APPROVED by
Resolution No. 1617
of the Government of the Republic of Lithuania
of 17 November 2010

VENTA RIVER BASIN DISTRICT MANAGEMENT PLAN

CHAPTER I. GENERAL PROVISIONS

1. While implementing the provisions of the Law of the Republic of Lithuania on Water (Žin.*, 1997, No. 104-2615; 2000, No. 61-1816; 2003, No. 36-1544), which has also transposed the requirements 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 2004 special edition, Chapter 15, Volume 5, p. 275) (WFD) – the key European Union (EU) legal act in the field of water policy, the Environmental Protection Agency (EPA), in cooperation with the Lithuanian Geological Survey (LGS), has drawn up this Venta River Basin District (RBD) Management Plan.

Upon Lithuania's accession to the European Union, water bodies have to be managed and protected according to the natural hydrological boundaries of river basins instead of the administrative ones. A river basin means the area from which all surface water flows into one river. The river water quality is affected by natural processes within the territory of its basin and the overall impacts of economic activities. For the purpose of implementing the requirements of legislation on water protection, Lithuania will have to achieve "good" status for all water bodies within the country by the year 2015.

Water management will be continued in administrative units (municipalities); however, in order to achieve the objectives in water bodies, measures aimed at improving water status will have to be coordinated by municipal institutions in the whole or part of their territory falling within the total area of the common river basin.

Seeking to facilitate management of water and water bodies, the Lithuanian river basins were combined into the following four RBD: Nemunas, Venta, Lielupė and Dauguva. River basin district management plans and programmes for implementing relevant measures have to be produced and approved by the Government of the Republic of Lithuania for each river basin district. The management plans will be implemented in the period from 2010 through 2015 and updated every six years, that is, in 2015, 2021, etc.

The management plans shall present an overview of the current RBD status and the results of the analysis of impacts of human activity thereon, provide information on water protection objectives and their justification, identify water bodies at risk of failing to achieve good status by 2015, foresee measures for achieving water protection objectives, and give other relevant information. RBD management plans are intended for the public, state and municipal institutions, the European Commission, and various interested parties in Lithuania.

* *Valstybės žinios* [official gazette]

River basin management plans include both the identification of environmental priorities and the assessment of economic and social aspects. The management of water resources aims at balancing and coordinating water use for household, agricultural, industrial, recreational, and ecological purposes.

Striving for sustainable use of public, economic and natural resources and seeking a balance between water protection objectives and other public needs, legal acts provide for certain exceptions. One of them is the extension of the deadline for achieving the set objective (until 2027 at the latest), provided that the objective cannot be achieved in time for reasons of technical feasibility, disproportionate costs or natural conditions. When "good" status cannot be achieved even by 2027, another exception is allowed setting a lower objective, provided that a high objective cannot be achieved for reasons of technical feasibility, disproportionate costs, natural conditions, or high levels of pollution, and when the achievement of "good" status would lead to far-reaching negative socio-economic consequences that cannot be avoided by any significantly better environmental option.

When the achievement of water protection objectives is impeded by physical and morphological alterations by human activity to a water body, for example, construction of port facilities, dredging of the river bed, construction of a dam, the water body may be identified as "heavily modified" and less stringent water quality requirements may also be set for that body of water.

An important role in managing water resources is played by the public which has to take part in the process of the management of water bodies. The population has been informed about the most acute problems relating to water management and protection which were identified in the analysis of the characteristics of the RBD. Representatives of the general public and interested parties were twice invited to submit their comments and remarks on preliminary Venta RBD management plans, which were placed on the website of the EPA. The draft Venta RBD Management Plan and Programme of Measures were discussed at several meetings of the RBD Coordination Council and extended workshops. Reasonable written comments and remarks of interested parties were taken into account in amending the Management Plan.

Pursuant to the Procedure for the development of river basin district management plans and programmes of measures intended for achieving water protection objectives and agreement thereof with foreign states, which was approved by Order No. 591 of the Minister of Environment of the Republic of Lithuania of 25 November 2003 (Žin., 2003, No. 114-5170), the Environmental Protection Agency was appointed as the authority responsible for producing and coordinating RBD management plans across the Lithuanian territory, as well as for reporting to the European Commission.

CHAPTER II. CHARACTERISTICS OF THE VENTA RIVER BASIN DISTRICT

SECTION I. SURFACE WATER BODIES

2. The Venta RBD comprises the Lithuanian parts of the Venta, Bartuva and Šventoji river basins (Figure 1).

In Lithuania, the basins of the Venta, Bartuva and Šventoji lie at 55°37‘– 56°26‘ N and 21°9‘– 23°20‘ E. The total length of the Venta River is 343.3 km, and the catchment size constitutes 11.8 thousand km^2. A stretch of 159.1 km of the Venta from the springs flows in Lithuania, then another one of 1.7 km coincides with the Lithuanian-Latvian border. The Lithuanian part of the basin covers the area of 5 138.1 km^2. A lower section of the Venta and part of its basin lie on the territory of Latvia. The total length of the Bartuva River is 101.3 km, the catchment size is 2 020 km^2. A section of 55.3 km of the Bartuva from the springs flows in Lithuania, the catchment size of the river in Lithuania totals to 749.2 km^2. The other part of the Bartuva and its catchment are situated in Latvia. The total length of the Šventoji River is 68.4 km, of which 31.8 km (48.5–16.7 from the mouth) coincide with the Lithuanian-Latvian border. The total area of the Šventoji catchment is 471.9 km^2, of which 390 km^2 are situated in Lithuania, and the remaining part – in Latvia. The resulting total area of the Venta RBD is 6 278.3 km^2.

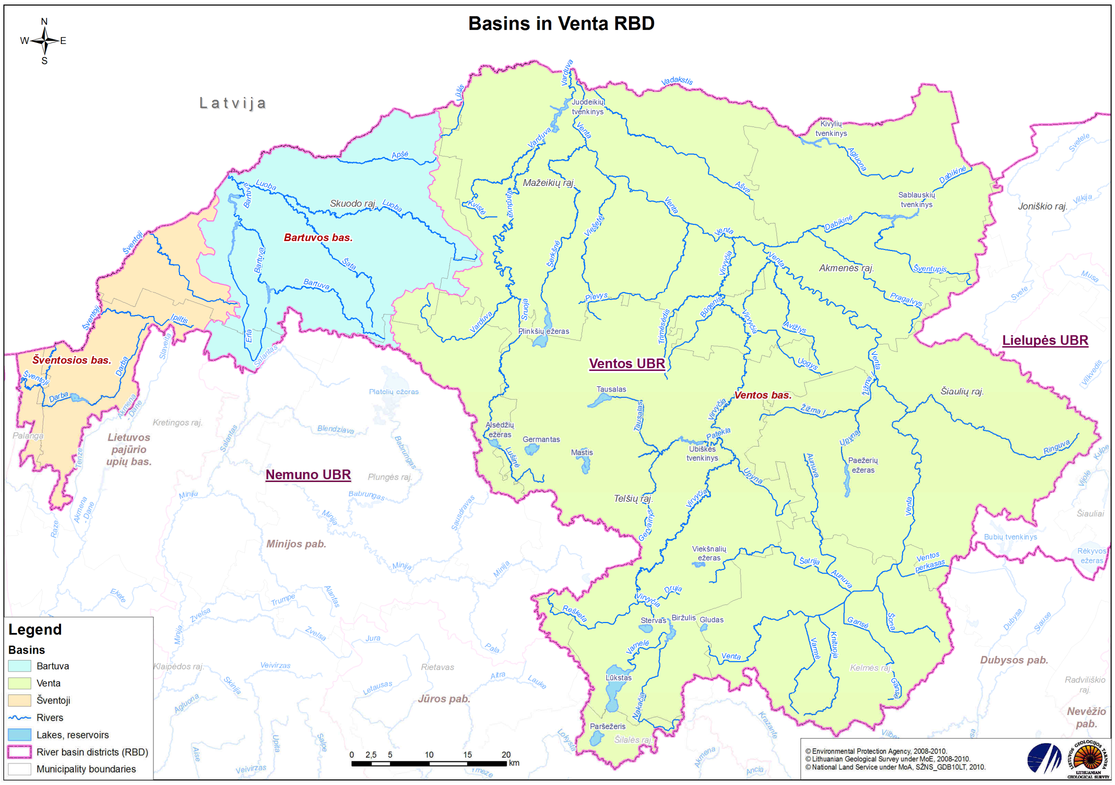


Figure 1. River basins in the Venta RBD

Characterisation of water bodies

Venta Basin

3. The Venta is the third longest river both in Lithuania and in Latvia. It rises in Lake Medainis situated at the altitude of 180 m of the Baltic System (BS) in Žvirgždžiai village, Telšiai district. Lake Medainis and a stretch of the upper Venta are part of the hydrographical reserve of the Venta sources. The upper reaches of the Venta and its left tributaries drain the north-eastern slopes of the Samogitian Upland (*Žemaičių aukštuma*) so the bed slopes of these stretches are rather high going up 0.1% in some places. Further, the river reaches the lowland of the middle reaches of the Venta with lower bed slopes and flow rate and enters Latvia at the mouth of the Varduva. From its springhead, the Venta River flows 142 km to the Lithuanian-Latvian border, the average bed slope is 0.085%. The Lithuanian part of the Venta Basin comprises 44% of its total catchment size.

The Venta Basin is dominated by low-permeable soils, 55.8 %of its surface is taken by wetlands, 7.3 % of the territory is covered with bogs, marshes and swamps, including the largest swamp Kamanos (39.6 km²). Conditions for regulating the natural runoff are better in uplands and at the foot thereof where gravely and sandy formations are much more common than in the lowland of the middle reaches of the Venta. The wood density in the Lithuanian part of the basin is 28%, lakes occupy 1.5% of the territory with 84 lakes larger than 0.005 km^2, of which 12 are larger than 0.5 km^2. The average annual runoff rate in the Venta Basin varies between 12.3 and 5.21 l/s/km². The most aqueous rivers are those draining the slopes of the Samogitian Upland and the least aqueous ones are the rivers that flow over the plains of the basin. The aggregate annual discharge of the Lithuanian part of the Venta Basin is 41 m^3/s. The river network in the Venta Basin is comprised of 440 rivers longer than 3 km and 1 770 ones which are shorter than 3 km. The total length of the rivers is 7 144 km. The density of the network of the rivers longer than 3 km totals to 0.68 km/km² and that of the smaller ones (i.e. shorter than 3 km) is 0.71 km/km².

The longest and the largest tributaries of the Venta according to their catchment size in Lithuania are the rivers Vadakstis, Virvytė, Varduva, Dabikinė and Ringuva (Table 1), the largest lakes are Lūkstas, Plinkšių ežeras and Mastis (Table 2).

Table 1. Length and catchment size of rivers in the Venta Basin

River	**Bank of inflow**	**Distance from the mouth, km**	**Length, km**		**Catchment size, km²**	
			total	**in Lithuania**	**total**	**in Lithuania**
Varmė	r	318.9	17.0	17.0	81.2	81.2
Knituoja	r	317.4	16.8	16.8	61.1	61.1
Gansė	r	313.7	19.3	19.3	116.2	116.2
Aunuva	l	312.1	25.5	25.5	186.0	186.0
Šona	r	308.5	16.5	16.5	68.1	68.1
Ringuva	r	276.2	33.6	33.6	322.2	322.2
Žižma	l	269.0	20.6	20.6	166.1	166.1
Avižlys	l	234.1	20.1	20.1	78.3	78.3
Uogys	l	232.0	27.6	27.6	68.2	68.2
Dabikinė	r	229.5	37.2 (3 km – along the border)	34.2	387.6	374.2
Virvytė	l	224.0	99.7	99.7	1134.2	1134.2
Pievys	l	216.2	26.9	26.9	69.0	69.0
Viešetė	l	201.0	23.6	23.6	92.2	92.2
Šerkšnė	l	194.9	38.1	38.1	285.2	285.2
Vadakstis	r	184.2	82.2 (53.8 – along the border, 20.6 – in Latvia)	7.8	1239.6	467.6
Varduva	l	182.5	90.3	90.3	586.7	586.7
Lūšis	l	173.7	31.5 (18.6 – along the border, 6.5 – in Latvia)	6.4	113.6	60.6

Source: Gailiušis, B., Jablonskis, J., Kovalenkovienė M. 2001. Lietuvos upės. Hidrografija ir nuotėkis.

Table 2. Largest lakes in the Venta Basin

Lake	Inventory number	Direct stream	Depth, m		Area, ha		Volume, thou. m³	Catchment size, km²
			max	average	in the plan[1]	on the List[2]		
Lūkstas	13-39	Varnelė	7.00	3.60	10.18	10.009	36 136.2	76.3
Plinkšių ežeras	3-6	Šerkšnė	11.75	3.61	3.463	3.935	12 490.0	143.0
Mastis	13-19	Mastupis	4.80	2.60	2.741	2.722	7 140.0	40.0
Paršežeris	24-1	Sietuva	4.00	2.60	1.939	1.934	5 068.1	29.0
Tausalas	3-10	Tausalas	6.10	3.34	1.886	1.912	5 255.0	8.8
Paežerių ežeras	14-1	Upyna	6.60	2.80	1.75	1.406	4 895.0	22.7
Germantas	13-16	Gerupis	5.80	2.40	1.569	1.646	3 760.2	9.5
Stervas	13-34	Sengovija	2.60	1.38	1.309	1.371	1 810.0	9.8
Biržulis	13-35	Virvytė	2.35	0.91	1.068	1.142	974.5	190.2
Alsėdžių ežeras	13-14	Sruoja	2.90	1.74	0.833	0.904	1 437.5	67.7
Gludas	14-8	Gludas	2.90	1.80	0.507	0.539	952.2	6.0
Viekšnalių ežeras	13-26	Viekšnupis	2.89	1.85	0.504	0.176	-	**?**

Source: Information obtained from the geographical information system (GIS) of the EPA.

The boundaries of the Venta Basin and municipalities situated within this basin are demonstrated in Figure 2.

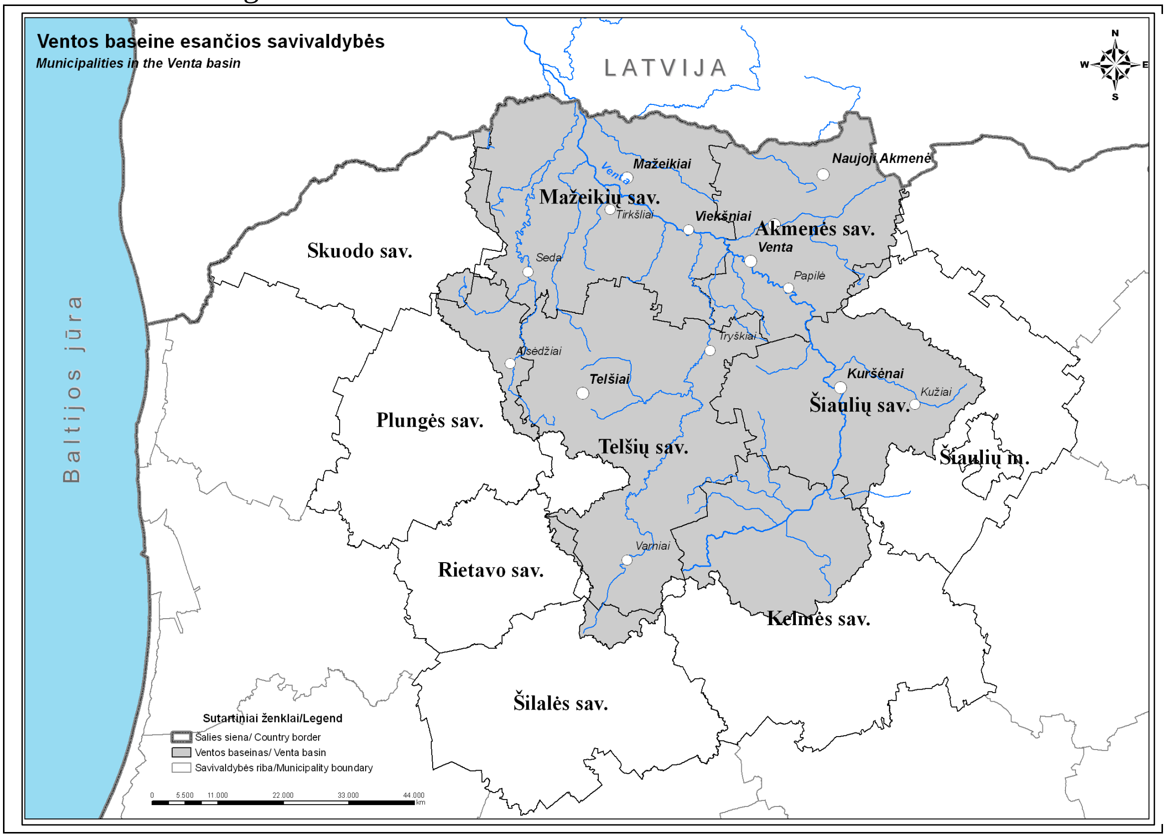


Figure 2. Municipalities in the Venta Basin

Bartuva Basin

4. The springs of the Bartuva are located in Mačiukiai village, Plungė district, 3 km away from Lake Plateliai. The springs are situated at the altitude of 152 m of the Baltic System (BS). The river rises on the north-western slope of the Samogitian Upland, in a moraine ridge that surrounds the pothole of Lake Plateliai. Having descended from the

[1] According to the bathymetric plan of the lake; the depth and volume are provided in accordance with this plan.

[2] According to the List of Inland Waterways of National Importance approved by Resolution No. 1268 of the Government of the Republic of Lithuania of 14 October 2003 (Žin., 2003, No. 98-4394; 2010 No. 72-3657)

Samogitian Upland, the Bartuva flows through the Coastal Lowland (*Pajūrio žemuma*), crosses the Lithuanian-Latvian border at the Apšė mouth and after 46 km enters lagoon Lake Liepoja on the coast of the Baltic Sea. The bed slope of the Bartuva on the territory of Lithuania varies between 0.91% in the upper reaches of the river and 0.087% in the border zone (the average slope is 0.26%). The Lithuanian part of the Bartuva Basin comprises 37 % of its total area.

The Bartuva Basin is dominated by low-permeable medium clay loams, with wetlands covering 84.6% of the area. Bogs, marshes and swamps comprise 4.6% of the territory, the largest number of wetlands is situated in the Latvian part of the basin, especially in the lower reaches of the river. The wood density of the basin is 3.2%, and the lake percentage is only 0.2%. There are 5 small lakes (the largest ones are Lake Juodkaičių ežeras – 2.8 ha, Lake Laumių ežeras – 2 ha, and Lake Lestis – 1.2 ha); however, there are quite a few ponds: Skuodo, Puodkalių, Mosėdžio, Šatės, Lyksūdės, Drūpių ponds, etc. The average annual runoff rate is 12.3 l/s/km². The average annual discharge of the Bartuva at the Lithuanian-Latvian border is 12 m^3/s, of which 9.2 m^3/s is the runoff of the Lithuanian part of the Bartuva Basin. The river network in the Bartuva Basin is comprised of 44 rivers longer than 3 km and 144 ones which are shorter than 3 km. The total length of the rivers is 555.8 km. The density of the network of the rivers longer than 3 km totals to 0.66 km/km² and that of the smaller ones (i.e. shorter than 3 km) is 0.22 km/km².

The longest and largest tributaries of the Bartuva according to their catchment areas in Lithuania are the rivers Apšė, Luoba and Erla. The length and the catchment size of the main rivers of the Bartuva Basin in Lithuania are given in Table 3.

Table 3. Length and catchment size of rivers in the Bartuva Basin

River	Bank of inflow	Distance from the mouth, km	Length, km		Catchment size, km²	
			total	in Lithuania	total	in Lithuania
Eiškūnas	l	75.4	16.5	16.5	36.9	36.9
Erla	l	61.2	27.6	27.6	111.4	111.4
Luoba	r	48.8	52.2	52.2	353.9	353.9
Apšė	r	46.0	40.3 (24 km – along the border)	16.3	357.1	122.4

Source: Gailiušis, B., Jablonskis, J., Kovalenkovienė M. 2001. Lietuvos upės. Hidrografija ir nuotėkis.

The boundaries of the Bartuva Basin and municipalities situated within this basin are demonstrated in Figure 3.

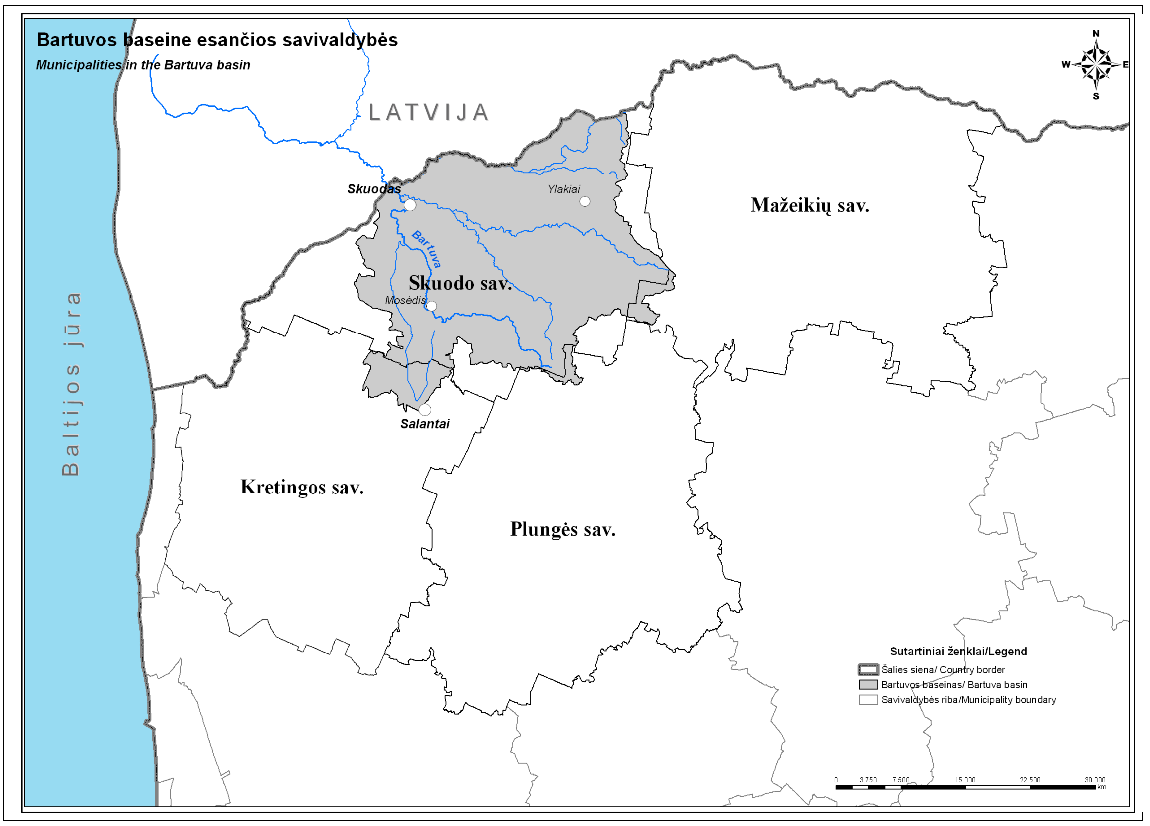


Figure 3. Municipalities in the Bartuva Basin

Šventoji Basin

5. The springs of the Šventoji are located in Šatraminiai village, Skuodas district, in the Western Samogitian Plain (*Vakarų Žemaičių lyguma*). The springs are situated at the altitude of 48 m of the Baltic System (BS). The upper reaches of the Šventoji have been reclaimed, and a stretch of 12 km from the springs has been regulated. Having descended from the Samogitian Upland, the Šventoji flows through the Coastal Lowland, crosses the higher terrace plains of the Baltic coast and enters the Baltic Sea at Šventoji settlement. For almost half of its length (31.8 km – 47%), the Šventoji flows along the Lithuanian-Latvian border. The bed slope of the Šventoji varies between 0.14% in the upper reaches and 0.004% in the lower reaches of the river (the average slope is 0.06%). The Lithuanian part of the Šventoji Basin comprises 83% of its total area.

Wetlands take up 83.2% of the Šventoji Basin, the swamp percentage is 4.2%, the wood density – 30.7%. There are very few lakes in the basin (the lake percentage is 0.3%), the largest lake is Kašučių ežeras (0.07 km^2) situated in the Darba catchment. The largest pond is Mažučių (1.2 km^2). The average annual runoff rate in the Šventoji Basin is ca. 11.5 l/s/km^2. The average annual discharge is ca. 5.3 m^3/s. The river network in the Šventoji Basin is comprised of 34 rivers longer than 3 km and 95 ones which are shorter than 3 km. The total length of the rivers is 384 km. The density of the network of the rivers longer than 3 km totals to 0.64 km/km^2 and that of the smaller ones (i.e. shorter than 3 km) is 0.18 km/km^2.

The longest and the largest tributaries of the Šventoji according to their catchment size in Lithuania are the rivers Darba, Įpiltis and Kulšė. The length and the catchment size of the main rivers of the Šventoji Basin in Lithuania are given in the table below:

Table 4. Length and catchment size of rivers in the Šventoji Basin

River	Bank of inflow	Distance from the mouth, km	Length, km		Catchment size, km²	
			total	in Lithuania	total	in Lithuania
Įpiltis	l	29.8	16.2	16.2	42.8	42.8
Kulšė	l	23.0	18.2	18.2	43.5	43.5
Darba	l	7.2	26.2	26.2	118.7	118.7

Source: Gailiušis, B., Jablonskis, J., Kovalenkovienė M. 2001. Lietuvos upės. Hidrografija ir nuotėkis

The boundaries of the Šventoji Basin and municipalities situated within this basin are demonstrated in Figure 4.

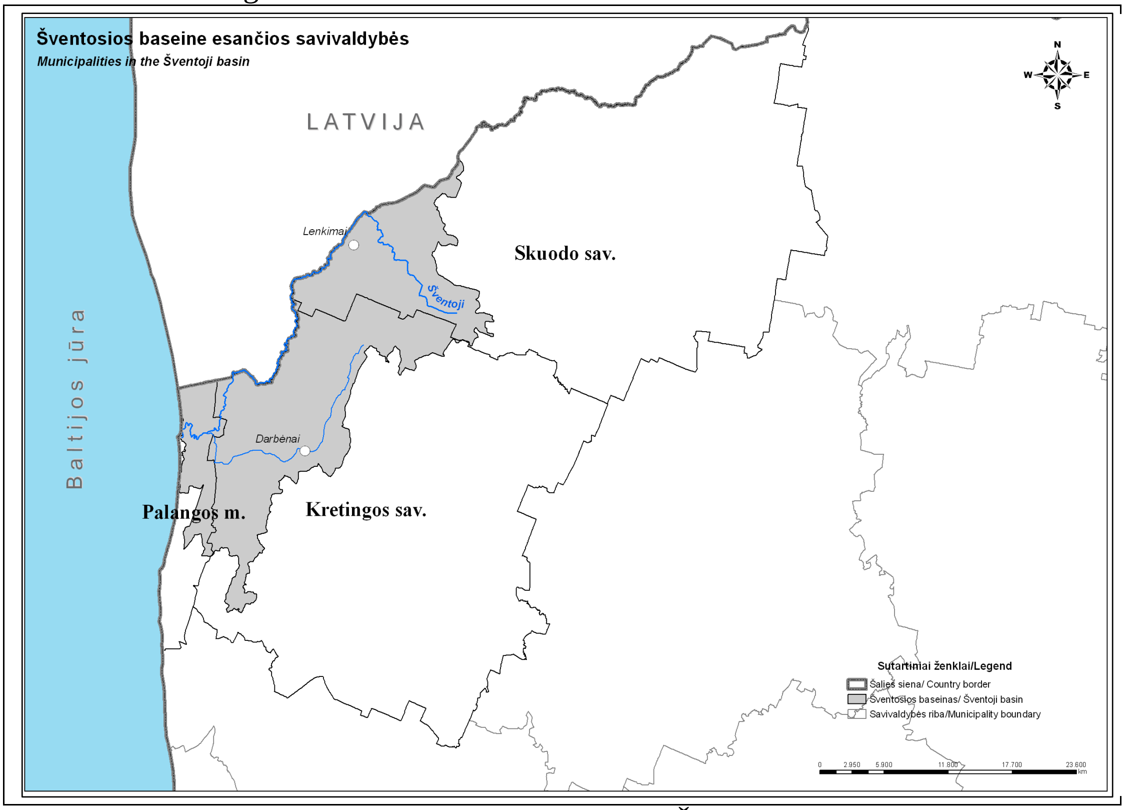


Figure 4. Municipalities in the Šventoji Basin

6. Table 5 below provides data on the municipal areas that belong to individual basins and sub-basins, meanwhile Table 6 gives information on the share of the relevant basins in individual municipalities.

Table 5. Areas of municipalities in the Venta RBD

Municipality	Area, km²	Share of the municipal area (%)		
		Venta RBD		
		Šventoji Basin	Bartuva Basin	Venta Basin
Joniškis distr.	1 151.7			0.3
Akmenė distr.	843.5			98
Skuodas distr.	911.1	13.7.	76	7
Šiauliai distr.	1807			49
Kretinga distr.	989.25	22.8	4	
Plungė distr.	1 105.4		0.6	16
Telšiai distr.	1 438.5			90
Kelmė distr.	1 704.6			35
Rietavas	585.6			3.3
Šilalė distr.	1 188.2			5
Mažeikiai distr.	1 220.1		1	99
Palanga town	79.12	50		

Source: experts‘ estimations

Table 6. Share of the basins in individual municipalities, %

Municipality	Venta RBD		
	Šventoji Basin 390 km^2	**Bartuva Basin 749.2 km^2**	**Venta Basin 5 138.1 km^2**
Joniškis distr.			0.1
Akmenė distr.			16
Skuodas distr.	32	92	1.2
Šiauliai distr.			17
Kretinga distr.	58	5	
Plungė distr.		1	3.5
Telšiai distr.			25.3
Kelmė distr.			12
Rietavas			0.4
Šilalė distr.			1
Mažeikiai distr.		2	23.5
Palanga town	10		

Source: experts' estimations

7. Ten municipalities are situated in the Venta Basin. 25.3% of the basin lies in Telšiai district municipality, a little less, 23.5% – in Mažeikiai district municipality.

Almost the entire Bartuva Basin (92%) belongs to Skuodas district municipality, with only small parts (1-5%) situated in the remaining three municipalities.

The least number of municipalities, only three, are situated in the Šventoji Basin. 58% of the basin area belongs to Kretinga district municipality, 32% – to Skuodas district municipality and 10% – to Palanga town municipality.

Typology of water bodies

8. Water bodies in the Venta RBD are assigned to the following categories: rivers, lakes, artificial water bodies (AWB) and heavily modified water bodies (HMWB). Water bodies differ in their natural characteristics, such as the size and bed slope of rivers, or the depth of lakes. The variety of such natural characteristics also affects aquatic communities: the species composition of aquatic organisms, as well as relative indicators of various species in communities, largely depends on natural conditions. Therefore, rivers, lakes, AWB and HMWB were further differentiated according to type taking into account the variety of natural characteristics of surface waters and the resulting differences in aquatic communities. A whole of certain characteristics typical of each type of water bodies when a water body in question has not been affected by human activities is called reference conditions of such body of water. A degree of deviation of characteristics from the reference conditions serves as a basis for identifying the actual ecological status of the water body (magnitude of human impact), i.e. determining which differences between the communities exist due to natural factors and which have been caused by anthropogenic pressures. Thus, the differentiation of water bodies with different natural characteristics into types is a mandatory condition for correct identification of the ecological status of these water bodies.

The following paragraphs provide information on types of water bodies in the categories of lakes and rivers within the Venta RBD and on the natural factors characterising these types.

Water bodies in the category of rivers

9. The category of river water bodies comprises all rivers with a catchment size larger than 50 km^2. Rivers with catchment areas smaller than 50 km^2 are not categorised into individual water bodies because they are included into larger drainage basins, which serve as the basis for the management of water bodies. Such management principle ensures not only good ecological status/potential of water bodies but also the quality of smaller rivers situated in respective basins.

10. Five river types differing in the characteristics of their aquatic communities have been identified within the Venta RBD. The river types are characterised by two main natural factors which determine the major differences between the communities: catchment size and bed slope. The characterisation of types also involves the elements which, pursuant to the Description of the Types of Surface Water Bodies, Description of the Indicators of Reference Conditions of the Quality Elements for Surface Waters, and the Description of the Criteria for the Identification of Artificial, Heavily Modified Water Bodies and Water Bodies at Risk, which were approved by Order No. D1-256 of the Minister of Environment of the Republic of Lithuania of 23 May 2005 (Žin., 2005, No. 69-2481), are obligatory in the typology of water bodies: absolute altitude and geology. On the basis of the latter factor, almost all rivers in Lithuania belong to one single type, meanwhile by the catchment size rivers fall within three groups. Rivers with a catchment area larger than 100 km^2 were additionally sub-divided into types by the criterion of the bed slope. The river types within the Venta RBD and the corresponding characterising factors are provided in Table 7 below.

Table 8. Typology of rivers in the Venta RBD

Descriptors	**Types**				
	1	**2**	**3**	**4**	**5**
Absolute altitude	< 200 m				
Geology	calcareous				
Catchment size, km^2	<100	100-1000		>1000	
Bed slope, m/km	-	<0.7	>0.7	<0.3	>0.3

Source: experts' analysis results

11. Taking into account the typology and human impact on the status of rivers, 104 river water bodies (including HMWB and AWB) with the total length of 1 520.8 km have been identified in the Venta RBD. The total length of 87 river water bodies in the Venta Basin is 1 164.2 km. 6 water bodies with the total length of 126.3 km are situated in the Šventoji Basin. 11 water bodies have been identified in the Bartuva Basin, their aggregate length totals to 230.4 km. Table 8 gives the number and length of water bodies of different types within the Venta RBD. Figure 5 demonstrates the territorial distribution of rivers of different types.

The aggregate length of small rivers which have not been identified as distinct water bodies within the Venta RBD totals to 12 262 km: 9 856 km are situated in the Venta Basin, 1 488 km – in the Bartuva Basin, 918 km – in the Šventoji Basin.

Table 8. Number and length of river water bodies of different types in the Venta RBD

Type	Venta Basin		Bartuva Basin		Šventoji Basin	
	Number of water bodies	Length of water bodies, km	Number of water bodies	Length of water bodies, km	Number of water bodies	Length of water bodies, km
1	65	739.1	7	108.8	3	40.3
2	7	104.4	0	0	2	78.2
3	11	202.5	4	121.6	1	7.8
4	2	22.5	0	0	0	0
5	2	95.7	0	00	0	0
Total	**87**	**1 164.2**	**11**	**230.4**	**6**	**126.3**

Source: experts' analysis results

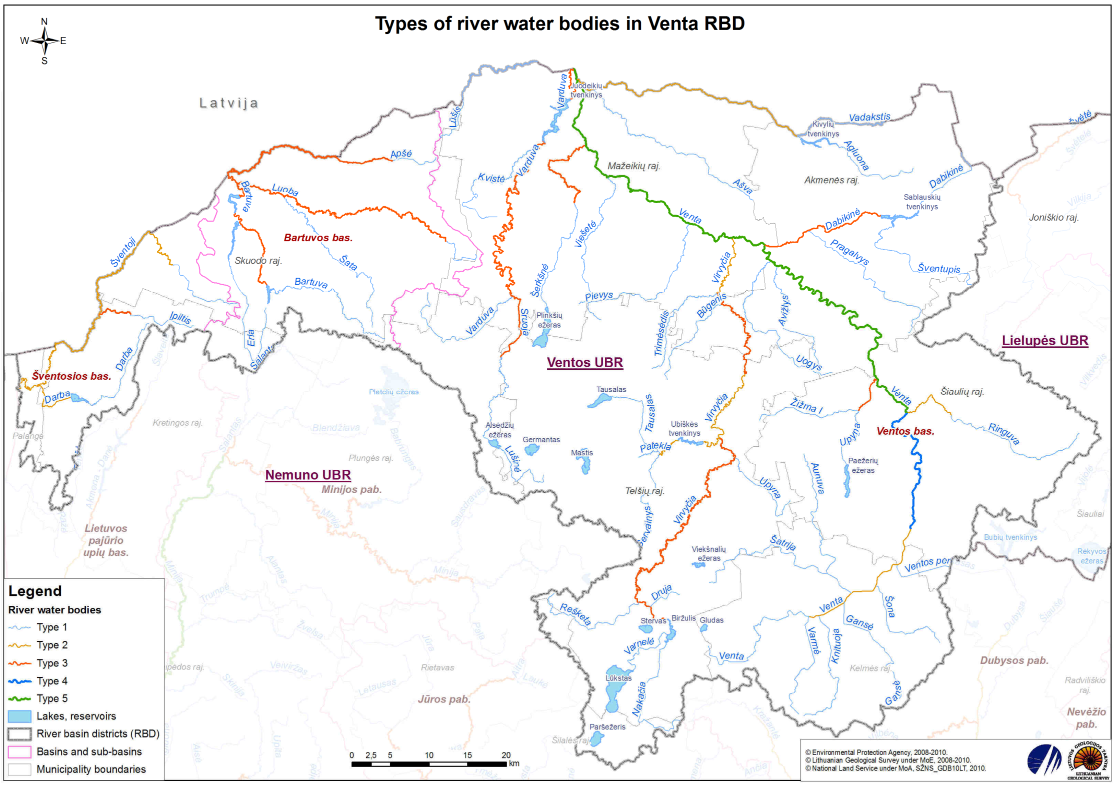


Figure 5. Types of river water bodies in the Venta RBD

The figure above and other figures given in the Management Plan are also provided in an interactive map at http://gis.gamta.lt/baseinuvaldymas.

Water bodies in the category of lakes and ponds

12. Two main types of lakes and ponds have been identified in the Venta RBD. The major factor that determines the most significant differences between the communities of aquatic organisms is the average depth of lakes. As in the case of rivers, the characterisation of the types of lakes also involves other obligatory factors, such as absolute altitude, geology, and surface area. By absolute altitude (obligatory factor), all Lithuanian lakes belong to one type. By geology, almost all lakes (with individual exceptions) are classified as calcareous, i.e. also belong to one type. All lakes are classified into one group of lakes larger than 0.5 km^2 (50 ha) (pursuant to the Description of the Types of Surface Water Bodies, Description of the Indicators of Reference Conditions of the Quality Elements for Surface Waters, and the Description of the Criteria for the Identification of Artificial, Heavily Modified Water Bodies and

Water Bodies at Risk, only the lakes with an area >0.5 km^2 shall be classified) because the differences in the aquatic communities in lakes larger than 0.5 km^2 within the Venta RBD are determined by the depth and not by the size of the lake. By average depth, lakes are differentiated into two groups: lakes with an average depth less than 3 m and those with the depth between 3 and 9 m.

The types of lakes within the Venta RBD and the descriptors characterising the types are presented in Table 9. Table 10 gives the number of water bodies in the category of lakes and ponds within the Venta RBD. Figure 6 demonstrates the territorial distribution of lakes of different types.

Table 9. Typology of lakes in the Venta RBD

Descriptors:	**Types**	
	1	**2**
Average depth (m)	< 3	3-9
Absolute altitude (m)	< 200	
Geology	calcareous (>1.0 meq/lg (Ca >15mg/l))	
Size (km^2)	>0.5	

Source: experts' analysis results

In ponds with an area larger than 0.5 km^2, the conditions typical of rivers have changed into the characteristics typical of lakes due to the impact of the head, hence such ponds are comparable to natural lakes and thus subject to the same depth criteria for the type identification.

The total number of water bodies in the category of lakes and ponds in the Venta RBD is 12 lakes and 8 ponds: 9 lakes and 6 ponds belong to Type 1, the remaining 3 lakes and 2 ponds are of Type 2.

Also, there are 660 lakes with an area smaller than 0.5 km^2 within the Venta RBD. Their aggregate area totals to 29.9 km^2. These lakes were not categorised into individual water bodies because most of them are included in larger drainage basins, which serve as the basis for the management of their status. Therefore, status improvement measures applied in the drainage basins of larger (with an area >0.5 km^2) lakes will also affect the quality of the smaller ones situated in the respective basins.

Table 10. Number and area of lakes and ponds in the Venta RBD

Type	**Venta Basin**		**Bartuva Basin**		**Šventoji Basin**	
	Number of water bodies	**Area, km^2**	**Number of water bodies**	**Area, km^2**	**Number of water bodies**	**Area, km^2**
Lakes						
1	9	12.236	-	-	-	-
2	3	15.902	-	-	-	-
Total	**12**	**28,138**	-	-	-	-
Ponds						
1	2	1.885	3	2.223	1	1.113
2	2	3,24	-	-	-	-
Total	**4**	**5.125**	**3**	**2.223**	**1**	**1.113**

Source: experts' analysis results

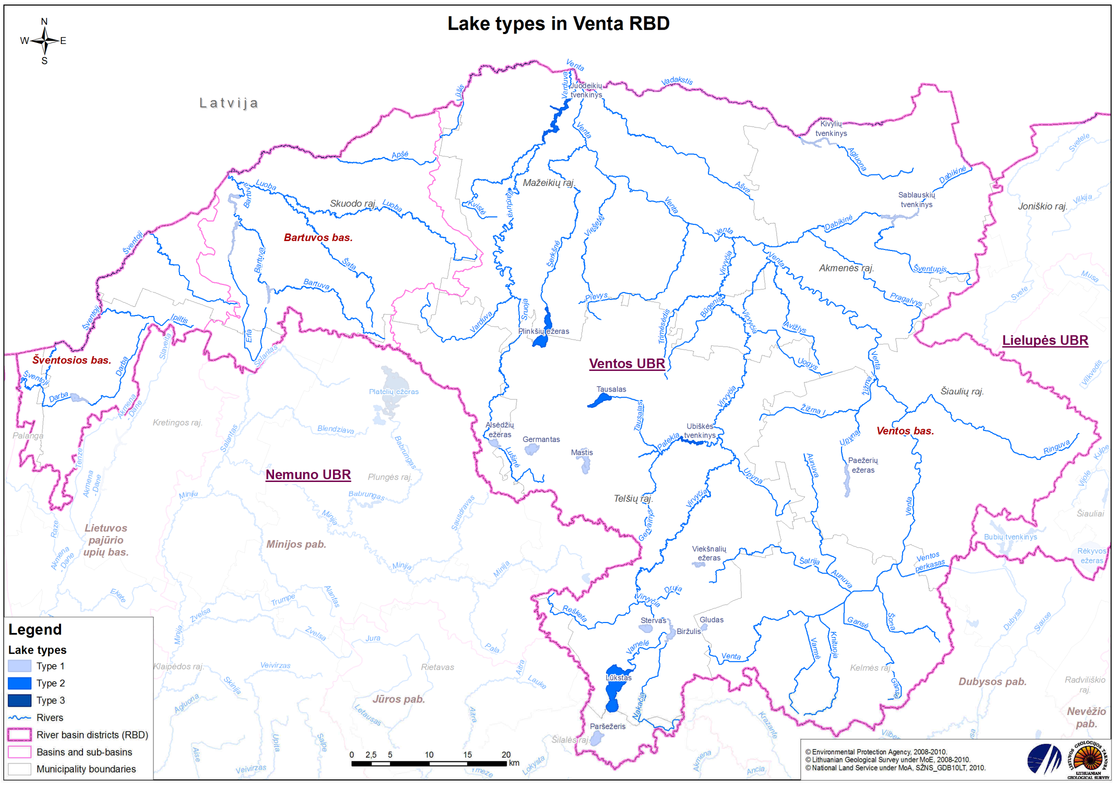


Figure 6. Types of water bodies in the category of lakes and ponds in the Venta RBD

Heavily modified water bodies

13. The characteristics (hydrological, morphological) of certain natural bodies of water have been strongly modified due to an impact of human economic activities, such as straightening and impoundment of rivers, intake of water affecting the hydrological regime, construction of port embankments, dredging, or alteration of the water level.

Good status of aquatic organisms in water bodies with significantly altered hydromorphological characteristics as a result of human economic activity often cannot be achieved, unless the activity is terminated and natural physical characteristics are restored. Should restoration of natural physical characteristics to such water body have far-reaching negative socio-economic consequences, or if the benefits of such altered characteristics of water bodies cannot be achieved (due to technical or economic reasons) by way of other measures which are a significantly better environmental option, such body of water is deemed to be a heavily modified water body.

