments of hydrological and meteorological characteristics, prepare data for the purposes of surface water resource balancing, and conduct development and methodological work for PSHM.

On 1 September, the State Hydrological and Meteorological Service (PSHM) published a report on the occurrence of the hydrological low water period caused by the prolonged rainfall scarcity in a large part of the country.

Due to the fact that the groundwater table, within the observation and research network for groundwater monitoring, had remained below the warning water level for a long time, in August and September, the Polish Hydrogeological Survey service issued warnings about the hydro-geological risk in the form of a hydro-geological low water period in shallow water-bearing zones with free water tables. That hydrological and hydro-geological situation caused residents across many regions in the country to have problems with water supply from domestic water wells or local water supply systems. The low level of water in rivers caused, i.a., operational difficulty for power plants using open cooling systems. Moreover, based on the analysis of the climatic water balance (KBW), the Institute of Soil Science and Plant Cultivation – State Research Institute notified about the occurrence of agricultural drought across the country in general.

Increased flood safety level

Measures in this regard will aim to improve safety through hydraulic-structure projects relevant to flood protection, based on water management needs verified by water regions. These will be accompanied by measures involving watercourse maintenance and flood redirection to mitigate the flood risk, among other measures. Projects will be implemented to increase the safety of major agglomerations, industrial plants, transmission and municipal infrastructure, and cultural heritage sites of outstanding value located in areas at risk of flooding. Warning systems for climate- and water-related hazards will be developed and modernised, data measurement and transmission will be automated through the expansion of fast and reliable teletransmission systems, forecasting models and public information systems will be modernised. Flood-risk mitigation measures in areas of outstanding natural and landscape values should prioritise solutions that are as environmentally non-invasive as possible. Projects will be undertaken to adapt the municipal infrastructure to potential severe-weather hazards, including floods, high or low temperatures and rainstorms. Transport and power infrastructures will be developed with due consideration given to potential natural hazards and disasters in that alternative access

roads and power supply sources will be planned and constructed. The existing infrastructure in river valleys (road embankments and railroad fills, bridges, culverts, overhead power lines, pipelines, etc.) will be adapted for resilience to potential hazards that can destroy or damage such infrastructure. These measures will include the mandatory construction of at least two alternative overhead power lines and access routes to settlements in areas at risk. Priority will be given to the construction of linear infrastructure along river valleys and the seacoast. In this context, it is particularly important to expand and upgrade protection-infrastructure elements in the shore area of the Baltic and in the Żuławy area. Also, a dense network of well-equipped general-aviation airports and hospital helipads will be used to facilitate possible rescue operations.

Increasing the available water resource and drought mitigation

Storage needs in river basin areas will be identified and possible courses of action will be set to achieve a storage rate of 12-15 percent of the average annual runoff from the area of Poland (7-9 bn m^3) to be later consistently included in spatial development plans. The projects and measures will be designed to give due consideration to the storage potential of natural structures and on-site micro-storage solutions, and also to keep in line with the pre-established standards for ensuring water supply for the purposes of agricultural food production and agri-food processing. A rule will be introduced under which buildings will be constructed as close to cropland and other recharge areas of minor storage reservoirs of various forms whose purpose is to capture rainwater and, in after-drought periods, to irrigate crops and natural structures requiring recharge. The planned location of various types of storage reservoirs will depend on whether the previously identified needs are verified, and also on the water demands established in line with the current development policies of regions, and water and environmental needs of drainage basins as identified by the water administration. Also, measures will be taken to adapt existing drainage systems. Agglomeration areas will introduce a requirement to store rainwater to reduce flooding in densely developed areas, utilising this resource to maintain green infrastructure in urbanised areas and for other purposes as the value of water abstracted for domestic human uses grows.

Water-resource development and protection areas

A sound management of water resource abstracted for human supply and economic development should ensure a balance between the consumption and recovery of the resource, while making sure that wastewater is properly treated. Water consumption should ensure sustainable social development while recognising the needs of future generations and making sure these will be met. The sound use of the water resource should be supported by increased storm water management within drainage basins, especially in agglomerations and other urbanised areas. Defined in the Water-Environment Programme (PWŚK), areas with water deficits as a result of the over-deployment of the water resource in the process of issuing water permits should require close cooperation between the authorities issuing these permits, i.e. district governors, and relevant Regional Water Management Boards. Voivodeship spatial development plans should identify areas where the following objectives should be pursued:

a. protecting and, possibly, regenerating landscape structures responsible for area micro-storage, including wetlands and minor-watercourse valleys;

b. adapting and upgrading existing drainage systems, and excavating small storage reservoirs to capture rainwater and, in after-drought periods, to irrigate crops of agricultural holdings and large-scale commercial farms;

c. excavating storage and multi-purpose reservoirs, if such an objective will be set for a drainage basin, under the European Convention on the Protection of the Archaeological Heritage (Revised) (Journal of Laws of 1996, No. 120, item 564);

d. precluding projects with large water-consumption and wastewater-discharge needs from being located in water-scarce areas or areas with poor-quality water resources;

e. managing rainwater circulation;

f. designating protected green areas around lakes and protected areas of water-supply well sites and major aquifers;

g. recognising protected areas of water-supply well sites and major aquifers;

h. coordinating area-sanitation measures included in the National Municipal Wastewater Treatment Programme (KPOŚK) and related programmes, and in lower-level planning documents.

Voivodeship spatial development plans should comprise a document that provides information on at least combined surface and groundwater bodies, and on all measures provided for them in the Water-Environment Programme, and river-basin water management plans. Such documents include water-management documents relating to combined surface and groundwater bodies whose boundaries do not overlap with administrative boundaries.

2.4. Water quality state, trends and monitoring

The status monitoring and assessment system of water used for the public supply of water intended for human consumption

Water used for the public supply of water intended for human consumption and water which can be used for this purpose must comply with the water-quality requirements provided for in the Regulation of the Minister of the Environment of 27 November 2002 on the requirements to be met by surface water used for the public supply of water intended for human consumption (Journal of Laws No. 204, item 1728), hereinafter “the Regulation on water for public supply” and in the Regulation of the Minister of Health of 13 November 2015 on the quality of water intended for human consumption (Journal of Laws, item 1989), hereinafter “the Regulation on water for consumption” The monitoring system for this kind of water has a dual structure.

A separate assessment procedure is conducted by the State Sanitary Inspection according to the criteria specified in the Regulation on water for consumption and the Inspectorate for Environmental Protection (GIOŚ and WIOŚ, at the State and voivodeship levels, respectively) in accordance with the rules of the Regulation on water for public supply.