Such water bodies include ponds with an area larger than 0.5 km^2, where the conditions typical of rivers have changed into the characteristics typical of lakes due to the impact of the head therefore ponds larger than 0.5 km^2 are comparable to natural lakes and their differentiation into types is subject to the same criteria of average depth.

The available data of studies on aquatic communities show that the ecological status of straightened rivers is worse than good according to biological quality elements though the parameters of physico-chemical quality elements do conform to the good ecological status criteria. If straightened stretches are not consistently maintained, in the long run they tend to re-meander naturally. However, the process of natural restoration of river beds to a very large extent depends on the slope, substratum of the bed, and riparian vegetation, for instance, tree branches and similar obstacles that impede the flow of the river and otherwise affect the restoration and effectiveness. Straightened rivers with higher slopes as well as those flowing over forested areas have higher potential of natural restoration than straightened rivers with low slopes (lower than 1.5 m/km) and destroyed natural riparian vegetation. In addition, a high river bed slope naturally ensures a larger variety of habitats (changes in flow rate, depth of the river bed and soil composition) and hence the ecological status of straightened rivers with higher slopes by biological quality elements is often higher than that in straightened rivers with low slopes. The majority of straightened rivers or stretches with a low slope are situated in the areas of intensive agriculture and urbanised areas in the plains of the Venta RBD. Artificial restoration of the river beds is hardly possible, especially in urbanised territories where remeandering possibilities are very limited. Therefore, straightened rivers with low bed slopes flowing over urbanised territories of the Venta RBD have been designated as HMWB (Figure 7).

In addition, heavily modified water bodies include stretches of rivers with cascades of hydropower plants. Analyses of monitoring data and scientific research results have shown that the status of biological elements in river stretches below HPP often fails the criteria for good status. As the distance from the HPP site increases, the negative impact of the respective HPP becomes weaker. However, if there are a few HPP situated close to each other in the bed of one and the same river, a potentially decreased impact of the HPP located up the river is again intensified by the head of the HPP located downstream, i.e. the impact is exerted both by the head itself (lift of the water level and slow-down of the river flow) and by the operation of the HPP (fluctuation of the water level). Consequently, the river sections between the adjacent hydropower plants are considered heavily modified water bodies. Such economic activities determine that a stretch of the river Virvytė in the length of 80 km from Baltininkai HPP to the lower reaches of the river has been identified as a heavily modified water body in the Venta RBD. This section (comprising 80% of the total river length) contains even 10 hydropower plants. Apart from hydromorphological changes, the heads of the hydropower plants have blocked the way for fish migration from the main river (Venta) to the Virvytė as well as within the Virvytė catchment itself.

The category of HMWB also includes Lake Biržulis. After the land reclamation of the basin, straightening and dredging of the outflow carried out in 1954, the water level of the lake dropped by 1.5 m and the area decreased from ~ 7.84 km^2 to 1.19 km^2. Such drastic reduction of the lake area resulted in loss of many habitats important for aquatic organisms, the bottom of the remaining part of the lake is all covered with silt. Resuspension of nutrients accumulated in the silt give rise to regular blooming of the lake.

The final designation of water bodies as HMWB within the Venta RBD was conducted following the Guidance Document for the Common Implementation Strategy for the Water Framework Directive and some feedback from foreign experience.

The HMWB designation process aims at justifying the reason of why the pre-designated HMWB should be finally classified as HMWB and therefore should have less stringent objectives in terms of ecological status improvements. Indeed, a significant hydromorphological alteration is not sufficient to justify that a water body should be designated as HMWB. It has to be shown that the restoration measures needed to achieve good ecological status would significantly affect the users of a water body in question or the wider environment and that the users do not have any alternative means to achieve the same benefits as those offered by a respective water body in the category of HMWB.

The HMWB designation process consisted of the following steps:

13.1. Pre-designation: identification of the location, size, etc. of the water body, description of the hydromorphological changes and ecological alteration(s);

13.2. Characterisation of the user(s) benefiting from the changes (subject or users that would benefit from the changes);

13.3. Identification of measures to restore good ecological status of the water body (hydromorphological characteristics);

13.4. Description of the impacts of the measure(s) on the user(s) and on the wider environment;

13.5. Test: Are the impacts significant?

13.6. Identification of potential alternative means for the user to achieve the same function;

13.7. Test: Are these alternatives feasible technically, economically and environmentally?

14. The following HMWB have been identified within the Venta RBD taking into account hydromorphological changes caused by anthropogenic economic activities:

14.1. ponds with an area larger than 0.5 km^2 the main uses of which are generation of energy in hydropower plants (HPP) and recreation. There are eight such water bodies in the Venta RBD: four in the Venta, three in the Bartuva Basin and one in the Šventoji Basin;

14.2. straightened rivers with a low slope (<1.5 m/km) flowing over urbanised territories. There are 11 such water bodies in the Venta RBD: 7 in the Venta Basin, 3 in the Šventoji Basin and 1 in the Bartuva Basin;

14.3. four water bodies in the Virvytė River downstream of Baltininkai HPP;

14.4. Lake Biržulis where reclamation carried out in its basin altered the hydrological regime of the lake.

14.5. The number of surface heavily modified water bodies identified in the Venta RBD totals to 24: 8 ponds, 1 lake and 15 river water bodies.

HMWB in the category of rivers account for 14% of the total number of river water bodies. The aggregate length of heavily modified rivers is 261 km, which makes up 17% of the total length of all river water bodies.

The number and length of heavily modified water bodies in the category of rivers in the Venta RBD is provided in Table 11.

Table 11. Number and length of heavily modified water bodies in the category of rivers in the Venta RBD

Basin	River water bodies		of which HMWB		HMWB, %	
	Number	Length, km	Number	Length, km	of the total numbers of river WB	of the total length of river WB
Venta	87	1 164.2	11	198.1	12.6	17.0
Bartuva	11	230.2	3	22.8	27.3	9.9
Šventoji	6	126.4	1	40.3	16.7	31.9
Total in Venta RBD	104	1 520.8	15	261.2	14.4	17.2

Source: experts' analysis results

Artificial water bodies

15. Artificial water bodies are water bodies formed in places where they had not existed before, without modifying the existing water bodies. There is only one water body classified as an artificial one in the Venta RBD – the Venta-Dubysa Canal, which connects the Nemunas and Venta river basins.

HMWB and AWB are demonstrated in Figure 7.

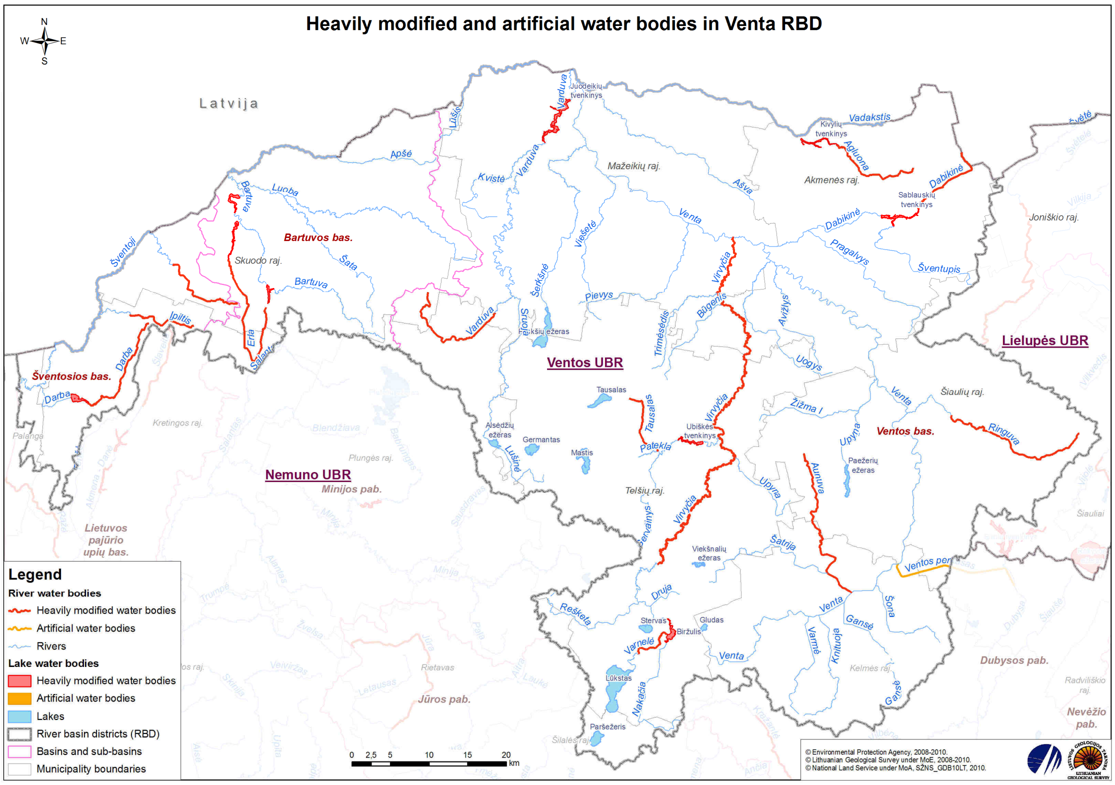


Figure 7. Heavily modified and artificial water bodies in the Venta RBD

Reference conditions for surface water bodies

16. Successful planning and introduction of measures required for the ensuring of good ecological status of surface waters directly depend on adequate selection of quality elements (biological, physico-chemical, hydromorphological) for status assessment, and on establishment of the criteria for the parameters of these elements. However, the main precondition of correct ecological status assessment is the establishment of a reference

point. The reference point means values typical of the parameters for quality elements under natural, i.e. reference conditions with no anthropogenic impacts. As water bodies of different types are habitats for diverse aquatic communities, each of them requires reference values of the parameters for water quality elements.

Reference characteristics of rivers and lakes must be established on the basis of analysis in water bodies with no or a minimum impact by human economic activities. There is only one such water body (Lake Germantas) in the Venta RBD. The Venta RBD borders the Nemunas RBD, so these two are geographically close. There are no material differences in climatic or hydrological characteristics which could determine any notably specific natural characteristics of the water bodies (and, consequently, the structure and composition of the aquatic communities). Neither are there any differences between the characteristics of the aquatic organisms in the water bodies of relevant status and type, which was confirmed by the analysis of the monitoring data and fieldwork results.

Rivers

17. In rivers, values of reference conditions for biological elements were established only for the parameters for fish and zoobenthos (no reference conditions were established for macrophyte parameters due to shortage of data). Parameter values of reference conditions for macrophytes will have to be specified when more data is collected. Values of parameters indicative of physico-chemical quality elements characterising the quality of water, which ensure reference conditions for the biological elements, were established as well. Reference conditions for rivers were also characterised in accordance with the hydromorphological and chemical status criteria. Values and characterisation of reference conditions for river types according to the parameters of the water quality elements are provided in Table 12.

Table 12. Values and characterisation of reference conditions for river types according to parameters of water quality elements

No.	**Quality element**		**Parameter**	**River type**	**Spatial assessment scale**	**Value/characterisation of reference conditions**
1.	Biological	Taxonomic composition, abundance and age structure of fish fauna	Average value of the Lithuanian Fish Index (LFI)	1-5	monitoring site	1
2.			Relative abundance of intolerant fish individuals in the community (NTOLE n), %	1		61
				2		22
				3		45
				4		18
				5		27
3.			Absolute number of intolerant fish species in the community (NTOLE sp), unit	1		3
				2		-
				3		5
				4		-
				5		5
4.			Relative abundance of tolerant fish	1		1
				2		33

No.	Quality element			Parameter	River type	Spatial assessment scale	Value/characterisation of reference conditions
				individuals in the community (TOLE n), %	3		2
					4		37
					5		23
5.				Relative number of tolerant fish species in the community (TOLE sp), %	1		-
					2		18
					3		14
					4		18
					5		14
6.				Relative abundance of omnivorous fish individuals in the community (OMNI n), %	1		3
					2		37
					3		4
					4		53
					5		38
7.				Absolute number of reophilic fish species in the community (RH sp), unit	1		-
					2		5
					3		8
					4		6
					5		10
8.				Relative abundance of litophilic fish individuals in the community (LITH n), %	1		96
					2		52
					3		93
					4		33
					5		65
9.				Relative number of litophilic fish species in the community (LITH sp), %	1		83
					2		41
					3		72
					4		39
					5		52
10.		Taxonomic composition and abundance of zoobenthos		Average annual value of the ecological quality ratio (EQR) of the Danish Stream Fauna Index (DSFI)	1-5	monitoring site	1
11.				Average annual value of DSFI	1-5		7
12.	Hydromorphological	Hydrological regime	Quantity and dynamics of water flow	Quantity of water flow	1-5	monitoring site	There are no changes in the natural water flow quantity due to human activities (water intake, operation of HPP, water discharge from ponds, or

No.	Quality element			Parameter	River type	Spatial assessment scale	Value/characterisation of reference conditions
							an impact of the head), or fluctuation is insignificant (≤10% of the average flow during a period in question). However, the flow quantity may not be less than the minimum natural flow during the dry period (average of 30 days).
13.		River continuity		River continuity	1-5	stretch*	There are no artificial barriers for fish migration.
14.		Morphological conditions	Structure of the riparian zone	Structure of the river bed	1-5	stretch*	Natural bed (unregulated, no shore embankments)
15.				Length and width of the natural riparian vegetation zone	1-5	stretch*	The zone of natural riparian vegetation (forests) covers at least 70% of the length of the shoreline of the river bed. The width of the forest zone must be at least 50 m.
16.	Physico-chemical	General	Nutrient conditions	Annual average value of nitrate nitrogen (NO_3-N), mg/l	1-5	monitoring site	$\leq$ 0.90
17.				Annual average value of ammonium nitrogen (NH_4-N, mg/l	1-5		$\leq$ 0.06
18.				Annual average value of total nitrogen (N_t), mg/l	1-5		$\leq$ 1.40
19.				Annual average value of phosphate phosphorus (PO_4-P), mg/l	1-5		$\leq$ 0.03
20.				Annual average value of total phosphorus (P_t), mg/l	1-5		$\leq$ 0.06
21.			Organic matter	Annual average value of biological oxygen demand in 7 days (BOD_7), mg/l	1-5	monitoring site	$\leq$ 1.80
22.			Oxygenation conditions	Annual average value of dissolved oxygen in water (O_2), mg/l	1,3,4,5	monitoring site	$\geq$ 9.5
					2		$\geq$ 8.5
23.		Specific pollutants		Values of substances	1-5	monitoring	Measured values are

No.	Quality element		Parameter	River type	Spatial assessment scale	Value/characterisation of reference conditions
			listed in Annex 1 and part A of Annex 2 to the Wastewater Management Regulation approved by Order No. D1-236 of the Minister of Environment of the Republic of Lithuania of 17 May 2006 (Žin., 2006, No. 59-2103; 2010, No. 59-2938)		site	below the quantitative assessment limit for the respective substance (detection limit).
24.			Values of substances listed in part B of Annex 2 to the Wastewater Management Regulation, with the exception of the values of nutrients given in lines 16-20 of this table	1-5	monitoring site	Measured values are below the natural level and the values of synthetic pollutants are below the quantitative assessment limit (detection limit).

* The length of the river stretches where the parameters for hydromorphological quality elements are assessed: rivers with the catchment area < 100 km^2 – 0.5 km upstream and 0.5 km downstream of the monitoring site; rivers with the catchment area from 100 to 1000 km^2 – 2.5 km upstream and 2.5 downstream of the monitoring site.
Source: experts’ analysis results

Lakes

18. In lakes, values of reference conditions for the biological water quality elements were specified only for the parameter of phytoplankton meanwhile reference values established for the parameters for other biological elements are only preliminary ones, with the parameters currently being tested. Parameter values for reference conditions will have to be specified when more data is available. Also, values of parameters indicative of physico-chemical water quality elements, which should ensure reference conditions for the biological elements, were established, as well as parameters for the hydromorphological quality elements and criteria for chemical status were characterised. Values and characterisation of reference conditions for lake types according to the parameters of the water quality elements are given in Table 13.

Table 13. Values and characterisation of reference conditions for lake types according to parameters of water quality elements

No.	Quality elements		Parameter	Lake type	Value/characterisation of reference conditions
1.	Biological	Taxonomic composition, abundance and biomass of phytoplankton	Mean value of the EQR of the average annual value and the EQR of the maximum value of chlorophyll *a*	1,2	1
2.			Average annual value of chlorophyll *a*, µg/l	1, 2	2.5

No.	Quality elements			Parameter	Lake type	Value/characterisation of reference conditions
3.				Maximum value of chlorophyll *a*, µg/l	1, 2	5.0
4.	Hydromorphological	Hydrological regime	Quantity and dynamics of water flow	Changes in the water level	1,2	There is no unnatural decrease in the water level (the level has not been lowered, there is no intake of water), or changes are insignificant (the level is not lower than the natural minimum average annual water level), or there is no anthropogenic impact which would determine the said alteration of the water level. There is no unnatural fluctuation of the water level (fluctuation conditioned by the operation of a HPP constructed on an effluent or tributary of the lake), or such fluctuation is within the limits of the minimum and maximum natural average annual water level.
5.		Morphological conditions	Structure of the lake shore	Changes in the shoreline	1,2	The shoreline is natural (not straightened, no shore embankments), or changes are insignificant (≤5% of the lake shoreline)
6.				Length of the natural riparian vegetation zone	1,2	The zone of natural riparian vegetation (forests) covers at least 70% of the length of the lake shoreline.
7.	Physico-chemical	General	Nutrient conditions	Annual average value of total nitrogen (N_t), mg/l	1, 2	≤ 1.00
8.				Annual average value of total phosphorus (P_t) mg/l	1, 2	≤ 0.020
9.		Specific pollutants		Values of substances listed in	1,2	Measured values are

No.	Quality elements		Parameter	Lake type	Value/characterisation of reference conditions
			Annex 1 and Part A of Annex 2 to the Wastewater Management Regulation		below the quantitative assessment limit for the respective substance (detection limit).
10.			Values of substances listed in part B of Annex 2 to the Wastewater Management Regulation, with the exception of the values of nutrients given in lines 7 and 8 of this table	1,2	Measured values are below the natural level and the values of synthetic pollutants are below the quantitative assessment limit (detection limit).

Source: experts' analysis results

Unnatural changes in the water level should be taken into account only in case of pressures from human activities which would result in alteration of the water level in the said way (dampers, hydropower plants, drainage of the basin, or any other human activity which would cause reduction or unnatural fluctuation of the water level). In the event of any anthropogenic impact, the average minimum natural water level and the limits of the minimum and maximum average natural annual water level (deviation from which serves as a basis for assessing the present hydrological status of the lake according to hydrological parameters) should be established by analysing characteristics of the water level fluctuation which dominated before the impact of human activities, and if no such data is available – using data on characteristics of the water level fluctuation in comparable lakes which have not been affected by human activities.

Maximum ecological potential of artificial and heavily modified water bodies

19. Hydrological and morphological characteristics in artificial and heavily modified water bodies directly depend on the objectives of the formation or modification of such water bodies. Any change in the hydromorphological characteristics results in corresponding changes in the aquatic communities which live in the water bodies. Hence the ecological status of such water bodies should be assessed on the basis of the criteria applied for the evaluation of the ecological status of the water body type with the most similar characteristics. On the other hand, conditions formed in artificial or heavily modified water bodies are usually not identical to the ones in natural water bodies therefore characterisation of their status employs the notion of ecological potential instead of ecological status. The reference point for classifying the ecological potential for AWB and HMWB is maximum ecological potential (equivalent of reference conditions in natural water bodies). Since the hydromorphological conditions of such water bodies often do not allow attaining the same status of aquatic organisms as in natural water bodies, less stringent requirements may be set for the parameters indicative of biological elements. However, if the hydromorphological conditions occurring in AWB and HMWB are identical to the conditions in natural water bodies of a respective type, maximum ecological potential of aquatic communities is considered to be corresponding to high ecological status, i.e. it has to conform to the same criteria. The requirements for the parameters indicative of the physico-chemical water quality elements and chemical status in all cases remain the same as those for natural water

bodies, unless they cannot be met due to the nature of an individual AWB or HMWB. In bodies of water where the hydromorphological conditions prevent attainment of the same status of aquatic organisms as in natural water bodies, good ecological potential is deemed to be ensured only in the event of introduction of at least minimum measures that allow for mitigation of impacts of hydromorphological modifications (e.g. restoring woody riparian vegetation where it has been completely destroyed, or providing for at least minimum obstacles for the water flow that determine at least minimum heterogeneity of the composition of the river soil), i.e. measures which will not have any negative impact on anthropogenic objectives pursued when constructing an artificial water body or significantly modifying a natural one. Meanwhile maximum ecological potential can be attained only by applying all possible measures (e.g. partial remeandering of river beds).

Artificial water bodies

20. Only one water body, the Venta-Dubysa Canal connecting the Nemunas and Venta river basins, has been assigned to the category of artificial water bodies in the Venta RBD. According to their ecological qualities, artificial canals are similar to rivers of a respective type. However, the hydro-morphological conditions formed therein are not consistent with such conditions in natural rivers (straight bed, absence of certain habitats, potential qualitative and quantitative alterations in the flow). It can happen that high status by biological quality elements is not achieved in the artificial canal due to absence of certain specific habitats and changes in the natural hydrological regime even after the introduction of supplementary measures. Therefore, maximum ecological potential of biological quality elements can conform only to the requirements for good ecological status which are applied to natural rivers: ecological quality ratio (EQR) of DSFI ≥ 0.63, and LFI ≥ 0.70.

Requirements for parameters indicative of physico-chemical quality elements of water quality and chemical status (concentrations of specific pollutants) remain the same as those in respect of natural rivers (Table 14).

Heavily modified water bodies

21. HMWB include ponds with an area larger than 0.5 km^2, straightened rivers with a low bed slope flowing over urbanised areas in the plains of the Venta Basin, a stretch of the Virvytė downstream Baltininkai HPP and Lake Biržulis.

The hydromorphological conditions formed in ponds larger than 0.5 km^2 as well as the aquatic communities are consistent with those in natural lakes, with an exception of ponds of hydropower plants with unnatural fluctuation of the water level. Parameters indicative of their hydromorphological quality elements are deemed to be failing the criteria for maximum ecological potential. However, maximum ecological potential of the biological and physico-chemical quality elements in such water bodies should conform to the high status criteria applicable for natural lakes.

The decrease of the water level and surface area of heavily modified Lake Biržulis resulted in significant reduction of macrophyte and fish communities, which at present correspond to communities typical of dystrophic lakes. The ecological status classification systems by parameters indicative of the said biological elements have not been completed yet, so at present the ecological potential of Lake Biržulis (like the ecological status of other, natural lakes in the Venta RBD) can be assessed only on the basis of parameters indicative of physico-chemical quality elements and phytoplanton, meanwhile maximum ecological potential according to the parameters of the said quality elements should conform to the high ecological status criteria applicable to natural lakes.

Table 14. Characterisation of maximum ecological potential in ponds and Lake Biržulis which are designated as HMWB(1)

No.	Quality element	Parameter			Value/characterisation of maximum ecological potential
1.	Biological	Taxonomic composition, abundance and biomass of phytoplankton		Mean value of the EQR of the average annual value and the EQR of the maximum value of chlorophyll *a*	>0.67
2.	Physico-chemical	General	Nutrient conditions	Annual average value of total nitrogen (N_t), mg/l	<1.30
3.					<2.00 *
4.				Annual average value of total phosphorus (N_p), mg/l	<0.040
5.					<0.100 *
6.	Hydromorphological	Hydrological regime	Quantity and dynamics of water flow	Changes in the water level	There is no unnatural decrease in the water level (the level has not been lowered, there is no intake of water), or changes are insignificant (the level is not lower than the natural minimum average annual water level), or there is no anthropogenic impact which would determine the said alteration of the water level.
7.		Morphological conditions	Structure of the lake shore	Changes in the shoreline	The shoreline is natural (not straightened, no shore embankments), or changes are insignificant (≤5% of the lake shoreline)
8.				Length of the natural riparian vegetation zone	The zone of natural riparian vegetation (forests) covers at least 70% of the length of the lake shoreline.

(1) Parameters indicative of hydromorphological quality elements of ponds with a regulated water level (HPP) and of heavily modified Lake Biržulis are deemed to be failing the characterisation of maximum ecological potential.
* Criteria for marked parameters are applied for assessing the ecological potential of high-drainage lakes (water circulation ratio, i.e. the ratio of the quantity of the annual river flow to the volume of the pond, K>100).
Source: experts' analysis results

The ecological potential of the heavily modified rivers with a straightened bed should be defined following the criteria applicable for the assessment of the types of rivers of the corresponding catchment size and bed slope. High ecological status by the biological quality elements cannot be achieved due to the absence of certain specific habitats and changes in the natural hydrological regime. Monitoring data indicates that maximum ecological potential of the biological quality elements should be conforming to the values of the criteria for good ecological status which are applied to natural rivers of a respective type, i.e. DSFI EQR ≥0.63, and LFI ≥0.70 (Table 15). Maximum ecological potential for the hydromorphological elements has to meet the criteria for good ecological status. The maximum ecological potential requirements for the physico-chemical water quality elements correspond to the good ecological status criteria for rivers with natural beds.

The ecological potential of the heavily modified stretch of the Virvytė downstream of Baltininkai HPP should be assessed using the criteria applicable for the assessment of the types of rivers with a respective catchment size and bed slope (Types 1 and 3). High ecological status by biological quality elements cannot be achieved due to changes in the natural hydrological regime and disruption of the river continuity (barriers for fish migration). Monitoring as well a field and scientific research data indicates that maximum ecological potential by biological quality elements can be consistent only with the values of good status set for natural rivers of corresponding types, i.e. DSFI EQR ≥ 0.63 and LFI ≥ 0.70 (Table 15). Requirements for physico-chemical water quality elements are the same as those for rivers with natural beds.

Parameters and their values for maximum ecological potential of the artificial canal, heavily modified stretch of the Virvytė downstream of Baltininkai HPP and heavily modified rivers with straightened beds are provided in Table 15.

Table 15. Characterisation of maximum ecological potential in canals and in rivers designated as heavily modified water bodies

No.	**Quality element**			**Parameter**	**Spatial assessment scale**	**Value/characterisation of maximum ecological potential**
1.	Biological	Taxonomic composition, abundance and age structure of fish fauna		LFI	monitoring site	>0.70
2.		Taxonomic composition and abundance of zoobenthos		DSFI EQR	monitoring site	>0.63
3.	Hydromorphological	Hydrological regime	Quantity and dynamics of water flow	Quantity of water flow	monitoring site	There are no changes in the natural water flow quantity or fluctuation due to anthropogenic impacts (HPP operation) is ≤30% of the average flow during a period in question. However, the flow quantity may not be less than the minimum natural flow during the dry period (average of 30 days).
4.		River continuity		River continuity	stretch*	There are no artificial barriers for fish migration.
5.		Morphological conditions	Structure of the riparian zone	Structure of the river bed	stretch *	The shoreline is meandrous, there are shallow and deep places in the bed determining

No.	Quality element			Parameter	Spatial assessment scale	Value/characterisation of maximum ecological potential
						changes in the flow velocity and soil composition.
6.				Length and width of the natural riparian vegetation zone	stretch *	The zone of natural riparian vegetation (forests) covers at least 50% of the length of the shoreline of the river bed.
7.	Physico-chemical	General	Nutrient conditions	Annual average value of nitrate nitrogen (NO_3-N), mg/l	monitoring site	<1.30
8.				Annual average value of ammonium nitrogen (NH_4-N), mg/l		<0.10
9.				Annual average value of total nitrogen (N_t), mg/l		<2.00
10.				Annual average value of phosphate phosphorus (PO_4-P), mg/l		<0.050
11.				Annual average value of total phosphorus (P_t), mg/l		<0.100
12.			Organic matter	Annual average value of biological oxygen demand in 7 days (BOD_7), mg/l	monitoring site	<2.30
13.			Oxygenation conditions	Annual average value of dissolved oxygen in water (O_2), mg/l	monitoring site	>8.50 in water bodies of Type 1, 3, 4, 5

* The length of the river stretches where the parameters for hydromorphological quality elements are assessed: rivers with the catchment area < 100 km^2 – 0.5 km upstream and 0.5 km downstream of the monitoring site; rivers with the catchment area from 100 to 1000 km^2 – 2.5 km upstream and 2.5 downstream of the monitoring site.
Source: experts' analysis results

Methodology for identifying the status of surface water bodies

Criteria for assessment of the ecological status of rivers

22. The ecological status of rivers is assessed on the basis of physico-chemical, hydromorphological and biological quality elements, which reflect all significant

impacts of anthropogenic activities.

The ecological status of rivers is assessed on the basis of the physico-chemical quality elements, which are parameters characterising general conditions (nutrients, organic matter, oxygenation): NO_3-N, NH_4-N, N_{total}, PO_4-P, P_{total}, BOD_7, and O_2. Water bodies are assigned to one of five ecological status classes on the basis of the average annual values of each parameter (Table 16). The criteria given in Table 16 have been agreed with the neighbouring country Latvia.

Table 16. Ecological status classes of rivers according to parameters indicative of physico-chemical quality elements

No.	Quality element		Parameter	River type	Parameter value for reference conditions	Criteria for ecological status classes of rivers according to parameter values for physico-chemical quality elements				
						High	Good	Moderate	Poor	Bad
1	General	Nutrient conditions	NO_3-N, mg/l	1-5	0.90	<1.30	1.30-2.30	2.31-4.50	4.51 -10.00	>10.00
2			NH_4-N, mg/l	1-5	0.06	<0.10	0.10-0.20	0.21-0.60	0.61-1.50	>1.50
3			N_{total}, mg/l	1-5	1.40	<2.00	2.00-3.00	3.01-6.00	6.01-12.00	>12.00
4			PO_4-P, mg/l	1-5	0.03	<0.050	0.050-0.090	0.091-0.180	0.181-0.400	>0.400
5			P_{total}, mg/l	1-5	0.06	<0.100	0.100-0.140	0.141-0.230	0.231-0.470	>0.470
6		Organic matter	BOD_7, mg/l	1-5	1.80	<2.30	2.30-3.30	3.31-5.00	5.01-7.00	>7.00
7		Oxygenation	O_2, mg/l	1, 3, 4, 5	9.50	>8.50	8.50-7.50	7.49-6.00	5.99-3.00	<3.00
8			O_2, mg/l	2	8.50	>7.50	7.50-6.50	6.49-5.00	4.99-2.00	<2.00

Source: experts' analysis results

The ecological status of rivers is assessed on the basis of the following parameters characterising hydromorphological quality elements, such as hydrological regime (quantity and dynamics of water flow), river continuity, and morphological conditions (shoreline structure): quantity of flow, river continuity, structure of the river bed, and length and width of the natural riparian vegetation zone. When all parameters indicative of the hydromorphological quality elements are consistent with the characterisation of high ecological status, such water body is deemed to be at high ecological status according to the hydromorphological quality elements (Table 17). When at least one parameter for the hydromorphological quality elements fails the characterisation of high ecological status, such water body is considered to be failing high ecological status according to the hydromorphological quality elements.

Table 17. Characterisation of high ecological status of rivers according to parameters indicative of hydromorphological quality elements

No.	Quality element		Parameter	Spatial assessment scale	Characterisation of high ecological status of rivers according to parameters for hydromorphological quality elements
1	Hydrological regime	Quantity and dynamics of water flow	Quantity of water flow	monitoring site	There are no alterations in the quantity of the natural flow due to human activities (water intake, operation of HPP, water discharge from ponds, or an impact of the head), or fluctuation is insignificant (≤10% of the average flow during a period in question). However, the flow quantity may not be less than the minimum natural flow during the dry period (average of 30 days).

No.	Quality element		Parameter	Spatial assessment scale	Characterisation of high ecological status of rivers according to parameters for hydromorphological quality elements
2	River continuity		River continuity	stretch *	There are no artificial barriers for fish migration.
3	Morphological conditions	Shoreline structure	Structure of the river bed	stretch *	The bed is natural (not straightened, no shore embankments).
4			Length and width of the natural riparian vegetation zone	stretch *	The zone of natural riparian vegetation (forests) covers at least 70% of the length of the bed shore. The width of the forest zone must be at least 50 m.

* The length of the river stretches where the parameters for hydromorphological quality elements are assessed: rivers with the catchment area < 100 km^2 – 0.5 km upstream and 0.5 km downstream of the monitoring site; rivers with the catchment area from 100 to 1000 km^2 – 2.5 km upstream and 2.5 km downstream of the monitoring site, and rivers with the catchment area >1000 km^2 – 5 km upstream and 5 km downstream of the monitoring site.
Source: experts' analysis results

The ecological status of rivers is assessed on the basis of the following biological quality elements: taxonomic composition, abundance, age structure of fish fauna and taxonomic composition, abundance of zoobenthos.

The indicator used to assess the ecological status of rivers by the taxonomic composition, abundance, age structure of fish fauna is LFI. Observing the average annual value of LFI, water bodies are assigned to one of five ecological status classes (Table 18).

Table 18. Ecological status classes of rivers according to taxonomic composition, abundance and age structure of fish fauna

Quality element	Indicator	River type	Criteria for ecological status classes of rivers according to parameter values for fish fauna				
			High	Good	Moderate	Poor	Bad
Taxonomic composition, abundance and age structure of fish fauna	LFI	1-5	>0.93	0.93-0.71	0.70-0.40	0.39-0.11	<0.11

Source: experts' analysis results

The indicator used to assess the ecological status of rivers according to the taxonomic composition and abundance of zoobenthos is DSFI. Observing the average annual value of DSFI EQR, water bodies are assigned to one of five ecological status classes (Table 19).

Table 19. Ecological status classes of rivers according to taxonomic composition and abundance of zoobenthos

Quality element	Indicator	River type	Criteria for ecological status classes of rivers according to the EQR of parameter values for zoobenthos				
			High	Good	Moderate	Poor	Bad
Taxonomic composition and abundance of zoobenthos	DSFI	1-5	≥ 0.78	0.77-0.64	0.63-0.50	0.49-0.35	<0.35

Source: experts' analysis results

Criteria for assessment of the ecological status of lakes

23. The ecological status of lakes is assessed on the basis of physico-chemical, hydromorphological and biological quality elements.

The parameters characterising general conditions (nutrients), which is a physico-chemical element, are as follows: total nitrogen (N_{total}) and total phosphorus (P_{total}). Water bodies are assigned to one of five ecological status classes on the basis of the average annual values of each parameter measured in samples of the surface water layer (Table 20).

Table 20. Ecological status classes of lakes according to parameters indicative of the physico-chemical quality element

No.	Quality element		Parameter	Lake type	Parameter value for reference conditions	Criteria for ecological status classes of lakes according to parameter values for the physico-chemical quality element				
						High	Good	Moderate	Poor	Bad
1	General	Nutrient conditions	N_{total}, mg/l	1, 2	1.00	<1.30	1.30-1.80	1.81-2.30	2.31-3.00	>3.00
3			P_{total}, mg/l	1, 2	0.020	<0.040	0.040-0.060	0.061-0.090	0.091-0.140	>0.140

Source: experts' analysis results

The ecological status of lakes is assessed on the basis of the following parameters indicative of hydromorphological quality elements, such as hydrological regime (quantity and dynamics of water flow) and morphological conditions (structure of the lake shoreline): changes in the water level, alterations of the shoreline, the length of the natural riparian vegetation zone. When all parameters for the hydromorphological quality elements are consistent with the characterisation of high ecological status, such water body is deemed to be at high ecological status according to the hydromorphological quality elements (Table 21). When at least one parameter for the hydromorphological quality elements fails the characterisation of high ecological status, such water body is considered to be failing high ecological status according to the hydromorphological quality elements.

Table 21. Characterisation of high ecological status of lakes according to parameters indicative of hydromorphological quality elements

No.	Quality element		Parameter	Characterisation of high ecological status of lakes according to parameters for hydromorphological quality elements
1	Hydrological regime	Quantity and dynamics of water flow	Changes in the water level	There is no unnatural decrease in the water level (the level has not been lowered, there is no intake of water), or changes are insignificant (the level is not lower than the natural minimum average annual water level), or there is no anthropogenic impact which would determine the said alteration of the water level. There is no unnatural fluctuation of the water level (fluctuation conditioned by operation of HPP constructed on an effluent or tributary of the lake), or such fluctuation is within the limits of the minimum and maximum natural average annual water level.
2	Morphological conditions	Shoreline structure of the lake	Changes in the shoreline	The shoreline is natural (not straightened, there are no shore embankments), or changes are insignificant (≤5% of the lake shoreline).
3			Length of the natural riparian vegetation zone	The zone of natural riparian vegetation (forests) covers at least 70% of the length of the lake shoreline.

Source: experts' analysis results

The ecological status of lakes is assessed on the basis of the following parameter indicative of biological quality elements, such as the taxonomic composition, abundance and biomass of phytoplankton: the average annual value and the maximum value of chlorophyll *a*. Observing the mean of the EQR of the annual average value and of the EQR of the maximum value of the parameter, water bodies are assigned to one of five ecological status classes (Table 22).

Table 22. Ecological status classes of lakes according to taxonomic composition, abundance and biomass of phytoplankton

Quality element	Parameter	Lake type	Criteria for ecological status classes of lakes according to the EQR of parameter values for phytoplankton				
			High	Good	Moderate	Poor	Bad
Taxonomic composition, abundance and biomass of phytoplankton	Chlorophyll *a* (the mean of the EQR of the annual average value and of the EQR of the maximum value)	1, 2	>0.67	0.67-0.33	0.32-0.14	0.13-0.07	<0.07

Source: experts' analysis results

Criteria for assessment of the ecological potential of artificial heavily modified water bodies

24. The ecological potential of rivers which have been designated as HMWB and of canals is assessed on the basis of physico-chemical, hydromorphological and biological quality elements.

The parameters indicative of physico-chemical quality elements, such as general conditions (nutrients, organic matter, oxygenation), used to assess the ecological potential of rivers designated as HMWB are as follows: NO_3-N, NH_4-N, N_{total}, PO_4-P, P_{total}, BOD_7, and O_2. The water body is assigned to one of five ecological potential classes on the basis of the average annual values of each parameter (Table 23).

Table 23. Ecological potential classes of canals and of rivers designated as HMWB according to parameters indicative of physico-chemical quality elements

No.	Quality element		Parameter	Type of water body	Criteria for ecological potential classes according to parameter values for physico-chemical quality elements				
					Maximum	Good	Moderate	Poor	Bad
1	General	Nutrient conditions	NO_3-N, mg/l	1-5	<1.30	1.30-2.30	2.31-4.50	4.51 -10.00	>10.00
2			NH_4-N, mg/l	1-5	<0.10	0.10-0.20	0.21-0.60	0.61-1.50	>1.50
3			N_{total}, mg/l	1-5	<2.00	2.00-3.00	3.01-6.00	6.01-12.00	>12.00
4			PO_4-P, mg/l	1-5	<0.050	0.050-0.090	0.091-0.180	0.181-0.400	>0.400
5			P_{total}, mg/l	1-5	<0.100	0.100-0.140	0.141-0.230	0.231-0.470	>0.470
6		Organic matter	BOD_7, mg/l	1	<2.30	2.30-3.30	3.31-5.00	5.01-7.00	>7.00
7		Oxygenation	O_2, mg/l	1, 3, 4, 5	>8.50	8.50-7.50	7.49-6.00	5.99-3.00	<3.00
8			O_2, mg/l	2	>7.50	7.50-6.50	6.49-5.00	4.99-2.00	<2.00

Source: experts' analysis results

The ecological potential of rivers designated as HMWB and of canals is assessed on the basis of the following parameters indicative of hydromorphological quality elements, such as hydrological regime (quantity and dynamics of water flow), river continuity, and morphological conditions (shoreline structure): quantity of flow, river continuity, structure of the river bed, length of the natural riparian vegetation zone. When all parameters for the hydromorphological quality elements are consistent with the characterisation of maximum ecological potential, such water body is deemed to be of maximum ecological potential according to the hydromorphological quality elements (Table 24). When at least one parameter for the hydromorphological quality elements fails the characterisation of maximum ecological potential, such water body is considered to be failing maximum ecological potential according to the hydromorphological quality elements.

Table 24. Characterisation of maximum ecological potential of canals and of rivers designated as HMWB according to parameters indicative of hydromorphological quality elements

No.	**Quality element**		**Parameter**	**Spatial assessment scale**	**Characterisation of maximum ecological potential according to parameters for hydromorphological quality elements**
1	Hydrological regime	Quantity and dynamics of water flow	Quantity of water flow	monitoring site	There are no alterations in the quantity of the natural flow due to human activities (operation of HPP) or fluctuation is ≤30% of the average flow during a period in question. However, the flow quantity shall not be less than the minimum natural flow during the dry period (average of 30 days).
2	River continuity		River continuity	stretch *	There are no artificial barriers for fish migration.
3	Morphological conditions	Shore structure	Structure of the river bed	stretch *	The shoreline is meandrous, there are shallow and deep places in the bed determining changes in the flow velocity and soil composition.
4			Length of the natural riparian vegetation zone	stretch *	The zone of natural riparian vegetation (forests) covers at least 50% of the length of the bed shoreline.

* The length of the river stretches where the parameters for hydromorphological quality elements are assessed: rivers with the catchment area < 100 km^2 – 0.5 km upstream and 0.5 km downstream of the monitoring site; rivers with the catchment area from 100 to 1000 km^2 – 2.5 km upstream and 2.5 km downstream of the monitoring site, and rivers with the catchment area >1000 km^2 – 5 km upstream and 5 km downstream of the monitoring site.
Source: experts' analysis results

The ecological potential of canals and of rivers designated as HMWB is assessed on the basis of the following parameters indicative of biological quality elements: taxonomic composition, abundance, age structure of fish fauna and taxonomic composition and abundance of zoobenthos.

The indicator used to assess the ecological status of rivers designated as HMWB and of canals according to the taxonomic composition, abundance, age structure of fish fauna is the LFI. The water body is assigned to one of five ecological status classes on the basis of the average annual value of the LFI (Table 25).

Table 25. Ecological potential classes of canals and of rivers designated as HMWB according to taxonomic composition, abundance and age structure of fish fauna

Quality element	**Indicator**	**Type of water body**	**Criteria for ecological potential classes according to parameter values for fish fauna**				
			Maximum	**Good**	**Moderate**	**Poor**	**Bad**
Taxonomic composition, abundance and age structure of fish fauna	LFI	1-5	≥ 0.71	0.70-0.40	0.39-0.20	0.19-0.10	<0.10

Source: experts' analysis results

The indicator used to assess the ecological potential of canals and of rivers designated as heavily modified water bodies according to the taxonomic composition and abundance of zoobenthos is the DSFI. Water bodies are assigned to one of five ecological potential classes on the basis of the average annual value of the DSFI EQR (Table 26).

Table 27. Ecological potential classes of canals and of rivers designated as HMWB according to the taxonomic composition and abundance of zoobenthos

Quality element	Indicator	Type of water body	Criteria for ecological potential classes according to the EQR of parameter values for zoobenthos				
			Maximum	Good	Moderate	Poor	Bad
Taxonomic composition and abundance of zoobenthos	DSFI	1-5	≥ 0.64	0.63-0.50	0.49-0.36	0.35-0.21	<0.21

Source: experts' analysis results

The ecological potential of ponds and lakes designated as HMWB is assessed on the basis of physico-chemical, hydromorphological and biological quality elements.

The parameters indicative of physico-chemical quality elements, such as general data (nutrients), used to assess the ecological potential of ponds and lakes designated as HMWB are as follows: total nitrogen and total phosphorus. The water body is assigned to one of five ecological potential classes on the basis of the average annual values of each parameter in samples of the surface water layer (Table 27).

Table 27. Ecological potential classes of ponds and lakes designated as HMWB according to parameters indicative of physico-chemical quality elements

No.	**Quality element**		**Parameter**	**Type of water body**	**Criteria for ecological potential classes by parameter values for physico-chemical quality elements**				
					Maximum	**Good**	**Moderate**	**Poor**	**Bad**
1	General data	Nutrients	N_{total}, mg/l	1, 2	<1.30	1.30-1.80	1.81-2.30	2.31-3.00	>3.00
3			N_{total}, mg/l*	1, 2	<2.00	2.00-3.00	3.01-6.00	6.01-12.00	>12.00
4			P_{total}, mg/l	1, 2	<0.040	0.040-0.060	0.061-0.090	0.091-0.140	>0.140
6			P_{total}, mg/l l*	1, 2	<0.100	0.100-0.140	0.141-0.230	0.231-0.470	>0.470

* Criteria for marked parameters are applied for assessing the ecological potential of high-drainage lakes (water circulation ratio, i.e. the ratio of the quantity of the annual river flow to the volume of the pond, K>100).

Source: experts' analysis results

The ecological potential of ponds (with an unregulated water level) which are designated as HMWB is assessed on the basis of the following parameters indicative of hydromorphological quality elements, such as hydrological regime (quantity and dynamics of water flow) and morphological conditions (shoreline structure): changes in the water level, changes in the shoreline, length of the natural riparian vegetation zone. When all parameters indicative of the hydromorphological quality elements are consistent with the characterisation of maximum ecological potential, such water body is deemed to be of maximum ecological potential according to the hydromorphological quality elements (Table 28). When at least one parameter for the hydromorphological quality elements fails the characterisation of maximum ecological potential, such water body is considered to be failing maximum ecological potential according to the hydromorphological quality elements. The parameters indicative of the hydromorphological elements in ponds with a regulated water level (HPP are constructed on such ponds) and in Lake Biržulis are deemed to be failing the characterisation of maximum ecological potential.

Table 28. Characterisation of maximum ecological potential of ponds (with an unregulated water level) designated as HMWB according to parameters indicative of hydromorphological quality elements

No.	Quality element		Parameter	Characterisation of maximum ecological potential according to parameters for hydromorphological quality elements
1	Hydrological regime	Quantity and dynamics of water flow	Changes in the water level	There is no unnatural decrease in the water level (the level has not been lowered, there is no intake of water), or changes are insignificant (the level is not lower than the natural minimum average annual water level), or there is no anthropogenic impact which would determine the said alteration of the water level.
2	Morphological conditions	Shore structure	Changes in the shoreline	The shoreline is natural (not straightened, there are no shore embankments), or changes are insignificant (≤5% of the lake shoreline).
3			Length of the natural riparian vegetation zone	The zone of natural riparian vegetation (forests) covers at least 70% of the length of the bed shoreline.

Source: experts' analysis results

The parameters for assessing the ecological potential of ponds and lakes designated as HMWB according to biological quality elements, such as the taxonomic composition, abundance and biomass of phytoplankton, is the average annual value and the maximum value of chlorophyll *a*. Observing the mean of the EQR of the annual average value and of the EQR of the maximum value of chlorophyll *a*, the water body is assigned to one of five ecological potential classes (Table 29).

Table 29. Ecological potential classes of ponds and lakes designated as HMWB according to taxonomic composition, abundance and biomass of phytoplankton

Quality element	Parameter	Type of water body	Criteria for ecological potential classes according to the EQR of parameter values for phytoplankton				
			Maximum	Good	Moderate	Poor	Bad
Taxonomic composition, abundance and biomass of phytoplankton	Chlorophyll *a* (the mean of the EQR of the annual average value and of the EQR of the maximum value)	1-3	>0.67	0.67-0.33	0.32-0.14	0.13-0.07	<0.07

Source: experts' analysis results

Criteria for assessment of the chemical status of surface waters

25. "Good surface water chemical status" means the chemical status required to meet the environmental objectives for surface waters pursuant to the Law of the Republic of Lithuania on Water (Žin., 1997, No. 104-2615; 2003, No. 36-1544), i.e. the chemical status achieved by a body of surface water in which concentrations of pollutants do not exceed the environmental quality standards established in relevant legislation setting environmental quality standards.

The chemical status of surface waters is divided into two quality classes. Where a body of water achieves compliance with all environmental quality standards established under national legislation setting environmental quality standards, it is classified as achieving good chemical status. If not, the body is recorded as failing good chemical status.

The criteria for assessing the chemical status of surface waters are the maximum allowable concentrations of substances listed in Annexes 1 and 2 to the Wastewater Management Regulation approved by Order No. D1-236 of the Minister of Environment of the Republic of Lithuania of 17 May 2006 (Žin., 2006, No. 59-2103; 2010, No. 59-2938) in a receiving water body.

Status classification rules for surface water bodies

26. The status of surface water bodies shall be classified as follows:

26.1. Identification of the status of surface water bodies encompasses assessment of their ecological status (or ecological potential for artificial and heavily modified water bodies) and chemical status. The status of the water body shall be determined by the poorer of its ecological status and chemical status assigning the water body to one of the two classes: conforming to good status or failing good status.

26.2. The ecological status of rivers and lakes shall be classified into five classes: high, good, moderate, poor and bad. The level of confidence in the assessment of the ecological status can be high, medium and low.

26.3. When parameters indicative of biological and physico-chemical quality elements meet the criteria for high ecological status and parameters indicative of hydromorphological quality elements meet the criteria for high ecological status as well, the ecological status of the water body shall be high and the level of confidence in the status assessment shall be high.

26.4. When only parameters indicative of hydromorphological quality elements fail the characterisation of high ecological status meanwhile parameters indicative of biological and physico-chemical quality elements do meet the criteria for high ecological status, the ecological status of the water body shall be good and the level of confidence in the status assessment shall be medium.

26.5. When parameters indicative of biological and/or physico-chemical quality elements fail the criteria for high ecological status, the assessment of the ecological status of the water body shall not consider parameters for hydromorphological quality elements, except in the cases specified in paragraphs 26.6.2, 26.6.3, 26.6.5, 26.6.6 and 26.9 of these rules.

26.6. When at least one parameter indicative of biological and/or physico-chemical quality elements fails the criteria for high ecological status but meets the criteria for good ecological status meanwhile the values of other parameters for biological and physico-chemical quality elements do meet the criteria for high ecological status, the ecological status of the water body shall be classified in the following way depending on the water quality element:

26.6.1. when at least both one parameter indicative of biological quality elements and one parameter indicative of physico-chemical quality elements fail the criteria for high ecological status but meet the criteria for good ecological status, the ecological status of the water body shall be good and the level of confidence in the status assessment shall be high;

26.6.2. when only one of a few parameters indicative of biological quality elements fails the criteria for high ecological status but the relative deviation (in per cent) of its value from the lowest value in the range of the criteria for good ecological status is equal to or higher than 50 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for good ecological status and parameters indicative of hydromorphological quality elements do meet the criteria for high status, the ecological status of the water body shall be high and the level of confidence in the status assessment shall be medium; when the data is available only for one parameter indicative of biological quality elements, the level of confidence in the status assessment shall be low;

26.6.3. when only one of a few parameters indicative of biological quality elements fails the criteria for high ecological status but the relative deviation (in per cent) of its value from the lowest value in the range of the criteria for good ecological status is equal to or higher than 50 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for good ecological status and parameters indicative of hydromorphological quality elements fail the criteria for high ecological status, the ecological status of the water body shall be good and the level of confidence in the status assessment shall be medium; when the data is available only for one parameter indicative of biological quality elements, the level of confidence in the status assessment shall be low;

26.6.4. when only one of a few parameters indicative of biological quality elements fails the criteria for high ecological status but the relative deviation (in per cent) of its value from the lowest value in the range of the criteria for good ecological status is lower than 50 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for good ecological status, the ecological status of the water body shall be good and the level of confidence in the status assessment shall be low;

26.6.5. when only one of a few parameters indicative of physico-chemical quality elements fails the criteria for high ecological status but the relative deviation (in per cent) of its value from the lowest value in the range of the criteria for good ecological status is equal to or lower than 25 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for good ecological status (in the case of dissolved oxygen and water transparency – equal to or higher than 75 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for good ecological status) and parameters indicative of hydromorphological quality elements do meet the criteria for high ecological status, the ecological status of the water body shall be high and the level of confidence in the status assessment shall be medium; when the data is available only for one parameter indicative of biological quality elements, the level of confidence in the status assessment shall be low;

26.6.6. when only one of a few parameters indicative of physico-chemical quality elements fails the criteria for high ecological status but the relative deviation (in per cent) of its value from the lowest value in the range of the criteria for good ecological status is equal to or lower than 25 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for good ecological status (in the case of dissolved oxygen and water transparency – equal to or higher than 75 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for good ecological status) and parameters indicative of hydromorphological quality elements fail the criteria for high ecological status, the ecological status of the water body shall be good and the level of confidence in the status assessment shall be medium; when the data is available only for one parameter indicative of biological quality elements, the level of confidence in the status assessment shall be low;

26.6.7. when only one of a few parameters indicative of physico-chemical quality elements fails the criteria for high ecological status but the relative deviation (in per cent) of its value from the lowest value in the range of the criteria for good ecological status is higher than 25 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for good ecological status (in the case of dissolved oxygen and water transparency – lower than 75 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for good ecological status), the ecological status of the water body shall be good and the level of confidence in the status assessment shall be low;

26.6.8. when at least two parameters indicative of biological or physico-chemical quality elements fail the criteria for high ecological status but meet the criteria for good ecological status, the ecological status of the water body shall be good and the level of confidence in the status assessment shall be medium.

26.7. When at least one parameter indicative of biological and/or physico-chemical quality elements fails the criteria for good ecological status but meets the criteria for moderate ecological status meanwhile the values of other parameters for biological and physico-chemical quality elements do meet the criteria for good ecological status, the ecological status of the water body shall be assessed as follows:

26.7.1. when at least both one parameter indicative of biological quality elements and one parameter indicative of physico-chemical quality elements fail the criteria for good ecological status but meet the criteria for moderate ecological status, the ecological status of the water body shall be moderate and the level of confidence in the status assessment shall be high;

26.7.2. when only one of a few parameters indicative of biological quality elements fails the criteria for good ecological status but the relative deviation (in per cent) of its value from the lowest value in the range of the criteria for moderate ecological status is equal to or higher than 50 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for moderate ecological status, the ecological status of the water body shall be good and the level of confidence in the status assessment shall be medium; when the data is available only for one parameter indicative of biological quality elements, the level of confidence in the status assessment shall be low;

26.7.3. when only one of a few parameters indicative of biological quality elements fails the criteria for good ecological status but the relative deviation (in per cent) of its value from the lowest value in the range of the criteria for moderate ecological status is lower than 50 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for moderate ecological status, the ecological status of the water body shall be moderate and the level of confidence in the status assessment shall be low;

26.7.4. when only one of a few parameters indicative of physico-chemical quality elements fails the criteria for good ecological status but the relative deviation (in per cent) of its value from the lowest value in the range of the criteria for moderate ecological status is equal to or lower than 25 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for moderate ecological status (in the case of dissolved oxygen and water transparency – equal to or higher than 75 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for moderate ecological status), the ecological status of the water body shall be good and the level of confidence in the status assessment shall be medium; when the data is available only for one parameter indicative of biological quality elements, the level of confidence in the status assessment shall be low;

26.7.5. when only one of a few parameters for physico-chemical quality elements fails the criteria for good ecological status but the relative deviation (in per cent) of its value from the lowest value in the range of the criteria for moderate ecological status is higher than 25 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for moderate ecological status (in the case of dissolved oxygen and water transparency – lower than 75 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for moderate ecological status), the ecological status of the water body shall be moderate and the level of confidence in the status assessment shall be low;

26.7.6. when at least two parameters indicative of biological and/or physico-chemical quality elements fail the criteria for good ecological status but meet the criteria for moderate ecological status, the ecological status of the water body shall be moderate and the level of confidence in the status assessment shall be medium.

26.8. When parameters indicative of biological quality elements meet the criteria for high or good ecological status but the ecological status is more than one class poorer by one or more parameters indicative of physico-chemical quality elements, the ecological status of the water body shall be one class higher than indicated by the values of the parameters for physico-chemical quality elements (or any of the parameters for physico-chemical quality elements which shows a poorer status) and the level of confidence in the status assessment shall be low.

26.9. When parameters indicative of physico-chemical quality elements meet the criteria for high or good ecological status but the ecological status is more than one status class poorer by parameters indicative of biological quality elements (or any of the parameters for biological quality elements which shows a poorer status), the ecological status of the water body shall be assessed as follows:

26.9.1. when the ecological status is more than one status class poorer by parameters indicative of biological quality elements (or any of the parameters for biological quality elements which indicates a poorer status) than by parameters indicative of physico-chemical quality elements, meanwhile parameters indicative of hydromorphological quality elements conform to the characterisation of high ecological status, the ecological status of such water body shall not be subject to classification. In such case it is highly likely that the sample of the status analysis data of the water body or the analysis site has not been representative and hence analysis of the status of the water body has to be conducted anew or another representative site for the analysis has to be selected;

26.9.2. when the ecological status is one status class poorer by parameters indicative of biological quality elements (or any of the parameters for biological quality elements which indicates a poorer status) than by parameters indicative of physico-chemical quality elements, meanwhile parameters indicative of hydromorphological quality elements fail the characterisation of high ecological status, the ecological status of the water body shall be determined by the values of the parameters for biological quality elements and the level of confidence in the status assessment shall be low if the ecological status is one class poorer by one parameter, or medium if the ecological status is one class poorer by several parameters;

26.9.3. when the ecological status is more than one status class poorer by parameters indicative of biological quality elements (or any of the parameters for biological quality elements which indicates a poorer status) than by parameters indicative of physico-chemical quality elements, meanwhile parameters indicative of hydromorphological quality elements fail the characterisation of high ecological status, the ecological status of the water body shall be determined by the values of the parameters for biological quality elements and the level of confidence in the status assessment shall be low.

26.10. When parameters indicative of biological quality elements meet the criteria for high ecological status but the ecological status is one status class poorer by parameters indicative of physico-chemical quality elements, meanwhile parameters indicative of hydromorphological quality elements fail the characterisation of high ecological status, the ecological status of the water body shall be good and the level of confidence in the status assessment shall be medium.

26.11. When parameters indicative of both biological and physico-chemical quality elements fail the criteria for good ecological status but meet the criteria for moderate, poor or bad ecological status, the ecological status of the water body shall be assessed as follows:

26.11.1. when the same ecological status class is indicated by the values of parameters for both biological and physico-chemical quality elements, the status of the water body shall be determined by these parameter values and the level of confidence in the status assessment shall be high;

26.11.2. when the ecological status is one status class poorer by at least one of a few parameters indicative of physico-chemical quality elements than by parameters indicative of biological quality elements, the ecological status of the water body shall be determined by the values of the parameters indicative of biological quality elements (or any of the parameters for biological quality elements which indicates a poorer status) and the level of confidence in the status assessment shall be medium;

26.11.3. when the ecological status is two status classes poorer by at least one of a few parameters indicative of physico-chemical quality elements than by parameters indicative of biological quality elements, the ecological status of the water body shall be determined by the values of the parameters indicative of biological quality elements (or any of the parameters for biological quality elements which indicates a poorer status) and the level of confidence in the status assessment shall be low;

26.11.4. when the ecological status is one status class poorer by parameters indicative of biological quality elements (or any of the parameters for biological quality elements which indicates a poorer status), the ecological status of the water body shall be assessed as follows:

26.11.4.1. when only one of a few parameters indicative of biological quality elements fails the criteria for moderate ecological status but the relative deviation (in per cent) of its value from the lowest value in the range of the criteria for poor ecological status is equal to or higher than 50 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for poor ecological status, the ecological status of the water body shall be moderate and the level of confidence in the status assessment shall be medium; when the data is available only for one parameter indicative of biological quality elements, the level of confidence in the status assessment shall be low;

26.11.4.2. when only one of a few parameters indicative of biological quality elements fails the criteria for moderate ecological status but the relative deviation (in per cent) of its value from the lowest value in the range of the criteria for poor ecological status is lower than 50 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for poor ecological status, the ecological status of the water body shall be poor and the level of confidence in the status assessment shall be low;

26.11.4.3. when at least two parameters indicative of biological quality elements fail the criteria for moderate ecological status but meet the criteria for poor ecological status, the ecological status of the water body shall be poor and the level of confidence in the status assessment shall be medium;

26.11.4.4. when only one of a few parameters indicative of biological quality elements fails the criteria for poor ecological status but the relative deviation (in per cent) of its value from the lowest value in the range of criteria for bad ecological status is equal to or higher than 50 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for bad ecological status, the ecological status of the water body shall be poor and the level of confidence in the status assessment shall be medium; when the data is available only for one parameter indicative of biological quality elements, the level of confidence in the status assessment shall be low;

26.11.4.5. when only one of a few parameters indicative of biological quality elements fails the criteria for poor ecological status but the relative deviation (in per cent) of its value from the lowest value in the range of the criteria for bad ecological status is lower than 50 per cent of the absolute difference between the lowest value and the highest value in the range of the criteria for bad ecological status, the ecological status of the water body shall be bad and the level of confidence in the status assessment shall be low;

26.11.4.6. when at least two parameters indicative of biological quality elements fail the criteria for poor ecological status but meet the criteria for bad ecological status, the ecological status of the water body shall be bad and the level of confidence in the status assessment shall be medium.

26.12. When the ecological status is two status classes poorer by parameters indicative of biological quality elements (or any of the parameters for biological quality elements which indicates a poorer status) than by parameters indicative of physico-chemical quality elements, the ecological status of the water body shall be determined by the values of the parameters for biological quality elements and the level of confidence in the status assessment shall be low.

26.13. When there is no data available on parameters indicative of biological quality elements, the ecological status of the water body shall be determined by the value of parameters indicative of physico-chemical quality elements which is attributed to the poorest status class and the level of confidence in the status assessments shall be:

26.13.1. low when the ecological status is assessed on the basis of modelling results or when a poorer status is indicated by the value of only one parameter for physico-chemical quality elements which was obtained during analysis;

26.13.2. medium when the values of at least two parameters for physico-chemical quality elements which were obtained during analysis indicate a poorer ecological status and belong to the same ecological status class.

26.14. The ecological potential of artificial and heavily modified water bodies shall be classified into maximum, good, moderate, poor and bad. The level of confidence in the assessment of the ecological potential shall be determined observing the classification rules for the ecological status of rivers and lakes given in paragraphs 26.3-26.11.

26.15. Surface water bodies shall be assigned to one of the two chemical status classes: conforming to good status or failing good status. A surface water body shall be deemed to be at good chemical status when concentrations of all substances listed in Annexes 1 and 2 to the Wastewater Management Regulation do not exceed the maximum allowable concentrations. A surface water body shall be deemed to be failing good chemical status when the concentration of at least one substance listed in Annexes 1 and 2 to the Wastewater Management Regulation exceeds the maximum allowable concentration.

26.16. The precision of the ecological status and ecological potential established corresponds to the precision of measurements of parameters indicative of the quality elements used for the classification.

Status assessment methods should be agreed between countries, i.e. intercalibrated, so that the ecological status and ecological potential of water bodies is assessed in the same way.

SECTION II. GROUNDWATER BODIES

27. There is one groundwater body (GWB) in the Venta RBD – the Venta GWB of Permian-Upper Devonian deposits (LT003002300). It occupies the area of 6276.08 km^2 and its boundaries coincide with the boundaries of the Venta RBD (Figure 8).

Status of groundwater wellfields

28. As on 1 March 2009, 170 wellfields were registered with the Register of the Earth Entrails on the territory of the Venta RBD in the Quaternary (Q), Cretaceous (K_2+K_1), Upper Permian (P_2), Famenian (D_3fm), Permian-Famenian (P_2+D_3fm), and Stipinai (D_3st) aquifers (groups of aquifers) (Figure 9). The largest wellfields are those of Telšiai, Mažeikiai, Kuršėnai, Skuodas and Naujoji Akmenė towns. More detailed information about the distribution of the wellfields is provided in Table 30

Table 30. Groundwater wellfields in the Venta RBD

Groundwater body	Geological index of the aquifer	Number of wellfields
Venta GWB of Permian-Upper Devonian deposits	Q	27
	K_2+K_1	1
	P_2	97
	D_3fm	29
	P_2+D_3fm	15
	D_3st	1
	Total in RBD:	**170**

Source: experts' estimations using the data of the Register of the Earth Entrails of the LGS

The volume of groundwater abstracted from individual wellfields during the recent years has been varying from a few tens to several thousands m^3/day, totalling to 20 933 m^3/day on average on the territory of the entire RBD (Table 31).

Table 31. Water abstraction in groundwater wellfields in the Venta RBD

Groundwater body	Geological index of the aquifer	Abstracted volume *		
		m^3/day	% of the volume abstracted in the GWB	% of the volume abstracted in the RBD
Venta GWB of Permian-Upper Devonian deposits	Q	3 802	18.2	18,2
	P_2	4 329	20.7	20,7
	D_3fm	8 732	41.7	41,7
	P_2+D_3fm	3 918	18.7	18,7
	D_3st	137	0.7	0,7
	K_{2-1}	15	0.1	0,1
Total in GWB and RBD:		**24 642**	**100.0**	**100.0**

* average of the period 2008-2009

Significant groundwater resources within the Venta RBD have been surveyed and approved observing the procedure laid down by the LGS and total to 89 535 m^3/day. The volume of groundwater currently abstracted in the Venta RBD amounts to 20 933 m^3/day, or 23.4% of the surveyed and approved groundwater resources. According to the data provided by SWECO-BKG-LSPI, the future demand for 2015 in the wellfields of this river basin district would increase to 34300 m^3/day, or 38.3% of the explored and approved groundwater resources. This means that the quantitative status of the groundwater body and wellfields is good because the groundwater resources are much more abundant than the current or planned groundwater abstraction.

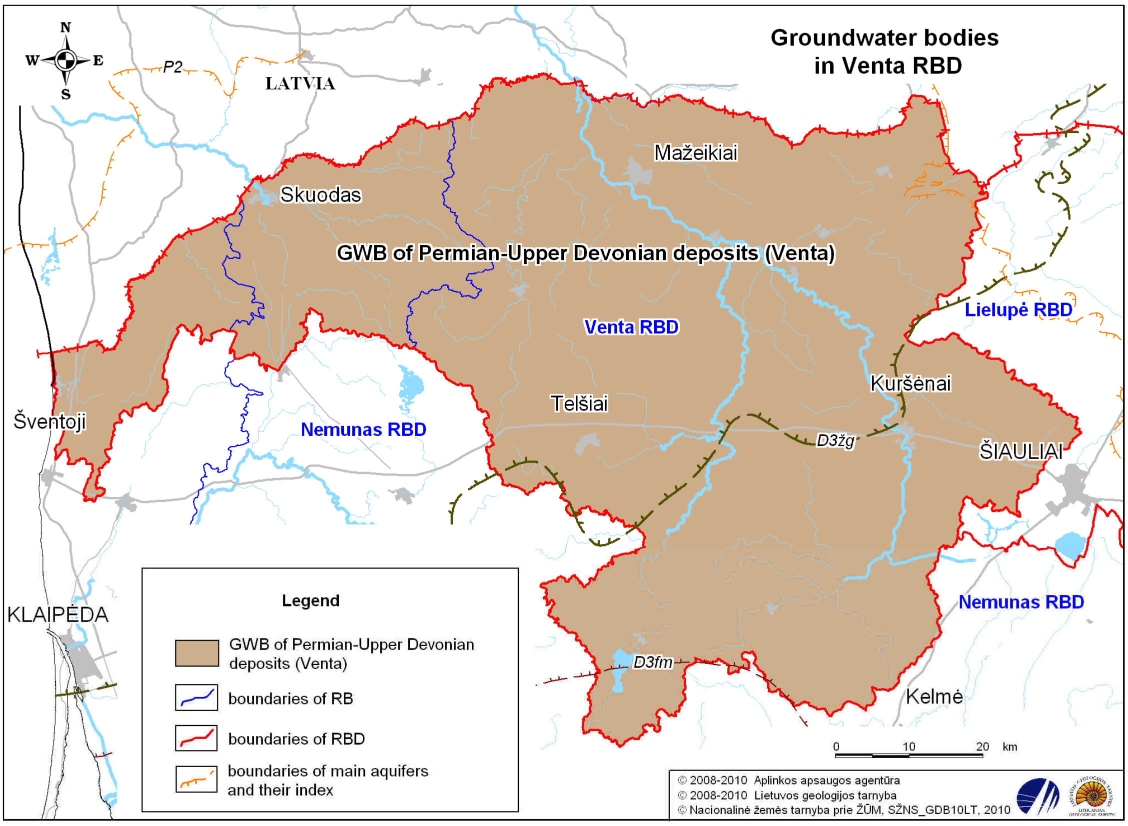


Figure 8. Groundwater bodies in the Venta RBD

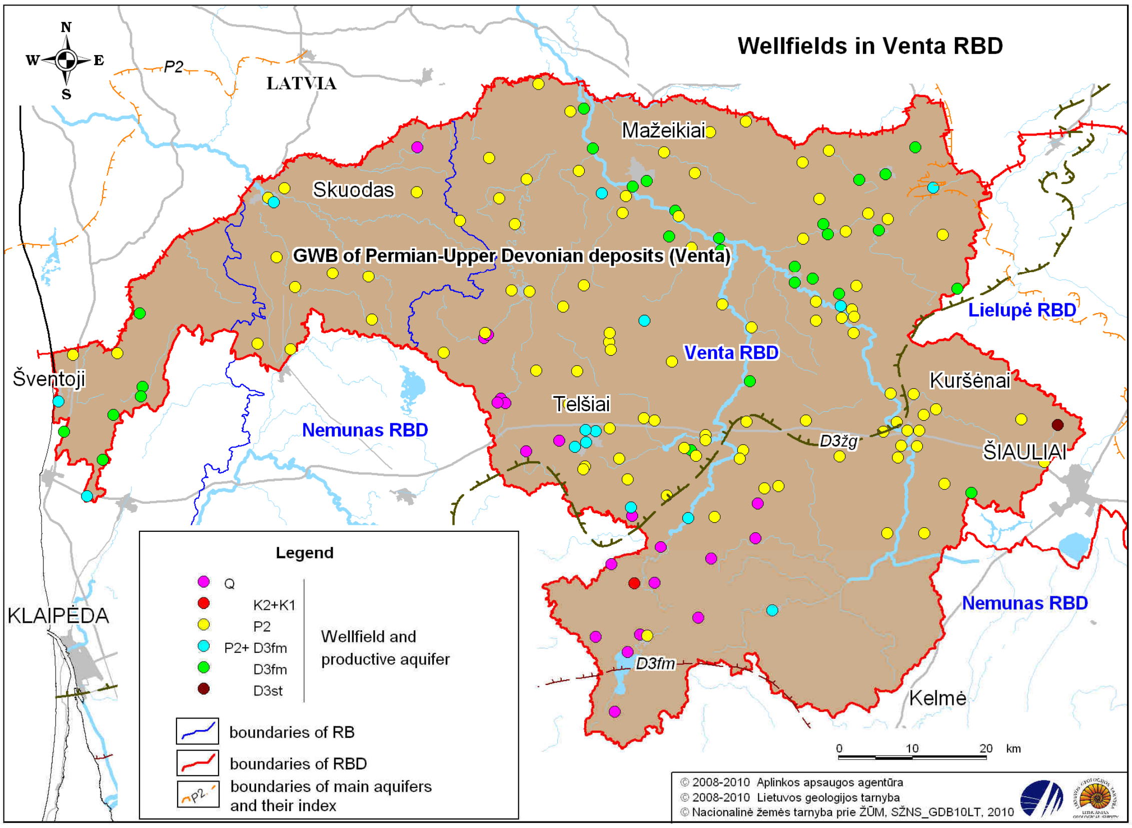


Figure 9. Groundwater wellfields in the Venta RBD

The qualitative status of the wellfields in the Venta RBD is also good. From the eastern periphery of the district, Upper Permian (P_2) and Upper Devonian-Famenian (D_3fm) aquifers, otherwise called Žagarė aquifers, are situated in the Venta RBD. These aquifers contain groundwater of high quality which is exploited by practically all wellfields in the Venta RBD. Water of high quality in Žagarė ($D_3žg$) aquifers is contained in fissured dolomite, and further westwards – also in fissured limestone of Upper Permian (P_2) deposits.

There is only one problem related to the quality of groundwater, which is of natural origin – the so-called anomaly of fluorides. The anomaly is spread westwards from Mažeikiai up to the Baltic Sea and southwards nearly up to Telšiai where the concentration of this toxic indicator often exceeds the critical threshold value of 1.5 mg/l.

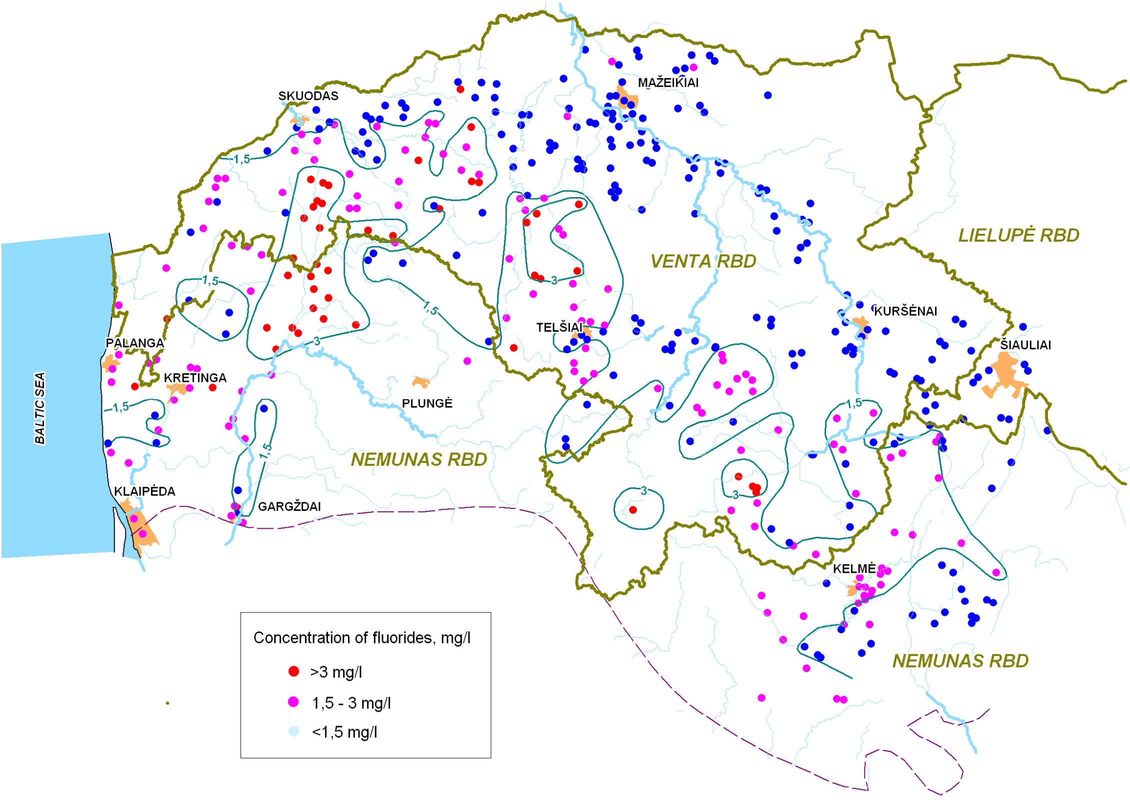


Figure 10. Anomaly of fluoride in the Upper Permian aquifer

SECTION III. IMPACT OF CLIMATE CHANGE ON SURFACE WATER BODIES AND GROUNDWATER WELLFIELDS

29. During the study, climate forecasts were developed for the territory of the Venta Basin or nearby its boundary (for Šiauliai and Telšiai). Prognostic values of the weather temperature, precipitation amount, minimum relative air humidity, speed of wind and sunshine duration for all months for the years 2001-2010 and 2011-2020 were estimated and compared to the climate norm values (1971-2000). It was established that the impact of the climatic factors on variation of water quality in the Venta RBD should be of minor importance. A more serious impact on the quality could be expected only in the event of change of the precipitation and evaporation ratio.

30. The analysis of the predicted changes of the climatic elements during the first two decades of the 21st century during individual seasons demonstrated the following:

30.1. The weather temperature in the Venta RBD will be rising during all seasons. The most significant changes in the weather temperature are forecasted for winters and springs (up to 1.5ºC), meanwhile changes during other seasons will not be higher than 1ºC.

30.2. The majority of climate models indicated that the annual precipitation in Lithuania in 2001-2010 will be lower than at the end of the 20th century, meanwhile in 2011-2020 the annual precipitation is expected to go up. The amount of precipitation should increase at the beginning of the year and slightly go down in the second half of summer and at the beginning of autumn.

30.3. No major changes either in the average annual river runoff or runoff during individual seasons and months due to climate changes are expected until 2020. Potential major changes predicted in the Venta RBD are related to the runoff distribution during a year and to the ratio of the constituents of the water balance.

30.4. Earlier beginning of spring floods is expected in 2020 in most of the rivers in the Venta RBD (floods will begin earlier but will last longer, ending at the same time as today). However, this process has been fairly insignificant.

30.5. Untypical high winter floodings (starting in autumn and lasting until spring floods) are expected to occur more frequently in the rivers of the Venta RBD around 2020 due to climate changes.

30.6. Groundwater flow in the Venta RBD will remain stable in 2020. Slight changes are expected both in the values and in the distribution of the flow during a year.

30.7. In 2020, increase of the average annual water level of lakes in the eastern part of the Venta RBD can be expected. Such changes first of all will be determined by alteration in the amount of precipitation and will be mostly noticeable in low-drainage lakes

30.8. As from 1961, droughts in the Venta RBD have been occurring every 3.5 years (i.e. two droughts during seven years) on average. Lately, there has been a growing tendency to have more frequent, prolonged and more intensive droughts.

30.9. Droughts in 2002 and 2006 were especially strong and long, and made the most powerful (up to now) impact on the river runoff in the Venta RBD – many small tributaries of the Venta stopped flowing at all.

30.10. The available information allows assuming that the tendency of more frequent prolonged and strong droughts that result in reduction of the river runoff and water level of lakes will also remain in the coming years.

30.11. Prognostic scenarios indicate that definitely more considerable climate changes will be occurring in future. However, the changes in the climatic factors forecasted until 2020 are not expected to have a significant impact on the water balance, runoff regime and water quality and hence will not prevent the attainment of the water protection objectives at this stage.

CHAPTER III. SUMMARY IMPACTS OF ECONOMIC ACTIVITIES

SECTION I. SIGNIFICANT IMPACT ON RIVERS AND LAKES

31. A significant impact is the impact of an economic activity which results in a (potential) failure to meet the requirements for good ecological and/or chemical status. Drivers of significant impacts include loads from one pollution source or aggregate pollution from a number of sources, as well as hydromorphological changes in water bodies due to the straightening of river beds and an impact of HPP. When the impact of anthropogenic activities persists even after the introduction of the basic measures, such water bodies are designated as water bodies at risk and supplementary measures are provided for to achieve good ecological status/potential therein.

Point pollution sources and loads

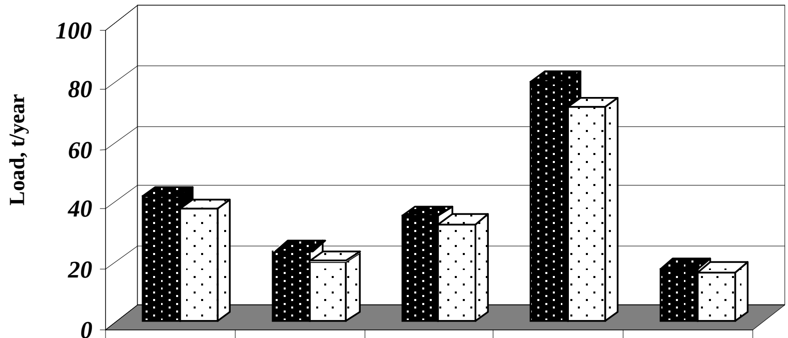
32. According to the data provided by the EPA, there were 131 wastewater dischargers on the territory of Lithuania emitting effluents to surface water bodies within the Venta RBD in 2009: 109 outlets were discharging wastewater to surface water bodies of the Venta Basin, 10 – to water bodies of the Bartuva Basin and 12 – to water bodies of the Šventoji Basin. The number and designation (codes) of the dischargers within the Venta RBD are provided in Table 32 below.

Table 32. Number of point pollution dischargers in the Venta RBD

Basin	Total number of dischargers	Number of dischargers with the following designation (code)*						
		0	1	2	3	4	5	6
Venta	109	21	16	2	1	42	25	2
Bartuva	10	1	1	0	0	3	5	0
Šventoji (Coastal)	12	2	0	0	1	5	4	0
TOTAL:	**131**	**24**	**17**	**2**	**2**	**50**	**34**	**2**

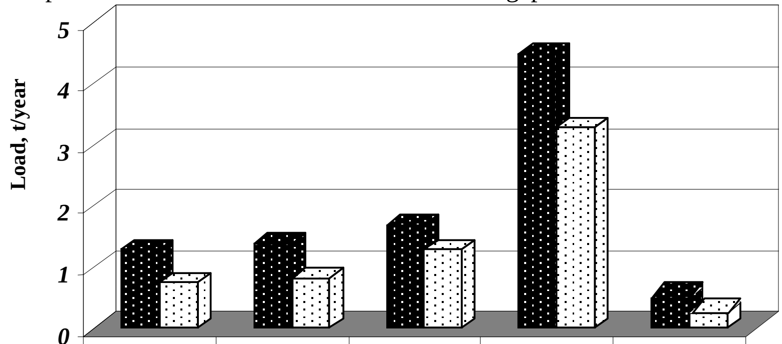
Source: EPA data (2009)
* Designation (codes) of the dischargers:
0 – Untreated effluents;
1 – Urban wastewater treatment plants (WWTP) (municipal services);
2 – WWTP which are included in the balance of industrial enterprises and which also treat urban wastewater;
3 – WWTP of industrial enterprises;
4 – WWTP in rural areas, except for WWTP of industrial enterprises;
5 – Surface runoff treatment facilities;
6 – Other WWTP.

33. There are eight agglomerations within the Venta RBD with a population equivalent (p.e.) of more than 2 000: seven in the Venta Basin and one in the Bartuva Basin. Wastewater dischargers of these agglomerations emit the major part of point pollution loads. The aggregate loads of pollution emitted into surface water bodies from towns and rural areas and pollution loads of large agglomerations (>2 000 p.e.) in 2009 are demonstrated in Figures 11-13.



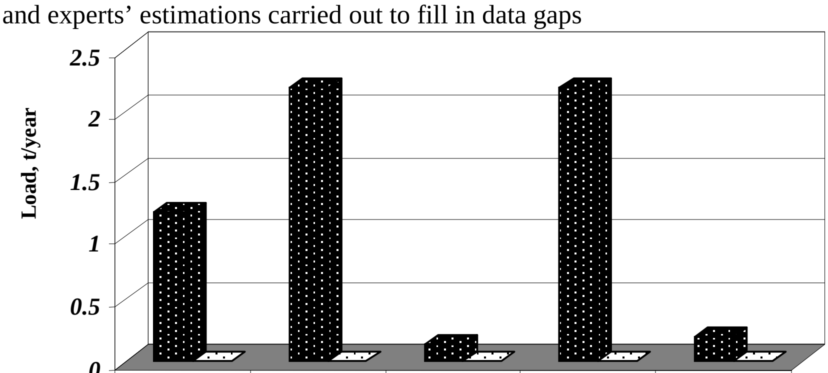
	BOD7	NH4-N	NO3_N	TN	TP
■ Aggregate pollution loads from WWTP in urban and rural areas, t/year	41.9	23.8	35.2	80.4	17.7
■ Pollution loads from WWTP in agglomerations >2000 p.e., t/year	37.7	19.7	32.7	71.9	16.5

Figure 11. Aggregate pollution loads from WWTP in urban and rural areas and pollution loads in settlements with a p.e. > 2 000 in the Venta Basin
Source: EPA data (2009) and experts' estimations carried out to fill in data gaps



	BOD7	NH4-N	NO3_N	TN	TP
■ Aggregate pollution loads from WWTP in urban and rural areas, t/year	1.3	1.4	1.7	4.5	0.5
■ Pollution loads from WWTP in agglomerations >2000 p.e., t/year	0.75	0.83	1.3	3.3	0.26

Figure 12. Aggregate pollution loads from WWTP in urban and rural areas and pollution loads in settlements with a p.e. > 2 000 in the Bartuva Basin
Source: EPA data (2009) and experts' estimations carried out to fill in data gaps



	BOD7	NH4-N	NO3_N	TN	TP
■ Aggregate pollution loads from WWTP in urban and rural areas, t/year	1.2	2.2	0.14	2.2	0.2
■ Pollution loads from WWTP in agglomerations >2000 p.e., t/year	0	0	0	0	0

Figure 13. Aggregate pollution loads from WWTP in urban and rural areas and pollution loads in settlements with a p.e. > 2 000 in the Šventoji Basin
Source: EPA data (2009) and experts' estimations carried out to fill in data gaps

34. The major share of urban industrial wastewater enters wastewater treatment plants together with municipal wastewater. However, a number of enterprises have their own wastewater treatment facilities wastewater from which is discharged directly into water bodies. There were eight industrial wastewater outlets in the Venta RBD in 2009: seven were located in the Venta Basin and one in the Šventoji Basin. Industrial wastewater outlets in the Venta Basin emit discharges of three fisheries ponds, two companies engaged in waste disposal, one can product production company, and one poultry farm. Industrial wastewater in the Šventoji Basin is emitted from a brewery. In addition, there are wastewater treatment facilities of two industries, which also treat urban wastewater, in the Venta Basin. These are WWTP of the oil refinery AB Mažeikių nafta and of Akmenė branch of the milk-processing company AB Pieno žvaigždės. In 2009, about 18.3 tonnes of BOD_7, 4.3 tonnes of ammonium nitrogen, 9.3 tonnes of nitrate nitrogen, 19.2 tonnes of total nitrogen and 3.3 tonnes of total phosphorus were emitted from the industrial wastewater outlets to the water bodies in the Venta Basin. It should be pointed out, however, that the loads from the oil refinery Mažeikių nafta, which also discharges urban wastewater, accounted for the major part of the said loads, namely: 12.7 tonnes of BOD_7, 4.1 tonnes of ammonium nitrogen, 9.2 tonnes of nitrate nitrogen, 18.2 tonnes of total nitrogen and 3.1 tonnes of total phosphorus. The loads of industrial wastewater in the Šventoji Basin in 2009 were as follows: 0.13 tonnes of BOD_7, 0.08 tonnes of ammonium nitrogen, 0.06 tonnes of nitrate nitrogen, 0.16 tonnes of total nitrogen and 0.014 tonnes of total phosphorus.

35. According to the EPA data (2009), there are 54 surface runoff outlets within the Venta RBD: 42 outlets emitting surface runoff to the Venta Basin, 6 – to the Bartuva Basin and 6 – to the Šventoji Basin. The said outlets mainly discharge surface runoff collected from the most polluted industrial territories. It is estimated that the annual amount of pollutants which enter water bodies within the Venta Basin with surface runoff totals to about 21.5 tonnes of BOD_7, 10.7 tonnes of total nitrogen and 1 tonne of total phosphorus. The amounts entering water bodies in the Bartuva Basin are estimated at about 0.08 tonne of BOD_7, 0.09 tonne of total nitrogen and 0.02 tonne of total phosphorus, and those discharged to the Šventoji Basin are as follows: approximately 0.3 tonne of BOD_7, 0.4 tonne of total nitrogen and 0.1 tonne of total phosphorus.

36. The pollution loads discharged from different point pollution sources are summarised in Table 33. Following the data on point pollution loads, the major part of all point pollution loads of BOD_7 enters the water bodies in the Šventoji Basin and Venta Basin with domestic wastewater (i.e. 74% of the total point BOD_7 loads in the Šventoji Basin and 94% – in the Bartuva Basin). Meanwhile in the Venta Basin, domestic wastewater accounts for only about 50% of the total point pollution load of BOD_7. Domestic wastewater is the major source of point pollution with total nitrogen in all basins. As much as 73% of the overall load of total nitrogen in the Venta Basin enters water bodies with domestic wastewater. The input of total nitrogen with domestic wastewater in the Šventoji Basin is 80%, in the Bartuva Basin – as much as 98%. The share of total phosphorus loads discharged with domestic wastewater totals to about 80% in the Venta Basin, 64% in the Šventoji Basin and even 96% in the Bartuva Basin.