The monitoring activities conducted by the Inspectorate for Environmental Protection (IOŚ)

The monitoring of bodies of groundwater intended for consumption is conducted as part of the monitoring of protected areas which is a component of State Environmental Monitoring. In regards to groundwater -the measurement points used for this type of monitoring constitute an element in this type of water research and observation network. Pursuant to Art. 155a (5) of the Act – Water Law, the Polish Hydrogeological Survey conducts studies of and assesses groundwater in terms of its physico-chemical and quantitative characteristics, while the general groundwater status is assessed by the GIOŚ. In practice, monitoring studies are conducted by the Polish Geological Institute – National Research Institute (a department of the Polish Hydrogeological Survey) at the request of the Chief Inspectorate for Environmental Protection (GIOŚ).

Studies and assessment of surface water quality are conducted, similarly to groundwater, within the framework of State Environmental Monitoring, which results from Art. 155a (2) of the Act of 18 July 2001 – Water Law (Journal of Laws of 2014, item 659, as amended). Pursuant to (3) of that Article, studies of surface-water quality in terms of physico-chemical and biological characteristics are conducted by the Voivodeship Inspectorate for Environmental Protection (WIOŚ), while the assessment of surface water-body status is assigned to the WIOŚ at the voivodeship level and to the GIOŚ at the catchment-area level. The monitoring of water used for public supply is conducted by the WIOŚ and includes selected physico-chemical, chemical, biological and microbiological parameters. The scope and frequency of tests are defined in the Regulation of the Minister of the Environment of 5 August 2016 on the forms and manner of monitoring of surface water bodies and groundwater (Journal of Laws, item 1178).

The analysis embraces 66 indicators, including colour, temperature, sulphates, phosphates, pesticides, ammonia and total coliforms.

The minimum measurement frequency (per year) depends on a number of supplied persons and the type of surface-water body. It ranges from 1 to 12 times per year, although in most cases it is 4-8 times per year.

All surface-water bodies intended for water abstraction for the public supply of water for human consumption are also, pursuant to the Regulation of the Minister of the Environment of 19 July 2016, subject to the forms and methods of monitoring surface water and groundwater bodies, and to monitoring in a representative point of monitoring the ecological status or potential, and the chemical status, as part of diagnostic and operational monitoring.

The Regulation on water for public supply specifies:

1. The requirements to be met by surface water used for the public supply of water intended for human consumption,

2. The frequency of sampling water, analysis reference methods, and the methods for assessing whether water meets the required conditions.

Pursuant to the Regulation, water that is used to supply the population with drinking water can be classified under one of the following three categories:

Category A1 — water requiring only physical purification, particularly filtration and disinfection;

Category A2 — water requiring normal physical and chemical purification, in particular pre-oxidation, coagulation, flocculation, decantation, filtration, and disinfection (final chlorination);

Category A3 — water requiring highly efficient physical and chemical purification, in particular oxidation, coagulation, flocculation, decantation, filtration, active carbon adsorption and disinfection (ozonation, final chlorination).

The assessment of the status of waters used for public supply of drinking water is carried out in accordance with the Regulation of the Minister of Environment of 21 July 2016 on the classification status of surface water and environmental quality standards for priority substances (Journal of Laws, item 1187).

Monitoring conducted by the State Sanitary Inspection

Water suitability for consumption assessment – the rules

Pursuant to § 3 of the Regulation on water for consumption, water is safe for human health if it meets the following requirements:

1. It is free of pathogenic micro-organisms and parasites in amounts which could be potentially dangerous to human health, and of all substances constituting potential threats to human health; it does not exhibit aggressive corrosive properties; it complies with:

a/ The basic microbiological requirements specified in Annex No. 1 to the Regulation;

b/ The basic chemical requirements specified in Annex No. 2 to the Regulation;

2. Additional microbiological, organoleptic, physico-chemical and radioactive-substance-related requirements which should be met by water are specified in Annex No. 3 to the Regulation.

3. Additional chemical requirements which should be met by water are specified in Annex No. 4 to the Regulation.

Pursuant to § 17 of the said Regulation, the relevant State District Sanitary Inspector or Border State Sanitary Inspector, on the basis of reports on the results of studies conducted according to a specific schedule submitted by water and sewerage companies and entities using water from individual water-abstraction points as part of commercial activities or in public buildings, determines the following criteria:

The suitability of water for consumption – when water meets the requirements specified in Annexes No. 1-3 to the Regulation and the parameters specified in (2), (4) and (5) of Annex No. 4 to the Regulation,

- The suitability of water for consumption under a granted special authorisation – when water does not meet the requirements specified in Annex No. 2 to the Regulation, excluding the requirements specified for bromates and lead and it is not possible to improve its quality within 30 days to the level required by the regulations, the water and sewerage company and the entity using water from an individual abstraction point as part of its commercial activities or in public buildings may apply for a special authorisation releasing it from complying with these requirements. If water is found suitable for consumption under the conditions of a granted special authorisation, the water and sewerage company and the entity using water from an individual abstraction point as part of its commercial activities or in public buildings, determines

the scope and date of implementing corrective measures with the appropriate State District or State Border Sanitary Inspector.

- The conditional suitability of water for consumption – determining the conditional suitability of water is possible when the exceeded parameter values allowed for a given parameter do not pose a threat to health and can be remedied within 30 days. Stating the conditional suitability of water for consumption is not possible for the parameters specified in Annexes 1 and 3A to the Regulation. If water is found conditionally suitable for consumption, the water and sewerage company and the entity using water from an individual abstraction point as part of its commercial activities or in public buildings may determine the scope and date of implementing corrective measures with the appropriate State District or State Border Sanitary Inspector.
- The permissible values of a given parameter must not remain exceeded for a period longer than 30 days in total over the preceding 12 months.
- Water unsuitable for consumption – the competent State District or State Border Sanitary Inspector orders the closure of the water-supply system or other device supplying water to the public and the taking of corrective actions by the water and sewerage company and the entity using water from an individual water abstraction point as part of commercial activities or in public buildings, specifying the date for their performance.

Periodic water-quality assessments

Pursuant to § 19 (1) of the Regulation of the Minister of Health of 13 November 2015 on the quality of drinking water, the relevant State District or State Border Sanitary Inspector issues periodic water-quality assessments on the basis of:

1) Reports provided for in § 8 (2) on the results of studies conducted according to a specified schedule, submitted by the entities provided for in § 5 and § 6,

2) Analyses of corrective actions,

3) The monitoring activities provided for in § 16.

Periodic water-quality assessments contain information regarding compliance in the supervised area with the requirements specified in Annexes 1-4 to the Regulation in the period for which the assessment is prepared. They are also useful to the responsible head of the commune (or the mayor) as a source of information necessary for taking measures aimed at supplying water of acceptable quality to consumers.

Periodic water quality assessments are issued:

1) At least once a year – if the quality of water from water-supply devices or an individual water-abstraction point is examined once per month at the most, and the obtained results comply with the requirements specified in Annexes 1–4 to the Regulation.