Table 33. Point pollution loads from different pollution sources in the Venta RBD

Basin	BOD_7, t/year			Total nitrogen, t/year			Total phosphorus, t/year		
	Domestic WW	Industrial WW	Surface runoff	Domestic WW	Industrial WW	Surface runoff	Domestic WW	Industrial WW	Surface runoff
Šventoji	1.2	0.13	0.3	2.2	0.16	0.4	0.2	0.014	0.1
Bartuva	1.3	-	0.08	4.5	-	0.09	0.5	-	0.02
Venta	41.9	18.3	21.5	80.4	19.2	10.7	17.7	3.3	1

Source: EPA data (2009) and experts' estimations carried out to fill in data gaps

Impacts of point pollution sources

37. Mathematical modelling results show that point pollution loads in the Šventoji Basin are insignificant in the context of the overall loads. Point pollution loads in the Venta Basin account for 16% of the aggregate ammonium nitrogen input to the main rovers and about 20% of the aggregate input of total nitrogen. The input of point pollution sources to the aggregate pollution with ammonium nitrogen in the Bartuva Basin totals to about 20%, the input of total phosphorus is approximately 4%. The share of point pollution with BOD_7 and nitrate nitrogen in the aggregate load is insignificant and makes up only a few per cent both in the Venta Basin and in the Bartuva Basin. However, despite a relatively small share of point pollution in the total load of pollution entering water bodies, it can have a significant impact on the quality of river water during dry periods, therefore the assessment of the impact of point pollution took into account the place of each discharger in the river and the hydrological data of the receiving water body.

Following mathematical modelling results, none of the point pollution sources in the Šventoji and Bartuva basins exerts any significant impact on the quality of the receiving water bodies. It should be mentioned that concentrations of di-(2-ethylhexyl) phthalate (DEHP) in the Šventoji were found to be exceeding the established norms during the study "Screening of substances dangerous for the aquatic environment in Lithuania" conducted in 2006. However, sources of hazardous substances and their routes to rivers have not been identified yet.

A significant impact on the river quality in the Venta Basin may be exerted by wastewater discharged from Kuršėnai, Naujoji Akmenė, Akmenė and Telšiai wastewater treatment facilities. Mathematical modelling results indicate that concentrations of ammonium nitrogen and total phosphorus in the Tausalas River may be failing the good ecological status criteria under the current pollution loads from Telšiai WWTP. The present pollution from Kuršėnai WWTP determines concentrations of total phosphorus in the Venta failing the good ecological status criteria. A new wastewater treatment plant was constructed in Naujoji Akmenė in 2009. However, despite the effective operation of the facilities, the wastewater therefrom is discharged into the very upper reaches of a small river Agluona. Assessment results indicate that the present pollution loads discharged from Naujoji Akmenė may be the reason why concentrations of ammonium nitrogen and total phosphorus fail the good ecological status requirements in the Agluona. Besides, findings of the study "Preparation of a feasibility study on the construction of stormwater management systems in selected problematic settlements and development of recommendations for the construction of such systems in individual typical cases" demonstrated that the Agluona River is significantly affected not only by domestic wastewater but also by surface (stormwater) runoff. It is planned that an assessment of the impact of surface runoff will make use of the findings of the measure recommended in the Programme of Measures for the

Lielupė RBD, namely, “to perform analysis of surface runoff in Rokiškis with a view to identify loads of BOD7, biogenic and petroleum substances as well as heavy metals entering the rivers with surface runoff”.

Transference of a discharger of Naujoji Akmenė WWTP to the Agluona (before, wastewater used to be discharged to the Drūktupis) reduced pollution of the Dabikinė. The most significant discharger at the moment is the one of Akmenė WWTP. The available data shows that the Dabikinė River may be significantly affected not only by discharges from Akmenė WWTP but also by illegal pollution by inhabitants of Akmenė town, hence concentrations of ammonium nitrogen and total phosphorus in the river may be failing the good ecological status requirements.

During the project “Identification of substances dangerous for the aquatic environment in Lithuania” carried out in 2006, concentrations of DEHP were found to be exceeding the established norms in the Venta at the border with Latvia. Though additional studies are required to be able to identify the source of the hazardous substance, it is believed that the pollutant may be transported by the Varduva which receives wastewater from the oil refinery AB Mažeikių nafta.

Diffuse pollution sources and loads

38. Study results show that diffuse pollution does not exert any significant negative impact on the quality of water bodies within the Venta RBD. This problem is pressing only in the Venta Basin.

38.1. Information about the land use within the Venta RBD is provided in Table 34. The information on the areas of built, nature and agricultural territories was estimated using the CORINE land cover database. The data on the declared agricultural land was obtained from the National Paying Agency (NPA). Since now a large number of farmers declare their crop areas, the area of the declared agricultural land is expected to reflect the area of currently cultivated land. The data provided in Table 34 demonstrates that cultivated agricultural land constitutes about 70% of the total area suitable for agricultural activities.

Cultivated agricultural land in the Venta Basin constitutes about 44%, in the Bartuva Basin – about 60%, and in the Šventoji Basin – approximately 40% of the total area of the respective basins. Arable land occupies about 52% of the total declared agricultural land in the Venta and Šventoji basins and only about 33% in the Bartuva Basin. Grasslands and pastures make up 48% of the total declared agricultural land in the Venta and Bartuva basins each and 67% in the Bartuva Basin.

Table 34. Land use in the Venta RBD

Basin	Area, km^2	Built areas, km^2	Nature areas, km^2	Agricultural areas, km^2	Declared agricultural land, km^2		
					Total area, km^2	Area of arable land, km^2	Area of grassland and pastures, km^2
Venta	5 137.3	155.65	1 604	3 288.4	2 262.8	1 195.4	1 067.4
Bartuva	748.75	27.4	113	603.13	451	150.5	300.5
Šventoji	390	13.8	155.3	219.45	153.6	79	74.6
Total:	**6 276.05**	**196.85**	**1 872.3**	**4 110.98**	**2 867.4**	**1 424.9**	**1 442.5**

Source: CORINE data of 2006 and data on declared crop areas for 2008 provided by the NPA

38.2. The major share of diffuse agricultural pollution consists of loads entering the soil with animal manure and mineral fertilisers. Pollution inputs with animal manure are calculated taking into account the number of livestock units (LSU) and assuming that one LSU produces 546 kg of BOD_7, 100 kg of N_{total} and 17 P_{total} per year. The total number of LSU and the number of LSU kept on farms of different size within the Venta RBD is provided in Table 35 below.

Table 35. Total number of LSU in the Venta RBD and the number of LSU on farms of different size

RBD	Basin	LSU	LSU on farms with more than 300 LSU	LSU on farms with 10 to 300 LSU	LSU on farms with up to 10 LSU
Venta	Šventoji	4 408.50	113.83	1 953.39	2 341.28
Venta	Bartuva	18 205.84	1 212.61	9 971.76	7 021.47
Venta	Venta	66 943.36	8 143.21	29 795.92	29 004.23
Total in Venta RBD:		**89 525.7**	**9 469.65**	**41 721.07**	**38 366.98**

Source: 2008 animal inventory data provided by the Agri-Information and Rural Business Centre

Animal husbandry is most intensive in the Bartuva Basin, where the number of livestock units per hectare totals to 0.24 on average. The LSU density in other basins of the Venta RBD is almost twice lower: 0.11 LSU/ha in the Šventoji Basin and 0.13 LSU/ha in the Venta Basin.

The annual input of BOD_7 into the soil with animal manure in the Bartuva Basin is estimated to be 133 kg/ha and the inputs of total nitrogen and total phosphorus – 24.3 kg/ha and 4.13 kg/ha respectively. The loads entering the soil with animal manure in the Venta Basin are approximately 71 kg/ha of BOD_7, 13 kg/ha of total nitrogen and 2.2 kg/ha of total phosphorus, and those in the Šventoji Basin are 61.7 kg/ha of BOD_7, 11.3 kg/ha of total nitrogen and 1.92 kg/ha of total phosphorus.

Table 36. Livestock pollution loads in Venta RBD

RBD	Basin	BOD_7		Total nitrogen		Total phosphorus	
		t/year	kg/ha	t/year	kg/ha	t/year	kg/ha
Venta	Šventoji	2 407.04	61.7	440.85	11.3	74.90	1.92
Venta	Bartuva	9 940.39	132.68	1 820.58	24.30	309.50	4.13
Venta	Venta	36 551.07	71.14	6 694.34	13.03	1 138.04	2.21

Source: experts' estimations carried out taking into account the estimated number of LSU in the basins

Since no actual data on the use of mineral fertilisers in Lithuania is available at the moment, an analysis of the structure of agricultural utilised land was carried out and the most appropriate crop fertilisation norms recommended by specialists of agriculture were considered. Estimations of the demand of fertilisers for crops also took into account the amount of nutrients generated with animal manure.

The estimated demand of mineral fertilisers in the Venta RBD is provided in Table 37.

Table 37. Demand of mineral fertilisers estimated taking into account the crop structure

RBD	Basin	Mineral nitrogen fertilisers		Mineral phosphorus fertilisers	
		t/year	kg/ha	t/year	kg/ha
Venta	Šventoji	820.44	21.0	151.2	3.9
Venta	Bartuva	1 935.8	25.9	330.8	4.4
Venta	Venta	12 395.25	24.1	2 371.41	4.6
in Venta RBD:		**15 151.49**	**24.1**	**2 853.41**	**4.5**

Source: experts' estimations carried out taking into account the crop structure and the recommended most appropriate fertilisation norm

38.3. Inhabitants whose sewage is not collected and diverted to sewerage networks usually use outdoor toilets. As a result, pollution from these toilets as diffuse pollution can be transported with surface runoff to water bodies. According to the information provided by municipalities, there are 100 142 people whose sewage is not centrally collected in settlements with more than 100 inhabitants within the Venta RBD, which makes up about 48% of the total number of the population. The number of non-sewered population in the Venta RBD is provided in Table 38 below.

Table 38. Total number of inhabitants and the number of non-sewered inhabitants in settlements with population of more than 100 in the Venta RBD

Basin	Total number of inhabitants in settlements with population of more than 100	Number of non-sewered inhabitants in settlements with population of more than 100
Venta	177 474	81 651
Šventoji	10 570	5 354
Bartuva	19 916	13 137
TOTAL:	**207 960**	**100 142**

Source: information provided by municipalities (2007)

Diffuse pollution loads entering the soil from different diffuse pollution sources are summarised in Table 39 below. The table data demonstrates that pollution by non-sewered population accounts for a minor share of diffuse pollution. The main source of diffuse pollution is agriculture. It is estimated that about 34% of diffuse total nitrogen and total phosphorus loads may be entering water bodies in the Šventoji and Venta basins with animal manure. The amount in the Bartuva Basin is about 48%. However, these figure may be not precise because the exact amounts of mineral fertilisers used are not available.

Table 39. Diffuse pollution loads from different pollution sources in the Venta RBD

Basin	BOD_7, t/year			Total nitrogen, t/year			Total phosphorus, t/year		
	Manure	Mineral fertilis.	Population	Manure	Mineral fertilis.	Population	Manure	Mineral fertilis.	Population
Šventoji	2407.0	-	137.1	440.8	820.4	23.6	74.9	151.2	4.8
Bartuva	9940.4	-	336.3	1820.6	1936	57.8	309.5	330.8	11.8
Venta	36551	-	2090.3	6694.3	12395	359.3	1138.0	2371.4	73.5

Source: experts' estimations carried out taking into account the LSU number and crop structure in the basins

Impact of diffuse pollution sources

39. Mathematical modelling methods were engaged to assess the impact of diffuse pollution sources on water bodies.

39.1. Mathematical modelling results show that pollution of non-sewered population does not have any major impact on the quality of water bodies. These loads account for only up to 2% of the total amount of pollutants which enter the water bodies within the Venta RBD.

39.2. Agriculture has been estimated to be the major source of pollution with nitrate nitrogen. Agricultural sources in the Venta RBD account for 70% of the total nitrate nitrogen load which enters the water bodies in this river basin district. The input of ammonium nitrogen to water bodies from agricultural sources in the Venta RBD totals to 60% of the total ammonium nitrogen load. Agriculture generates about 50% of the total phosphorus load generated in the Venta and Bartuva basins and approximately 30% of the one generated in the Šventoji Basin.

Agricultural activities in the Venta RBD are rather intensive hence agricultural pollution loads can have a significant impact on the quality of water bodies. This impact is manifested in increased concentrations of nitrate nitrogen failing the good ecological status criteria in rivers. It should be noted, however, that agricultural impacts are significant not in the entire river basin district. Monitoring data shows that the input of nitrate nitrogen in water bodies in the Bartuva Basin is rather low despite intensive agricultural activities in this area and pollutant concentrations meet the good ecological status requirements. Concentrations of nitrate nitrogen generated in agriculture in the Šventoji Basin are low as well and do not exceed the criteria set or good ecological status. Analyses show that concentrations of nitrate nitrogen may be failing the good ecological status requirements as a result of agricultural pressures in 11 water bodies identified in the rivers Dabikinė, Šventupis, Ringuva, Ašva and Agluona. The total area where concentrations of nitrate nitrogen are likely to fail the good ecological status/potential criteria is about 1 175 km^2, which makes up about 23% of the total area of the Venta Basin. To be able to achieve good ecological status by nitrate nitrogen, the total reduction of agricultural pressures in the Venta Basin should be around 141 tonnes per year.

39.3. Impact of animal husbandry complexes on the quality of drainage water

There are three large animal husbandry companies with more than 900 LSU in the Venta RBD. The amount of BOD_7 in the liquid fraction of organic fertilisers (OF) totals to 6 000-9 000 mgO_2/l, the amount of total nitrogen is 1 000-1 400 mg/l, total phosphorus – 200-300 mg/l, potassium – 400-600 mg/l, dry matter – up to 10 g/l.

The average annual leaching of nitrogen and phosphorus compounds transferred with drainage runoff estimated on the basis of the available information on the number of LSU held on the animal husbandry farms in the Venta RBD and on the area of the application of organic fertilisers is provided in Table 40 below.

Table 40. Annual leaching of nitrogen and phosphorus compounds transferred with drainage runoff in areas of animal husbandry companies

Basin	Company	LSU, units	Area of application of organic fertilisers, ha	Annual leaching with drainage runoff, kg	
				N_{total}	P_{total}
Venta	Skabeikių agrofirma	1 075	4 167.65	19 021	377
Bartuva	UAB Mažeikių rugelis, Ylakių paukštynas	900	170	935	14
Venta	UAB Eigirdžių agrofirma"	1 260	200	1 107	16

Source: experts’ estimations

Estimations of the average annual volume of leaching with drainage runoff from areas where OF are spread show that animal husbandry complexes do not exert any significant impact on the water quality. However, the assessment of leaching with drainage from animal husbandry areas should not be based on the annual average concentrations as it is done now; instead, pollutant concentrations should be measured and assessed in samples taken immediately after the OF application. Tables 41 and 42 provide annual leaching of nitrogen and phosphorus and the total input of substances from drainage systems in the Venta RBD.

Table 41. Nitrogen leaching with drainage in the Venta RBD

Basin	Average annual leaching with drainage, kg/ha	Total amount, kg
Šventoji	6.10	104 300.10
Bartuva	4.44	211 290.15
Venta	5.22	1 236 964.57

Source: experts' estimations

Table 42. Phosphorus leaching with drainage in the Venta RBD

Basin	Average annual leaching with drainage, kg/ha	Total amount, kg
Šventoji	0.145	2 542.32
Bartuva	0.095	5 185.98
Venta	0.110	28 156.63

Source: experts' estimations

The average annual nitrogen and phosphorus leaching with drainage is not high. The average annual concentration of total nitrogen in the Venta RBD varies from 0.28 to 0.34 mg/l and that of phosphorus – from 0.006 to 0.008 mg/l. Such low leaching of transferred pollutants is determined by their small loads in the basins. Hence, it can be maintained that the input of nitrogen and phosphorus leached with drainage into pollution of surface water is of a minor significance.

The amounts of nitrogen and phosphorus leached with drainage were estimated using expert judgement – having identified respective shares of nitrogen and phosphorus in the total pollutant load, which was done on the basis of the available information on the annual nitrogen and phosphorus loads in the RBD, soil characteristics, drained areas, etc.

40. A list of rivers suffering from a significant impact of point and diffuse pollution within the Venta RBD is provided in Table 43.

Table 43. A summary list of rivers suffering from a significant impact within the Venta RBD ("1" indicates a significant impact)

Basin	**River/river stretch at risk**	**Parameter which determines the designation of the river as a water body at risk**					**Major pollution sources**
		BOD_7	**NH_4-N**	**NO_3-N**	**TP**	**HS**	
Venta	Venta	0	0	0	1	0	Kuršėnai WWTP
Venta	Varduva	0	0	0	0	1	Unidentified source
Venta	Tausalas	0	1	0	1	0	Telšiai WWTP
Venta	Dabikinė	0	0	1	1	0	Akmenė WWTP
							Illegal pollution by non-sewered population
							Agriculture (NO_3-N)
Venta	Agluona	0	1	1	1	0	Naujoji Akmenė WWTP
							Naujoji Akmenė surface runoff
							Agriculture (NO_3-N)
Šventoji	Šventoji	0	0	0	0	1	Unidentified source
Venta	Šventupis	0	0	1	0	0	Agriculture
Venta	Ringuva	0	0	1	0		Agriculture
Venta	Ašva	0	0	1	0	0	Agriculture

Source experts' analysis results

Background pollution loads

41. Mathematical modelling results demonstrated that the annual background pollution load transported by rivers within the Venta RBD may be around 1 942 tonnes of BOD_7, 32 tonnes of ammonium nitrogen, 850 tonnes of nitrate nitrogen, and 38 tonnes of total phosphorus. The share of the background pollution accounts for about 65% of the total load of BOD_7, 23% of ammonium nitrogen, 25% of nitrate nitrogen, and approximately 34% of total phosphorus transported by rivers.

Transboundary pollution

42. Venta RBD is a transboundary river basin district hence a relevant issue here is transboundary pollution. Pollution loads generated on the territory of Lithuania are transported to Latvia by the main rivers Venta and Bartuva. The average annual amounts transported from Lithuania to the neighbouring country are estimated at about 2 313 tonnes of BOD_7, 118 tonnes of ammonium nitrogen, 2 756 tonnes of nitrate nitrogen and 93 tonnes of total phosphorus. The loads transported by the Bartuva are 370 tonnes of BOD_7, 10 tonnes of ammonium nitrogen, 385 tonnes of nitrate nitrogen and 12 tonnes of total phosphorus.

The ecological status of both the Venta and the Bartuva at the Latvian border is classified as good so pollution generated in Lithuania and transported by the main rivers does not have any significant impact on the ecological status of water bodies in the neighbouring country. However, concentrations of di-(2-ethylhexyl) phthalate (DEHP) and trichloromethane were found to be exceeding the established norms in the Venta at the border during the study "Screening of substances dangerous for the aquatic environment in Lithuania" conducted in 2006. Accordingly, pollution generated in Lithuania may have a significant impact on the chemical status of the Venta situated on the Latvian territory. It should be noted that concentrations of hazardous substances exceeding the MAC were detected during one-time measurements, therefore additional analyses have been planned to identify the level of pollution with hazardous substances more accurately.

Significant impact of river straightening

43. Regulation of river beds result in morphological changes, which are assessed using the criterion K_3:

$$K_3 = \frac{\sum L_{reg}}{L_u}$$

where ΣL_{reg} is the aggregate length of regulated river stretches, km; L_u is the total length of the river.

When $K_3 \leq 20\%$, morphological changes in the river bed are minimum, and anthropogenic transformations do not have any significant impact thereon. When this value is exceeded by up to 10%, morphological changes are assumed to be small; when the exceedance is up to 30% – changes are medium; when 30-100% – changes are significant; and when the value is exceeded by more than 100% – morphological changes are considered to be very significant.

The criterion K_3 was used to identify water bodies (river stretches) at risk or HMWB due to the impact of bed straightening. When a straightened stretch is shorter than 30% of the total length of the water body of a certain type and its length is less than 3 km (river stretches shorter than 3 km the characteristics of which differ from the neighbouring stretches are not considered to be separate water bodies and they are assigned to the neighbouring water bodies), the impact of straightening was deemed to be insignificant and such stretch was not identified as a separate water body at risk or a HMWB due to morphological changes. When these criteria were exceeded, the impact was considered to be significant.

Straightened rivers with a low slope (<1.5 m/km) flowing over urbanised areas were assigned to HMWB. Straightened rivers with a low slope (<1.5 m/km) which are not flowing over urbanised areas and straightened rivers which flow over hilly areas (slope >1.5 m/km) were assigned to water bodies at risk.

The length of river stretches designated as HMWB and water bodies at risk due to a significant impact of straightening is given in Table 44.

Table 44. Length of river stretches suffering from a significant impact of straightening and number of water bodies

Basin	Length of straightened river beds, km	Length of rivers designated as HMWB due to straightening, km	Length of rivers designated as WB at risk due to straightening in flat areas, km	Length of rivers designated as WB at risk due to straightening in hilly areas, km
Šventoji	40.3	40.3	0	0
Bartuva	43.6	22.8	0	20.8
Venta	472.7	110.6	204.2	157.9
Total in Venta RBD	**556.6**	**173.7**	**204.2**	**178.7**

Source: experts' analysis results

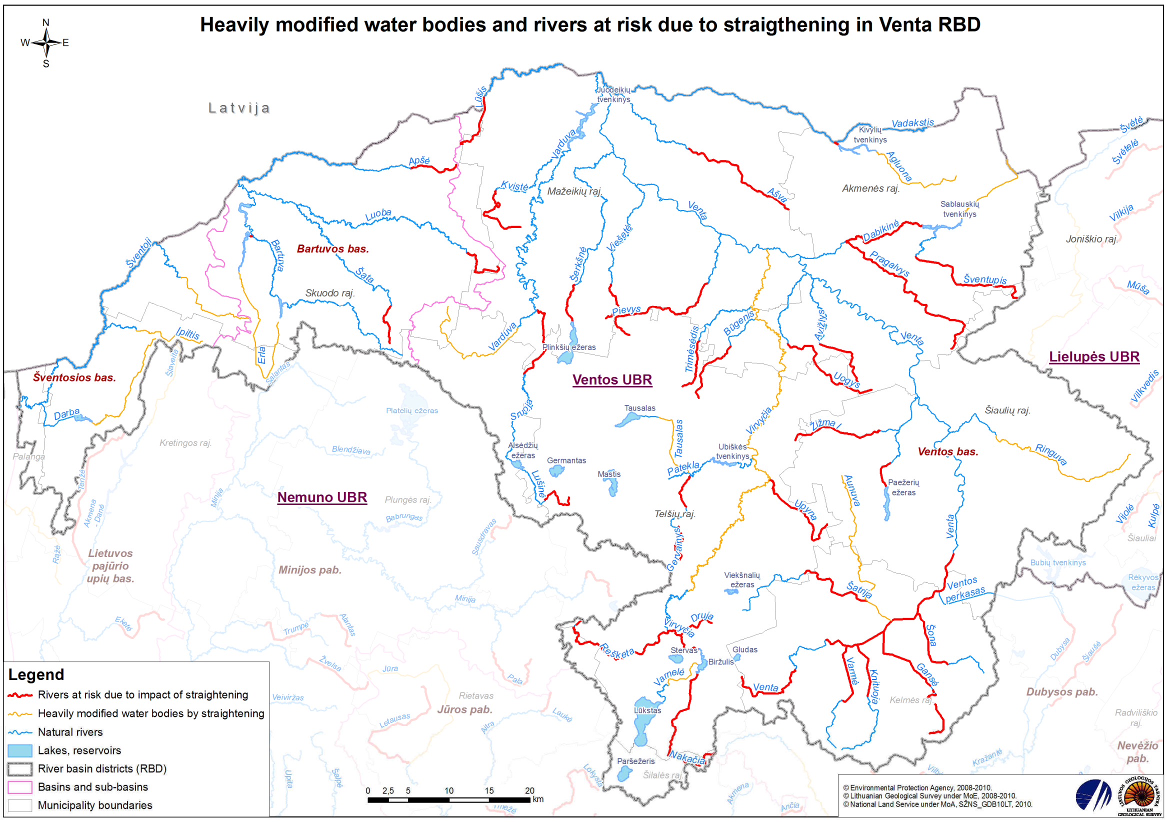


Figure 14. Straightened rivers at risk and heavily modified river water bodies

Impacts of hydropower plants

44. Rivers in the Venta RBD are noted for their high hydropower generation capacity (43 MWh/km^2) in the country. There are 28 HPP on the rivers in this river basin district. The area of the ponds of five of these HPP is larger than >0.5 km^2 (classified as HMWB due to their large area; the characteristics of such ponds are more similar to lakes than to rivers). The largest number of HPP have been constructed on the Virvytė River. Since these HPP stand at a small distance from each other, they are deemed to be exerting a significant impact on the river water even though their ponds are smaller than 0.5 km^2 (almost the entire Virvytė has been designated as a HMWB due to the impact of HPP).

The most typical impacts of hydropower plants constructed on river beds are frequent fluctuations of the water level in the river stretches below the HPP, insufficient discharge, erosion of pond sides and river bed. Light sediments fractions are washed away from the river bottom in the water level pulsation zone, and higher aquatic vegetation (macrophytes) and benthic invertebrates are not able to survive. Frequent fluctuation of the water level is disastrous for spawn and young fish: during the detention of water, spawn and young fish are left on land, and when the turbines are started up, i.e. when the flow and the water level significantly increases, they are taken out into habitats unsuitable for their development and growth. Thus, usually only opportunistic species which easily adapt to various conditions survive in the impact zone of the HPP. In addition, turbines of certain types severely damage fish which get drawn therein.

The most significant fluctuations of the water level occur at the HPP, in the river stretch below the dam. The length of the active water level pulsation zone depends on the rate between the installed discharge of the HPP and the multi-annual discharge of the river, the turbine type and number, and the operational regime of the HPP. The impact of the HPP operational regime goes down in proportion to the distance from the HPP (the longer the distance, the less intensive fluctuations); fluctuations also significantly decrease upon the inflow of water of larger tributaries.

The impact of the HPP is considered insignificant (i.e. the river stretch below the HPP is not assigned to a risk category) only if the installed discharge is lower than the minimum multi-annual discharge of the river, and there are modern turbines which are capable of adapting to any flow regime (in such case only a short river stretch is subject to a significant impact), and the operational regime of the HPP does not significantly affect hydrological and hydromorphological river conditions.

The majority of HPP (around 80%) in the Venta RBD are hydropower plants with a low dam (pressure) height. Most of them are also drainage ponds. Drainage capacity of a pond, i.e. the ratio between the annual water runoff volume and the volume of the pond, is a good indicator showing how many times a year the water changes in the pond. When $K \geq 100$ (accumulated water changes every third day), more than 90% of ponds with a low dam height are drainage ponds. Such HPP exert a significant impact on the hydrological regime of rivers downstream of the HPP dam only in a short river stretch and hence is not deemed to be important within a wider context. Nevertheless, there is still a possibility of an impact on transportation of sediments as well as on fish migration (disrupted river continuity).

However, when HPP dams (even of a low height and with drainage ponds) are situated within small distances from each other on the river, their impact on the hydrological regime of the river becomes significant (all hydraulic characteristics of the river are significantly altered: when the impact of one HPP is about to end, the impact of the head of another HPP begins, i.e. the flow is stopped). Consequently, a stretch of the Virvytė downstream of Baltininkai HPP has been designated as a heavily modified water body (10 HPP have been constructed on this stretch). Scientific research data shows that the status of fish and zoobenthos in all stretches of the Virvytė downstream of the HPP is moderate or poor and good status is not attainable in the event of HPP cascades. Following the results of research conducted by the Institute of Ecology of Vilnius, University, the aim is to ensure at least moderate status of biological elements.

Five HPP of 28, which are currently operating in the Venta RBD, are not likely to have any major impact on the river stretches downstream of the dams (provided that turbines are operated at the most efficient mode, so that the hydrological regime in the tail bay is close to the natural one to the maximum extent). Other two HPP (Leckava HPP and Kernai HPP) are exerting a significant impact on the ecological status of the river downstream of the dams (Ašva and Erla); however, the HPP are standing very close to the river mouth (no measures will be effective, their significance on the overall ecological status of water bodies is very low within a wider context) hence the river stretches below the said HPP should not be designated as water bodies subject to a significant impact. The remaining 21 HPP do exert a significant impact on the river stretches downstream of the dams, ten of them have been constructed on the Virvytė, a heavily modified water body as a result of the HPP operation. Also, turbines which significantly injure fish and do not conform to the runoff regime should be replaced with environmentally friendlier ones in four HPP in the Venta RBD (those in Leckava, Alsėdžiai, Rudikiai and Viekšniai).

To be able to perform a more accurate assessment of the level of significance of the impact, measurements of the base values of the parameters indicative of quality elements are required at a few most representative HPP. Such measurements have been provided for in the in the Programme for Achieving Water Protection Objectives within the Nemunas River Basin District approved by Resolution No. 1098 of the Government of the Republic of Lithuania of 21 July 2010 (Žin., 2010, No. 90-4756). Since the characteristics of rivers in the Venta RBD as well as the characteristics of HPP constructed thereon are similar to those in the Nemunas RBD, it will be possible to use the results of the measurements of HPP impacts carried out in the Nemunas RBD for the assessment of the significance of HPP impacts in the Venta RBD.

Table 45. HPP in the Venta RBD

Basin	River	Main river	HPP location	Municipality
HPP which exert a significant impact				
Bartuva	Bartuva	Bartuva	Puodkaliai	Skuodas distr.
Bartuva	Bartuva	Bartuva	Skuodas	Skuodas distr.
Venta	Dabikinė	Venta	Sablauskiai	Akmenė distr.
Venta	Patekla	Virvytė	Ūbiškė	Telšiai distr.
Venta	Sruoja	Varduva	Alsėdžiai	Plungė distr.
Venta	Varduva	Venta	Kulšėnai	Mažeikiai distr.
Venta	Varduva	Venta	Ukrinai	Mažeikiai distr.
Venta	Varduva	Venta	Vadagiai	Mažeikiai distr.
Venta	Varduva	Venta	Juodeikiai	Mažeikiai distr.
Venta	Varduva	Venta	Renavas	Mažeikiai distr.
Venta	Venta	Venta	Užventis	Kelmė distr.
Venta	Virvytė (HMWB)	Venta	Baltininkai	Telšiai distr.
Venta	Virvytė (HMWB)	Venta	Biržuvėnai	Telšiai distr.
Venta	Virvytė (HMWB)	Venta	Juciai	Telšiai distr.
Venta	Virvytė (LPVT)	Venta	Gudai	Mažeikiai distr.
Venta	Virvytė (HMWB)	Venta	Sukončiai	Telšių distr.
Venta	Virvytė (HMWB)	Venta	Balsiai	Akmenė distr.
Venta	Virvytė (HMWB)	Venta	Kairiškiai	Akmenė distr.
Venta	Virvytė (HMWB)	Venta	Rakiškis	Akmenė distr.
Venta	Virvytė (HMWB)	Venta	Kapėnai	Akmenė distr.
Venta	Virvytė (LPVT)	Venta	Skleipiai	Mažeikiai distr.
Other HPP				
Bartuva	Erla	Bartuva	Kernai	Skuodas distr.
Venta	Venta	Venta	Rudikiai	Akmenė distr.
Venta	Venta	Venta	Viekšniai	Mažeikiai distr.
Venta	Venta	Venta	Jautakiai	Mažeikiai distr.
Venta	Venta	Venta	Kuodžiai	Mažeikiai distr.
Venta	Šerkšnė	Venta	Šerkšnėnai	Mažeikiai distr.
Venta	Ašva	Vadakstis	Leckava	Mažeikiai distr.

Source: experts' analysis results

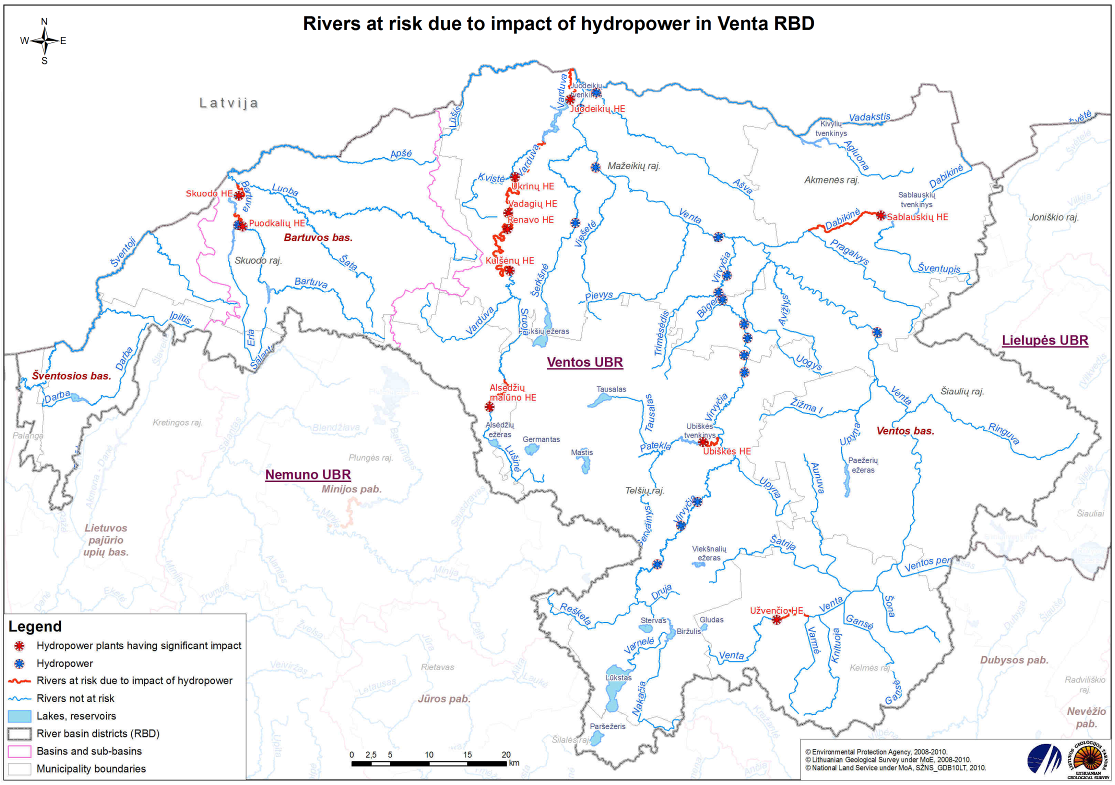


Figure 21. HPP exerting a significant impact in the Venta RBD

Drainage reclamation

45. The purpose of drainage reclamation is to regulate the moisture regime of the soil thus providing favourable conditions for plants. Lithuania is situated in the zone of surplus humidity therefore ditches were dug and drainage systems were constructed to remove this surplus from cultivated land. The functions of a receiving water body in such systems are performed by rivers, streams and ditches. Since natural rivers are not capable of proper receipt of moisture surplus, they are regulated by adjusting them to receive surplus water flowing by gravity. In fact, a new bed is formed and flow regime is altered in regulated flows: beds are straightened, steady latitudinal and longitudinal cross-sections of the bed are formed, allowable flow rates are selected (slopes and the bottom may not be washed out), and the head is removed. In addition to the said alterations, the structure of the landscape is changing in drained areas: diversity and heterogeneity of elements of the land use diminishes, homogeneity increases, and biological diversity declines.

Table 46. Reclaimed area in the Venta RBD

Basin	Total reclaimed area, ha	Drained area, ha	Share of the total reclaimed area in the basin area, %
Šventoji	25 912.12	17 853.05	54.9
Bartuva	52 715.62	50 081.24	70.4
Venta	255 027.07	244 153.04	49.6

Source: GIS database of land reclamation status Mel_DB10LT

Scientific analyses established that evaporation is reduced in reclaimed areas, which is especially noticeable in spring and at the beginning of summer (April-June). It was also established that drainage determines higher maximum river runoff, although runoff occurs later than in non-drained areas. Together with drainage runoff, soluble chemical substances are washed out of the soil. Depending on land cultivation methods, crop composition and the volume of drainage runoff, the outwash of soluble nitrogen compounds can increase from 1.3 to 5.0 times, and that of phosphorus – 1.1 to 2.4 times as compared to non-drained areas.

The impact of drainage reclamation on the hydrological regime of rivers and streams is more significant in small basins. The larger is the basin, the lower is the impact of drainage reclamation. The hydrological regime of rivers in large river basins is mainly determined by groundwater in deeper aquifers and not by drainage water. The total reclaimed area and drained area in the Venta RBD is given in Table 46.

Having in mind the present nitrogen and phosphorus loads, it can be concluded that drainage reclamation will not prevent achieving the established water protection objectives.

Abstraction of surface water and its impact on rivers and lakes

46. The average annual abstraction of surface water within the Venta RBD totals to 10 308.7 thousand m^3. Abstraction of surface water is conditioned by the concentration of economic entities in the RBD. The main users of surface water are industrial, energy and fish farming companies. The water users and volumes of water abstracted thereby within the Venta RBD are given in Table 47.

Table 47. Users of surface water in the Venta RBD

User	Place	Average annual abstraction, thou. m^3	Source of abstraction
AB Oruva	Mažeikiai distr.	356.5	Venta River
UAB Mažeikių vandenys	Mažeikiai distr.	58.3	Venta River
UAB Šilo Pavėžupis	Kelmė distr.	1 635.24	Gansė River
UAB Žemaitijos žuvis	Telšiai distr.	1 602.5	Sruoja River
AB Akmenės cementas	Akmenė distr.	419.0	Agluona River
AB Bugenių bekonas	Mažeikiai distr.	12.5	Šerkšnė-Markija River
AB Pavenčių cukrus	Šiauliai distr.	356.8	Urdupis River
UAB Skabeikių agrofirma	Akmenė distr.	18.9	Eglesys River
Mažeikių akcinė linų bendrovė	Mažeikiai distr.	1.0	Venta River
UAB Žemaitijos keliai	Telšiai distr.	6.1	Lake Tausalas
UAB Scandye	Telšiai distr.	4.0	pond (Virvytė River)
AB Mažeikių nafta	Mažeikiai distr.	4 061.2	Juodeikių pond
AB Daugelių plytinė	Šiauliai distr.	4.5	pond (Venta River)
UAB Automatika	Kretinga distr.	1.0	Žiba River
UAB OKZ HOLDING Baltija	Palanga	107.0	pond (Šventoji River)

Source: EPA data for 1997-2009

Potentially, the largest user of surface water in agriculture is irrigation. However, according to data of the Ministry of Agriculture of the Republic of Lithuania and the State Land Planning Institute, there were no areas irrigated with surface water in the Venta RBD in 2001-2008. The areas suitable for irrigation are provided in Table 48 below. Taking into account the forecasted climate changes, the demand of irrigation may increase in future. However, a poor technical state of the irrigation systems as well as the economic conditions allow maintaining that there will be no surface water abstraction for agricultural purposes during the coming 5-10 years.

Table 48. Irrigated land (ha) in the Venta RBD

Municipality	Area of irrigated land in the land reclamation cadastre	Area suitable for use	Irrigated with water in 2001-2008
1	2	3	4
Akmenė distr.	127.60	127.60	0.00
Mažeikiai distr.	0.00	0.00	0.00
Kelmė distr.	0.00	0.00	0.00
Kretinga distr.	150.00	87.64	0.00
Plungė distr.	0.00	0.00	0.00
Rietavas distr.	0.00	0.00	0.00
Skuodas distr.	0.00	0.00	0.00
Šilalė distr.	133.00	133.00	0.00
Telšiai distr.	0.00	0.00	0.00
Joniškis distr.	242.00	242.00	0.00

Source: data of the Ministry of Agriculture of the Republic of Lithuania and the State Land Planning Institute of 2001-2008

Rivers were identified where water abstraction during low water can lead to hydrological changes (Table 50), therefore it is important to ensure that the provisions of the Procedure for the Use of Surface Water Bodies for Water Abstraction Purposes approved by Order No. D1-302 of the Minister of Environment of the Republic of Lithuania of 2 June 2008 (Žin., 2008, No. 64-2439) are observed in these water bodies.

Table 49. Water abstraction during low water

Basin	River	User	Potential impact	
			in summer	in winter
Venta	Gansė	UAB Šilo Pavėžupis	high	low
Venta	Sruoja	UAB Žemaitijos žuvis	moderate	insignificant

Source: experts' analysis results

The impact of water abstraction on the hydrological regime of lakes is assessed with the help of a comprehensive analysis of the following characteristics and changes therein: the average annual lake water level (AAL) (m), average annual water level fluctuation amplitude (ALA) (the difference between the highest and the lowest water level, m) and the ratio between the average annual summer and winter levels (SWL). Such methodology is widely applied in the EU Member States as well as in the USA. The said characteristics should be assessed separately for shallow (<10 m) and deep (>10 m) lakes. The assessment results serve as the basis for identifying the demand of water abstraction. The indicators for the assessment of hydrological changes due to water abstraction in lakes are provided in Table 50.

Table 50. Assessment of hydrological changes due to water abstraction in lakes

Lake type	Changes in the water level			Impact
	AAL	ALA (%)	SWL (%)	
Shallow	<10%	<10	0	low
	10-20%	10-20	>0	medium
	>20%	>20	>0	high
Deep	<0.5 m	<10	0	low
	0.5-1.5 m	10-20	>0	medium
	>1.5 m	>20	>0	high

Source: experts' analysis results

Such assessment requires a lot of comprehensive information about bathymetric measurements and seasonal water level fluctuation and water abstraction characteristics.

However, no detailed information is available at the moment. The assessment of the average annual water abstraction and the average water level characteristics in the lake identified only minor hydrological changes (changes in the water level <10%).

Fish farming ponds and their impact

47. There are two commercial pond fish farming companies in the Venta RBD. The area and other characteristics of fish farming ponds are provided in Tables 51-53.

Table 51. Fish farming companies and area of fish farming ponds in the Venta RBD

Basin	Fish farming company	Annual fish output*, kg	Pond area**, ha	
			Certified for ecological fish farming***	Total
Venta	UAB Šilo Pavėžupis	924 000	-	924
Venta	UAB Žemaitijos žuvis	409 600	409.6	409.6

*estimated as a multiplication of the average annual productivity (1 000 kg/ha) in ponds of various types according to fish maturity age and the area of the ponds in the fish farming region in northern Lithuania;
** Resolution No. 826 of the Government of the Republic of Lithuania of 3 July 2001 on the approval of the List of Commercial Fish Farming Ponds and Pond Areas (Žin., 2001, No. 58-2087);
*** Order of the Minister of Agriculture of the Republic of Lithuania on the approval the Rules for Ecological Agriculture of 18 March 2003 (Žin., No. 1-21; 2004, No. 74-2561).

Table 52. Pond fish sales

Fisheries company	Annual production sales, kg				
	2005	2006	2007	2008	2009
UAB Šilo Pavėžupis	98 300	167 300	267 700	150 000	364 000
UAB Žemaitijos žuvis	80 000	31 200	45 000	45 000	10 500

Source: Lithuanian Institute of Agrarian Economics

Following the data of the EPA for 2000-2008, the quality parameters of water emitted from these fish farming ponds (concentrations BOD_7, N_{total} and P_{total}) seldom exceed exceeded the allowable norms (Table 53). The average annual load which enters water bodies estimated on the basis of the annual volume of water discharged and concentrations of respective substances is provided in Table 54.

Table 53. Quality parameters of water emitted from fish farming ponds*

Fish farming company	Receiving water body	Annual volume of water emitted, thou. m^3	BOD_7, mgO_2/l	Suspended matter, mg/l	Total nitrogen, mg/l	Total phosphorus , mg/l
UAB Šilo Pavėžupis	Gansė River Šona River	2 756 228	0.2-2.5 0.8-5.3	3.5-14.0 7.0-22.0	4.2-6.9 0.9-2.5	0.022-0.12 0.04-0.21
UAB Žemaitijos žuvis	Sruoja River	1 840	0.4-1.8	1.7-4.2	n.d.	0.009-0.06
Allowable norms (established pursuant to Rules for the Issuing, Renewal and Revocation of Integrated Pollution Prevention and Control Permits (Žin., 2002, No. 85-3684; 2005, No. 103-3829)	surface water bodies	-	7.0	15	5	0.4

** annual average values
Source: experts' estimations

Table 54. Average annual load which enters water bodies

Fisheries company	Receiving water body	BOD_7, tO_2	Suspended matter, t	Total nitrogen, t	Total phosphorus, t
UAB Šilo Pavėžupis	Gansė River Šona River	3.72 0.69	24.1 3.31	15.3 0.39	0.20 0.03
UAB Žemaitijos žuvis	Sruoja River	2.02	5.42	no data available	0.06

The amounts of total phosphorus and BOD_7 in water emitted from the ponds are extremely low. Such amounts are typical of river stretches which are little affected by anthropogenic activities, which raises doubts concerning the sampling procedure. Following the EPA requirements, during the release of water samples must be taken at least three times a week and discharge must be measured continuously. Accordingly, stricter control over sampling should be introduced in the fish farming ponds.

SECTION II. SURFACE WATER BODIES AT RISK

Water bodies at risk in the category of rivers

48. In the category of rivers, water bodies at risk are those which are significantly affected by water abstraction, straightening of the river bed, HPP, and water quality problems caused by anthropogenic pollution.

48.1. Water bodies at risk due to water abstraction are those which can undergo significant changes of the hydrological regime during low water.

48.2. Water bodies at risk due to the straightening of their beds are river stretches with straightened beds and a slope higher than 1.5 m/km which flow over hilly areas and river stretches with straightened beds and a slope lower than 1.5 m/km which flow over flat non-urbanised areas.

48.3. Water bodies at risk also include river stretches downstream of the HPP to the place where the river catchment area becomes 10% larger as compared to the catchment area at the head. However, no river affected by the straightening or HPP is regarded a water body at risk when monitoring data indicates good status of biological quality elements.

48.4. Water bodies at risk due to water quality problems include all water bodies which, as forecasted, will continue failing the established criteria for good ecological and chemical status even after the implementation of the basic measures, i.e. the anthropogenic pollution impact will remain significant despite the implementation of the requirements of the Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment (OJ, 2004 special edition, Chapter 15, Volume 2 p. 26) (Urban Wastewater Treatment Directive) and the Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (OJ, 2004 special edition, Chapter 15, Volume 2, p. 68) (Nitrates Directive), hence concentrations in rivers will be exceeding the threshold values of good ecological or chemical status or good ecological potential.

49. The following parameters indicative of physico-chemical quality elements were used for the establishment of conformity of water bodies to the criteria of good ecological status:

49.1. average annual concentration of $BOD_7 \leq 3.3$ mgO_2/l;

49.2. average annual concentration of ammonium nitrogen ≤0.2 mg/l;

49.3. average annual concentration of nitrate nitrogen ≤2.3 mg/l;

49.4. average annual concentration of total nitrogen ≤3.0 mg/l[(1)];

49.5. average annual concentration of phosphate phosphorus ≤0.09 mg/l;

49.6. average annual concentration of total phosphorus ≤0.14 mg/l;

50. Water bodies at risk due to water quality problems were identified on the basis of summary water quality monitoring data and mathematical modelling results. Mathematical modelling was used to assess present pollution loads and resulting pollutant concentrations in rivers as well as potential changes in pollutant concentrations after the implementation of the basic measures.

51. There are 104 water bodies with the total length of 1 521 km in the category of rivers within the Venta RBD. Of these, 50 water bodies (48%) were designated as water bodies at risk. The length of the water bodies at risk is 647.3 km.

The risk factors which determine the assignment of river water bodies in the Venta RBD to the risk group are given in Table 55 below.

Table 55. Water bodies at risk in the category of rivers in the Venta RBD and risk factors; "1" indicates a risk

Basin	Risk factors							Number of WB	Length, km
	HMWB	Water abstraction	HPP	Straightening	Water quality problems				
					Point pollution	Diffuse pollution	Causes are not known		
Bartuva	0	0	0	1	0	0	0	3	20.7
	0	0	1	0	0	0	1	1	24.0
Šventoji	0	0	0	0	0	0	1	1	69.9
Venta	0	0	0	0	0	1	0	4	31.4
	0	0	0	1	0	0	0	28	302.4
	0	0	0	1	0	1	0	2	33.7
	0	0	1	0	0	0	0	2	14.3
	0	0	1	0	0	0	1	1	55.4
	0	0	1	1	0	0	0	1	5.8
	0	0	1	1	1	1	0	1	12.3
	1	0	0	0	0	1	0	2	34.7
	1	0	0	0	1	0	0	1	10.3
	1	0	0	0	1	1	0	1	14.1
	0	1	0	1	0	0	0	1	10.3
	0	0	0	0	1	1	0	1	8.0

Source: experts' analysis results

51.1. Bartuva Basin

There are two HPP exerting a significant impact on water bodies in the Bartuva Basin – HPP in Skuodas and in Puodkaliai. Both HPP are located on the Bartuva River. so one river water body, the Bartuva River, is designated as a water body at risk. Monitoring data shows that biological parameters in the Bartuva fail the good ecological status criteria even upstream Skuodas and Puodkaliai HPP. However, the reasons of this failure are not known at the moment.

Three river water bodies were identified as water bodies at risk due to the river bed straightening in the Bartuva Basin. The length of these water bodies is 20.7 km.

No water bodies at risk due to impacts of point pollution, diffuse pollution or an aggregate impact of both point and diffuse pollution have been identified in the Bartuva Basin. No significant impact of water abstraction has been identified either.

51.2. Šventoji Basin

One water body identified in the Šventoji Basin is a water body at risk because of concentrations of di(2-ethyhexyl)phthalate detected to be exceeding the established norms. No source of the HS has been identified, so the causes of the pollution are deemed to be not known.

No water bodies at risk due to a significant impact of water abstraction or HPP have been identified in the Bartuva Basin. No water bodies at risk because of point pollution, diffuse pollution or an aggregate pollution have been identified either.

51.3. Venta Basin

The largest number of water bodies, as many as 33, in the Venta Basin are designated as water bodies at risk because of the impact of bed straightening. Their aggregate length is 364.5 km.

Also, there are nine HPP in the Venta Basin exerting a significant impact on the ecological status of rivers situated in Kulšėnai, Ukrinai, Vadagiai, Užventis, Alsėdžiai, Ūbiškė, Juodeikiai, Sablauskiai and Renavas. Impacts of HPP condition designation of five river water bodies as water bodies at risk. Their total length is 87.8 km.

Eleven water bodies in the Venta Basin have been classified as water bodies at risk due to the impact of diffuse agricultural pollution. These have been identified in the tributaries of the Venta: in the Dabikinė, Ringuva, Šventupis, Ašva and Agluona. Here concentrations of nitrate nitrogen fail the good ecological status criteria. Point pollution determines assignment of four water bodies to the risk category. One water body in the Tausalas River is deemed to be a water body at risk because of the impact of Telšiai WWTP. It has been established that concentrations of ammonium nitrogen and total phosphorus in the Tausalas River may be failing the good ecological status criteria even after the reconstruction of Telšiai WWTP (i.e. introduction of the basic measures under the Urban Wastewater Directive). Calculations demonstrated that the Dabikinė River should no longer suffer from a significant impact of pollution after the implementation of the basic measures under the Urban Wastewater Directive and construction of new wastewater treatment facilities in Akmenė and Naujoji Akmenė. However, measurements performed at the water company Akmenės vandenys demonstrate significant pollution of the Dabikinė even after having transferred the discharger of Naujoji Akmenė to the Agluona River. As a result, two water bodies in the Dabikinė River have been classified as water bodies at risk due to the impact of point pollution. One water body in the Agluona River is a water body at risk because of pollution by Naujoji Akmenė WWTP and surface (stormwater) runoff.

Also, concentrations of total phosphorus in the Venta downstream of Kuršėnai (due to pollution by Kuršėnai WWTP) are currently failing the good ecological status criteria. However, pollution with total phosphorus is expected to go down to the allowable level after the implementation of the basic measures under the Urban Wastewater Treatment Directive therefore the water body identified below Kuršėnai has not been designated as a water body at risk.

One water body in the Varduva River downstream of the discharger of the oil refinery AB Mažeikių nafta has been classified as a water boy at risk because of concentrations of di(2-ethylhexyl) phthalate (DEHP) found to be exceeding the established norms. No source of the HS has been identified, so the causes of the pollution are deemed to be not known.

One water body in the Gansė River is suffering from a significant impact of water abstraction.

Four water bodies at risk in the Venta Basin are assigned to the category of HMWB.

River water bodies at risk due to the impact of HPP and bed straightening as well as water quality problems within the Venta RBD are demonstrated in Figure 16.

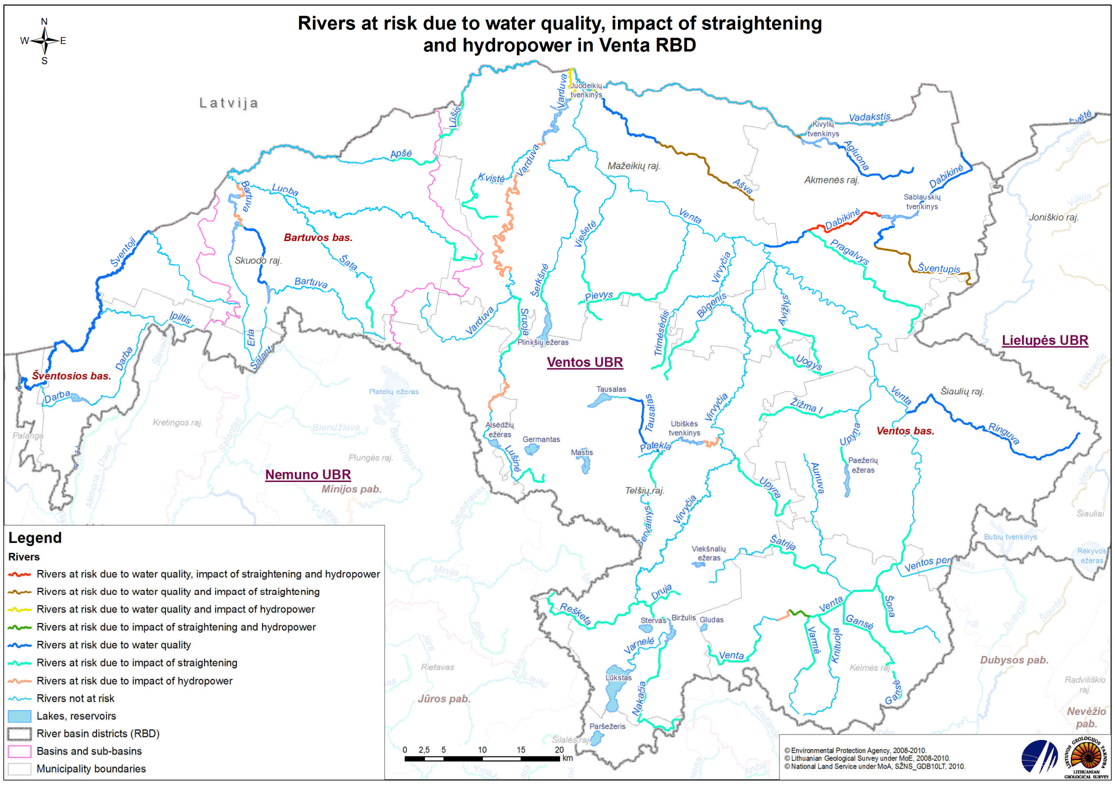


Figure 16. Rivers in the Venta RBD classified as water bodies at risk due to various factors

Source: experts' analysis results

Supplementary measures have been provided for to achieve good ecological status/potential of river water bodies at risk in the Venta RBD.

Water bodies at risk in the category of lakes and ponds

52. Water bodies in the category of lakes and ponds have been identified as water bodies at risk when the critical values of total nitrogen, total phosphorus and

chlorophyll *a* were exceeded: N_{total} > 1.80 mg/l, P_{total} > 0.060 mg/l, EQR of chlorophyll *a* > 0.33.

The ecological status of water bodies in the category of lakes and ponds was assessed on the basis of the national monitoring data, the data provided in the study "Identification of Lithuanian lakes subject to restoration and preliminary selection of restoration measures for these lakes for improving their status", and MIKE BASIN mathematical modelling results. The latter results were used to assess concentrations of total phosphorus conditioned by diffuse and point pollution in the water bodies of the Venta RBD in the category of lakes and ponds.

53. When assigning lakes and ponds to water bodies at risk or those not at risk, priority was given to the national monitoring results, meanwhile the results of the lake study were used in the event of absence of such results. However, if no national monitoring data on the indicators of a lake or pond in question was available and the modelling results showed that the lake/pond should be on a preliminary list of water bodies at risk (when the study data indicates the opposite), the lake or pond was assigned to water bodies at risk. The following order of priorities was observed for the assignment of lakes and ponds to water bodies at risk/not at risk:

53.1. When there was national monitoring data available on the indicators of the ecological status of a lake/pond, the lake/pond was assigned to the ecological status class indicated by the monitoring data. In such case the modelling and study findings were not taken into account.

53.2. When there was no national monitoring data available and a lake in question should not be assigned to the risk group but its status is critical or problematic according to the study findings, such lake was assigned to water bodies at risk.

53.3. When there was no national monitoring data available and a lake in question should be assigned to the risk group on the basis of the modelling results but the study findings indicate a stable status and presence of anthropogenic impact, or the lake is defined as naturally eutrophic, such lake was designated as a water body at risk.

53.4. When there was no monitoring data available and a lake in question should not be assigned to the risk group on the basis of the modelling results but the study findings indicate its critical or problematic status, such lake was designated as a water body at risk.

53.5. When there was no monitoring data available and a lake in question should not be assigned to the risk group on the basis of the modelling results and the study findings indicate a stable status and presence of an anthropogenic impact, or the lake is defined as naturally eutrophic, such lake was not designated as a water body at risk.

53.6. When there was no monitoring data available and a lake in question should be assigned to the risk group on the basis of the modelling results, such lake was designated as a water body at risk.

The water bodies at risk in the category of lakes in the Venta RBD and their risk factors are listed in Table 56.

Table 56. Water bodies at risk in the category of lakes; “1” indicates risk factors

Sub-basin	Lake / pond	Area, km^2	Risk factors			
			Diffuse pollution	Point pollution	Potential impact of historic pollution	Other reasons
Venta	Lake Alsėdžių ežeras	0.905			1	
	Lake Biržulis	1.19	1			1
	Lake Gludas	0.533				1
	Lake Mastis	2.717	1	1		
	Lake Paežerių ežeras	1.514				1
	Lake Tausalas	1.905			1	
	Kivylių pond	0.768	1			
	Sablauskių pond	1.116		1		1
	Ubiškės pond	0.754	1	1		
Bartuva	Mosėdžio I pond	0.542	1			

Source: experts’ analysis results

Following the modelling results for pollution loads from diffuse and point pollution sources, the main factor which determines lower than good ecological status of ponds Kivylių, Ubiškės and Mosėdžio I is diffuse pollution. Ubiškių pond is also significantly affected by point pollution (67% of the total pollution load).

Ecological status poorer than good in lakes Alsėdžių ežeras and Tausalas may be determined by historic pollution (modelling results suggest good ecological status of these lakes).

Following the modelling results, the ecological status of Lake Paežerių ežeras should also be good; however, monitoring data (2009) and a lake study findings indicate poor status. The level of Lake Paežerių ežeras was lowered in 2008 as a result of the reconstruction of the dam (this lake was formed by impoundment). Consequently, the eco-system was destabilised, which could be reflected in the monitoring data of 2009.

Poor ecological potential of Lake Biržulis could be determined by resuspension of biogenic substances accumulated in bottom sediments into the water and significant drop in the water level (the water level was lowed by 1.5 m). In addition, the lake may be affected by diffuse pollution (the modelling results suggest that the lake is subject to certain pressures although its ecological status should still be good.

Causes conditioning poor ecological status of Lake Gludas are not known. Mathematical pollution load modelling results indicate that the status of the lake should be high. However, following the lake study findings, sometimes fish deaths occur in this lake during prolonged ice cover periods. No monitoring data is available on the quality parameters of this lake. Hence, monitoring of physico-chemical and biological quality elements parameters would enable a more accurate assessment of the ecological status of the lake.

Pollution load modelling results suggest high ecological status/potential of Lake Mastis and Sablauskių pond; according to both monitoring data and lake study findings (for Lake Mastis), the ecological status/potential of the water bodies is lower than good. It should be noted that, following the modelling data, point pollution in these water bodies account for 45-47% of the total pollution load therein (although as such it should not be exerting a significant impact). The status of Lake Mastis may also be materially affected by pollutants transported with surface runoff from the urban areas. Also, it is highly likely that the lake is being polluted with domestic wastewater discharged from households illegally connected to the surface runoff collection system. The causes determining poorer than good ecological potential of Sablauskių pond are not clear.

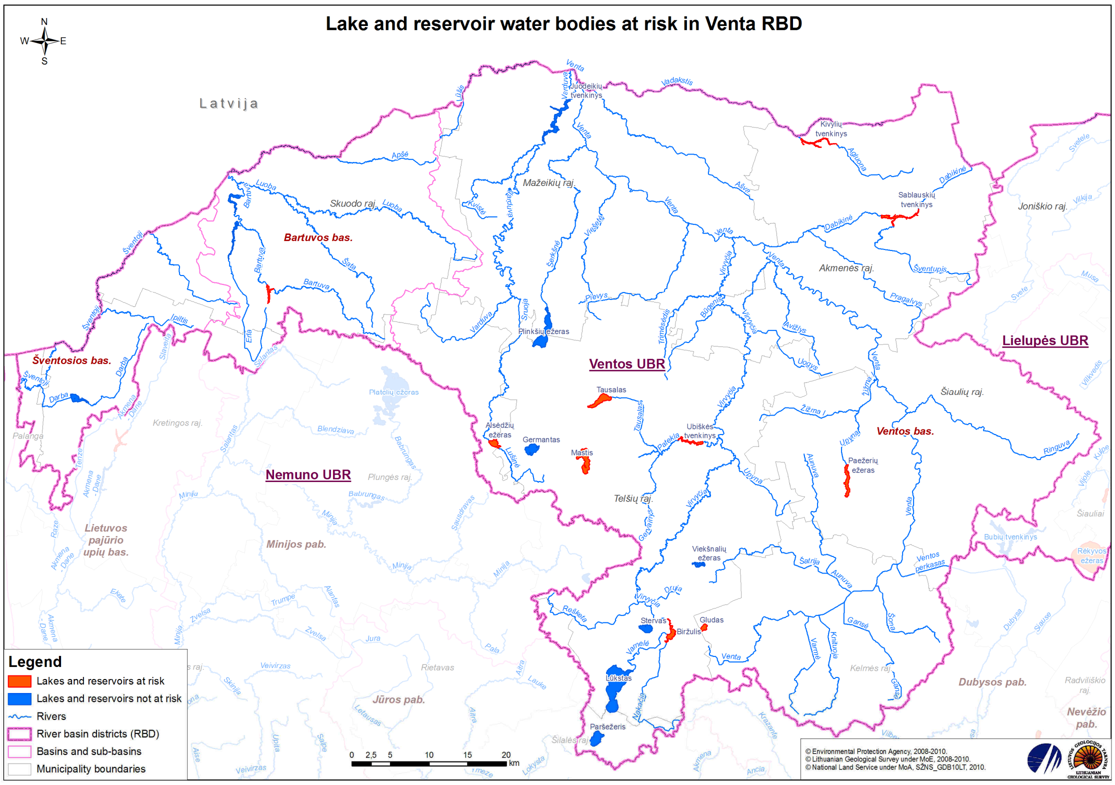


Figure 17. Lakes and ponds in the Venta RBD classified as water bodies at risk

Source: experts' analysis results

Supplementary measures have been provided for to achieve good ecological status/potential of water bodies at risk in the category of lakes and ponds in the Venta RBD.

SECTION III. IMPACT OF ECONOMIC ACTIVITIES ON GROUNDWATER WELLFIELDS

Impact of diffuse and point pollution on shallow groundwater and, consequently, on surface water bodies

General description

54. A quantitative impact of diffuse pollution on shallow groundwater is demonstrated in maps of increased concentrations of individual analytes of its hydro-chemical composition in shallow groundwater as compared to their background (natural) values, which illustrate the extent of contamination of shallow groundwater with a specific polluting substance in a certain place. The maps can be prepared using maps of technogenic loads and average concentrations of analytes in different types of land use. Such maps, which demonstrate increased concentrations of nitrates and ammonium in shallow groundwater of the Venta and neighbouring RBD due to impacts of diffuse pollution, are given in Figures 18 and 19. The maps show that the concentrations of the said nitrogen compounds do not exceed the standards of drinking water at the regional level. The nitrate concentration in shallow groundwater is close to the maximum

allowable concentration (MAC), which is 50 mg/l, and the ammonium concentration totals to 2.44 mg/l exceeding the MAC a few times (0.5 mg/l) only in certain localities (mainly in wells in urbanised areas). However, this is usually a pollution problem of dug wells constructed in an inadmissible place from the point of view of hygienic requirements, and not of the shallow groundwater layer.

55. A quantitative impact of shallow groundwater affected by diffuse pollution on surface water within the Venta RBD was assessed using mathematical models of groundwater filtration, where values of discharge of groundwater outflow into individual rivers in each calculated block of the model were established. Leaching of nitrates, ammonium, phosphates, total nitrogen, nitrate nitrogen, ammonium nitrogen, and phosphate phosphorus with groundwater to surface water bodies was estimated having entered additional values of the parameters of groundwater pollution in the models. The results of this assessment for the Venta RBD are provided in Table 57.

Table 57. Simulated leaching of pollution with shallow groundwater to surface water bodies in the Venta RBD

River basin	Area, km^2	Simulated shallow groundwater flow module, $l/s/km^2$	Parameter	Simulated leaching with groundwater, t/year
Šventoji	390.03	1.04	NO_3	19.8
			NH_4	2.68
			PO_4	1.02
			$N_{total.}$	6.51
			$N\text{-}NO_3$	4.47
			$N\text{-}NH_4$	2.04
			$P\text{-}PO_4$	0.33
Bartuva	748.75	2.03	NO_3	74.32
			NH_4	10.07
			PO_4	3.84
			N_{total}	24.45 (5.4)
			$N\text{-}NO_3$	16.78
			$N\text{-}NH_4$	7.67
			$P\text{-}PO_4$	1.25 (8.4)
Venta	5 137.29	1.38	NO_3	345.64
			NH_4	46.83
			PO_4	17.84
			N_{total}	113.73 (4.6)
			$N\text{-}NO_3$	78.05
			$N\text{-}NH_4$	35.68
			$P\text{-}PO_4$	5.80 (6)
Total in Venta RBD:	**6 276.08**	**1.44**	**NO_3**	**439.76**
			NH_4	**59.58**
			PO_4	**22.70**
			N_{total}	**144.69 (5)**
			$N\text{-}NO_3$	**99.3**
			$N\text{-}NH_4$	**45.39**
			$P\text{-}PO_4$	**7.38 (6,6)**

* The figure given in brackets is percentage of the aggregate load from all potential pollution sources within the entire river basin, which was calculated in the MIKE BASIN surface water model. Source: modelling results of 2010.

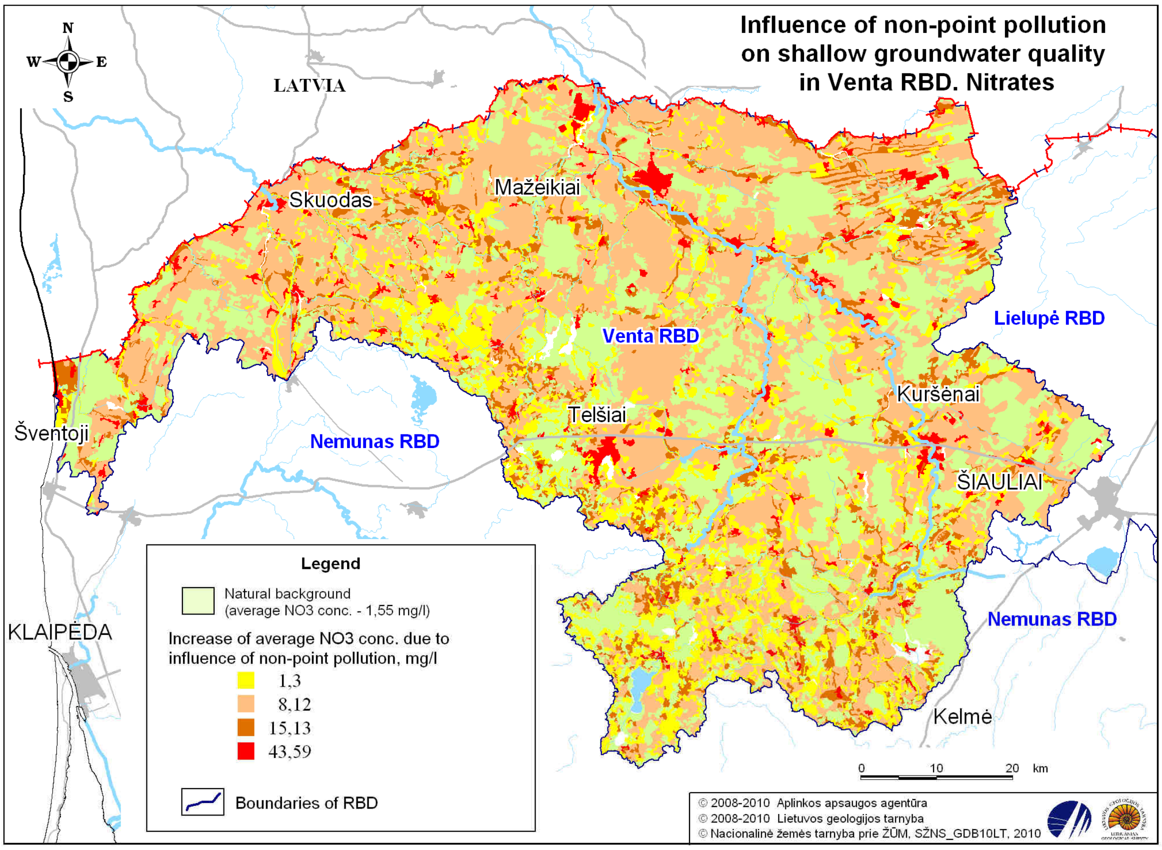


Figure 18. Impact of diffuse pollution on shallow groundwater quality. Nitrates.

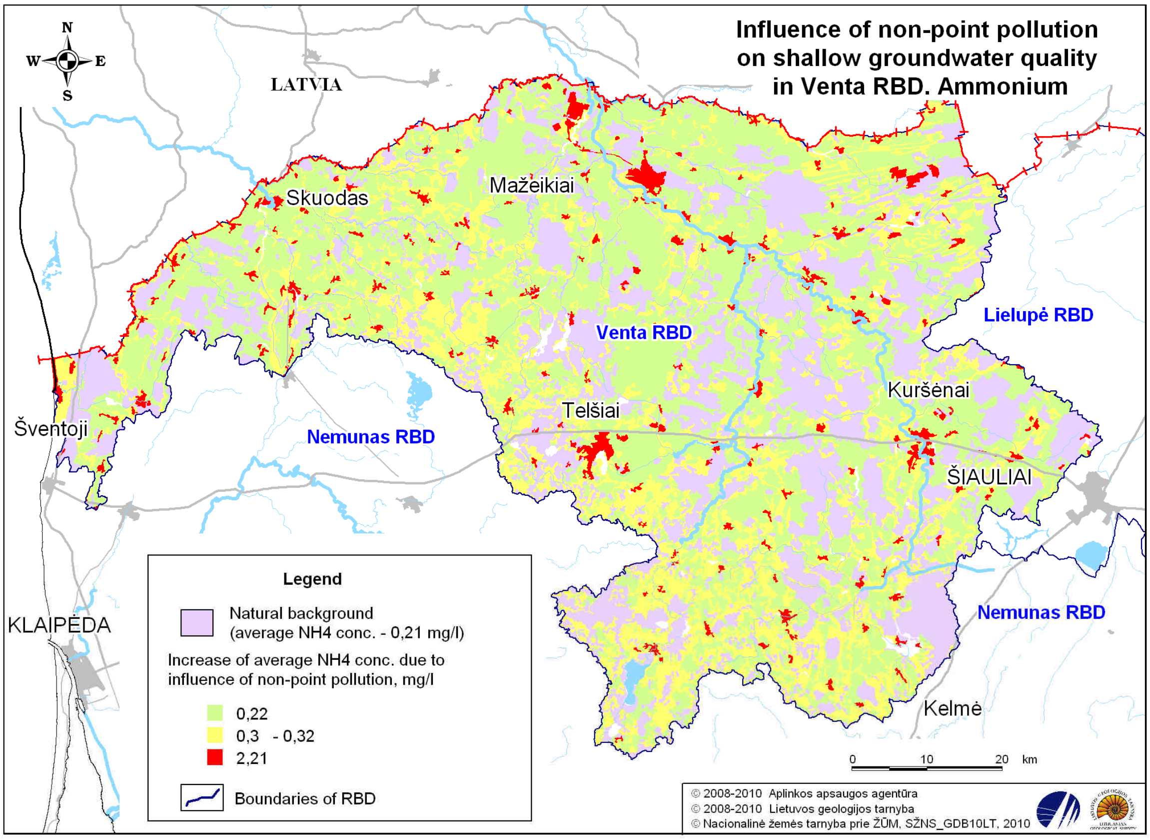


Figure 19. Impact of diffuse pollution on shallow groundwater quality. Ammonium.

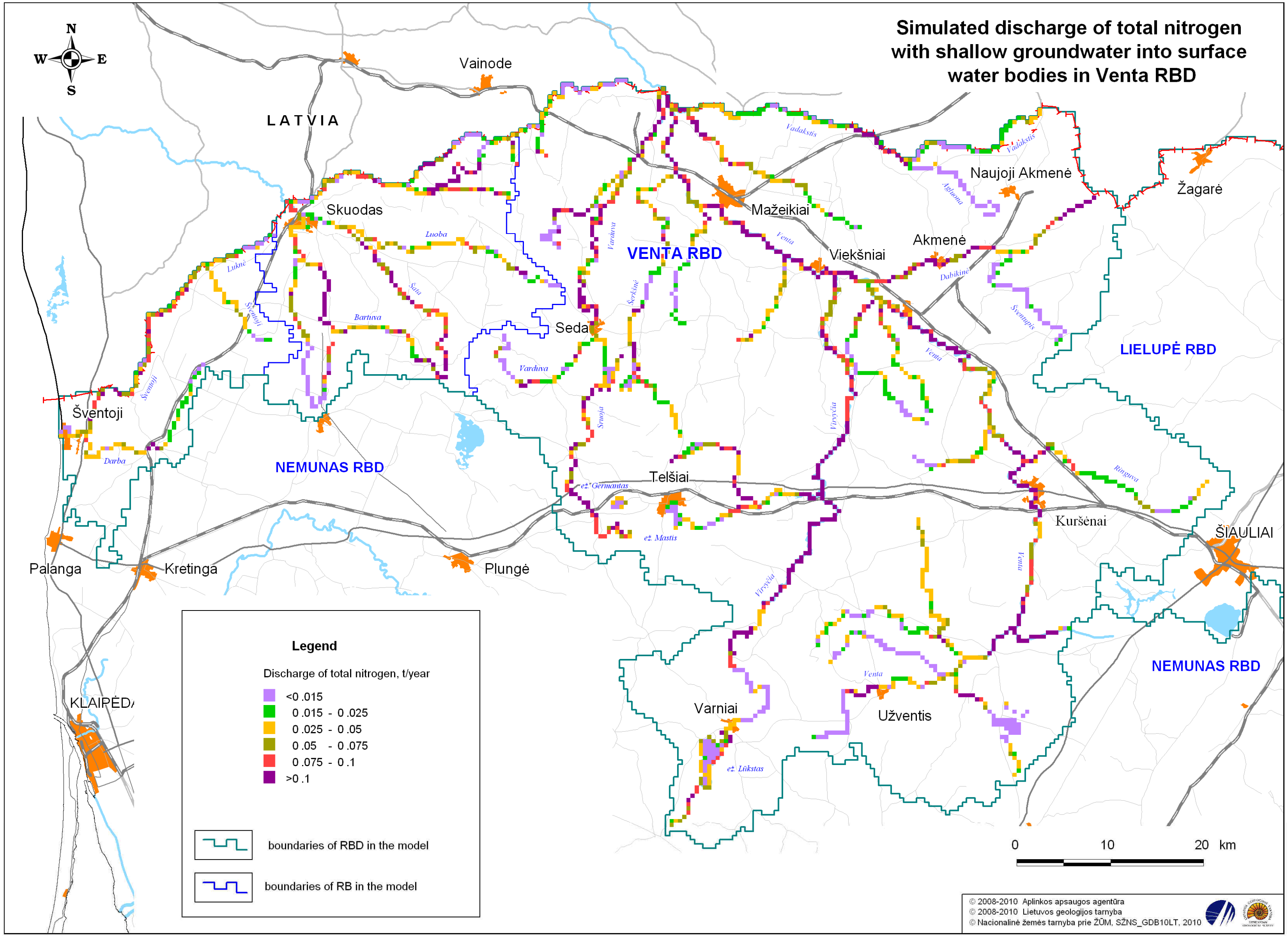


Figure 20. Simulated total leaching of nitrogen with shallow groundwater to surface water bodies in the Venta RBD

The average increase of nitrate concentrations in shallow groundwater in Venta RBD as a result of the impact of diffuse pollution is 9 mg/l, and of ammonium – 0.33 mg/l. In this RBD, natural territories with background concentrations of nitrates and ammonium (NO_3 – 1.55 mg/l, NH_4 – 0.21 mg/l) take the area of 1 883 km^2, i.e. almost one third of the RBD area. The largest part of the area (43%) has been subject to diffuse pollution from agricultural fields situated in clayey soils, where the average concentration of nitrates is higher by 8.12 mg/l and that of ammonium – by 0.22 mg/l as compared to the background values. 8% of the area is taken by agricultural fields situated in sandy soils, where the average concentration of nitrates in shallow groundwater is 16.68 mg/l and of ammonium – 0.53 mg/l (the increase due to the impact of diffuse pollution is respectively 15.13 mg/l and 0.32 mg/l). Urbanised areas where the most significant impact of diffuse pollution on shallow groundwater is observed occupy as little as 3% of the total RBD area. Here the average concentration of nitrates exceeds the background values by 43.59 mg/l and totals to 45.14 mg/l, the concentration of ammonium exceeds the background values by 2.21 mg/l and totals to 2.44 mg/l.

The amounts of pollutants leaching to surface water bodies with groundwater given in Table 58 show how much of these compounds enter surface waters as a result of groundwater–river interaction. The entry of the said compounds from groundwater to surface waters, i.e. to different oxidation-reduction conditions, results in rapid destruction, transformation, decay, dilution and other processes of these pollutants, hence their concentrations significantly go down. However, even without taking into account the said destruction and other processes, it can be maintained that the share of diffuse pollution which enters rivers of Venta RBD with groundwater flow in the aggregate amount of pollutants in rivers is of a minor significance. For instance, the amount of total nitrogen leaching to surface water bodies with groundwater accounts for 4.6-5.4%, the amount of phosphate phosphorus – for 6-8.4% of the total amounts of these pollutants in the individual basins of the Venta RBD. Hence, even without considering the said destruction and other processes, which reduce concentrations of pollutants leaching from shallow groundwater into surface water, it can be maintained that there are no groundwater wellfields which would pose risk to surface water bodies in the shallow aquifer within the Venta RBD (the amounts of pollution leaching with shallow groundwater does not exceed 50% of the total amount of pollution of surface water indicated in the EC guidelines). Having in mind that concentrations of nitrogen compounds leaching from groundwater to surface waters go down at least 2.5 times as a result of their destruction, transformation, dilution and other processes (the background concentration of total nitrogen in shallow groundwater is 0.51 mg/l, its concentration in a river during the minimum flow is 0.2 mg/l), the actual impact of diffuse pollution of shallow groundwater on surface water would be even lower.

Figure 20 demonstrates distribution of the leaching of total nitrogen with shallow groundwater in each simulated river along the entire bed depending on filtration properties of the shallow aquifer, concentration of pollutants in shallow groundwater, and the flow gradient. The size of the calculated blocks in the model is 0.5x0.5 km, which means that the figures given in the map show the magnitude of the outflow of this diffuse pollution component with shallow groundwater in a river stretch of 500 m. Following the modelling results, the highest leaching of nitrogen compounds is found in individual stretches of the rivers Venta, Virvytė, Vadakstis, Bartuva, where agricultural or urbanised areas are located in the neighbourhood of the river slope. In many of these areas, the annual leaching of the said pollutants in a river stretch of 500 m totals to 0.075-0.1 and more tonnes.

Impacts of point pollution

56. The most important and potentially most dangerous objects of point pollution in the Venta RBD, as in other districts, are animal husbandry complexes. Other large potentially polluting objects situated in this RBD include the cement company AB Akmenės cementas, Būtingė oil terminal and oil refinery AB Mažeikių nafta. However, a sufficient amount of data on groundwater status is available only at the oil refinery adn some of its objects.

According to the data of LGS, two complexes were studied in 2004-2007 within the Venta RBD, situated in Akmenė district (UAB Skabeikių agrofirma) and Telšiai district (UAB Eigirdžių agrofirma) (Figure 21). Although programme monitoring of groundwater is performed in these complexes, none of them has a sufficient amount of data to be able to analyse groundwater pollution trends. No comprehensive groundwater pollution studies or monitoring had been conducted here previously either.

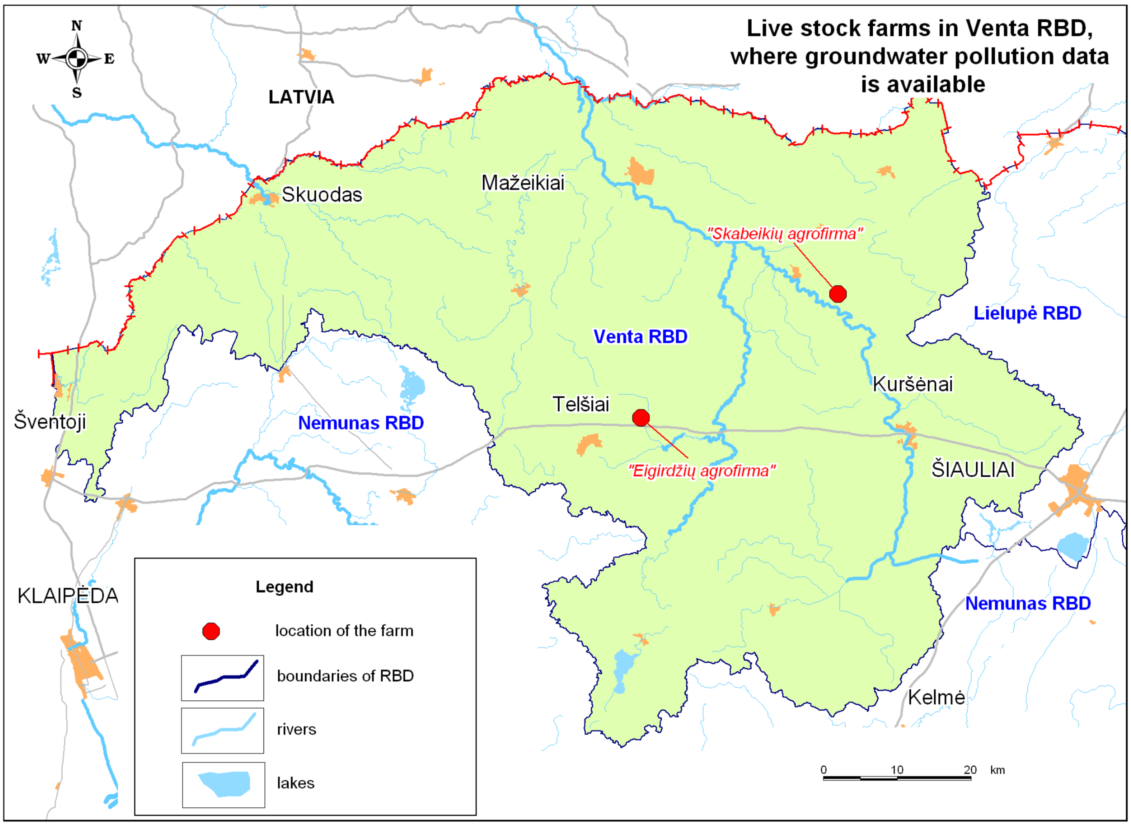


Figure 21. Animal husbandry complexes where data is available on pollution of shallow groundwater

Accordingly, only groundwater monitoring data available from other complexes situated in the RBD, which is also very scarce, can be invoked. The data indicates that even such source areas of intensive pollution of groundwater as animal husbandry/pig breeding complexes (AHC) and agricultural irrigation fields in all known cases are only local epicentres of pollution: facts demonstrate that pollution does not spread further than 100-150 m from the pollution source centre. Having in mind that sanitary protection zones (SAZ) of slurry application fields of animal husbandry complexes vary between 50 m (when wastewater is injected into the soil) and 200 m (when high pressure and low pressure sprinklers are used), it is obvious that even highly polluted shallow groundwater in such fields will not leach from the area of the AHC and a respective slurry application fields, i.e. will not exert any negative impact on shallow groundwater in the neighbouring areas.

The same data suggests that a negative impact of AHC on groundwater even in irrigation fields with a very high level of pollution is noticed maximum at the depth of 20-30 m.

Still, even the available scarce information and multi-annual hydro-geological experience allows maintaining that the impact of polluted shallow groundwater on surface water will be only minor almost in all cases and definitely lower than the said impact of surface outwash or drainage runoff due to the following reasons:

56.1. As a result of self-cleaning processes, such objects will not pollute surface water sources located farther than 100 m away from these sources because shallow groundwater will already be clean from pollution.

56.2. Shallow groundwater would noticeably pollute surface water only in the event of a high level of pollution of shallow groundwater in the vicinity of the surface water source, i.e. when the concentration of a pollutant in shallow groundwater exceeds the one in surface water tens or even hundreds times. However, such single, momentary cases of pollution have been registered only in a few complexes.

56.3. Less polluted shallow groundwater can pollute surface water when the amount of the outflow of shallow groundwater to the surface water source is equal to its discharge. Since shallow groundwater outflow modules rarely exceed several litres per second per square kilometre, only very small streams or reclamation ditches which cross a sufficiently large pollution source (1 km^2 or larger) can be polluted. However, comprehensive and long-term special investigations are required to be able to estimate this pollution separating this “underground” pollution of surface water from its direct pollution which occurs during irrigation of such fields.

Groundwater monitoring of a certain scope has been performed on the territory of the oil refinery Mažeikių nafta and in the neighbouring area since 1990, observing the status of groundwater on the territory of the company and a thermal power plant in the vicinity of the oil refinery as well as in the wellfield of the company Mažeikių nafta. Contamination of groundwater with petroleum products (PP) in a sufficiently modern company is monitored only in an few places (a couple of wells out of several dozens) where it is difficult to avoid such contamination, namely: 1) in PP loading platforms; 2) in the main stock of PP tanks (petrol and liquid petroleum oil). The monitoring data shows that contamination of groundwater with PP, at least in the area of platforms, is rather old: similar concentrations of BTEX (benzene, toluene, ethylbenzene and xylene) were registered in well No. 27886 in 1990-1991 and in well No. 27904, which replaced the former one, in 2004–2008: 2.3–63.5 mg/l in No. 27886 and 1.8–54.9 mg/l in No. 27904. Higher groundwater contamination was registered in well No. 27903 located in the area of petrol tanks, where concentrations of BTEX varied between 42.4 mg/l and 242.6 mg/l. It should be noted that the latter maximum concentration was registered in 2008. Contamination of groundwater with BTEX in the area of liquid petroleum oil tanks has always been significantly lower and totalled to mere 0.024–3.84 mg/l.

However, no BTEX have been detected in the remaining wells located on the territory of the company, or their concentrations are extremely low (hundredths of milligram). In general, pollution can hardly be traced in these wells, e.g. concentrations of chlorides nowhere exceed 10–38 mg/l and those of sulfates do not exceed 90 mg/l. Values of the permanganate index are higher, sometimes reaching 15–25 mg/l O_2, concentrations of hydro-carbonates are also high (up to 500–700 mg/l), which is usually connected with degradation of petroleum products in the soil.

Multi-annual shallow groundwater and surface water monitoring results on the territory of another object of Mažeikiai oil refinery, a power plant, demonstrate only slight and local contamination of shallow groundwater and this contamination does not progress. Concentrations of petroleum products in shallow groundwater doe not exceed tenths of milligram in one litre. The maximum concentration of chlorides and sulfates here are a little higher and total to 100–200 mg/l, and as such they are still lower even than the amounts set in the Hygiene Norm for drinking water. The amounts of ammonium (up to 16.3 mg/l) and non-oxidized organic matter (OM) are rather high in shallow groundwater in the vicinity of sludge ponds: here the values of the Permanganate Index and bichromate number go up to 17 mg/l of O_2 and 150 mg/l of O_2, respectively, and the concentrations of hydro-carbonates, which are as high as 750 mg/l, indicate rapid decay of the OM. Hence it can be concluded that such local contamination of shallow groundwater with non-toxic substances does not pose any threat to surface water.