2) At least once every 6 months – if the quality of water from water-supply devices or an individual water-abstraction point is examined more than once per month at the most, and the obtained results comply with the requirements specified in Annexes 1–4 to the Regulation.

3) Depending on the granted special authorisation or stated conditional suitability of water for consumption – if the quality of water from water-supply devices or an individual water abstraction point does not meet the requirements specified in Annexes 1–4 to the Regulation.

Area water-quality assessments and estimating the health risk to consumers

Pursuant to § 20 (1) of the Regulation of the Minister of Health of 13 November 2015 on the quality of drinking water, the State Sanitary Inspection bodies, on the basis of the assessments provided for in § 19 (1) conduct area water-quality assessments and estimations of health risk to consumers.

An area water-quality assessment is issued at least once a year by:

1) The State District or State Border Sanitary Inspector responsible for the supply zone of the commune or district – communicated to the authoritative head of the commune (or the Mayor) and district governor;

2) The State Sanitary Inspectorate for the voivodeship – communicated to the authoritative voivodeship marshal;

3) The country's Chief Sanitary Inspectorate.

The procedure for exceeded parameters

Pursuant to the Regulation, water is completely safe for health if it complies with the requirements specified therein.

In every case of exceeded parameters, the State Sanitary Inspection bodies take individual action and issue a decision to conditionally approve the water for consumption (for a specific period of time). The decision is made on the basis of health criteria taking into account an estimation of the risk caused by the values of the said parameters' being exceeded. It should be noted, however, that a certificate of the conditional suitability of water for consumption or a temporary special authorisation are issued on a case-by-case basis after considering the health-risk level. Water which poses a significant risk to consumers is not approved for consumption.

Every case of exceeding the parameters specified in the Regulation requires performing an assessment of the threats and an estimation of the risk of potential events which pose a threat to consumer health and an assessment of the suitability of water for consumption. Water-quality assessment is conducted separately for every water-supply system.

Pursuant to Art. 3 (1) of the Act of 7 June 2001 on collective water supply and sewage collection, water supply is included in communes' own responsibilities and is implemented by water-supply companies, which are responsible for ensuring the appropriate sanitary condition.[1] Furthermore, it should be noted that activities to improve the status of water, including those of water bodies intended for the public supply of water for human consumption are included in the national water-environment programme and its updates, specifying the entities responsible for their implementation.

The availability and use of data

Basic information on water-status assessment is publicly accessible on the GIOŚ website, including in the form of annual reports on the condition of the natural environment in individual voivodeships. Detailed information is available on request. Information obtained from the monitoring conducted by the State Sanitary Inspection is available, i.a., in the form of monthly reports for voivodeships on exceeded parameter values published on http://mjsw.gis.gov.pl/. Information from the said sources is used mainly by the water-administration authorities, other State-administration bodies and bodies conducting environmental-impact assessments and expert studies of investment compliance with the Water Framework Directive.