Since Mažeikiai oil refinery and the neighbouring areas are located in the zone of the source of deeper aquifers, which are comparatively well isolated from shallow groundwater hence there is no threat of pollution of these aquifers. Accordingly, here it can also be maintained that pollution of shallow groundwater in the object of the oil refinery Mažeikių nafta is of point, or local character (stays within the territory of the company) and as such does not pose any threat to sources of drinking water or surface water.

Impacts of groundwater exploitation in deeper confined aquifers on surface water bodies

57. Abstraction of groundwater from confined aquifers reduces their piezometric surface and increases the vertical flow of groundwater, which is one of the sources of groundwater resources, deeper down and thus reduces its outflow to rivers and other surface water bodies.

The main productive aquifer in the Venta RBD, Permian-Famenian complex, occurs deep and is sufficiently well isolated from surface water. In the entire area of the RBD, except for its northern part, this complex is covered with a regional aquitard of Lower Triassic clay deposits. Quaternary intermoraine aquifers occur locally and produce only small volumes of water. Hence the impact of deeper confined aquifers on surface water bodies is only minor. A quantitative assessment can be made by comparing the modules of groundwater resources in the Venta RBD which are abstracted today and which are planned for the future (Table 58).

Table 58. Modules of present and prospective groundwater resources in the Venta RBD

GWB	Area, km^2	Volume of current groundwater abstraction (m^3/d)* / module ($l/s \cdot km^2$)	Volume of groundwater resources planned for abstraction in 2015 (m^3/d)** / module ($l/s \cdot km^2$)
Venta GWB of Permian-Upper Devonian deposits	6 276.08	20 933/0.04	34 300/0.06

Source: Register of the Earth Entrails of the LGS and SWECO-BKG-LSPI

* Average of 2008-2009; ** Data provided by SWECO-BKG-LSPI

The data provided in the table above shows that the modules of groundwater resources which are currently exploited and those which are planned to be abstracted in future are tenths and hundredths of l/s/km^2. This means that even if all groundwater resources were formed only at the expense of decrease of groundwater outflow to rivers, this decrease would not exceed the said figures. It is clear that exploitation of deep groundwater aquifers in this RBD practically cannot have any impact on shallow groundwater and surface water.

A quantitative impact of groundwater abstraction in the neighbouring countries (Latvia) on shallow and deeper groundwater within the Venta RBD was assessed using a mathematical modelling method. A mathematical model included all major productive confined aquifers: Quaternary intermoraine aquifers, aquiferous formations of the Upper Permian, Famenian and Permian-Famenian complex, Stipinai aquifer, Plavinas (Įstras-Tatula and Kupiškis-Suosa) and Šventoji-Upninkai aquifers (complexes).

The modelling established that groundwater abstraction in the neighbouring countries (Latvia) will not exert any negative impact on the status of groundwater bodies within the Venta RBD.

Groundwater wellfields which have a negative impact on the status of surface water bodies and/or terrestrial systems dependent on groundwater

58. The conclusion on the impact of groundwater abstraction on surface water bodies is supported by results of the simulated prognostic decrease of the groundwater table when wellfields in the Venta and neighbouring RBD are used at the discharge which meets the abstraction demand in 2015.

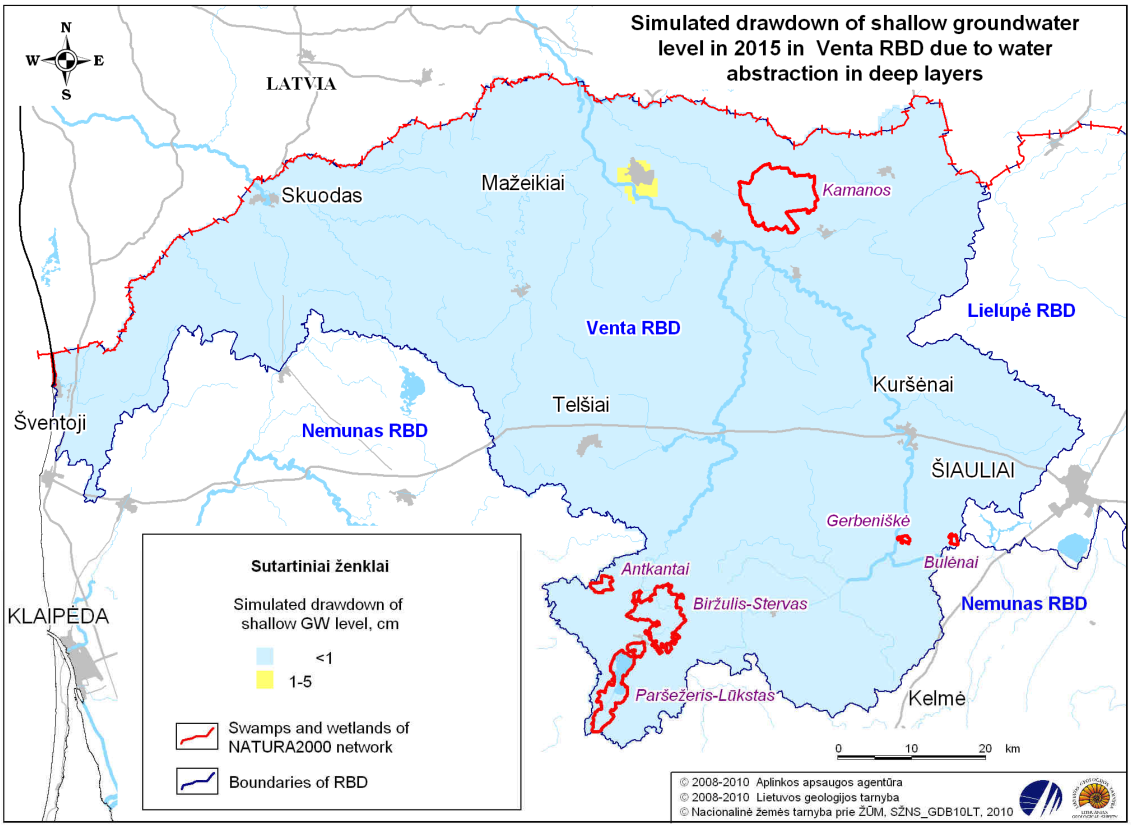


Figure 22. Simulated prognostic decrease of groundwater table in the Venta RBD in 2015 as a result of the use of confined aquifers

The modelling results demonstrated in Figure 22 above show that the use of wellfields within the Venta RBD at the prospective discharge level of 2015 practically does not have any impact on the groundwater table – the simulated decrease of the groundwater table within the entire territory of the RBD is not lower than 1 cm. Somewhat lower decrease (2-3 cm) is expected only in the vicinity of Mažeikiai where the regional aquitard of Triassic deposits becomes pinched out and the prospective discharge in the wellfields is almost twice higher than the present one. Figure 22 also demonstrates bogs, marshes and wetlands included in the NATURA 2000 network within this RBD – in none of them the prognostic decrease of the groundwater table exceeds 1 cm. This means that there are no groundwater wellfields within the Venta RBD which would have an adverse impact on the status of surface water bodies and/or terrestrial systems dependent on groundwater.

CHAPTER IV. PROTECTED AREAS

59. Pursuant to the Law of the Republic of Lithuania on Protected Areas (Žin., 1993, No. 63-1188; 2001, No. 108-3902), protected areas are areas of land and/or water with set up clear boundaries, which are of the acknowledged scientific, ecological, cultural and other value, and which have a special protection and use mode.

Protected areas in Lithuania are established in order to preserve values of the natural and cultural heritage, biological diversity, to sustain ecological balance of the landscape, sustainable use and restoration of natural resources, to establish conditions for knowledge-oriented tourism, scientific research and monitoring of the environment status, to promote the natural and cultural heritage.

Particularly protected areas lying within Venta RBD take up 84 726 ha, or about 13.5% of the total area of the basin (Table 60) and are a little below the national average. The Venta RBD contains relatively less reserves and biosphere polygons. The percentage of state parks corresponds to the national average and the relative area of strict reserves (mainly because of Kamanos strict nature reserve) is more than twice larger than the national average (Figure 23).

Table 59. Categories and areas of protected areas in the Venta RBD

Categories and types of protected areas	Number	Area* (ha)	Percentage of protected areas in the RBD	Ratio with the country's average
Strict nature reserves and small strict reserves	1	3 935	0.63	>
Natural and complex reserves	28	9 631	1.53	<
Recuperational plots	-	-	-	<
National parks	1	7 665	1.22	<
Regional parks	4	52 311	8.33	>
Biosphere reserves	-	-	-	<
Biosphere polygons	3	11 038	1,76	<
Total:	37	83 513*	13.30	<

* The area of reserves situated within biosphere reserves was subtracted from the total area.

Source: Data provided by the State Service for Protected Areas for 2010 and distributed in the RBD by experts.

The Law of the Republic of Lithuania on Protected Areas sets forth public terms related to the protected areas, a legal basis for establishment, protection, management and control of the protected areas. Activities that may cause damage to the protected complexes and objects are prohibited in protected areas. The regulation of activities established by the law is specified in more detail in the regulations of protected areas of individual types as well as in environmental regulations.

Strict nature reserves

60. There is one state strict reserve in the Venta Basin – Kamanos strict nature reserve. It was established in 1979 and occupies the area of 3 935 ha. Kamanos nature reserve (both the reserve itself and the protection zone) were included into the List of Wetlands of International Importance of the Ramsar Convention of Wetland on 20 December 1993.

Strict reserves are areas subject to the strictest protection. The main mode of land use in these areas is conservational, economic activities are prohibited.

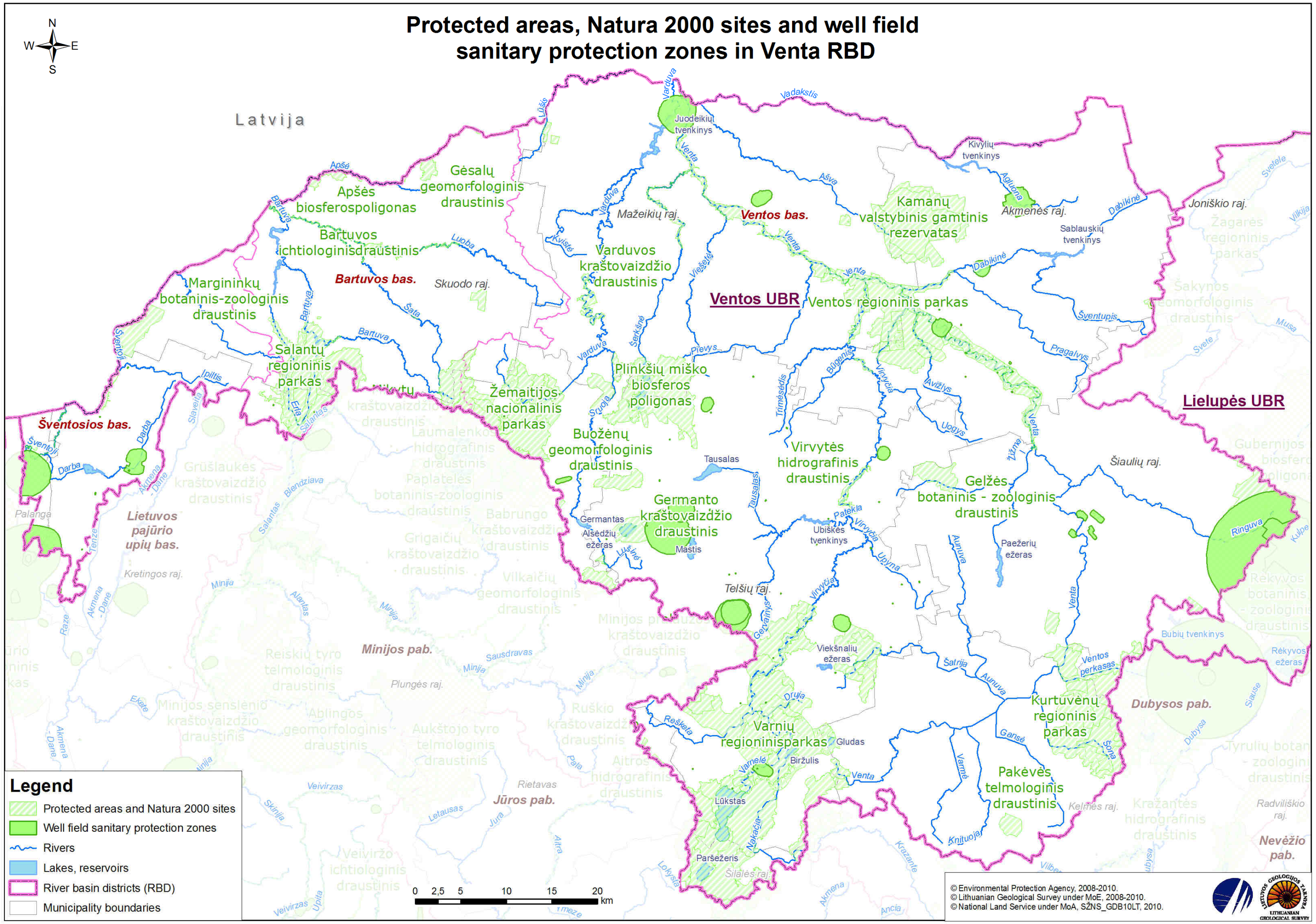


Figure 23. Protected areas in the Venta RBD

Reserves

61. Reserves – both state ones (Table 60) and those situated in state parks – play an important role in preserving the landscape and biological diversity within the Venta RBD.

Table 60. State reserves in the Venta RBD

	Reserve	Reserve type	Area, ha	Municipality
1.	Apuolė	landscape	318	Skuodas distr.
2.	Germantas	landscape	924	Telšiai distr.
3.	Plinkšiai	landscape	1 261	Mažeikiai distr., Telšiai distr.
4.	Ruškiai	landscape	*125	Rietavas
5.	Varduva	landscape	469	Mažeikiai distr.
6.	Buožėnai	geomorphological	733	Plungė distr., Telšiai distr.
7.	Gėsalai	geomorphological	325	Skuodas distr.
8.	Varputėnai	geomorphological	289	Šiauliai distr.
9.	Vilkaičiai	geomorphological	*498	Plungė distr.
10.	Šerkšnė	hydrographical	220	Mažeikiai distr.
11.	Virvytė	hydrographical	348	Telšiai distr.
12.	PaVirvytėi	botanical	64	Akmenė distr., Mažeikiai distr.
13.	Švendrė	botanical	*179	Šiauliai distr.
14.	Bartuva	zoological (ichtiological)	478	Skuodas distr.
15.	Vijoliai	zoological (entomological)	*9	Šiauliai distr.
16.	Gelžė	botanical	949	Šiauliai distr.
17.	Laumiai	botanical	254	Skuodas distr.
18.	Margininkai	botanical	1 303	Skuodas distr.
19.	Sudėnai	botanical	110	Kretinga distr.
20.	Girkančiai	telmological	*11	Akmenė distr.
21.	Karniškiės	telmological	*71	Akmenė distr.
22.	Pakėvė	telmological	451	Kelmė distr.
23.	Šernynė	telmological	121	Mažeikiai distr.
	Total		9 510	

* Only the share of the protected area situated within the boundaries of the RBD.

Source: Data provided by the State Service for Protected Areas for 2010 and distributed in the RBD by experts.

State parks

62. State parks make up the largest share of the protected areas system. The state parks situated in the venta RBD include Venta Regional Park, part of Žemaitija National Park, and parts of Kurtuvėnai, Salantai and Varniai Regional Parks (Table 61).

Table 61. State parks in the Venta RBD

	State park	Area, ha	Municipality
1.	Žemaitija National Park	*7 665	Plungė distr., Skuodas distr.
2.	Kurtuvėnai Regional Park	*7 628	Kelmė distr., Šiauliai distr.
3.	Salantai Regional Park	*6 445	Kretinga distr., Plungė distr., Skuodas distr.
4.	Varniai Regional Park	*28 303	Kelmė distr., Šilalė distr., Telšiai distr.
5.	Venta Regional Park	9 935	Akmenė distr. Mažeikiai distr., Šiauliai distr.
	Total	59 976	

* Only the share of the protected area situated within the boundaries of the RBD.

Source: Data provided by the State Service for Protected Areas for 2010 and distributed in the RBD by experts.

Biosphere monitoring territories

63. Biosphere monitoring territories are divided into biosphere reserves and biosphere polygons. There are no biosphere reserves within the Venta RBD.

Table 62. Biosphere monitoring territories in the Venta RBD

	Biosphere polygon	Area, ha	Municipality
1	Biosphere polygon of Apšė River	325	Skuodas distr.
2	Biosphere polygon of Gubernijos forest	*4 670	Joniškis distr., Šiauliai distr.
3	Biosphere polygon of Plinkšių forest	6 043	Mažeikiai distr., Telšiai distr.
	Total	11 038	

*Only the share of the protected area situated within the boundaries of the RBD

Source: Data provided by the State Service for Protected Areas for 2010 and distributed in the RBD by experts.

Network of NATURA 2000 sites

64. NATURA 2000 is a network of protected areas on the territory of the European Union, which covers natural habitats and species that are very important for the biological diversity of Europe. The network is developed by implementing the requirements of Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds of 30 November 2009 (OJ 2010 L 20, p. 7-25) (Birds Directive) and Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora of 21 May 1992 (OJ 2004 special edition, Chapter 15, Volume 2, p. 102) (Habitats Directive). Both directives require establishment of special protected areas for conservation of certain biological species or important habitats.

The network of NATURA 2000 sites in Lithuania has been developed incorporating it into the existing national system of protected areas. To date, the status of NATURA 2000 sites has been granted mainly to the existing protected areas (reserves, strict reserves, national and regional parks) or parts thereof.

There are 7 areas of importance for the conservation of birds (Table 63) and 39 areas of importance for the conservation of habitats within the Venta RBD (Table 64).

Table 63. Areas of importance for the conservation of birds in the Venta RBD

	Site of importance for the conservation of birds	Area, ha	Municipality
1	Apšė River valley	325	Skuodas distr.
2	Biržulis-Stervas wetland complex	3 620	Telšiai distr.
3	Old valeys of rivers Erla and Salantas	*940	Skuodas distr., Kretinga distr.
4	Kamanos bog **	6 412	Akmenė distr., Mažeikiai distr.
5	Plinkšių forest	6 043	Mažeikiai distr., Plungė distr., Telšiai distr.
6	Venta River valley**	3 356	Akmenė distr., Mažeikiai distr., Šiauliai distr.
7	Žemaitija National Park**	*7 665	Plungė distr., Skuodas distr.
	Total	28 361	

* Only the share of the protected area situated within the boundaries of the RBD.

** Overlaps with the area of importance for the conservation of habitats.

Source: Data provided by the State Service for Protected Areas for 2010 and distributed in the RBD by experts.

Table 64. Areas of importance for the conservation of habitats in the Venta RBD

	Area of importance for the conservation of habitat	Area, ha	Municipality
1.	Ankantų bog	420	Telšiai distr.
2.	Šventoji (Baltic) River	27	Kretinga distr., Palanga town
3.	Bulėnų bog	113	Šiauliai distr.
4.	Surroundings of Galvydiškė	965	Kelmė distr.
5.	Lake Gelžis	23	Telšiai distr.
6.	Gerbeniškės bog	99	Kelmė distr., Šiauliai distr.
7.	Lake Germantas	157	Telšiai distr.
8.	Gumbakiai exposure	1	Akmenė distr.
9.	Juodlės forest	956	Kelmė distr
10.	Kamanos bog**	6 412	Akmenė distr.
11.	Karalmiškio old forest	409	Kelmė distr.
12.	Laumių forest	254	Skuodas distr.
13.	Luoba River	458	Skuodas distr.
14.	Moteraitis meadows	17	Telšiai distr.
15.	Pakėvio forest	451	Kelmė distr.
16.	Paršežerio-Lūksto wetland complex	2876	Šilalė distr., Telšiai distr.
17.	Surroundings of Purviai village	149	Akmenė distr., Mažeikiai distr.
18.	Purvių forest	121	Akmenė distr., Mažeikiai distr.
19.	Rimšinės forest	21	Skuodas distr.
20.	Surroundings of Senosios Įpiltis village	70	Kretinga distr.
21.	Sprūdė meadows	21	Kelmė distr., Telšiai distr.
22.	Meadows of Sudėnai	110	Kretinga distr.
23.	Svilė springs	2	Kelmė distr.
24.	Svirkančiai exposure	0,1	Mažeikiai distr.
25.	Šatrija meadows	28	Telšiai distr.
26.	Šaukliai boulder area	73	Skuodas distr.
27.	Šerkšnė River	230	Mažeikiai distr.
28.	Šventoji River valley at Margininka	155	Skuodas distr.
29.	Varduva River	469	Mažeikiai distr.
30.	Varputėnų forest	289	Šiauliai distr.
31.	Venta River**	179	Akmenė distr., Mažeikiai distr., Šiauliai distr.
32.	Venta River valley upstream of Papilė town	73	Akmenė distr., Šiauliai distr.
33.	Venta River valley upstream from Venta village	13	Akmenė distr.
34.	Venta River valley downstream of Papilė town	78	Akmenė distr.
35.	Vidgirio forest	33	Mažeikiai distr.
36.	Višetė River	2	Mažeikiai distr.
37.	Žemaitija National Park **	*7 665	Plungės r., Skuodas distr.
	Total	23 419	

* Only the share of the protected area situated within the boundaries of the RBD.

** Overlaps with the area of importance for the conservation of birds.

Source: Data provided by the State Service for Protected Areas for 2010 and distributed in the RBD by experts.

The legal basis of the NATURA 2000 networks is two EU directives: Birds Directive and Habitats Directive. The EU environmental policy ensures effective maintenance of unique biological diversity throughout Europe as well as the same legal obligations for all EU Member States in protecting the sites incorporated in the NATURA 2000 network.

Sanitary protection zones of wellfields

65. As on 1 April 2010, 170 wellfields located in the Venta RBD were registered with the Register of the Earth Entrails of the LGS (Figure 24). The largest ones are wellfields in Telšiai, Mažeikiai, Kuršėnai, Skuodas and Naujoji Akmenė towns.

Pursuant to the Procedure for the Approval of Explored Solid Minerals approved by Order No. 1-146 of the Director of the Lithuanian Geological Survey under the Ministry of Environment of 14 July 2010 (Žin., 2010, No. 86-4576), exploitable resources of groundwater must be assessed and approved for all operating and newly designed public water supply and mineral water wellfields. In addition, all wellfields must have the established sanitary protection zones (SPZ) which are designed to protect sources of drinking groundwater and natural mineral water against pollution, as well as to ensure the safety and quality of drinking water supplied to customers. SPZ are established, installed and maintained observing the provisions of the Lithuanian Hygiene Norm HN 44:2006 "Delineation and maintenance of sanitary protection zones of wellfields" approved by Order No. V-613 of the Minister of Health of the Republic of Lithuania of 17 July 2006 (Žin., 2006, No. 81-3217) and those provided in Chapter XX "Sanitary protection zones of groundwater wellfields" of the Special Conditions of Land and Forest Use approved by Resolution No. 343 of the Government of the Republic of Lithuania of 12 May 1992 (Žin., 1992, Nr. 22-652). After the approval of a special plan for the SPZ of a wellfield, the special land use conditions are entered in the Real Property Cadastre and Real Property Register pursuant to the procedure laid down in Article 22 of the Law of the Republic of Lithuania on Land (Žin., 1994, No. 34-620; 2004, No. 28-868) and the Regulations of the Real Property Cadastres of the Republic of Lithuania approved by Resolution No. 534 of the Government of the Republic of Lithuania of 15 April 2002 (Žin., 2002, No. 41-1539; 2005, No. 80-2899). This is an important requirement because it ensures application of restrictions on economic activity within the SPZ.

The number of the SPZ of public water supply wellfields in the State Geological Information System during the period 2003-2009 totalled to 89. SPZ for these wellfields abstracting more than 100 m^3/day on average, SPZ have been defined or established pursuant to the provisions of paragraph 20.2 of the Lithuanian Hygiene Norm HN 44:2006. For wellfields abstracting less than 100 m^3/day on average, pollution restriction belts have been established within 50 m from the well pursuant to paragraph 20.1 of the said Hygiene Norm.

SPZ for three wellfields – Šiaulių I (Lepšių), Šiaulių II (Birutės) and the one of the dairy food company Žemaitijos pienas – have been established in the Venta Basin observing the Lithuanian Hygiene Norm HN 44:2006.

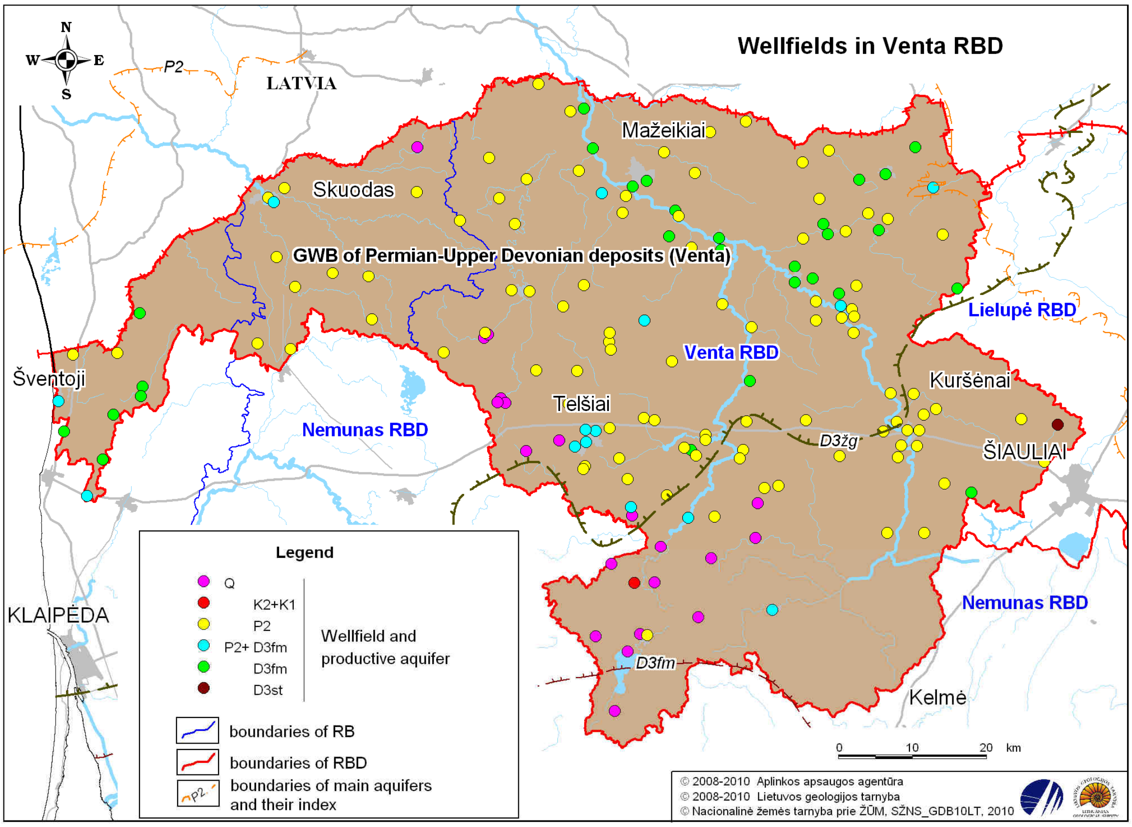


Figure 24. Groundwater wellfields in the Venta RBD

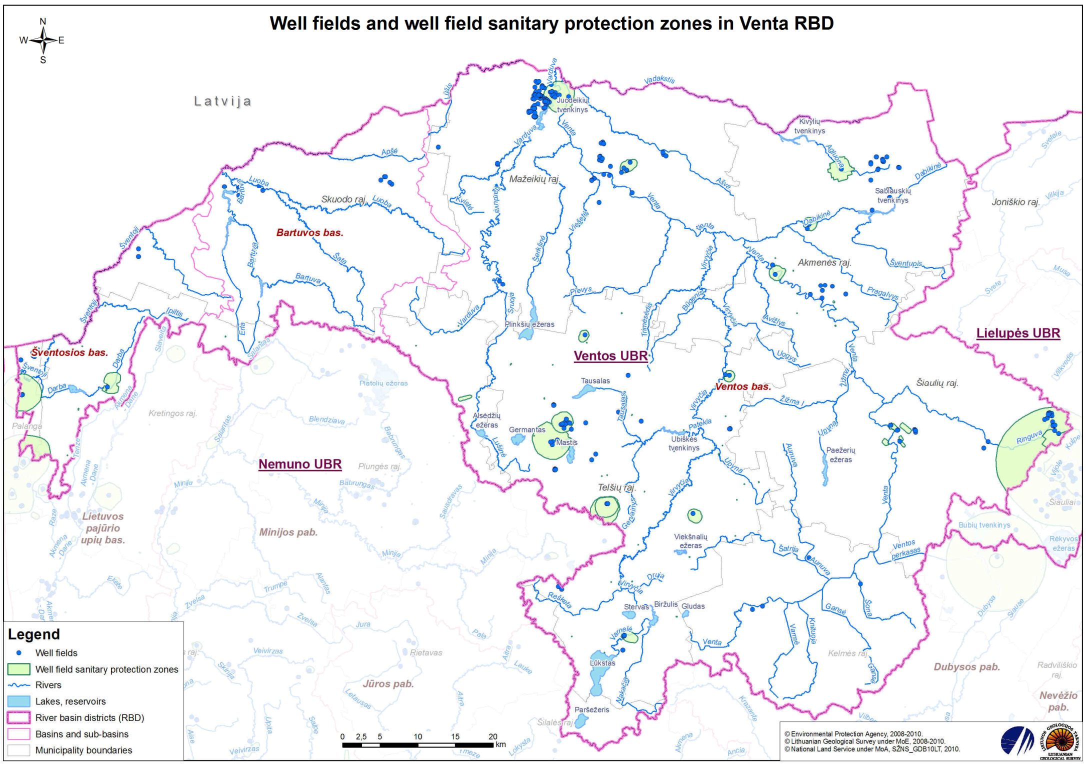


Figure 25. Groundwater wellfields and their SPZ in the Venta RBD

CHAPTER V. MONITORING AND STATUS ASSESSMENT OF WATER BODIES IN THE VENTA RBD

SECTION I. SURFACE WATER BODIES

66. Pursuant to the requirements of the Law of the Republic of Lithuania on Water, the status of surface water bodies is assessed through surveillance and operational monitoring of water bodies and, if needed, investigative monitoring.

The purpose of monitoring is to identify the status of the existing water bodies, to evaluate the effectiveness of pollution reduction measures, and to obtain data which would serve as the basis for taking decisions, during the programme implementation period, on provision of conditions for the attainment of good ecological and chemical status of rivers, lakes, ponds, and related ecosystems.

Monitoring is carried out in accordance with the National Environmental Monitoring Programme.

67. Surveillance monitoring is carried out in order to get information about the overall status of water bodies in the country and its long-term changes. This information is required for designing key measures intended to ensure protection of water bodies in future, supplementing and ensuring the differentiation of water bodies into types, establishing reference conditions for water body types. For the purpose of implementing water quality management based on the basin principle as regulated by law, the surveillance monitoring network was selected so as to enable an assessment of the status of water bodies within each river basin district, basin or sub-basin.

68. Taking into account the monitoring site and the importance of information in respect of the entire river basin district, surveillance monitoring was subdivided into two types: intensive (conducted every year) and extensive (conducted twice during the implementation of the management plan in a RBD).

Surveillance intensive monitoring sites were selected:

68.1. in the major rivers of the basin;

68.2. in transboundary water bodies situated at the border;

68.3. in water bodies suffering from significant agricultural pressures;

68.3. in reference water bodies (unaffected by anthropogenic pressures);

68.4. in other water bodies of national significance.

69. Surveillance extensive monitoring is carried out for water bodies which are indicative of the overall status of water bodies, i.e. in water bodies the ecological status of which currently conforms to the criteria for high and good ecological status, or the ecological potential conforms to the criteria for maximum and good ecological potential.

70. Operational monitoring is undertaken in water bodies the current ecological status or ecological potential of which is lower than good. The purpose of operational monitoring is to establish the status of surface water bodies identified as being at risk of failing to meet their water protection objectives, and to assess any changes in the status resulting

from the programmes of measures for the achievement of the water protection objectives. This monitoring allows assessing the impact of sources of pollution on the receiving water body.

71. Investigative monitoring is undertaken in cases when the reason of failure of a parameter indicative of a quality element to conform to the good status requirements has not been identified, or when the extent or impact of accidental pollution needs to be identified.

72. The key objective of a monitoring programme is to establish and monitor the status of all water bodies in the country; therefore the network of monitoring sites is established in respect of water bodies. In total, 104 water bodies in the category of rivers, 20 water bodies in the category of lakes and ponds have been identified within the Venta RBD. Consequently, the task of the monitoring programme is to reflect the status of all 124 water bodies in the Venta RBD. To this end, monitoring of all required quality elements has been provided for and has been carried out in accordance with the General Requirements for the Monitoring of Water Bodies approved by Order No. 726 of the Minister of Environment of the Republic of Lithuania of 31 December 2003 (Žin., 2004, No. 10-290), which specify only the minimum monitoring frequency. An exception is provided only for the minimum frequency of the monitoring of parameters indicative of biological elements: macrophytes (in all water bodies, except for reference condition sites), fish fauna and zoobenthos (in water bodies in the category of lakes and heavily modified lakes, except for reference condition sites). Macrophyte communities are one of the most inert ones among biological elements, their reaction to qualitative changes in their living environment is exceptionally slow. The water exchanger rate is much lower in lakes and ponds than in rivers, hence communities of fish fauna and zoobenthos also change very slowly. Consequently, parameters indicative of biological elements are sufficient to be monitored once in six years in such specific cases, and not once in three years as provided for in the General Requirements for the Monitoring of Water Bodies (Žin., 2004, No. 10-290). Such monitoring frequency is deemed to be sufficient to be able to assess changes in the status of biological quality elements.

Network of monitoring sites for water bodies in rivers, heavily modified and artificial river water bodies

73. 104 water bodies were identified as falling into the category of rivers (including heavily modified and artificial water bodies) within the Venta RBD. If monitoring sites are established in each water body, the monitoring network would become too wide. Consequently, the development of the monitoring network took into account the fact that a number of water bodies in each sub-basin are similar by their typology, status and factors conditioning the status. In order to streamline the monitoring network, water bodies were grouped on the basis of their typology, status and factors determining the status. At least one monitoring site was selected for each group of water bodies assuming that such one monitoring site represents the status of all water bodies within the group. Such grouping of water bodies for monitoring purposes was performed in respect of water bodies at high and good ecological status and maximum and good ecological potential as well as water bodies where poorer than good status is determined by the bed straightening. For example, when a monitoring site is in a water body of Type 1 at high ecological status, it is assumed that the monitoring data of this site will reflect the quality of all water bodies of Type 1 at high ecological status in a respective basin. Individual operational monitoring sites were provided for in respect of other

water bodies where poorer than good ecological status is conditioned by HPP impact, diffuse and/or point pollution.

The type of monitoring was determined based on the results of the assessment of the ecological status of water bodies. Operational monitoring is required for all water bodies which are not included in the surveillance intensive monitoring networks and the ecological status of which is currently lower than good, meanwhile surveillance monitoring should be carried out for the remaining water bodies.

The programme of monitoring of all water bodies in the category of rivers (including heavily modified and artificial water bodies) in the Venta RBD covers 51sites. Surveillance intensive monitoring should be carried out in 8 sites, surveillance extensive monitoring – in 22 sites, operational monitoring – in 21 sites. 2 sites in the surveillance intensive monitoring programme are planned for investigating agricultural impact. The surveillance intensive monitoring programme also includes observations in the river flowing into the Baltic Sea (1 site), transboundary rivers (3 sites, one of which is also intended for observing agricultural impact) and in the main tributaries (3 sites).

The number of monitoring sites for rivers in the Venta RBD is provided in Table 65 below.

Table 65. Type and number of monitoring sites for rivers within the Venta RBD

Basin	Number of surveillance intensive monitoring sites		Number of surveillance extensive monitoring sites	Number of operational monitoring sites
	Total	in rivers subject to agricultural pressures		
Venta	5	2	14	19
Bartuva	2	0	5	2
Šventoji	1	0	3	0
Total:	**8**	**2**	**22**	**21**

Source: experts' data

Network of monitoring sites for lakes and ponds

74. The status of lakes and ponds can be affected and determined by different factors; thus, due to the unique conditions in each lake or pond, monitoring should be carried out in respect of all water bodies falling within the category of lakes and ponds. The programme of monitoring of lakes in the Venta RBD covers the total of 20 water bodies (including ponds and heavily modified Lake Biržulis). Surveillance intensive monitoring (monitoring of reference conditions) should be carried out in 1 lake, extensive monitoring – in 5 lakes. Operational monitoring is required for 2 lakes, investigative monitoring – in 4 lakes. Surveillance extensive monitoring is planned for 4 ponds, operational monitoring – for 3 ponds and investigative monitoring – for 1 pond.

The number of monitoring sites for lakes and ponds within the Venta RBD is provided in Table 66 below.

Table 66. Type and number of monitoring sites for lakes and ponds within the Venta RBD

Basin	Monitoring of lakes				Monitoring of ponds		
	Surveillance intensive	Surveillance extensive	Operational	Investigative	Surveillance extensive	Operational	Investigative
Venta	1	5	2	4	1	2	1
Bartuva	-	-			2	1	
Šventoji	-	-			1		
Total:	**1**	**5**	**2**	**4**	**4**	**3**	**1**

Source: experts' data

Monitoring programme for rivers, heavily modified and artificial river water bodies

Surveillance intensive monitoring

75. Frequencies of the monitoring of parameters indicative of all quality elements were established so as to ensure a high level of data confidence and precision. Hydrological regime and general parameters for physico-chemical elements shall be measured 12 times a year (every month) in all intensive surveillance monitoring sites, and concentrations of the main ions shall be monitored at the same frequency in transboundary rivers and in the main tributaries. Such measurement frequency and continuous measurements in the same monitoring sites will ensure a high level of confidence in the assessment of natural and anthropogenic changes.

Concentrations of metals shall be measured every year 12 times a year in the surveillance intensive monitoring site in the Venta downstream of Mažeikiai because here concentrations of specific pollutants were found to be exceeding the MAC in previous years. Monitoring in two water bodies which are designated as water bodies at risk due to pollution with specific pollutants (priority substances) are required in respect of substances the concentrations of which were registered to be exceeding the MAC, namely: di(2-ethylhexyl)phthalate and chloromethane in the Varduva and di(2-ethylhexyl)phthalate in the Šventoji. Concentrations of metals shall be measured every year 12 times a year in areas of intensive agricultural activities and in rivers flowing into the sea. If the concentrations of specific pollutants and metals do not exceed the MAC during the first year of measurement, repeat samples may be taken after three years. Once a year concentrations of specific pollutants and metals in the Venta downstream of Mažeikiai shall also be measured in bottom sediments and in biota.

Regularity of the analysis of parameters indicative of biological elements in surveillance intensive monitoring sites differs depending on the characteristics of the biological objects. Macrophytes should be monitored only in places representative of rivers other than Type 1. Though the General Requirements for the Monitoring of Water Bodies (Žin., 2004, No. 10-290) provide for the monitoring of macrophyte parameters once in three years, in experts' opinion, one time every six years is sufficient because macrophyte communities are one of the most inert ones (changing the most slowly) among biological elements. Measurements of parameters for fish fauna, which are quicker to react to environmental changes, in the sites of intensive monitoring should be performed once in three years and zoobenthos should be monitored every year. Parameters for phytobenthos should be measured on an annual basis three times a year. Of all biological elements, these parameters are the first to react to changes in the water quality hence three measurements per year are expected to provide information on momentary (short-term) impacts of changes in the water quality. Parameters indicative of morphological conditions in rivers, which change the most slowly, and river continuity are sufficient to be monitored once during a six-year monitoring cycle.

Table 67. Surveillance intensive monitoring programme for rivers

Monitoring elements and parameters		Surveillance intensive monitoring in rivers												
		Rivers flowing into the sea				Transboundary rivers			Main tributaries			Basins in agricultural areas		
		1	2	3	4	2	3	4	2	3	4	2	3	4
Physico-chemical quality elements	General parameters	AP 1	1	12	6	3	12	6	3	12	6	2*	12	6
	Main ions	AP 2	1	12	6	3	12	6	3	12	6	2*	4	2
	Metals in water	AP 3	1	12	6	1	12	6	0	0	0	2*	12	6
	Metals in bottom sediments and biota	AP 4	1	1	6	1	1	6	0	0	0	2*	1	6
	Specific pollutants in water	AP 5	1	12	6	1	12	6	1	12	6	0	0	0
	Specific pollutants in bottom sediments and biota	AP 6	1	1	6	1	1	6	1	1	6	0	0	0
Biological quality elements	Macrophytes	AP 7	1	1	1	2	1	1	3	1	1	1	1	1
	Zoobenthos	AP 8	1	1	6	3	1	6	3	1	6	2*	1	6
	Fish fauna	AP 9	1	1	2	3	1	2	3	1	2	2*	1	2
	Phytobenthos	AP 10	1	3	6	3	3	6	3	3	6	2*	3	6
Hydromorphological quality elements	Hydrological regime	AP 11	1	12	6	3	12	6	3	12	6	2*	12	6
	Morphological conditions	AP 12	1	1	1	3	1	1	3	1	1	2*	1	1
	River continuity	AP 13	1	1	1	3	1	1	3	1	1	2*	1	1

Explanation of the column numeration:

1 – analytical package, lists of parameters for each analytical package are provided in Table 70

2 – number of monitoring sites

3 – annual number of samples in sites

4 – frequency during a six-year monitoring cycle

*one site is located in a transboundary river, i.e. the same site is included in the table twice – as a transboundary site and as a site subject to agricultural pressures

Note:

If concentrations of specific pollutants in samples do not exceed the established environmental quality standards during the first year of monitoring, repeat samples for assessment of the concentrations may be taken after three years.

Source: experts' data

Surveillance extensive monitoring

76. Surveillance extensive monitoring aims at observing general status in water bodies (natural rivers, heavily modified rivers and artificial canals) which meet the requirements for good ecological status or good ecological potential. Surveillance extensive monitoring is envisaged for water bodies where no surveillance intensive monitoring sites have been established or in cases when surveillance intensive monitoring data is not sufficient for the assessment of the status of the entire water body. There are 51 such water bodies within the Venta RBD, 22 surveillance extensive monitoring site have been envisaged for their monitoring. These monitoring sites shall ensure the assessment of the ecological status and ecological potential of all water bodies outside the category of water bodies at risk with a medium level of confidence.

The following elements shall be observed in surveillance extensive monitoring sites: general physico-chemical parameters, main ions, parameters indicative of biological elements, hydrological regime, morphological conditions, and river continuity. The monitoring frequency and regularity for the relevant parameters correspond to those laid down in the General Requirements for the Monitoring of Water Bodies (Žin., 2004, No. 10-290) and are sufficient for monitoring the overall ecological status of water bodies and ensuring medium confidence and precision level of the data. Measurements of all parameters in the same monitoring site should be performed every three years, except for parameters for macrophytes, which are to be monitored once during a six-year cycle (macrophyte communities are the most stable of all biological elements) and only in sites in rivers larger than Type 1. During the monitoring year, general physico-chemical parameters and the hydrological regime should be measured four times a year (every three months) and the remaining parameters – once a year.

22 surveillance extensive monitoring sites are envisaged for the Venta RBD.

Table 68. Surveillance extensive monitoring programme for rivers (natural and heavily modified rivers and artificial canals)

Monitoring elements and parameters			**Surveillance extensive monitoring in rivers**		
		1	2	3	4
Physico-chemical quality elements	General parameters	AP 1	22	4	2
	Main ions	AP 2	22	4	2
Biological quality elements	Macrophytes	AP 7	12	1	1
	Zoobenthos	AP 8	22	1	2
	Fish fauna	AP 9	22	1	2
	Phytobenthos	AP 10	22	1	2
Hydromorphological quality elements	Hydrological regime	AP 11	22	4	2
	Morphological conditions	AP 12	22	1	1
	River continuity	AP 13	22	1	1

Explanation of the column numeration:

1 – analytical package, lists of parameters for each analytical package are provided in Table 70

2 – number of monitoring sites

3 – annual number of samples in sites

4 – frequency during a six-year monitoring cycle

Source: experts’ data

Operational monitoring

77. Operational monitoring is intended for the monitoring of the ecological status/potential in river stretches where the established water protection objectives are not likely to be achieved. This monitoring allows assessing changes in ecological status/potential which occur while implementing programmes of measures for the achievement of water protection objectives. The operational monitoring network in the Venta RBD covers 21 river sites (Table 70).

Frequencies of monitoring elements were established so as to obtain sufficient data for assessing the status of quality elements and its variation. Taking into account the fact that measures for the reduction of impacts of anthropogenic activities take effect with some delay (after a certain time period), measurements of the monitoring elements in operational monitoring sites should be repeated once in three years instead of every year. Such regularity is sufficient to be able to assess measures for the reduction of impacts of anthropogenic activities as well as changes in the status of biological elements. It should be noted that the absolute majority of biological elements react to improvements of their living environment after a certain time and not immediately.

Hence the said monitoring frequency ensures an adequate level of data confidence and precision.

In the monitoring sites, parameters indicative of all elements which might prevent the achievement of water protection objectives and parameters indicative of biological elements shall be monitored measuring their values every three years. Less frequent measurements, once every six years, shall be carried out only in respect of elements which change the most slowly, i.e. river morphology, continuity and macrophytes (the latter shall be monitored only in river stretches which are not Type-1 rivers). Though the monitoring frequency (once every six years) for macrophytes is lower than indicated in the General Requirements for the Monitoring of Water Bodies (Žin., 2004, No. 10-290), it is deemed to be sufficient because macrophyte communities are one of the most inert ones (changing the most slowly) of biological elements. General physico-chemical parameters shall be measured in all river sites subject to operational monitoring, taking measurements every three months (four times a year) during the monitoring year. Hydrological parameters (quantity of flow which partially determines concentrations of certain chemical elements in water) shall be monitored at the same frequency.

Monitoring of metals and other hazardous substances is recommended only in water bodies where these elements may prevent achievement of good chemical status. There are two such water bodies in the Venta RBD. Intensive monitoring covering observations of hazardous substances which have conditioned the designation of these water bodies as water bodies at risk has been envisaged for the said two water bodies hence there is no need of operational monitoring of these substances in these sites.

Parameters indicative of biological elements, i.e. those for zoobenthos and fish fauna, shall be measured once a year (every three years) and parameters for phytobenthos are recommended to be measured three times a year (every three years) because parameters for phytobenthos are the ones which change the most quickly as a result of changes in the water quality.

Table 69. Operational monitoring programme for rivers

Monitoring elements and parameters		**Operational monitoring sites**			
		1	2	3	4
Physico-chemical quality elements	General parameters	AP 1	21	4	2
Biological quality elements	Macrophytes	AP 7	8	1	1
	Zoobenthos	AP 8	21	1	2
	Fish fauna	AP 9	21	1	2
	Phytobenthos	AP 10	21	3	2
Hydromorphological quality elements	Hydrological regime	AP 11	21	4	2
	Morphological conditions	AP 12	21	1	1
	River continuity	AP 13	21	1	1

Explanation of the column numeration:

1 – analytical package, lists of parameters for each analytical package are provided in Table 71

2 – number of monitoring sites

3 – annual number of samples in sites

4 – frequency during a six-year monitoring cycle

Source: experts' data

Table 70. Parameters for river water quality elements in each analytical package

Analytical package	**List of parameters**
AP 1	General physico-chemical parameters: temperature, colour (Pt mg/l), pH, oxygen concentration, BOD_7, suspended matter, P total, PO_4-P, N mineral, N total, NO_3-N, NH_4-N, NO_2-N, TOC, COD, Cr, Ca, electric conductivity, alkalinity
AP 2	Main ions: Cl, SO_4, Na, K, Mg, Si
AP 3	Metals in water: lead and its compounds, nickel and its compounds, chromium – total, chromium – hexavalent, copper, cadmium, tin, vanadium, arsenic, zinc, aluminium, mercury
AP 4	Metals in bottom sediments: lead and its compounds, nickel and its compounds, chromium – total, chromium – hexavalent, copper, cadmium, tin, vanadium, arsenic, zinc, aluminium, mercury Metals in biota: cadmium and its compounds, lead and its compounds, mercury and its compounds
AP 5	Specific pollutants in water: In monitoring site No. R82: substances listed in Annex 1 and Part A of Annex 2 to the Wastewater Management Regulation approved by Order No. D1-236 of the Minister of Environment of the Republic of Lithuania of 17 May 2006 (Žin., 2006, No. 59-2103; 2009, No. 83-3473; 2010, No. 59-2938), dibutyl phthalate and polychlorinated biphenyls (PCB) In monitoring site No. R430: trichloromethane (chlorophorm) and di(2-ethylhexyl)phthalate In monitoring site No. R138: di(2-ethylhexyl)phthalate
AP 6	Specific pollutants in bottom sediments: In monitoring site No. R82: substances listed in Annex 1 and Part A of Annex 2 to the Wastewater Management Regulation approved by Order No. D1-236 of the Minister of Environment of the Republic of Lithuania of 17 May 2006 (Žin., 2006, No. 59-2103; 2009, No. 83-3473; 2010, No. 59-2938), dibutyl phthalate and polychlorinated biphenyls (PCB) In monitoring site No. R430: trichloromethane (chlorophorm) and di(2-ethylhexyl)phthalate In monitoring site No. R138: di(2-ethylhexyl)phthalate Specific pollutants in biota: anthracene, brominated diphenylethers, C10-13-chloroalkanes, di(2-ethylhexyl)phthalate, fluoranthene, hexachlorobenzene, hexachlorbutadiene, hexachlorocyclohexane, pentachloro-benzene, polycyclic aromatic hydrocarbons and tribultyltin compounds, and polychlorinated biphenyls (PCB)
AP 7	Macrophytes: species composition, abundance and bottom coverage with each species (SI or other adequate indices)
AP 8	Zoobenthos: species composition, abundance of individuals of each species (DSFI or other adequate indices)
AP 9	Fish fauna: species composition, abundance of individuals of each species (DSFI or other adequate indices)
AP 10	Phytobenthos: species composition, abundance
AP 11	Hydrological regime: quantity of water flow
AP 12	Morphological conditions: type of river bed, length and width of the natural riparian vegetation zone
AP 13	River continuity: artificial barriers for fish migration and transportation of outwash material

Source: experts' data

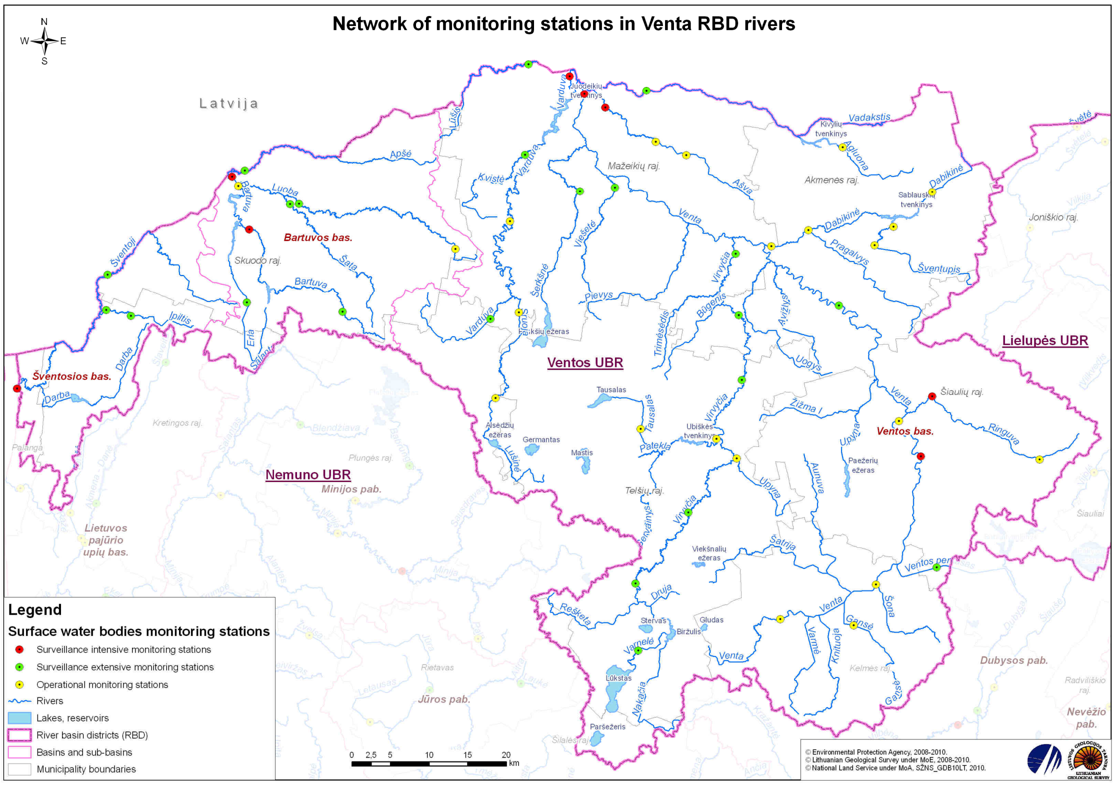


Figure 26. Monitoring network for rivers in the Venta RBD

Source: experts' data

Monitoring programme for lakes and heavily modified lake water bodies

Surveillance intensive monitoring

78. Surveillance intensive monitoring is intended for the monitoring of the ecological status of the most important lakes and ponds. This type of monitoring in the Venta RBD is proposed for Lake Germantas (Table 72).

Frequencies of the monitoring of parameters indicative of all quality elements were established so as to ensure a high level of data confidence and precision. General parameters for physico-chemical elements shall be measured seven times a year (every month) in all intensive surveillance monitoring sites. Parameters for phytobenthos, which are the first to react to changes in parameters for physico-chemical elements, in the intensive monitoring site should be measured on an annual basis six times a year (in April, May, July, August, September and October). Of all biological elements, these parameters hence three measurements per year are expected to provide information on momentary (short-term) impacts of changes in the water quality. Parameters for macrophytes, fish fauna and zoobenthos, which are slower reacting to environmental changes, are proposed to be monitored once in three years (twice during a six-year monitoring cycle). Morphological conditions and water exchange rate should be monitored once during a six-year monitoring cycle.

Table 71. Surveillance intensive monitoring programme for lakes and ponds

Monitoring elements and parameters		Surveillance intensive monitoring of reference conditions in Lake Germantas			
		1	2	3	4
Physico-chemical quality elements	General parameters	AP 14	1	7	6
Biological quality elements	Phytoplankton	AP 19	1	6	6
	Macrophytes	AP 20	1	1	2
	Fish fauna	AP 21	1	1	2
	Zoobenthos	AP 22	1	1	2
Hydromorphological quality elements	Water exchange rate	AP 23	1	1	1
	Morphological conditions	AP 24	1	1	1

Explanation of the column numeration:
1 – analytical package, lists of parameters for each analytical package are provided in Table 76
2 – number of monitoring sites
3 – annual number of samples in sites
4 – frequency during a six-year monitoring cycle

Source: experts' data

Surveillance extensive monitoring

79. Surveillance extensive monitoring is intended for the monitoring of the ecological status in water bodies outside the category of water bodies at risk. The surveillance extensive monitoring network in the Venta RBD covers 5 lakes and 4 ponds (Table 73). Lake ecosystems change very slowly therefore it is sufficient to monitor the relevant parameters once every six years. Though such monitoring frequency is lower than indicated in the General Requirements for the Monitoring of Water Bodies (Žin., 2004, No. 10-290), it is deemed to be sufficient for the monitoring of general ecological status of water bodies and ensuring medium confidence and precision level of the data.

General physico-chemical parameters and parameters for phytoplankton shall be measured at least four time a year (at the end of April – beginning of May, in the second half of July, second half of August, at the end of September – beginning of October). The remaining monitoring elements shall be measured once during a monitoring cycle. Measurements of parameters for macrophytes and zoobenthos are not recommended for naturally ageing lakes (communities therein may be changed due to natural factors).

Table 72. Surveillance extensive monitoring programme for lakes and ponds

Monitoring elements and parameters		Surveillance extensive monitoring in lakes and ponds						
			Lakes			Ponds		
		1	2	3	4	2	3	4
Physico-chemical quality elements	General parameters	AP 14	5	4	1	4	4	1
Biological quality elements	Phytoplankton	AP 19	5	4	1	4	4	1
	Macrophytes	AP 20	3	1	1	4	1	1
	Fish fauna	AP 21	5	1	1	4	1	1
	Zoobenthos	AP 22	5	1	1	4	1	1
Hydromorphological quality elements	Water exchange rate	AP 23	5	1	1	4	1	1
	Morphological conditions	AP 24	5	1	1	4	1	1

Explanation of the column numeration:
1 – analytical package, lists of parameters for each analytical package are provided in Table 76
2 – number of monitoring sites
3 – annual number of samples in sites
4 – frequency during a six-year monitoring

Source: experts' data

Operational monitoring

80. Operational monitoring is carried out in lakes and ponds where the established water protection objectives are not likely to be achieved. Such monitoring within the Venta RBD is required for 3 lakes and 3 ponds (Table 74).

With a view to monitor changes in the ecological status of the lake, measurements of parameters indicative of general physico-chemical elements and phytoplankton as well as chlorophyll *a* should be performed at least every three years four times a year. Parameters for other elements which change slower may be measured once during a six-year monitoring cycle. Taking into account the fact that measures for the reduction of impacts of anthropogenic activities take effect with some delay (after a certain time period), such regularity is sufficient to be able to assess changes in the status of parameters for quality elements. The absolute majority of biological elements (except for phytoplankton) react to improvements of their living environment in lakes after a very long time, hence it is believed that such monitoring frequency (once in six years) ensures sufficient data confidence and precision.

Table 73. Operational monitoring programme for lakes and ponds

Monitoring elements and parameters		**Operational monitoring in lakes and ponds**						
			Lakes			Ponds		
		1	2	3	4	2	3	4
Physico-chemical quality elements	General parameters	AP 14	2	4	2	3	4	2
Biological quality elements	Phytoplankton	AP 19	2	4	2	3	4	2
	Macrophytes	AP 20	2	1	1	3	1	1
	Fish fauna	AP 21	2	1	1	3	1	1
	Zoobenthos	AP 22	2	1	1	3	1	1
Hydromorphological quality elements	Water exchange rate	AP 23	2	1	1	3	1	1
	Morphological conditions	AP 24	2	1	1	3	1	1

Explanation of the column numeration:

1 – analytical package, lists of parameters for each analytical package are provided in Table 75
2 – number of monitoring sites
3 – annual number of samples in sites
4 – frequency during a six-year monitoring cycle

Source: experts' data

Investigative monitoring

81. Causes which condition poorer than good ecological status of three lakes (Alsėdžių ežeras, Mastis and Tausalas) and one pond (Sablauskių) are not clear enough (the lakes may be potentially affected by pollution from unidentified pollution sources and historic pollution). Hence more intensive – investigative monitoring every three years is recommended for these water bodies (Table 75) in order to obtain more precise data on seasonal variation of general physico-chemical parameters and, at the same time, to find out whether there are any phosphorus compounds released from bottom sediments during thermal stagnation (secondary pollution conditioned by historical pollution). Values of general physico-chemical parameters should be measured seven times a year instead of four (six times during the period from the end of April to the beginning of October and once during the period of ice cover) and those of parameters for phytoplankton – six times a year (during the period of intensive vegetation). Monitoring in Lake Alsėdžių ežeras and in Lake Tausalas would be performed in 2011 and 2014 and in Sablauskių pond – in 2012 and 2015.

In Lake Mastis, concentrations of specific pollutants and metals should be measured in addition to parameters indicative of physico-chemical and biological elements (four time a year in water, once a year in bottom sediments, twice during a six-year monitoring cycle, in 2012 and 2014). The lake is situated in an urban area therefore a possibility of the input of specific pollutants into the lake is highly likely. Also, the lake used to be polluted with industrial wastewater. There is no data on concentrations of specific pollutants and metals in this water body but such information is indispensable for the assessment of the present chemical status. Four measurements per year should ensure sufficient data confidence and precision because (differently from rivers) the monitored elements are not removed from the lake with water flow.

Investigative monitoring is also required in heavily modified Lake Biržulis. Poor ecological potential of the lake could have been determined by hydromorphological changes and pollution from unidentified pollution sources (or biogens accumulated in bottom sediments). To be able to carry out a more precise assessment of hydromorphological changes, morphological conditions (changes in the shore line, length and status of natural riparian vegetation, maximum depth of the lake, thickness of the bottom sediments layer) in Lake Biržulis should be assessed twice and not once during the monitoring cycle (every three years), in 2012 and 2015.

Table 74. Investigative monitoring programme for Lake Biržulis

Monitoring elements and parameters		**Investigative monitoring sites in lakes, ponds and heavily modified Lake Biržulis**									
			Lakes			Ponds			Lake Biržulis		
		1	2	3	4	2	3	4	2	3	4
Physico-chemical quality elements	General parameters	AP 14	3	12	2	1	12	2	1	12	2
	Metals in water	AP 15	1[(1)]	4	2	0	0	0	0	0	0
	Metals in bottom sediments and biota	AP 16	1[(1)]	1	2	0	0	0	0	0	0
	Specific pollutants in water	AP 17	1[(1)]	4	2	0	0	0	0	0	0
	Specific pollutants in bottom sediments and biota	AP 18	1[(1)]	1	2	0	0	0	0	0	0
Biological quality elements	Phytoplankton	AP 19	3	6	2	1	6	2	1	6	2
	Macrophytes	AP 20	3	1	1	1	1	1	1	1	1
	Fish fauna	AP 21	3	1	1	1	1	1	1	1	1
	Zoobenthos	AP 22	3	1	1	1	1	1	1	1	1
Hydromorphological quality elements	Water exchange rate	AP 23	3	1	1	1	1	1	1	1	1
	Morphological conditions	AP 24	3	1	1	1	1	1	1	1	2

[(1)] Lake Mastis

Explanation of the column numeration:

1 – analytical package, lists of parameters for each analytical package are provided in Table 75
2 – number of monitoring sites
3 – annual number of samples in sites
4 – frequency during a six-year monitoring cycle

Source: experts' data

Table 75. Parameters for water quality elements for lakes and ponds in each analytical package

Analytical package	List of parameters
AP 14	General physico-chemical parameters: transparency, oxygen concentration, temperature, pH, suspended matter, P total, N total, colour (Pt mg/l), electric conductivity, alkalinity, Ca, Fe, Si, NO_3-N, NO_2-N, PO_4-P, NH_4-N
AP 15	Metals in water: lead and its compounds, nickel and its compounds, chromium – total, chromium – hexavalent, copper, cadmium, tin, vanadium, arsenic, zinc, aluminium, mercury
AP 16	Metals in bottom sediments: lead and its compounds, nickel and its compounds, chromium – total, chromium – hexavalent, copper, cadmium, tin, vanadium, arsenic, zinc, aluminium, mercury Metals in biota: cadmium and its compounds, lead and its compounds, mercury and its compounds
AP 17	Specific pollutants in water: substances listed in Annex 1 and Part A to Annex 2 to the Wastewater Management Regulation approved by Order No. D1-236 of the Minister of Environment of the Republic of Lithuania of 17 May 2006 (Žin., 2006, No. 59-2103; 2009, No. 83-3473; 2010, No. 59-2938), dibutyl phthalate and polychlorinated biphenyls (PCB)
AP 18	Specific pollutants in bottom sediments: substances listed in Annex 1 and Part A to Annex 2 to the Wastewater Management Regulation approved by Order No. D1-236 of the Minister of Environment of the Republic of Lithuania of 17 May 2006 (Žin., 2006, No. 59-2103; 2009, No. 83-3473; 2010, No. 59-2938), dibutyl phthalate and polychlorinated biphenyls (PCB) Specific pollutants in biota: anthracene, brominated diphenylethers, C10-13-chloroalkanes, di(2-ethylhexyl)phthalate, fluoranthene, hexachlorobenzene, hexachlorbutadiene, hexachlorocyclohexane, pentachloro-benzene, polycyclic aromatic hydrocarbons and tribultyltin compounds, and polychlorinated biphenyls (PCB)
AP 19	Phytoplankton: species composition, abundance, biomass, parameters for indicative groups, chlorophyll *a*
AP 20	Macrophytes: species composition, abundance and bottom coverage with each species (SI or other adequate indices)
AP 21	Fish fauna: species composition, abundance of individuals of each species and biomass
AP 22	Zoobenthos: species composition, abundance of individuals of each species
AP 23	Water exchange rate
AP 24	Morphological conditions: changes in the shore line, length of the natural riparian vegetation zone

Source: experts' data

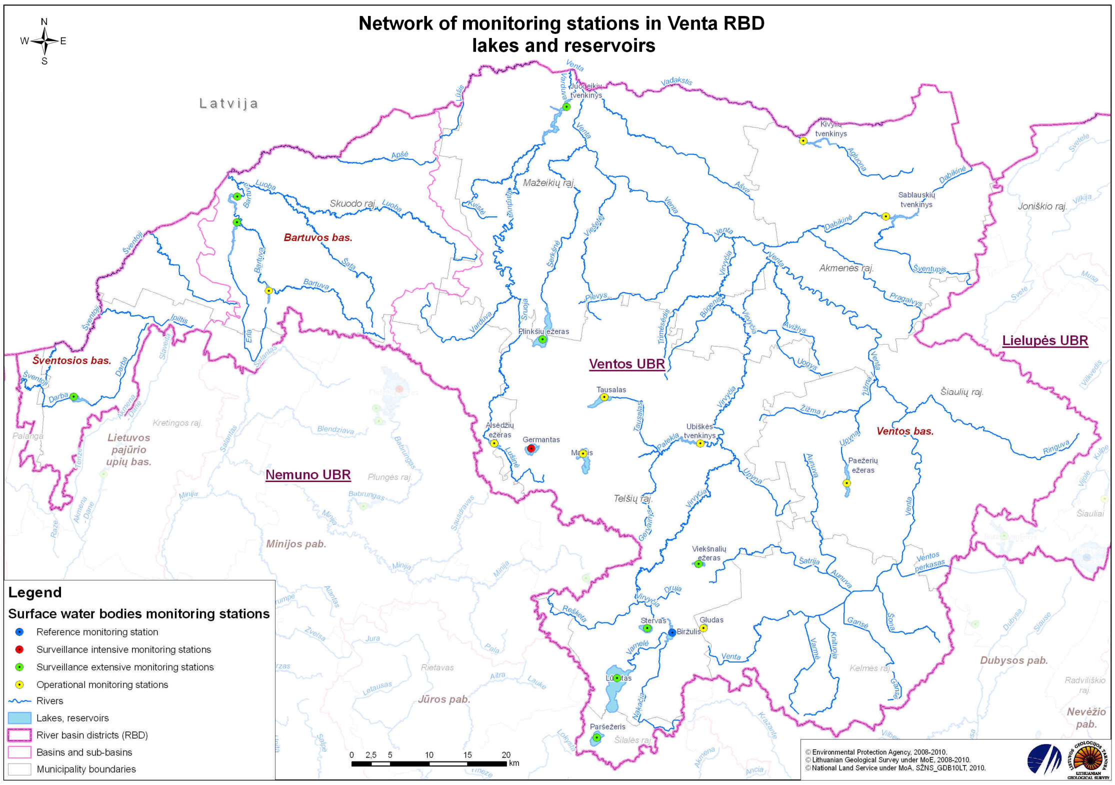


Figure 27. Monitoring network for lakes and ponds in the Venta RBD
Source: experts' data

Status assessment results for surface water bodies

Ecological status and ecological potential of rivers

82. Taking into account river typology and anthropogenic pressures on ecological status, 104 water bodies in the category of rivers were identified within the Venta RBD. The most important source of information for the assessment of the ecological status and ecological potential of water bodies was water quality monitoring data of 2005–2009. With a view to ensure accurate assessment, ecological status and ecological potential were identified on the basis of the results obtained only in the monitoring sites where at least four annual measurements of parameters indicative of physico-chemical quality elements were taken. Data of one-time measurements cannot reflect the actual status of water bodies and therefore was not used in order to avoid major errors. Also, dubious parameter values were excluded. The assessment of the ecological status and ecological potential of water bodies was conducted using the Methodology for the Identification of the Status of Surface Water Bodies approved by Order No. D1-210 of the Minister of Environment of the Republic of Lithuania of 12 April 2007 (Žin., 2007, No. 47-1814).

However, the available water quality monitoring data is not sufficient to identify the ecological status and ecological potential of all water bodies in the category of rivers within the Venta RBD. New principles for the delineation of water bodies were proposed while developing the Venta RBD Management Plan, therefore the monitoring data collected during 2005–2009 failed to reflect the ecological status of all newly delineated water bodies to the required extent. Thus, the ecological status and ecological potential of water bodies where water quality monitoring had not been conducted were identified on the basis of mathematical modelling results and taking into account hydromorphological parameters for river beds. The assessment of the ecological status and ecological potential on the basis of the modelling results was carried out employing simulated values of parameters indicative of physico-chemical quality elements. Values of parameters indicative of physico-chemical quality elements were estimated with the help of MIKE BASIN model upon evaluation of the present pollution loads and average hydrological conditions.

The mathematical modelling results and data on hydromorphological parameters for river beds were also used as additional information on the assessment of the ecological status and ecological potential of water bodies where monitoring was carried out during 2005-2009.

In cases of discrepancies between the ecological status or ecological potential evaluated on the basis of the monitoring data and the one assessed in accordance with the simulated values of parameters indicative of physico-chemical quality elements and hydromorphological parameters, the final assessment of the ecological status of a water body was performed as follows:

82.1. When the ecological status or ecological potential established on the basis of the monitoring data was lower than the one established in accordance with the simulated parameters for physico-chemical quality elements and hydromorphological parameters, the final assessment of the ecological status or ecological potential of the water body was performed using the monitoring data.

82.2. When the ecological status or ecological potential established on the basis of the simulated values of parameters indicative of physico-chemical quality elements and hydromorphological parameters was lower than the one established in accordance with the monitoring data, the final assessment of the ecological status or ecological potential of the water body was performed using the modelling results and the hydromorphological parameters.

Following the Regulations for the Assessment of Ecological Status and Ecological Potential, water bodies were identified as water bodies at risk when any potential significant anthropogenic impact was presumed with a view to minimise the risk of failing to notice deterioration in the current status.

The assessment of the ecological status of water bodies in the category of rivers within the Venta RBD demonstrated that there are 14 water bodies at high ecological status, which makes up 14.5% of all river water bodies in this river basin district. 4 water bodies at high ecological status are situated in the Bartuva Basin, 10 – in the Venta Basin. 6 heavily modified water bodies in the Venta RBD (5 in the Venta Basin and 1 – in the Bartuva Basin) meet the requirements for maximum ecological potential and constitute 6% of all river water bodies in this river basin district. 27 water bodies are at good ecological status (26% of all water bodies): 22 are situated in the Venta Basin, 2 – in the Bartuva Basin and 3 – in the Šventoji Basin. 6 heavily modified water bodies (6%) in the Venta RBD meet the good ecological potential requirements: 3 water bodies in the Venta Basin and 3 – in the Šventoji Basin. The largest number of water bodies – as many as 46 – in the Venta RBD are at moderate ecological status, constituting 44% of all river water bodies: 42 water bodies in the Venta Basin and 4 ones in the Bartuva Basin. Moderate ecological potential was identified in 3 HMWB (3%), all of them are located in the Venta Basin. Also, there is 1 water body at poor ecological status and 1 water body at poor ecological potential in the Venta Basin.

The aggregate length of river water bodies in the Venta RBD is 1 520.8 km. The length of water bodies at high ecological status totals to 234.4 km (15.4%), at good ecological status – 476 km (31.3%), at moderate ecological status – 522.6 km (34.4%), at poor ecological status – 8.4 km (0.6%). The length of heavily modified water bodies meeting the requirements for maximum ecological potential is 116.8 km (7.7%), the length of those in conformity with the requirements for good ecological potential – 103.5 (6.8%), for moderate ecological potential – 48.8 km (3.2%), for poor ecological potential – 10.3 km (0.7%).

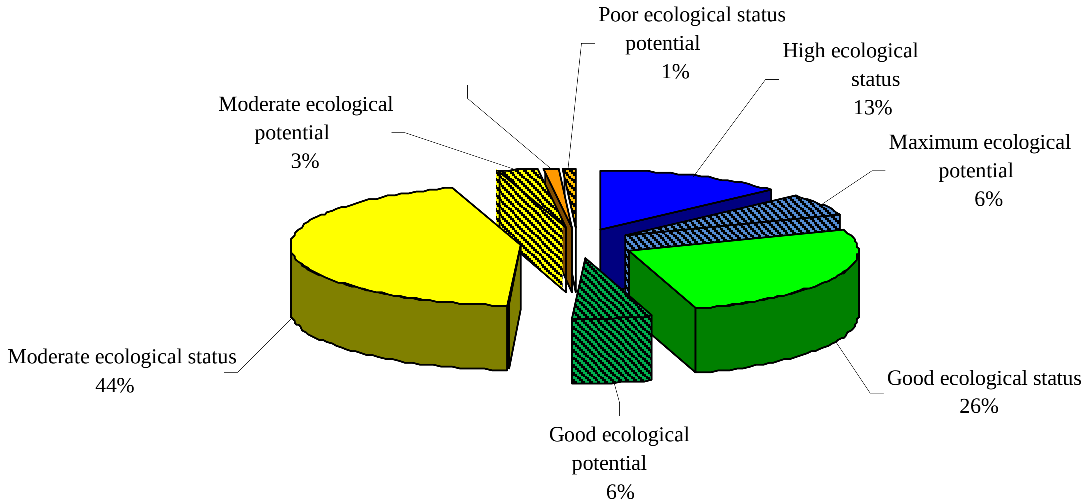


Figure 28. Ecological status and ecological potential of river water bodies in the Venta RBD

Source: experts' analysis results

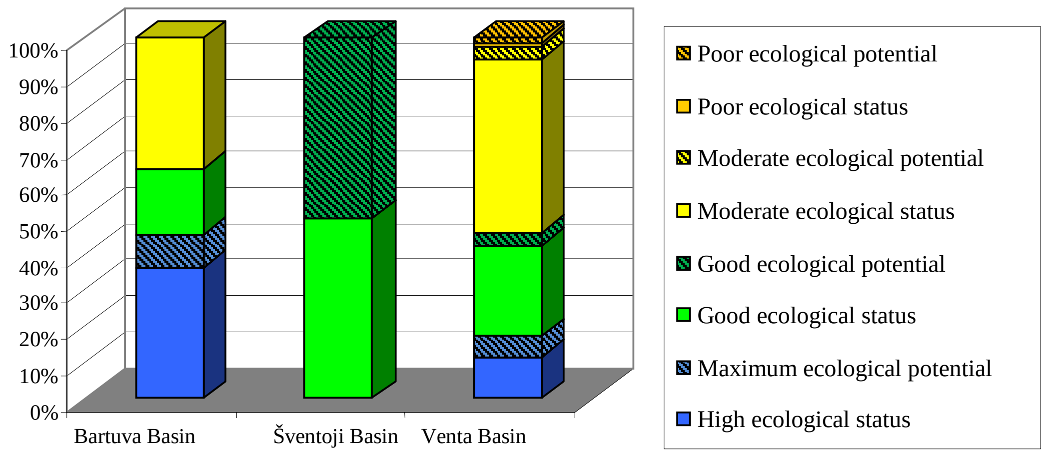


Figure 29. Ecological status and ecological potential of river water bodies in the Venta RBD

Source: experts' analysis results

An assessment of ecological status and ecological potential demonstrated that there are 47 water bodies (potentially) at ecological status poorer than good and 4 HMWB at ecological potential poorer than good within the Venta RBD. Analysis of factors determining ecological status showed that 31 water bodies with the aggregate length of 323 km fail the good ecological status requirements because of the straightening of their beds; 7 water bodies (52 km) fall short of the requirements for good ecological status due to water quality problems; poorer than good ecological status of 2 water bodies with the total length of 34 km is conditioned both by the bed straightening and water quality problems. HPP impacts determines poorer than good ecological status of 3 water bodies with the total length of 69.7 km. An aggregate impact of HPP and bed straightening determines poorer than good ecological status of one water body (5.8 km) and another water body (24 km) fails the good ecological status requirements due an impact of HPP and water quality problems. One water body (12 km) is subject to all risk factors: HP impact, straightening and water quality problems and one water body (10 km) suffers from pressures caused by water abstraction and bed straightening.

Poorer than good potential of 4 HMWB with the total length of 59 km is determined by water quality problems.

Reliability of assessment of ecological status and ecological potential is indicated by the level of confidence in the assessment which can be low, medium and high. Low level of confidence shows a likelihood of a major error meanwhile high level of confidence means that the ecological status or ecological potential was assessed with a minor error and hence is reliable.

An analysis of the level of confidence in the assessment of the ecological status and ecological potential of river water bodies in the Venta RBD demonstrated that high level of confidence can be granted to the assessment of the ecological status of three water bodies. The ecological status of 23 water bodies and ecological potential of two HMWB was identified with a medium level of confidence. Low confidence in the ecological status/potential assessment was granted in respect of the majority of water bodies in the Venta RBD: low confidence was granted in respect of the identification of the ecological status of 63 water bodies and ecological potential of 13 HMWB.

Distribution of river water bodies at different ecological status and ecological potential within the Venta RBD is demonstrated in Table 77.

Table 77. Distribution of river water bodies at different ecological status and ecological potential and their length within the Venta RBD

Basin	Ecological status									
	High		Good		Moderate		Poor		Bad	
	Number of water bodies	Length, km	Number of water bodies	Length, km	Number of water bodies	Length, km	Number of water bodies	Length, km	Number of water bodies	Length, km
Bartuva	4	134.6	2	28.1	4	44.7	0	0	0	0
Šventoji	0	0	3	86.1	0	0	0	0	0	0
Venta	10	99.8	22	361.8	42	477.9	1	8.4	0	0
Total in Venta RBD	**14**	**234.4**	**27**	**476**	**46**	**522.6**	**1**	**8.4**	**0**	**0**

Basin	Ecological potential									
	Maximum		Good		Moderate		Poor		Bad	
	Number of water bodies	Length, km	Number of water bodies	Length, km	Number of water bodies	Length, km	Number of water bodies	Length, km	Number of water bodies	Length, km
Bartuva	1	22.8	0		0	0	0	0	0	0
Šventoji	0	0	3	40.3	0	0	0	0	0	0
Venta	5	94	3	63.2	3	48.8	1	10.3	0	0
Total in Venta RBD	**6**	**116.8**	**6**	**103.5**	**3**	**48.8**	**1**	**10.3**	**0**	**0**

Source: experts' analysis results

Chemical status of rivers

83. The assessment of the chemical status of rivers was carried out on the basis of the river water quality monitoring data of 2005–2009 and taking into account into account the findings of the study “Screening of substances dangerous for the aquatic environment in Lithuania” conducted in 2006.

Following the water quality monitoring data, concentrations of specific pollutants (hazardous substances and priority hazardous substances) exceeded the allowable norms in six places: in the Venta downstream of Mažeikiai, in the Varduva at Grieža, in the Ašva at the Latvian border, in the Virvytė at Janapolė, in the mouth of the Šventoji and in the Bartuva upstream of Skuodas. Late, however, no significant pollution with specific pollutants was registered in the said places. Accordingly, the available monitoring data is not sufficient to prove that the rivers are currently failing good chemical status.

During the study “Screening of substances dangerous for the aquatic environment in Lithuania”, concentrations of di(2-ethylhexyl) phthalate (DEHP) were found to be exceeding the established norms in the Šventoji at the border and those of di(2-ethylhexyl) phthalate (DEHP) and trichloromethane – in the Venta at the border. Summary results of the water quality monitoring and the study demonstrated that in both cases exceeded concentrations of specific pollutants were registered in the rivers Šventoji and Venta.

However, routes and sources of the entry of the specific pollutants have not been identified. A potential source of pollution in the Venta is the oil refinery AB Mažeikių nafta effluents of which are transported to the Venta by the Varduva, therefore a stretch of the Varduva downstream of Mažeikiai oil refinery has been designated as a water body which fails good chemical status. Taking into account the analyses findings, it is assumed that a stretch of the Šventoji at the Latvian border up to the mouth is also failing good chemical status.

Ecological status and ecological potential of lakes and ponds

84. The ecological status of lakes within the Venta RBD was assessed on the basis of the following three information sources:

84.1. national monitoring data;

84.2. data presented in the study “Identification of Lithuanian lakes subject to restoration and preliminary selection of restoration measures for these lakes for the improvement of their status”;

84.3. mathematical modelling results.

When classifying the ecological status of lakes, priority was given to the national monitoring data, i.e. in case of availability of the national monitoring data on indicators of the ecological status of a lake, the lake in question was attributed to the status class indicated by the monitoring data, meanwhile the modelling results and the findings of the study were not taken into consideration. When no national monitoring data was available, the ecological status of lakes was classified observing the following principles:

Table 77. Ecological status classification principles for lakes

<table>
<tr><th colspan="2">Status according to modelling results</th><th>Status according to study findings</th><th>Final status</th></tr>
<tr><td colspan="2" rowspan="3">high</td><td>non-problematic lake</td><td>high</td></tr>
<tr><td>naturally eutrophic/of stable status, under anthropogenic pressures</td><td>good</td></tr>
<tr><td>problematic/at critical status</td><td>moderate</td></tr>
<tr><td colspan="2" rowspan="3">good</td><td>non-problematic lake</td><td>good</td></tr>
<tr><td>naturally eutrophic/of stable status, under anthropogenic pressures</td><td>good</td></tr>
<tr><td>problematic/at critical status</td><td>moderate</td></tr>
<tr><td>high</td><td>good</td><td>problematic – naturally old</td><td>good</td></tr>
<tr><td colspan="2" rowspan="3">moderate</td><td>non-problematic lake</td><td>good</td></tr>
<tr><td>naturally eutrophic/of stable status, under anthropogenic pressures</td><td>moderate</td></tr>
<tr><td>problematic/at critical status</td><td>moderate</td></tr>
<tr><td colspan="2" rowspan="3">poor</td><td>non-problematic lake</td><td>good</td></tr>
<tr><td>naturally eutrophic/of stable status, under anthropogenic pressures</td><td>moderate</td></tr>
<tr><td>problematic/at critical status</td><td>poor</td></tr>
</table>

Source: experts' data

Lakes Gludas, Paršežeris and Viekšnalių ežeras, where no monitoring data on parameters indicative of physico-chemical and biological elements is available, were assigned to respective ecological status classes on the basis of the assessment provided in the lake study and mathematical modelling data. Pursuant to the lake study, Lake Gludas is a problematic lake, therefore it was designated as a lake at moderate ecological status although its status should be high according to the modelling results. The lake study findings indicate anthropogenic pressures on Lake Paršežeris, meanwhile according to the modelling results its ecological status is high, so it was classified as a water body at good ecological status. The status of Lake Viekšnalių ežeras was assessed only on the basis of the modelling results (the lake study did not cover this lake), which suggested its good status, therefore the lake was designated as a water body at good ecological status.

85. Following the above said ecological status classification principles for lakes, 6 lakes of 12 ones with a surface area larger than 0.5 km^2 in the Venta RBD were identified as water bodies at risk. The ecological status of one lake (Germantas) is high both according to the monitoring and modelling data and the lake study findings, hence surveillance intensive monitoring of its reference conditions is proposed. The status of the remaining 5 lakes is good. Two of these, Plinkšių ežeras and Stervas, were identified as problematic in the lake study. However, since parameters of quality elements in these lakes do conform to the good ecological status criteria according to the national monitoring data, they were not designated as water bodies at risk.

86. The ecological potential of ponds in the Venta RBD was assessed on the basis of the national monitoring data. Four ponds of the eight ones larger than 0.5 km^2 in the Venta RBD were designated as water bodies at risk.

Table 78. Ecological status/potential of lakes and ponds in the Venta RBD

Lake / pond	**Ecological status / potential**	**Level of confidence in status assessment**
Biržulis*	poor	medium
Germantas	high	high
Gludas	moderate	low
Juodeikių pond	good	low
Kernų pond	maximum	low
Kivylių pond	moderate	medium
Lazdininkų pond	good	low
Lūkstas	good	high
Mastis	moderate	medium
Mosėdžio I pond	moderate	low
Paežerių ežeras	poor	medium
Paršežeris	good	low
Plinkšių ežeras	high	low
Sablauskių pond	moderate	low
Skuodo pond	good	low
Stervas	good	low
Tausalas	moderate	low
Ubiškės pond	poor	medium
Viekšnalių ežeras	good	low

* Lake Biržulis is deemed to be a HMWB

Source: experts' analysis result

87. Summing up the assessment of the ecological status and ecological potential of lakes and ponds in the Venta RBD, 2 water bodies are at high ecological status, 4 water bodies are at good ecological status, 4 water bodies are at moderate ecological status, 1 water body is at poor ecological status. 1 water body meets the requirements for maximum ecological potential, 3 water bodies are at good ecological potential, 3 water bodies are at moderate ecological potential, and 2 water bodies – at poor ecological potential (Ubiškės pond and Lake Biržulis).

High level of confidence was granted to the assessment of the ecological status/potential of lakes and ponds in respect in 2 water bodies (10%), medium confidence in the status assessment was granted in respect of 5 water bodies (25%) and low confidence – in respect of 13 water bodies (65%).

Monitoring of specific pollutants in lakes and ponds within the Venta RBD was not conducted. Since no data is available, it is assumed that all water bodies in the category of lakes within the Venta RBD are at good chemical status.

Summing up, at present 10 water bodies are at good ecological status or good ecological potential and 10 water bodies are failing the good ecological status/potential requirements.

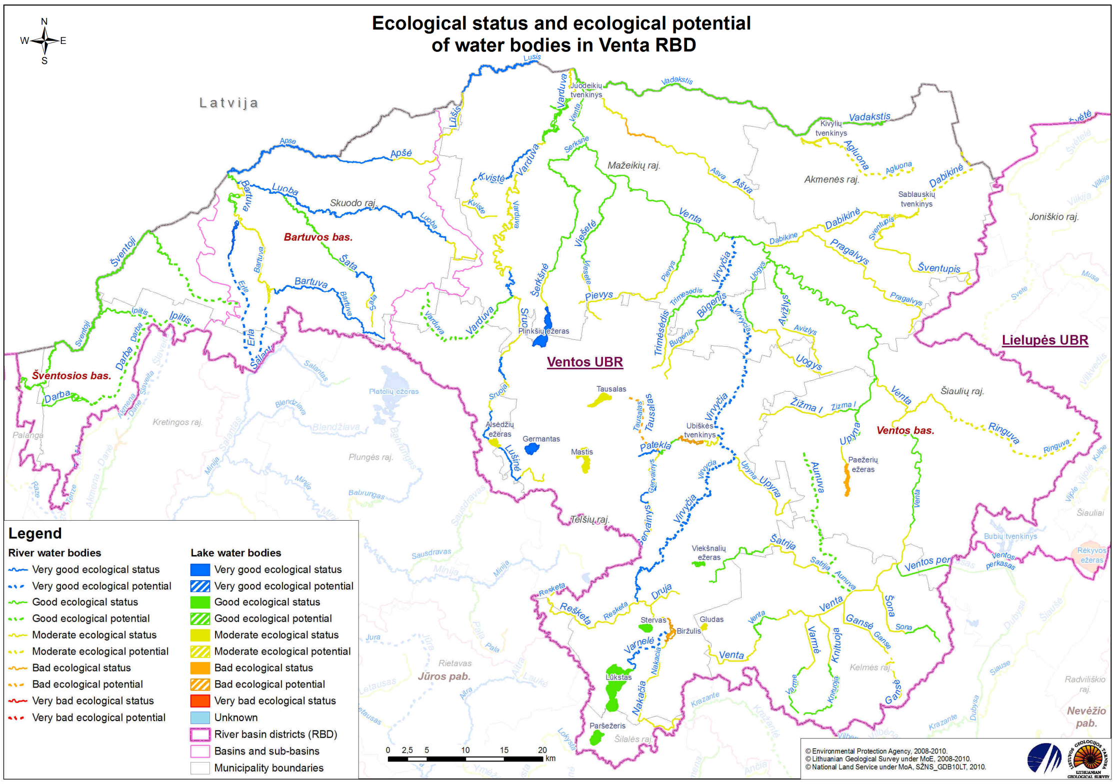


Figure 30. Ecological status and ecological potential of surface water bodies in the Venta RBD

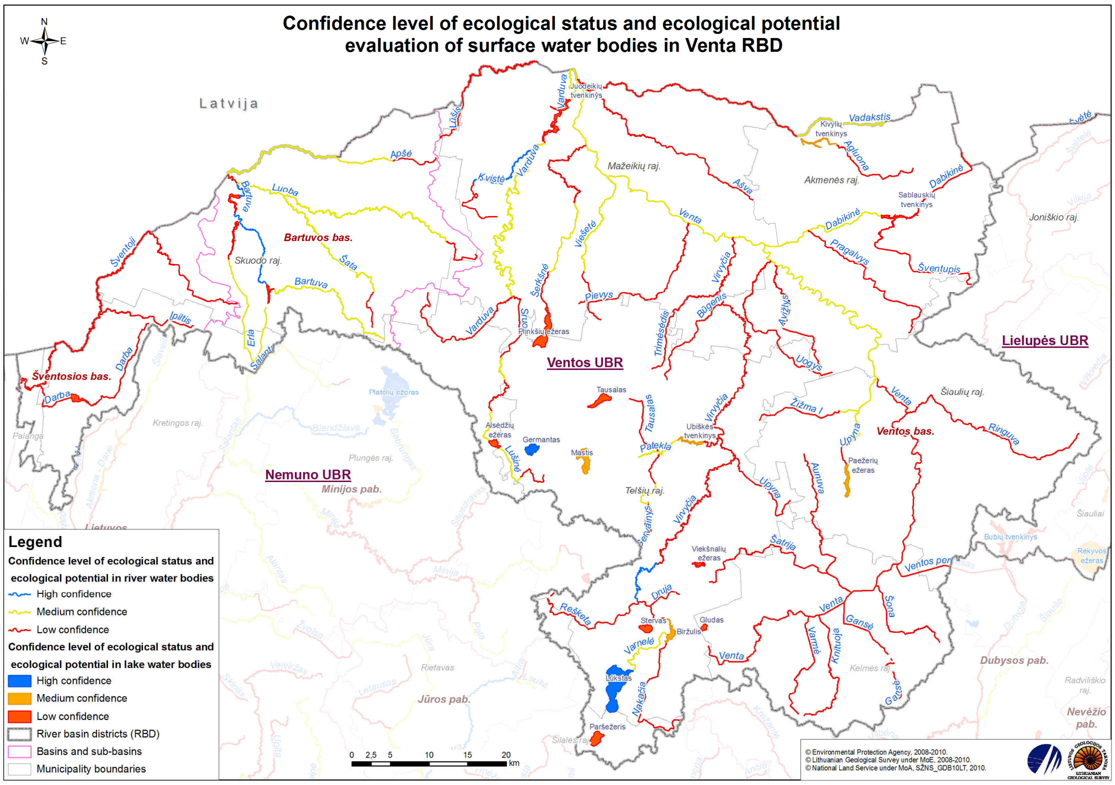


Figure 31. Level of confidence in the assessment of ecological status and ecological potential of surface water bodies in the Venta RBD

88. The chemical status of surface water bodies within the Venta is demonstrated in Figure 32 and the overall status – in Figure 33.