3. Actual land use activities

3.1. Land use map

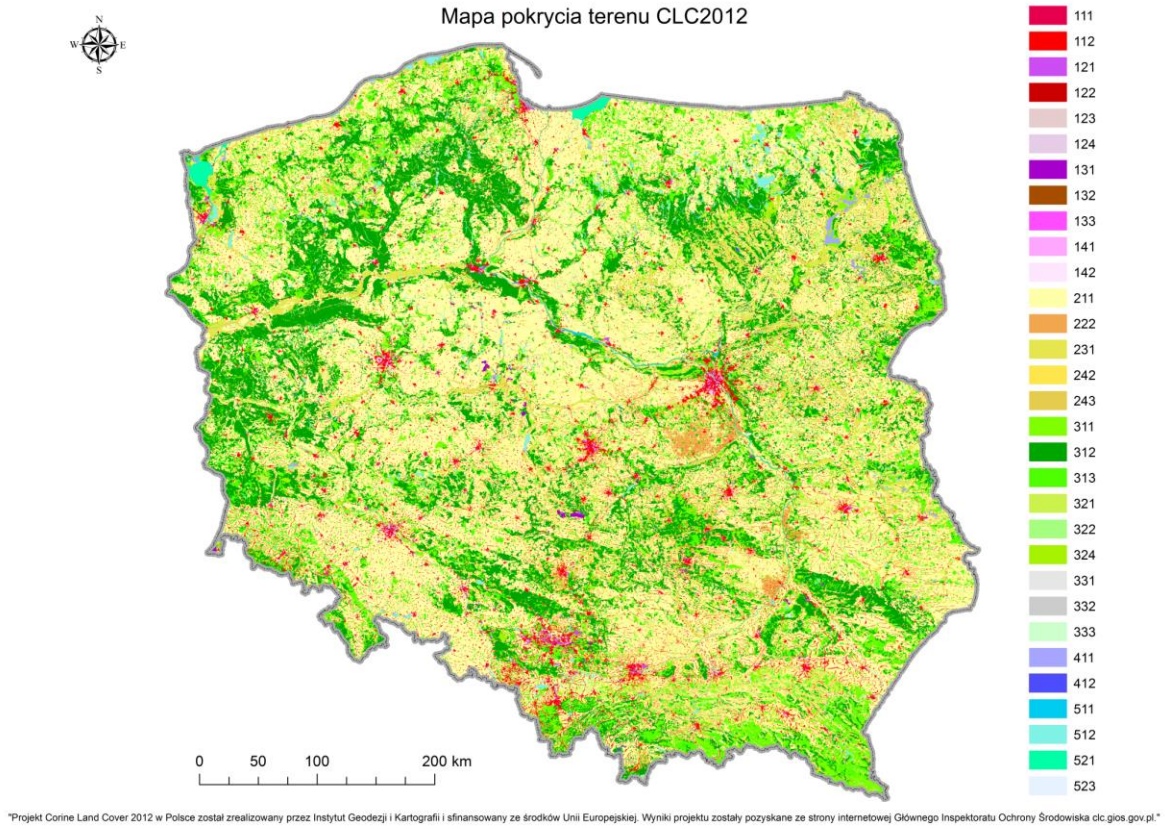

Figure 2. Corine Land Cover map

Table 5. Corine land cover

CODE_12	CLC description	Surface area (ha)	Surface area (%)
111	Continuous urban fabric	7890,103477	0,02525
112	Discontinuous urban fabric	1426943,688	4,566584
121	Industrial or commercial units	121891,5197	0,390084
122	Road and rail networks	25121,74026	0,080396
123	Port areas	2624,838819	0,0084
124	Airports	20541,08812	0,065737
131	Mineral extraction sites	49364,46158	0,157979
132	Dump sites	11306,54038	0,036184
133	Construction sites	18540,54907	0,059334
141	Green urban areas	17050,03505	0,054564
142	Sport and leisure facilities	58809,87514	0,188207
211	Non-irrigated arable land	13596359,7	43,511821
222	Fruit trees and berry plantations	162441,3951	0,519854
231	Pastures	2744013,35	8,781543
242	Complex cultivation patterns	860147,4601	2,752691
243	Land principally occupied by agricultur	1267396,656	4,055993
311	Broadleaved forest	1533855,949	4,908731
312	Coniferous forest	5626499,859	18,006236
313	Mixed forest	2460452,541	7,874076
321	Natural grasslands	32453,64948	0,10386
322	Moors and heathland	4117,541535	0,013177
324	Transitional woodland-shrub	530379,3543	1,697349
331	Beaches, dunes, sands	4642,092228	0,014856
332	Bare rocks	2495,991792	0,007988
333	Sparsely vegetated areas	8261,107252	0,026438
411	Inland marshes	101869,1465	0,326007
412	Peat bogs	9118,019595	0,02918
511	Water courses	76322,46446	0,244251
512	Water bodies	391562,2427	1,253099
521	Coastal lagoons	73897,57315	0,236491
523	Sea and ocean	1137,239717	0,003639

Poland area - 31247507,8357 ha

3.2. Overview of the particular land use activities

3.2.1. Urban areas

In order to comply with the obligations of the EU Accession Treaty, Poland was required to identify the actual needs in the field of the organisation of sewage management. It was necessary to provide certain instruments in Polish legislation. Therefore, the regulations laid down in art. 43 (3) and art. 208 (2) of the Act of 18 July 2001 Water Law (Journal of Laws No. 115, item 1229, as amended) placed an obligation on the Minister of the Environment to develop "The National Programme for Municipal Wastewater Treatment" and submit it to the Council of Ministers for approval by the end of 2003.

Pursuant to section 3 *of the Regulation of the Minister of the Environment of 22 July 2014 on the method for designating the area and boundaries of agglomerations (Journal of Laws 2014 item 995*), certain areas, i.e. agglomerations, were identified (set) in which the population or economic activity are congested to such an extent that municipal wastewater can be collected and transported to wastewater treatment plants or to the final point of discharge of the wastewater.

The agglomerations were divided into three groups depending on the size, determined on the basis of a criterion regarding quality standards for reclaimed water discharged to the receivers (appendix 1 to the *Regulation of the Minister of the Environment of 29 November 2002 on the conditions to be met for the discharge of wastewater to waters or the ground and on the substances of particular hazard to the water environment. The number of agglomerations are shown in individual size groups and the population equivalent of agglomeration characterising the biodegradable load.*

Table 6. Agglomerations and biodegradable loads for treatment

The size of an agglomeration (PE - population equivalent)	Number of agglomerations	Biodegradable loads qualifying for treatment in wastewater treatment plants expressed in	
		population equivalent (PE)	%
≥100 000	76	21 645 073	52,8
15 000 ÷ 100 000	366	13 653 438	33,3
2000 ÷ 15 000	936	5 718 398	13,9
Total	1378	41 016 909	100

Where the population equivalent (PE) means the organic biodegradable load's having a five-day biochemical oxygen demand (BOD5) of 60 g of oxygen per day.

The data submitted by municipalities were collected and analysed. It was established that:

- all the agglomerations with a PE of ≥ 15 000 are equipped with combined sewage systems,
- only 162 agglomerations with a PE of 2000 ÷ 15 000 (out of the total number of 936 agglomerations in this size group) are not provided with a sewage system,
- 561 agglomerations have combined sewage systems,
- in agglomerations with a PE of > 15 000, there are mostly mixed sewage systems, with both combined sewage networks and sanitary sewage networks,
- in agglomerations with a PE of < 15 000, there are sanitary sewage systems.

Moreover, the analysis showed that there are 683 wastewater treatment plants in the agglomerations, whose effluents meet the requirements laid down in the Regulation of the Minister of the Environment of 29 November 2002 on the conditions to be met for the discharge of wastewater to water or the ground and on the substances of particular hazard to the water environment (Journal of Laws, No. 212, item 1799), and Directive 91/271/EEC regarding the quality of wastewater.

377 wastewater treatment plants constitute a permanent solution, providing a full or partial service for an agglomeration by 2015. On the other hand, 306 wastewater treatment plants provide the service of the existing sewage systems, but to ensure the service by 2015 and a wider scope of provided sewage services connected with the expansion of network systems, the plants will require extension, or it will be necessary to build new wastewater treatment plants. In some of the plants, the only element which requires modernisation is sludge management, but the reduction of biodegradable loads is currently achievable.

The quantity of wastewater sludge created in municipal wastewater treatment plants in 2001 amounted to 397.2 thousand tonnes of dry matter.

Pursuant to art. 43 (3b) of the Water Law Act, a Marshal of a Voivodeship submits a report on the implementation of the National Programme for Municipal Wastewater Treatment in the Voivodeship to the President of the National Water Management Authority, no later than by the end of March. The report includes a list of agglomerations, information on the agglomerations' access to collective sewage systems and municipal wastewater treatment plants, information on progress in the implementation of undertakings defined in the national programme for municipal wastewater treatment and information on the number of megagrams of dry sludge matter in wastewater treatment plants in agglomerations and the treatment of the sludge, taking account of the country's division into river-basin districts and water regions.

The President of the National Water Management Authority, through the minister supervising water management, every two years submits to the Council of Ministers a report on the performance of the national programme for municipal wastewater treatment.

On 21 April 2015, the Council of Ministers approved the fifth update of the NPMWT. Previous updates had been prepared in order to verify and update the needs of agglomerations included in the NPMWT and newly created agglomerations. The 2005 update of the NPMWT covered 1 577 agglomerations, and the 2009 update covered 1 635 agglomerations. However, during the

preparation of the 2013 NPNWT update in 2013, some irregularities were found concerning the establishment of agglomerations regarding the calculation of PE and designation of their boundaries.

Hence, the number of agglomerations in the 2015 update amounted to 1 502 (38 million PE), where 1643 wastewater treatment plants were located. According to the adopted methodology, these agglomerations were divided into four priorities on the basis of the significance of investment and the urgency for providing financial resources. In addition, the update included the so-called agglomerations not classified into any of the priorities, which do not meet the conditions set out in the Council Directive 91/271/EEC, but are planning to implement investment measures, bringing them closer to meeting the requirements. As a result of work on the update and the performed analysis, the investment plans concerning the construction of sanitary sewage networks were limited in agglomerations for which the concentration ratio did not exceed 90 inhabitants for each kilometre of the planned sewerage network (Regulation of the Minister of the Environment of 22 July 2014 on the method for designating the area and boundaries of agglomerations, Journal of Laws of 2014 item 995). The amount of outlays for their completion has also been reduced proportionally to the reduction of the planned scopes of sewage-network construction works.

The investment plans presented by agglomerations show that 119 new wastewater treatment plants are due to be built and 985 other investments within the plant area are planned within the framework of the fourth update. Furthermore, it is necessary to conduct additional works resulting from the changes to the legal regulations. It means the obligation to adjust wastewater treatment plants to the requirements of art. 5 (2) of Directive 91/271/EEC, i.e. the provision of the enhanced removal of nitrogen and phosphorus in all the plants in agglomerations of over 10 000 PE. The analysis shows that the measures will include 187 wastewater treatment plants in 157 agglomerations. Also, 21780.8 kilometres of a new sewage network and the modernisation of 4193.6 kilometres of existing networks are due to be completed. Following the completion of all the investments, the PE for the users of sewage network will amount to 36 454 505, which accounts for 95.9% of the total PE. The financial resources needed for the implementation of the undertakings amount to PLN 29.91 billion in total.

3.2.2. Industrial areas

Information on industrial pollution is collected from studies presenting the results of pressures and impact analysis of anthropogenic pollution, covering all water categories in detail, for the purpose of developing updates to the National Water and Environmental Programme and Water Management Plans.

The identification of significant impacts was carried out at the water region level. It was followed by the compilation of the results for regions and an analysis of all the pressures in individual water bodies, along with the evaluation of their impact on water. In relation to industry, the catalogue of pressures, covering **point sources of pollution** and **water abstractions,** was used in the study.

In the area of the Vistula river basin (the largest river basin area in Poland - covering 59% of the area of Poland), industrial pollutants influencing **surface water** bodies are i.a. pollution from

crude oil processing, organic and inorganic chemical plants, paper mills, the textile industry, the iron and steel industry, food production, shipyards, etc. 1057 industrial wastewater discharge points were identified in the Vistula river basin area.

In the area of the Oder river basin (the second largest river basin area in Poland - covering 38% of the area of Poland), industrial pollutants influencing ground water bodies are i.a. organic and inorganic chemical plants, paper mills, the textile industry, the iron and steel industry, food production and shipyards. 513 industrial wastewater discharge points were identified in the Oder river basin area.

The main causal agents of the point sources of pollution of **groundwater** located in the Vistula river basin area are: industrial waste disposal sites and industry (industrial wastewater discharge), including the oil refining industry and gas and dust emissions.

The outcome of groundwater pollution, especially in heavily urbanised areas and those utilised commercially, is their poor chemical condition reflected mainly in low pH values (caused by i.a. discharge of acidic mine wastewater), the presence of light hydrocarbons, locally increased concentrations of heavy metals and the change in water chemical status which is reflected in the increased concentration of the following ions: sodium, potassium, chloride, nitrate and sulphate ions.

The intensive exploitation of groundwater constitutes another threat to the quantitative status of groundwater bodies in the Vistula river basin area. The total volume of water intake across the entire river basin area amounts to 1 253 376.14 thousand m^3 a year (intake registered in 2011), whereas nearly a third is related to mine dewatering. The main causal agent of the poor qualitative status of groundwater bodies is, apart from dewatering (of i.a. mining excavations), water intake for industrial purposes.

The point sources of pollution in the Oder river basin area were mainly analysed in terms of their impact on the chemical status of groundwater bodies. In most cases, due to a small area of facilities and related pollution emissions, as compared to the area of groundwater bodies, they were not considered a significant factor in the deterioration of the chemical status of a part of groundwater.

The monitoring of surface and groundwater bodies is carried out within the National Environment Monitoring. The examination and evaluation of water quality within NEM is regulated in art. 155a (2) of the Water Law Act. The examination of surface water quality in terms of physicochemical, chemical and biological elements is the responsibility of voivodeship environmental protection inspectors. The state hydrological and meteorological service has been conducted research of surface water in the field of its hydrological and morphological elements, while the Polish Hydrogeological Survey has been carrying out research and evaluating the status of groundwater in respect of physical and chemical elements together with the qualitative status. The regulation of the Minister of the Environment defines the forms of and methods for the monitoring of surface water and groundwater.

The aim of research within NEM is to provide knowledge on the condition of water, which is necessary to initiate measures aimed at improving the condition of water and protecting it from pollution (measures included in the update to the National Water and Environmental Programme). The activities should provide protection from i.a. industrial pollution. The

monitoring, together with planned and implemented measures, is conducted according to the six-year cycle of water management, arising from Polish legal regulations, transposing the provisions of directive No. 2000/60/EC establishing a framework for Community action in the field of water policy.

The measures defined in the National Water and Environmental Programme also include activities aimed at reducing pollution from industry, and these include:

the obligation to obtain a water-law permit for the discharge of industrial wastewater into the municipal wastewater collection and treatment systems (Art. 122 (1) (11) of the Water Law Act, the Regulation of the Minister of the Environment on the substances of particular hazard to the water environment, the discharge of which through industrial wastewater into sewage infrastructure requires a water-law permit;

the inspection of permissible substance masses in discharged industrial wastewater (Art. 45 (2) in conjunction with art. 156 (1) (3) of the Water Law Act, Art. 2 (1) (1(b)) of the Act on Environmental Protection Inspection, the Regulation of the Minister of the Environment on the permissible substance masses, discharged to industrial wastewater.

3.2.3. Agricultural land

Land use

In the total area of the country, which is approx. 31.3 mln ha, agricultural lands comprised 16.3 mln ha of all lands in 2015. Approx. 14.9 mln ha of lands belonged to individual households, which are the dominant units in Polish agriculture, whereas approx. 1.4 mln ha of the total land area was held by farms managed by legal persons or entities which do not have a legal personality.

The dominant share of the total agricultural land area was constituted by sown areas, and amounted to 73.9 %. Permanent grasslands comprised 18.3 % and permanent pastures 3.0 %. Set-aside land equalled 0.9 % of the total agricultural lands. The share of permanent crops was 2.7 %, whereas the area of kitchen gardens comprised 0.2 %. Individual households held a total of 13.2 mln of agricultural lands. i.e. 91.0 % of the total agricultural land area.

Table 7. Shares of the total agricultural land

Agricultural land	% share
Other agricultural land	1.00%
Permanent pastures	3.00%
Permanent grassland	18.30%
Sown land	73.90%
Kitchen gardens	0.20%
Permanent crops	2.70%
Set-aside land	0.90%

The **area of sown land** in 2015 equalled 10.8 mln ha. Individual households used 90.0 % of the total sown land area (9679.1 thousand ha) and remain close to the previous year's level. In 2015 the total number of farms which cultivated agricultural and garden produce amounted to 1216.6 thousand (86.2 % of the total number of farms).

The largest crop group regarding the area of sown land was constituted by cereals. with 69.9 % of the total sown land area. Next in the ranking were fodder plants (13.2 %) followed by industrial plants (10.6 %).

Table 8. Crop culture share

Crop group	% share
Industrial	10.60%
Potatoes	2.70%
Fodder	13.20%
Edible legumes	0.80%
Other	2.70%
Cereals	69.90%

The total sown area of cereals in 2015 amounted to 7511.8 thousand ha. 1111.0 thousand farms cultivated cereals.

Water quality protection

When Poland joined the EU, it was obliged to adopt EU legislation concerning water protection, including Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources. The purpose of the Nitrates Directive was to reduce water pollution caused by nitrates from agriculture and to prevent further contamination of water. In 2012, after examining the comments of the European

Commission, the number of Particularly Vulnerable Areas was verified. Due to that fact, starting from 2012, Poland has 48 PVAs, including 4 regions designated as at high risk of underground water pollution by nitrates of agricultural sources, 3 regions designated as at high risk of underground and surface water pollution by nitrates of agricultural sources, and 41 areas selected due to the risk of surface water pollution by nitrates from agricultural sources.

The areas particularly susceptible to pollutants, especially nitrogen compounds from agricultural sources, are those lands whose waters have already been polluted or are at risk of being contaminated. The Nitrates Directive defines the threshold values for the pollution of waters with nitrates. The basic qualification introduces the threshold value for the concentration of nitrates in underground waters at the level of 50 mg NO_3/l.

The Agricultural Drought Monitoring System in Poland (SMSR)

Drought monitoring in Poland is conducted by the Institute of Soil Science and Plant Cultivation, National Research Institute commissioned by the Ministry of Agriculture and Rural Development using the Agricultural Drought Monitoring System designed for this purpose.

The system's main task is to indicate the areas in which drought causes potential loss of crops referred to in the Act on crop and livestock insurance subsidies in Poland.

In order to evaluate the risk of drought the system of agricultural drought effects was created. It accounts for the climatic water balance and spatial variability of soil conditions. The value of climatic water balance is calculated for subsequent 60-year periods on the basis of meteorological measurements. In 2008 the system utilised data from 55 weather stations and approx. 220 rain gauges of the Institute of Meteorology and Water Management (IMGW).

Fertilisers

Mineral fertilisers (NPK) use per 1 ha of agricultural land in the year 2013/14 in pure component amounted to 132.9 kg/ha, including nitrogen fertilisers (75.5 kg, which is 6.4 % less than in the previous year), phosphorus fertiliser (23.4 kg, which is 8.6 % less than in the previous year) and potassium fertilisers (34.1 kg, which is 27.7 % more) [source: the CSO]. Farmers used on their crops approx. 1935 thousand tonnes of mineral fertilisers (NPK) per pure component. The use of fertilisers by particular groups:

nitrogen – 1098.4 thousand tonnes

phosphorus – 341.1 thousand tonnes

potassium – 495.8 thousand tonnes

calcium – 697.2 thousand tonnes

3.2.4. Forest

Poland is one of European leaders when it comes to the surface of forests. They occupy 29.2 percent of the territory of the country - an area of 9.1 million hectares.

Forest cover of the country increased from 21 percent in 1945 to 29.2 percent now. From 1995 until 2011 the forest area increased by 388 thousand ha. The basis of the work of afforestation is the "National Programme of Increasing Forest Cover", assuming an increase in forest cover to 30 percent in 2020 and to 33 percent in 2050.

Polish forests grow on the weakest soils, mainly due to the development of agriculture in previous centuries. This affects the distribution of types of forest habitat in Poland. More than 55 percent of forest area is occupied by woods. In other areas there are forest habitats, mostly mixed. They represent a small part of alder and riparian forests - a little more than 3 percent.

On the lowland and upland pine frequently occurs. In the mountains prevails spruce (west) and spruce with beech (east). The dominance of pine trees results from the way forest management was done in the past. Once monoculture (single crop species) were a response to large industrial demand for wood. Such forests have proved to be very resistant to climatic factors. They also easily fell victim to the expansion of pests.

The share of other species, mostly deciduous, in the Polish forests is systematically increasing - there are oaks, ashes, maples, sycamores, elms, and birch, beech, alder, poplar, hornbeam, aspen, linden and willow.

Polish forests are usually between the ages of 40 and 80 years. The average age of forest is 60 years. Since the end of World War II, the area has increased from 0.9 million hectares to nearly 1.85 million ha.

Forests serve, either naturally or as a result of forest management, a very important role in environmental protection, among others, through their environmental, social and industrial functions, according to the principles of sustainable forest management. According to the Law on Forests of 28 September 1991, forests can be considered protective forests, if they:

- • protect soil before washing or sterilizing, refrain removal of the ground, pull up the rocks or avalanches,
- • protect the resources of surface and underground water, regulate hydrological relations in basin and watershed areas,
- • reduce the formation or spread of the sands,
- • are permanently damaged as a result of industrial activities,
- • are the seed stands or animal refuges and position plants subject to species protection,
- • have a special status for natural science or for the defense and security of the country,
- • are located:

- within the administrative boundaries of cities and at a distance of 10 km from the administrative borders of cities with more than 50,000 inhabitants,
- within the protection zone around the sanatoria and health resorts,
- within the upper limit of the zone forests.

Forest affect the flow of water in river basins, affecting the reduction of flood risk and mitigating the effects of drought by increasing, compared with agricultural land, capacity to retain rainwater, as well as affecting the improvement of the quality of water flowing through the ecosystem. This feature is particularly important in the situation where the trend is the sequential growth of steppe areas, which are the cause of climate change and the development of industrial infrastructure. This is evident in areas with very permeable soils and poor habitats (most forest areas), as well as rich habitats fed by rainwater and groundwater. Forests contribute to increasing rainfall and the formation of misty deposits. Forests also decrease evaporation from the soil surface. Forest soil owes its porosity accumulation of humus in the litter, entering roots deep into the soil and the soil fauna. Small retention applied in the forests refers to activities related to the detention of the greatest amount of water in its surface and nearly-surface circulation. This is done using procedures that are divided into:

1. Technical: small water tanks, valves, weirs,

2. Non-technical: reforestation, forestation, plant shelterbelts, ponds, rural, ponds, wetlands.

In the 2007-2013 Financial Framework two large projects were completed:

"Increasing retention capacities of forest ecosystems and development of actions designed to counteract the causes of drought in forest ecosystems in the lowlands"

The project aims at water retention in areas administered by the State Forests within the basin streams, while maintaining and supporting the development of the natural landscape. The project included its range lowland ecosystems all over the country. it was attended by 176 forest districts from the area of 17 Regional Directorate of State Forests.

,,Increasing retention capacities of forest ecosystems and development of actions designed to counteract the causes of drought in forest ecosystems in the mountain areas "

The objective of the project was to slow down the outflow of water from mountain areas by increasing the retention basin. This minimizes the negative effects of natural phenomena, such as floods and destructive activities of flood and drought in mountainous forest areas.

In the 2014-2020 Financial Perspective the continuation of the implementation and execution of abovementioned projects is foreseen through:

The comprehensive project of adaptation of forests and forestry to climate change - a small retention and preventing water erosion in the lowlands;

A comprehensive project of adaptation of forests and forestry to climate change - a small retention and preventing water erosion in mountainous areas.

3.2.5. Pastures

Animals will more and more serve mankind for purposes reaching far beyond breeding and food production, as they will also become the resources used in order to meet biomedical needs. Scientific research must take into account these factors, anticipate consumers' expectations, and shape animal prodution in such a way as to meet the increasing demands in relation to animal welfare and environmental protection. The development of research in the field of animal breeding and animal production should focus on the following five directions.

THE USE OF ADVANCED MOLECULAR TECHNOLOGIES IN THE GENETIC IMPROVEMENT OF THE PRODUCTION AND FUNCTIONAL PROPERTIES OF DOMESTIC ANIMALS

Increased requirements in the sphere of the quality of animal products have necessitated changes in the evaluation of animals. The use of the molecular genetics method in the wider scope will be the key element of this aspect. The intense development of molecular technology facilitates the introduction of polymorphism assessment for the entire genom for the selection of animals, which is one of the most fundamental changes in breeding.

THE POSSIBILITY OF SHAPING THE QUALITY OF ANIMAL MATERIALS AND PRODUCTS IN TERMS OF CONSUMERS' EXPECTATIONS

Striving to meet the society's needs and requirements in the field of the high quality of products should be aimed at creating food safety along the entire food chain, from the producer to the consumer. Growing consumer requirements concerning animal products, including their nutrition value and health benefits, and their sensory properties, necessitate the search for new possibilities to improve the quality of obtained animal materials and products, and to introduce new processing technologies. In the case of slaughter animals, it is instrumental to improve their musculature and reduce the fat content. An aspect which is currently important in food production is the acquisition of materials and products beneficial to the condition of the human body. Milk and dairy products rank high in this respect.

THE USE OF BIOTECHNOLOGICAL METHODS IN ANIMAL BREEDING, PHARMACEUTICS, AND BIOMEDICINE

The practical implications related to animal reproduction biotechnology reach far beyond animal breeding and production. They cover the field of biomedicine and pharmaceutics, and provide tools for preserving biodiversity, saving endangered species and reviving extinct species.

Transgenesis (i.a. xenotransplantation) and cloning belong to the biotechnological methods in animal reproduction which display the largest number of potential possibilities.

Two basic directions of using the transgenesis of animals in biomedicine are due to be continued and developed. The first one is aimed at using transgenic animals as research models for human diseases, while the objective of the second one is the use of cells, tissues and organs from transgenic pigs in broadly understood regenerative medicine.

THE PRESERVATION OF ANIMAL BIODIVERSITY WITH THE USE OF IN SITU AND EX SITU METHODS IN SUSTAINABLE AGRICULTURE CONDITIONS

In situ protection is regarded as a preferred method of preserving the biodiversity of the farm-animal population in traditional production systems. It facilitates the preservation and adaptive use of the animal genetic pool in production sites, thus preserving their cultural values.

Over recent years, there has been growing attention to the introduction of an effective and economically efficient *ex situ* protection strategy as a supplemetary method. It constitutes additional security against the loss of the animal genetic pool resulting from erosion or crisis situations.

ENVIRONMENTAL PROTECTION AND INCREASED WELFARE AS PART OF THE DEVELOPMENT OF STATE-OF-THE-ART ANIMAL PRODUCTION

Together with the intensification of animal maintenance systems, problems involving animal welfare and environmental protection have occurred. Environmental protection was not an issue when animal maintenance was not concentrated to such a degree as it is today. The issues of providing the minimum level of farm-animal welfare and reducing the environmental impact of breeding methods were raised in late 1970s, at the same time becoming new determinants in the development of breeding technology.

Ecological agriculture is an alternative in the field of environmental protection and the improvement of animal welfare which should be developed in Poland. Small farms could serve this purpose. Livestock buildings and equipment should not only consume energy but also save it, or even generate it. The use of solar collectors, photovoltaic cells, wind generators, biogas plants of varying power, adjusted to the scale of production, is currently becoming an opportunity for these facilities.

3.2.6. Transport units

Paragraph 21 of the Regulation of the Minister of the Environment of 18 November 2014 depicts the conditions to be met during placing waste in water or ground and on substances particularly harmful to the aquatic environment (Dz. U. 2014, item. 1800) and specifies requirements, to be met when draining rainwater from the area of the roadway.

Wastewater management of roads has to meet the requirements mentioned in the preceding paragraph and taking flood wave created as a result of heavy rainfall on land roadway, characterized by a high ratio of impervious surface.

The acquisition of flood wave occurs through the use of storage tanks for rainwater catchment areas, conditioned by the adopted design solutions, determining their active capacity. Storing flood wave in tanks allows the use of appropriate technical equipment to drain rainwater to the external receiver in an amount that is not threatening to the flows occurring in it.

Meeting the requirements of Section 21 of the Regulation of the Minister of Environment of 18 November 2014. (Dz. U. 2014, item. 1800) also determines the use of the purification devices (clarifiers, separators, petroleum hydrocarbons) and the necessary technical parameters

resulting from the adopted design solutions, allowing for reduce pollution to the values required by Regulation.

Similar solutions are used in case of objects that support highways and expressways. Such objects are: MOP-s (service areas) and OUD / OUA (road / highway maintenance circuits). Additional factor that may have an effect on water pollution is wastewater with high loads of pollutants generated in those facilities. This type of wastewater includes sanitary sewage. The solution to the problem of sanitary sewage is connecting it to the existing local sewer or the use of biological sewage treatment plant, allowing the required reduction in pollution loads.

Additional sealed septic tanks, preceded by a dedicated separator petroleum hydrocarbons, allow

receiving wastewater from places that generate strong pollution on OUD / OUA (brine factories, petrol station, car wash or buildings, workshop and garage). Similar solution, based on the use of a sealed holding tank, is applied to the MOP-s, the places designed as stop/rest areas for vehicles transporting hazardous materials. Applied fittings allow to redirect a leak from the tanker, caused by unsealing of the tank.

Proper prevention of slippery roads in winter requires conducting specialized meteorological services for roads. This is done by using the appropriate chemicals, such as the wetted salt and brine; production of which is placed on OUD / OUA objects. In cases of substantial temperature decrease, a mixture of sodium chloride and calcium chloride is used. The use of chemicals reduces winter nuisance and improves road safety.

3.3. Impact of land use activities on water quality and quantity floods/droughts - DPSIR approach for the present/past state - prioritize national issues in DPSIR

Impact on water resources quality				
URBAN AREAS AND INDUSTRIAL UNITS				
Driving forces	Pressures	State (ECOSYSTEM SERVICES)	Impacts	Responses (MEASURES)
Industry, municipal management	Point source pollution; nitrate pollution	Concentration values of nutrients and chemicals	Eutrophication; lack of oxygen	WFD Article 11. 3 basic measures - Urban Wastewater Treatment Directive/ Implementation of appropriate measures; 1 KTM Construction or upgrades of wastewater treatment plants 16 KTM Upgrades or improvements of industrial wastewater treatment plants (including farms) Measures for surface water related with implementation of the National programme for municipal wastewater treatment: the construction and modernization of the sewerage network and wastewater treatment plant in the agglomeration construction of new wastewater treatment plants and sewerage networks Actions resulting from the need to organise the wastewater treatment system off agglomeration construction of individual wastewater treatment systems construction of new septic tanks and modernisation of existing ones regular schedule for the collection of liquid waste construction, expansion and modernization of the sewerage network and wastewater treatment plants

Urban development, industry	Abstraction of water	Quantity monitoring, groundwater levels monitoring, flow regime	Less water, the lack of water supplies, lack of drinking water, alteration of water level or volume, bad quantitative and quality status of waters	WFD Article 11. 3/d, 11.3/e basic measures/ Implementation of appropriate measures 13 KTM Drinking water protection measures (e.g. establishment of safeguard zones, buffer zones etc) Establishing source protection zones; obligation to obtain a water-law permit for water collection in the framework of particular water use; water management control; optimisation of water use
AGRICULTURE				
Driving forces	Pressures	State	Impacts	Responses

Agriculture	Use of fertilizers (resulting in Nitrate pollution), use of pesticides, bad management of livestock waste and manure	Concentration values of nutrients and chemicals	Eutrophication; lack of oxygen	Plain Sites Agriculture: Implementation of appropriate measures 2 KTM Reduce nutrient pollution from agriculture 3 KTM Reduce pesticides pollution from agriculture. 12 KTM Advisory services for agriculture WFD Article 11. 3 basic measures - Nitrate Directive Measures for surface water and groundwater under the Nitrates Directive included in National Programmes of Measures Preparation of an action programme for each designated area particularly exposed to pollution by nitrate compounds from agricultural sources compliance with conditions of storage of natural fertilisers and leakage handling compliance with fertilisation guidelines construction of new and extension of existing buildings for manure storage and liquid manure and slurry education of entities using fertilisers on NVZ on code of good agricultural practice and providing specialist consultancy for these entities
HYDROMORPHOLOGY				
Driving forces	Pressures	State	Impacts	Responses
Hydrological and hydromorphological alteration	Changes in flow regime; disturbance in the continuity of rivers	Flow regime, monitoring of biological elements	Changes in the natural flow regime, changes in the biological elements, less fish	WFD Article 11.4 supplementary measures/ Implementation of appropriate measures KTM6. Improving hydromorphological conditions of water bodies other than longitudinal continuity KTM7. Improvements in flow regime and/or establishment of ecological

				flows. Obligation to carry out an environmental impact assessment procedure for a project which may substantially influence the environment; development of a national program of restoration of surface waters; development of good practices in the field of hydrotechnical works and maintenance works

4. SWOT analysis and evaluation of gaps

STRENGTHS

- Poland has well established system for regulation of groundwater and surface water abstraction (water permits),
- Poland has national strategy for water management, which is harmonized with the requirements set in EU Water Framework Directive and of the Groundwater Directive,
- Strong legitimacy of water management authority,
- The increase innovation in water management,
- Implementation of the National Program of Municipal Sewage (extension of the sewerage network and municipal wastewater treatment plants),
- Improvement of flood safety (hazard maps and flood risk maps - the precise ranges of areas of flood risk basis for the proper land use policy in the areas of flood risk),
- Implementation of the measures defined in the Water Framework Directive (compliance with environmental objective, monitoring of surface water and groundwater).

WEAKNESSES

- Lack of awareness of the existence, importance and value of groundwater,
- Insufficient financial and technical resources for establishment of a stable model of water management,
- Rural areas without sewage system,
- Bad quality status of most of the surface water bodies,
- No sufficient time for accurate consultation on national legal acts implementing EU directives related to water management and protection,
- Lack of flexibility in the implementation of EU directives (for instance CD 98/83/EC, CD 2015/1787, CD 2013/51/EURATOM),
- Agricultural use of wastewater from food, especially potato, industry,
- Utilization of the parts of municipal wastewater by infiltration fields,
- Current Water Act and legal regulations on conditions for establishing sanitary protection zones is questionable and not good enough for efficient water protection,
- Weak regulations on water sanitary protection zones incorporation in land-use planning documents,
- Inconsistent and irrational law in the area of water management,

	▪ No reform water management, ▪ Improper strategic positioning of the National Council of Water Management.
OPPORTUNITIES ▪ to use of EU funds, particularly structural and cohesion funds for co-financing groundwater and surface water projects, ▪ to enable better transfer of the results of scientific and professional groundwater researches to target groups, namely the legislators, the decision-makers and those working on the implementation of EU directives, ▪ to finance national and regional scientific and applied interdisciplinary research on land use activities in order to protect drinking (potable) water, ▪ The promotion of the economical water and energy management, ▪ Implementation of good practice for maintenance of biodiversity, landscape, soil protection and water resources, ▪ The upgrading of the requirements of water management in urban planning, ▪ Changing the thinking and understanding of the Floods Directive 2007/60 / EC (minimizing flood risk and its management by: “moving away the flood from the people, “moving the people from the flood”, “learning to live with floods”, ▪ Updating water management plans, ▪ Implementation of the National Water- Environmental Program.	**THREATS** ▪ Water Management Strategy is only partly harmonized with other sectoral national strategies, which may threaten the implementation of the groundwater protection measures, ▪ Program of measures on sanitary protection zones is not based on the application of economic criteria and principles of "best environmental practice", ▪ Karstic areas and aquifers are not specifically treated in water legislation, which may pose the problems with implementation of the requirements set by EU directives, ▪ Long-term, low rank of water management in state policy, ▪ Low awareness and lack of responsibility of society for the use and protection of drinking water, ▪ Inadequate land use policy of local governments in terms of water management, ▪ Lack of consolidation of the water management community, ▪ No effective control of groundwater and surface water abstraction, ▪ Failure of education in the field of water management, ▪ Implementation and synergy of the Water Framework Directive and Directive 98/83 / EC.