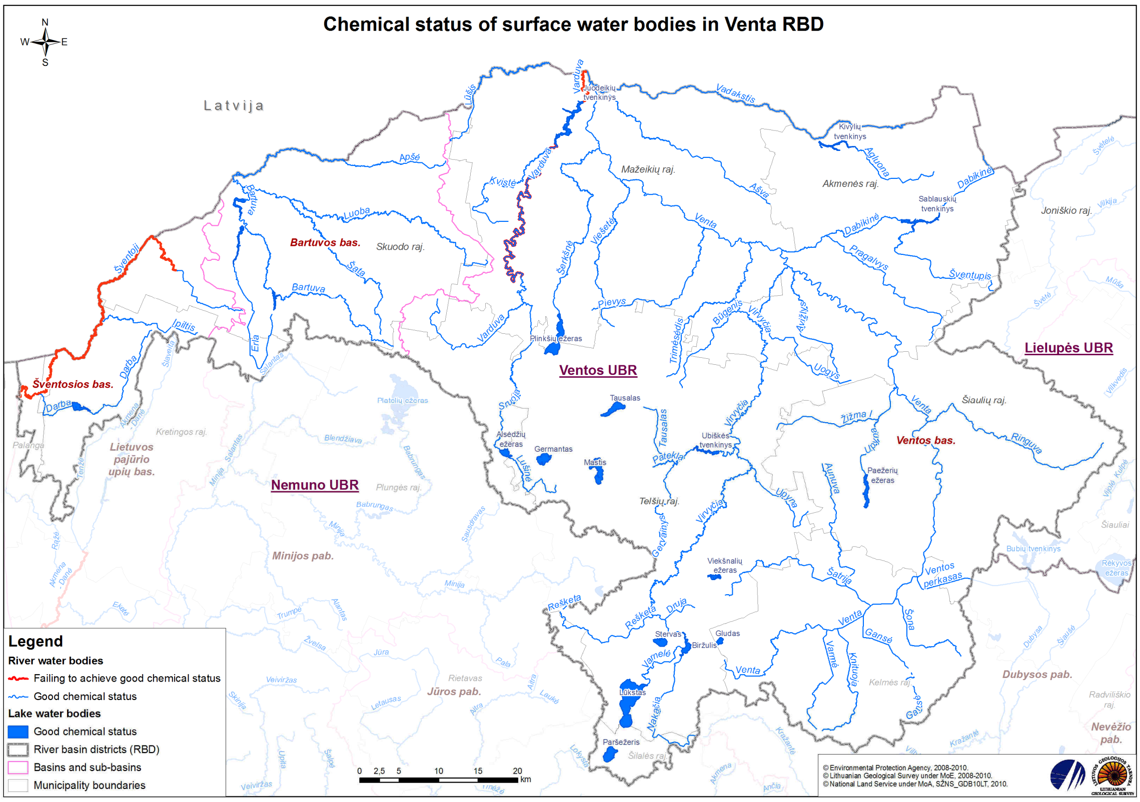


Figure 32. Chemical status of surface water bodies in the Venta RBD

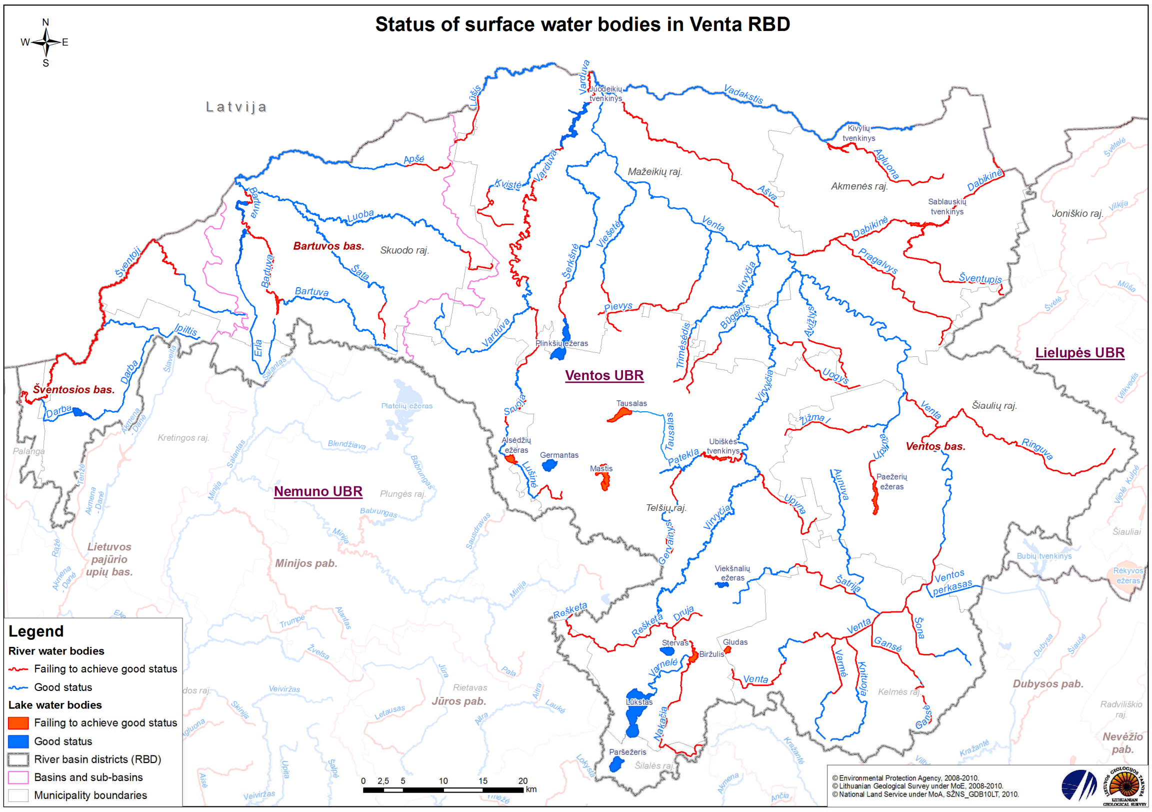


Figure 33. Overall status of surface water bodies in the Venta RBD

SECTION II. GROUNDWATER MONITORING

89. The objective set in the National Environmental Monitoring Programme for 2005-2010 approved by Resolution No. 130 of the Government of the Republic of Lithuania of 7 February 2005 (Žin., 2005, No. 19-608; 2008, No. 104-3973) is to assess sources of recovery of groundwater resources, trends of changes in the groundwater quality and respective factors, and to assess chemical composition of water in drinking water abstraction sites. To this end, general chemical composition of water as well as micro components, pesticides and organic compounds, biogenic elements therein are analysed/have to be analysed in selected 280 sites; the monitoring frequency – from once a year to once every two to six years.

National monitoring network

90. The groundwater national monitoring network in the river basins of the Venta RBD constitutes an important part of the national monitoring network in the country. Monitoring of groundwater quality and of groups of its individual indicators is conducted observing the principle of rotation: groundwater sampling for assessing general chemical composition and biogenic elements is more frequent (at least once a year) in a shallow aquifer the composition of which is changing more rapidly, and less frequent (every two years) – in confined aquifers. Specific chemical components, such as organic compounds, pesticides, metals the concentrations whereof in groundwater are very low, are monitored once in five years in selected wells where these components are likely to be detected.

The depth of occurrence of shallow groundwater is measured once a day with a help of electronic sensors. The groundwater table in confined aquifers is measured only prior to the sampling. The monitoring posts in the Venta RBD are demonstrated in Figure 34 and monitoring posts in the basins of the Venta RBD are listed in Table 79.

Table 79. National groundwater monitoring network in the Venta RBD

River basin	Type of aquifer		
	Shallow	Confined	
		Number of wells/posts	Geological index
Šventoji	-	1	D_3žg
Bartuva	1	2	D_3žg
Venta	5	9	agIII, P_2, D_3žg
Total:	**6**	**12**	

Source: LGS, 2009

Tables 80 and 81 list monitoring wells from which water samples are taken for the analysis of chemical status and quality of shallow and confined aquifers

Table 80. National monitoring posts for the monitoring of shallow groundwater quality

GWB code *	Monitoring post	Gr. No.	Basin	Coordinates		Geological index
				x	y	
LT003	Rūšupiai	296	Bartuva	6240251	349685	agIII
LT006	Vertininkai	203	Venta Tributaries	6186906	389451	lgIII
LT003	Daubariai	25388	Venta Tributaries	6241120	393896	gIII
LT003	Aunuvėnai	35982	Venta Tributaries	6190792	422823,5	lgIII
LT003	Papilė	35981	Venta Tributaries	6225315	424559	fIII
Total:			**5 wells**			

Source: LGS, 2009

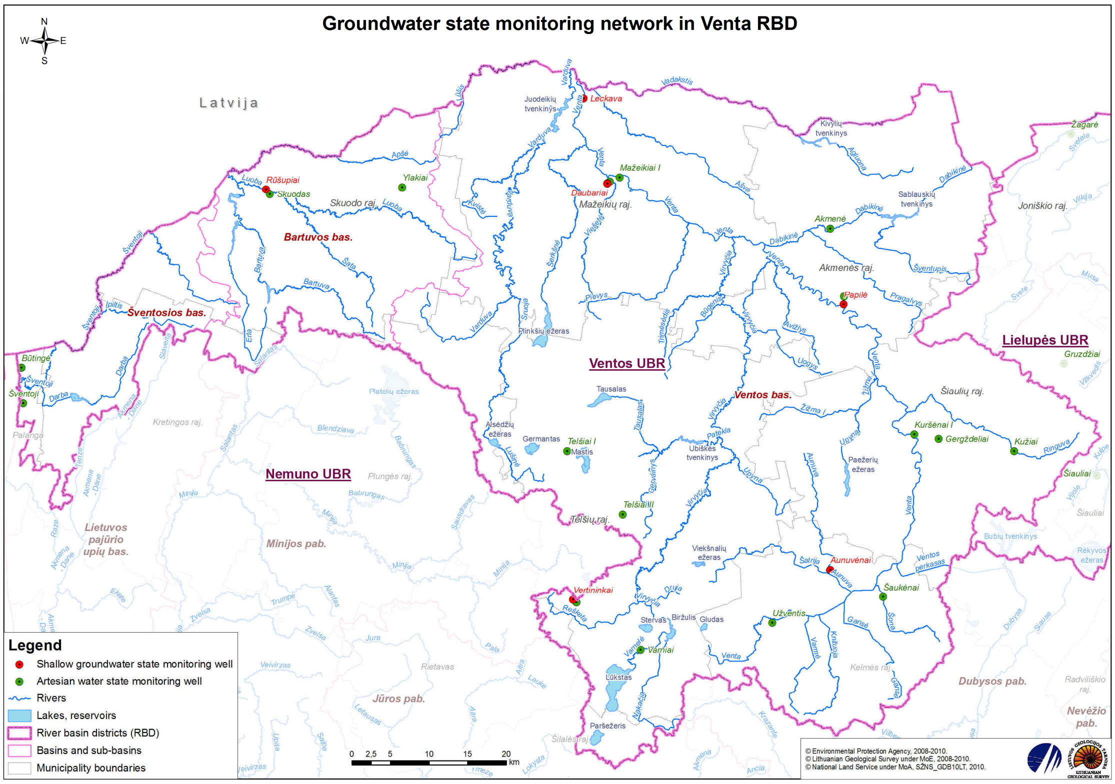


Figure 34. National groundwater monitoring network in the Venta RBD

Table 81. National monitoring posts for the monitoring of confined groundwater quality

GWB code	Monitoring post	Gr. No.	Basin	Coordinates		Index	Aquifer type
				x	y		
LT003	Šventoji	8594	Šventoji	6212400	318213	D_3žg	pre-Quaternary confined
LT003	Skuodas	8495	Bartuva	6239615	350179	D_3žg	pre-Quaternary confined
LT003	Ylakiai	19635	Bartuva	6240523	367327	P_2	pre-Quaternary confined
LT003	Telšiai I (Siraičiai)	7145	Venta Tributaries	6206212	388688	P_2	pre-Quaternary confined
LT006	Vertininkai	204	Venta Tributaries	6186647	389897	lgIII	kvartero spūdinis
LT003	Mažeikiai I	4644	Venta Tributaries	6241822	395514	D_3žg	pre-Quaternary confined
LT006	Telšiai II (Kungiai)	12509	Venta Tributaries	6197934	395888	agIII	kvartero spūdinis
LT006	Varniai	21431	Venta Tributaries	6180361	398221	P_2	pre-Quaternary confined
LT003	Užventis	15074	Venta Tributaries	6183860	415290	P_2	pre-Quaternary confined
LT003	Akmenė	8273	Venta Tributaries	6235157	422803	D_3žg	pre-Quaternary confined
LT003	Papilai	14763	Venta Tributaries	6226332	424599	P_2	pre-Quaternary confined
LT002	Kuršėnai I	22357	Venta Tributaries	6208376	433702	P_2	pre-Quaternary confined
LT006	Vertininkai	205	Venta Tributaries	6186647	389897	lgIII	Quaternary confined
Total:			**13 wells**				

Source: LGS, 2009

The groundwater water table is measured in posts listed in Table 82 below.

Table 82. National groundwater monitoring posts for the measuring of groundwater tables

GWB code	Monitoring post	Gr. No.	Basin	Coordinates x	Coordinates y	Index
LT003	Papilė	35981	Venta Tributaries	424559	6225315	fIII
LT003	Aunuvėnai	35982	Venta Tributaries	422823.5	6190792	lgIII
LT001	Daubariai	35936	Venta Tributaries	6241018	393898.4	gIII
LT001	Leckava, VMS	35980	Venta Tributaries	6252077	390826.8	aIV
LT006	Vertininkai	35946	Venta Tributaries	6186534	3899922	lgIII
Total:			**5 wells**			

Source: LGS, 2009

The density of the groundwater monitoring network in shallow and confined aquifers is provided in Tables 83 and 84.

Table 83. Shallow groundwater monitoring network in basins of the Venta RBD RBD

Basin	Basin area, km	100 km^2	Number of monitoring wells			Number of wells per 100 km^2	
			national	of economic entities	total number	national	total number
Venta	5.137	51.37	6	228	234	0.12	4.6
Mažeikiai				111			
excl. Mažeikiai	5.137	51.37	6	117	123	0.12	**2.4**
Bartuva	745.6	7.456	1	10	11	0.13	**1.5**
Šventoji	388	3.88		16	16	0	**4.1**
Total			**7**	**254**	**261**		

Source: LGS, 2009

Table 84. Confined aquifer monitoring network in GWB in the Venta RBD

GWB	Area, km^2	100 km^2	Number of monitoring wells			Number of wells per 100 km^2	
			national	of wellfields	total number	national	total number
Venta GWB of Permian-Upper Devonian deposits	6 247	62.47	21	27	48	0.34	0.77

Source: LGS, 2009

The present national monitoring network falls short of the latest environmental requirements. When developing the national monitoring network, the most important thing was to ensure that the monitoring posts more or less evenly reflect the natural shallow groundwater formation conditions and anthropogenic pressures on the area, and include all major aquifers utilised for public water supply. The interconnection of groundwater with surface water and other ecosystems was practically not taken into account at that time. This has resulted in uneven distribution of the national groundwater monitoring posts in individual river basins. For example, only the hydrochemical composition of confined water is monitored in the Šventoji Basin meanwhile data on the qualitative and quantitative status is not collected. Only the hydrochemical groundwater status is monitored in the Bartuva Basin.

Status of groundwater

91. A set of groundwater status maps demonstrating the chemical status of the major aquifers (groundwater bodies) and wellfields which are currently utilised has been compiled. Both the quantitative and chemical status of groundwater in the Venta RBD is good (Figures 35 and 36).

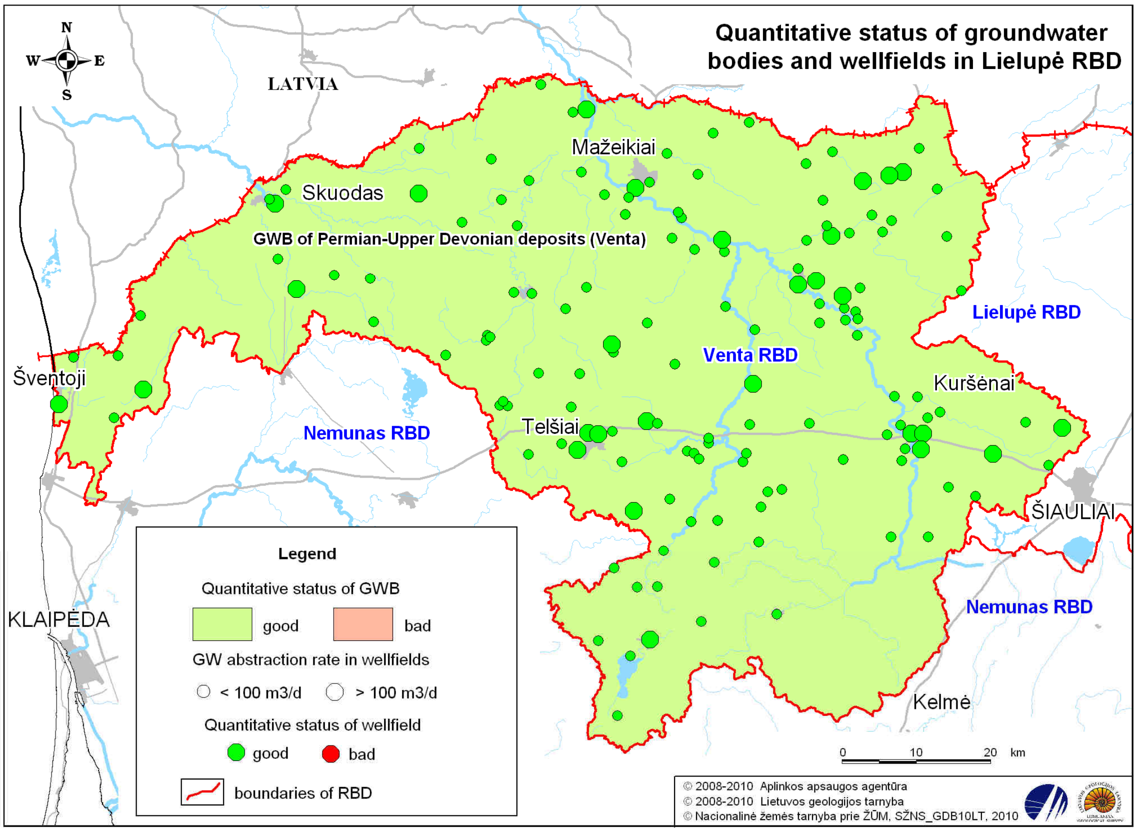


Figure 35. Quantitative status of groundwater bodies and wellfields in the Venta RBD

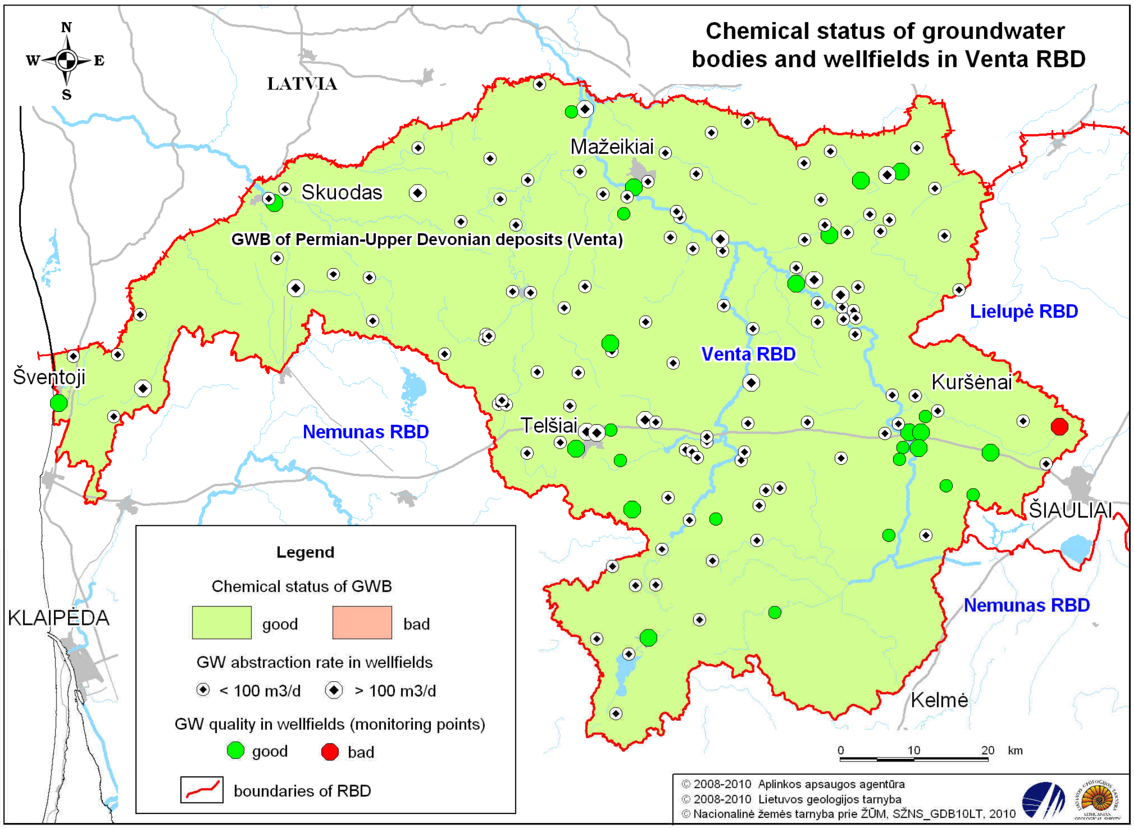


Figure 36. Chemical status of groundwater bodies and wellfields in the Venta

SECTION III. MONITORING OF PROTECTED AREAS

92. Pursuant to Order No. 695 of the Minister of Environment of the Republic of Lithuania of 31 December 2002 on the approval of the Monitoring Programme for Areas Important for the Conservation of Habitats or Birds (Žin., 2003, No. 4-161), monitoring in all areas of Community importance for the conservation of habitats and birds established in Lithuania must be carried out while implementing the Habitats Directive and the Birds Directive.

The objective of monitoring is to ensure collection of information on the status of and changes in the status of areas important for the conservation of habitats and birds as well as species and natural habitats therein that are subject to protection, and provision of this information to national and international authorities responsible for timely and adequate preparation and adoption of decisions necessary for the conservation of protected natural habitats and species of fauna or flora. The monitoring of areas important for the conservation of habitats and birds is supervised by the State Service for Protected Areas under the Ministry of Environment.

The status of and changes in the status of natural habitats under protection in areas important for the conservation of habitats and birds are observed in accordance with an approved action plan. The category of surface water bodies within the Venta Basin that are subject to monitoring pursuant to the General Requirements for the Monitoring of Water Bodies includes river estuaries, lake habitats and river habitats. The frequency of the habitat monitoring must be at least once every three years. The indicators subject to monitoring include the following: physical and chemical characteristics of water, variety and abundance of typical organisms, structure and distribution of plant communities. The scope and topics of the monitoring programmes differ depending on a protected area in question, varying from narrow programmes (e.g. monitoring of otters) to very wide ones (e.g. monitoring and assessment of the status of the location sites of plants included in the Red Book of Lithuania).

Certain parameters of monitoring of natural habitats or protected species (such as physical, chemical, dynamic characteristics of water, etc.) are not established when necessary and reliable data is obtained while carrying out monitoring in the same areas under other parts of the National Environmental Monitoring Programme. In such case monitoring of areas important for the conservation of habitats and birds and monitoring of the status of surface water bodies partially overlap both in respect of the parameters subject to monitoring and the frequency of monitoring, i.e. their objectives are the same.

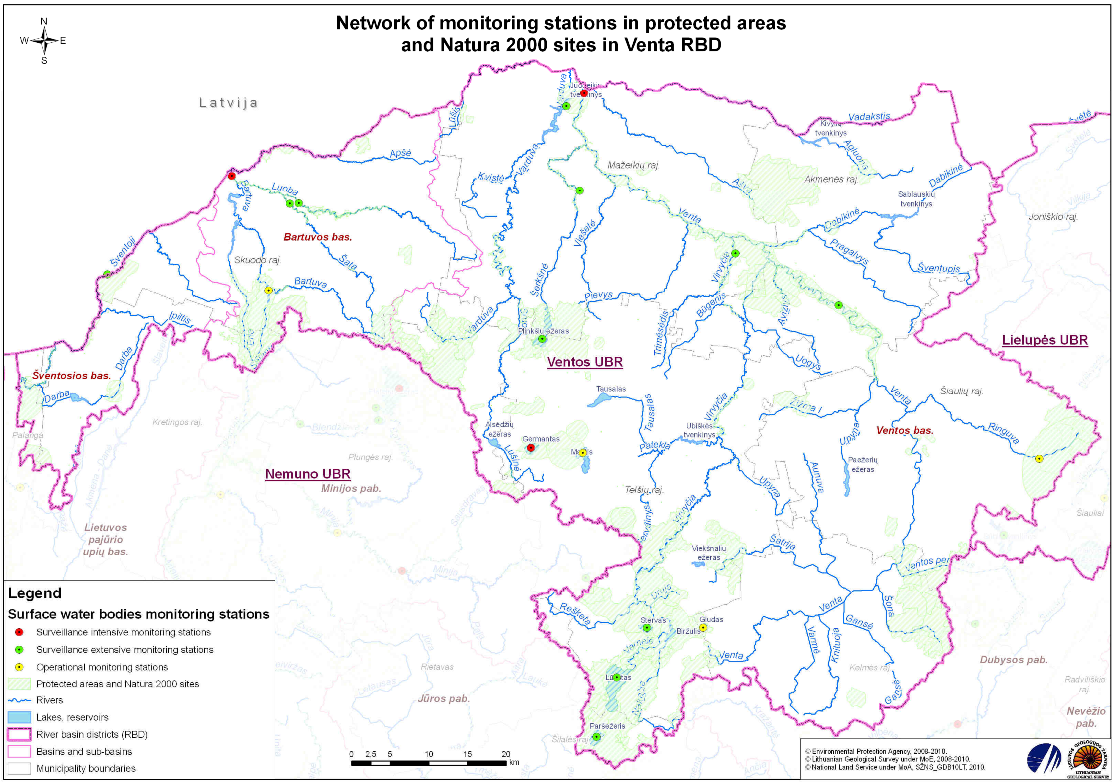


Figure 37. Monitoring network for protected areas in the Venta RBD

CHAPTER VI. ENVIRONMENTAL OBJECTIVES FOR SURFACE WATER BODIES AND GROUNDWATER WELLFIELDS

SECTION I. OVERALL WATER PROTECTION OBJECTIVES FOR SURFACE WATER BODIES

93. Pursuant to the requirements of the Law of the Republic of Lithuania on Water, compliance with the established quality standards and water protection objectives shall be achieved not later than by 2015. The key objectives are to prevent deterioration of status in all bodies of surface water and to achieve good status for all water bodies and good ecological potential for artificial and heavily modified water bodies.

For the purpose of reaching a balance between the needs of human economic activities and water protection objectives, a number of derogations have been provided for in the Law of the Republic of Lithuania on Water, including postponement of the set objective and establishment of a less stringent objective for reasons of technical feasibility, disproportionate costs, natural conditions, or pollution which is too high, if achievement of good status would involve severe negative socio-economic consequences which cannot be avoided by any other significantly better environmental options.

SECTION II. GOOD STATUS REQUIREMENTS FOR SURFACE WATER BODIES

Rivers

Biological elements

94. Classification systems applicable to the ecological status assessment in Lithuanian rivers have been developed (adapted) only for zoobenthos (DSFI) and fish fauna (LFI). Based on relationships between the values of LFI and DSFI as well as on the water quality and hydromorphological elements supporting the biological elements, threshold values of DSFI ≤ 0.63 and LFI ≤ 0.70 were set deviation from which would mean lower than good ecological status.

Physico-chemical elements

95. The general physico-chemical elements which have the most considerable impact on the status of biological elements in rivers include BOD_7, total phosphorus, $P\text{-}PO_4$, total nitrogen, $N\text{-}NH_4$, $N\text{-}NO_3$, and O_2. The values of the parameters for the water quality elements representing good ecological status of rivers which should be achieved by 2015 are provided in the table below.

Table 85. Parameter values of water quality elements for rivers

BOD_7, mgO_2/l	$\leq$3.3
P_{total}, mg/l	$\leq$0.14
$P\text{-}PO_4$, mg/l	$\leq$0.09
N_{total}, mg/l	$\leq$3.0
$N\text{-}NH_4$, mg/l	$\leq$0.2
$N\text{-}NO_3$, mg/l	$\leq$2.3
O_2, mg/l	$\geq$6.5 (in Type-2 rivers) $\geq$7.5 (in rivers of other types

Source: experts' analysis results

Hydromorphological elements

96. Hydromorphological elements are taken into account only for the purpose of identifying water bodies at high ecological status or maximum ecological potential. When the ecological status or ecological potential of a water body is lower than high according to the parameters indicative of biological elements, meanwhile the parameters indicative of physico-chemical and chemical elements do meet the high ecological status or maximum ecological potential requirements, the values for the hydromorphological elements are deemed to be meeting the requirements set for the relevant status/potential of the biological elements, i.e. the ecological status or ecological potential of the water body is not additionally classified on the basis of the parameters for these elements (assignment of the water body to a status/potential class lower than high/maximum is based only on the values of the parameters indicative of the biological quality elements). In other words, an analysis of potential causes of why values of the parameters indicative of the biological elements fail good ecological status or ecological potential would be limited to establishment (knowledge) of whether the parameters indicative of the hydromorphological elements have changed or not. On the other hand, the characterisation of the requirements for good ecological status to be aimed at and provision of adequate measures has involved formulation of criteria for good ecological status according to the hydromorphological elements.

96.1. Current data on aquatic organisms indicates that decrease in the water flow by more than 30% leads to poorer than good status of aquatic organisms. Continuously reduced water flow is one of the criteria for the assignment of water bodies to heavily modified water bodies. However, even individual, relatively short-term decreases in water flow can have a significant impact on the status of aquatic organisms (e.g. when water is accumulated or retained in ponds constructed for HPP or other purposes, and the natural yield is not let pass, or in the event of sharp and significant variations in the water yield when water is discharged from the pond situated on or connected to a river bed). All these factors should be included in the category of changes in the quantity and dynamics of the water flow. Hydrological parameters of rivers are deemed to be meeting the good status requirements when their deviation from the natural values of the mean of 30 days is ≤30%.

96.2. Straightened rivers with a slope less than 1.5 m/km which flow in plains over urbanised territories of the Venta RBD were identified as HMWB. Other straightened rivers were classified as water bodies at risk, expecting self-restoration of the river morphology in the long run. It is rather difficult to establish when morphological conditions ensure good ecological status according to biological elements because this also depends on the individual characteristics of a river in question. However, the overall goal would be to ensure at least partially natural conditions when:

96.2.1. natural riparian vegetation covers ≥50 % of the stretch length;

96.2.2. the cross-section of the bed is semi-natural, the bottom relief exhibits clear features of heterogeneity (the stretch contains both shallow and deeper places which determine changes in flow velocity and soil composition);

96.2.3. the form of the shoreline is heterogeneous, with coves or obstacles for the flow where flow velocity and/or direction is bound to change.

96.3. It is rather difficult to describe the aspired criteria for river continuity which would serve as a ground for concluding on conformity or failure to conform to the good status requirements for the biological elements, without taking into account hydromorphological changes conditioned by artificial barriers (impoundments). Artificial barriers are most damaging for populations of migratory fish (migrating from the sea to rivers or within river catchments). Every artificial barrier and resulting altered hydromorphological characteristics of the river above the barrier lead to either complete disappearance of migratory fish upstream of the barrier (fish which migrate from the sea to rivers), or significant reduction of resources of certain fish type (fish which migrate within river catchments). Even fish bypass channels (passes) do not prevent reduction of migratory fish resources, or complete disappearance thereof, due to disturbed reproduction (loss of spawning grounds and selective passing capacities of fish passes: not all fish manage to pass both towards the upper and lower reaches of the river). Taking into account the above-said, the objective is to improve the conditions for fish migration in places with current artificial barriers in rivers where migratory fish are living today or are known to have lived earlier.

Chemical status

97. The criteria for assessing the chemical status of surface waters are the maximum allowable concentrations of substances listed in Annexes 1 and 2 to the Wastewater Management Regulation approved by Order No. D1-236 of the Minister of Environment of the Republic of Lithuania of 17 May 2006 (Žin., 2006, No. 59-2103;

2010, No. 59-2938) in water bodies. Environmental quality standards (EQS) of certain priority hazardous substances in biota are set in paragraph 8.2.2 of the Wastewater Management Regulation. So far, no maximum allowable concentrations have been established for specific pollutants in bottom sediments.

Lakes

Biological elements

98. A classification system for the identification of the status of lakes within the Venta RBD has been completely developed only in respect of the parameters for chlorophyll *a* (which characterises the status of phytoplankton). The value for good ecological status in lakes to be aimed at is EQS ≥0.33 for phytoplankton.

Classification systems based on parameters for macrophyte and fish fauna have not been completed yet.

Physico-chemical elements

99. The general physico-chemical elements which have the most significant impact on the status of the biological quality elements in lakes are total nitrogen and total phosphorus. The values for the physico-chemical quality elements characterising good ecological status of lakes which should be attained in lakes by 2015 are as follows:

1) P_{total} – 0.06 mg/l

2) N_{total} – 1.8 mg/l

Hydromorphological elements

100. When the ecological status or ecological potential of a water body is lower than high according to the parameters indicative of biological elements, meanwhile the parameters indicative of physico-chemical and chemical elements do meet the high ecological status requirements, the values for hydromorphological elements are deemed to be meeting the requirements set for the relevant status/potential of the biological elements.

Classification systems for the identification of the status of lakes in the Venta RBD were developed only in respect of phytoplankton, which is more sensitive to changes in water quality. Systems in respect of biological quality elements which should be the most sensitive to changes in lake hydrology and morphology, i.e. macrophytes and fish, have not been completed yet. However, it is the reaction of these biological elements to hydromorphological changes that the criteria for good ecological status according to hydromorphological quality elements should be based on. There are examples in a geographically close river basin district, the Nemunas RBD, when decrease in the water level of a lake resulted in destruction of a variety of fish species. Yet, this data is not sufficient to be able to characterise pursued values of the ecological status according to the parameters indicative of hydromorphological quality elements which ensure good ecological status by the values of the parameters for biological quality elements. Since changes in parameters indicative of hydromorphological quality elements in lakes within the Venta RBD are relatively insignificant, the pursued values should be the same as the values which meet the requirements for high ecological status.

Chemical status

101. The criteria for assessing the chemical status of surface waters are the maximum allowable concentrations of substances listed in Annexes 1 and 2 to the Wastewater Management Regulation approved by Order No. D1-236 of the Minister of Environment of the Republic of Lithuania of 17 May 2006 (Žin., 2006, No. 59-2103; 2010, No. 59-2938) in water bodies. Environmental quality standards (EQS) of certain priority hazardous substances in biota are set in paragraph 8.2.2 of the Wastewater Management Regulation. So far, no maximum allowable concentrations have been established for specific pollutants in bottom sediments.

Requirements for ecological potential and water protection objectives for heavily modified and artificial water bodies

102. Classification of a body of water as a HMWB and AWB usually means that the ecological properties of the water body have been physically altered from the point of view of both morphological and hydrological characteristics. However, such designation does not account for ecological changes brought about by pollutants in water. The general quality criterion is good ecological potential achieved. It reflects ecological quality when a physical impact on a body of water, which allows classifying it as a HMWB or AWB, is acceptable. Further physical impact is deemed to be insignificant as long as it does not exceed a difference between reference conditions and good status in a natural body of water.

The classification of good ecological potential of HMWB or AWB was developed on the basis of an assessment of a degree of deviations from maximum ecological potential caused by anthropogenic pressures.

Artificial water bodies

103. By its ecological properties, the artificial Venta-Dubysa Canal is closest to rivers of Type 2. Maximum ecological potential of biological quality elements should conform to the good ecological status requirements set for natural rivers of a respective type. Accordingly, good ecological potential of quality elements should conform to the moderate ecological status requirements set for natural rivers: DSFI EQR $\geq$0.50 and LFI $\geq$0.40.

Requirements for physico-chemical quality elements and chemical status of artificial water bodies are the same as in natural water bodies of a respective type.

Heavily modified water bodies

104. Ponds with an area larger than 0.5 km^2 and their communities of aquatic organisms are comparable to those of natural lakes. Hence, good ecological potential of biological quality elements should meet the same good ecological status criteria applicable for lakes.

Table 86. The parameter value for good ecological potential of HMWB according to biological elements

Parameter	Parameter value
Chlorophyll *a* (mean of the EQR of the average annual value and the EQR of the maximum value)	$\leq$0.33

Source: experts' analysis results

105. It is proposed to characterise good ecological potential of heavily modified Lake Biržulis using the same criteria for chlorophyll a, total phosphorus and total nitrogen as the ones used for the characterisation of good ecological status of natural lakes in the Venta RBD.

106. The ecological potential of heavily modified straightened rivers should be assessed based on the system developed for natural rivers of a corresponding catchment size and slope. Good ecological potential of biological quality elements should meet the moderate status criteria established for natural rivers: DSFI EQR ≥0.50, LFI ≥0.40.

107. The ecological potential of the heavily modified stretch of the Virvytė downstream of Baltininkai HPP should be assessed based on the system developed for natural rivers of a corresponding catchment size and slope (Types 1 and 3). Good ecological potential of biological quality elements should meet the moderate status criteria established for natural rivers: DSFI EQR ≥0.50, LFI ≥0.40.

SECTION III. WATER PROTECTION OBJECTIVES FOR GROUNDWATER WELLFIELDS

108. Pursuant to the Procedure for the Establishment of Water Protection Objectives, the most important water protection objective is good quantitative and qualitative (chemical) status of groundwater wellfields:

108.1. when the status is good, it must be maintained;

108.2. when the status is lower than good, measures shall be introduced to improve the status;

108.3. when the status is critically going down, such process must be stopped.

There are no material changes in groundwater quality caused by groundwater pollution or abstraction in the Venta RBD. There is only one problem related to the quality of groundwater, which is of natural origin – the so-called anomaly of fluorides in aquifers of Upper Permian (P_2) and aquifers of Žagarė Upper Devonian (P_2) deposits. The solution of this problem is attributable to the category of the basic measures: the problem is expected to be solved after the implementation of the Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption (OJ 2004 special edition, Chapter 15, Volume 4, p. 90) (Drinking Water Directive). The measures are either to purify fluoride drinking water or to look for alternative water supply sources.

SECTION IV. ENVIRONMENTAL OBJECTIVES FOR PROTECTED AREAS

Environmental objectives for protected areas designated for the conservation of birds and habitats

109. The Habitats Directive and the Birds Directive require creating special protected areas for the conservation of birds and their habitats of Community importance. The implementation of the directives results in expansion of NATURA 2000 sites.

The objectives set in the Birds Directive and in the Habitats Directive support the objectives laid down in the Law of the Republic of Lithuania on Water. Both directives aim at sustainable development and ensuring quality of a living environment for both humans and birds. In certain cases, however, a question of priorities may arise, for instance, when constructing ponds, cleaning water bodies and adjusting these for recreation. Since protected areas occupy a very small part of the Lithuanian territory (10-15%), many constructions/activities can usually be placed outside the protected areas. Even remote economic activities may have a significant impact on the values of the protected areas. Therefore, significance of an impact of planned economic activities on NATURA 2000 sites must be established and, if necessary, an environmental impact assessment (EIA) performed.

110. The EU environmental policy ensures effective protection of the unique biological variety throughout Europe and guarantees that all EU Member States have the same legal obligations in respect of the conservation of areas included in NATURA 2000 network. Significance of an impact of planned economic activities on NATURA 2000 sites is established observing the Procedure for the Establishment of an Impact of Plans or Programmes and Planned Economic Activities on Potential NATURA 2000 Sites or Those Already Created, which was approved by Order No. D1-255 of the Minister of Environment of the Republic of Lithuania of 22 May 2006 (Žin., 2006, No. 61-2214).

SECTION V. EXTENSION OF THE DEADLINE FOR ACHIEVING ENVIRONMENTAL OBJECTIVES

111. The provisions on environmental objectives laid down in the Law of the Republic of Lithuania on Water include extension of the deadline for achieving these objectives, which means a possibility of short-term, medium-term or long-term deviation from good ecological status, which is otherwise to be attained by 2015.

Failure to achieve good ecological status by 2015 may be justified on the grounds of at least one of the following reasons:

111.1. the scale of improvements required can only be achieved in phases exceeding the timescale, for reasons of technical feasibility;

111.2. completing the improvements within the timescale would be disproportionately expensive;

111.3. natural conditions do not allow timely improvement in the status of the body of water.

112. An additional analysis was carried out upon the identification of the water bodies at risk within the Venta RBD (50 rivers, 10 lakes and ponds) in order to identify possibilities of achieving good ecological status or good ecological potential in these water bodies during the first cycle of the implementation of the Programme of Measures (2010-2015).

It is forecasted that good status or good potential during the first cycle will be achieved in 6 river water bodies. Good status will not be achieved in any lake/pond at risk. For the remaining water bodies at risk (44 rivers and 10 lakes/ponds), extension of the deadline for achieving environmental objectives is proposed for reasons of technical feasibility, disproportionate costs or natural conditions.

Technical feasibility

113. Technical reasons preventing the achievement of the good ecological status objectives can be as follows:

113.1. there is no technical solution to deal with the problem;

113.2. more time is needed to solve the problem than it has been provided;

113.3. there is no information on the cause of the problem hence no solution can be proposed.

114. The required extension for achieving good ecological status in water bodies within the Venta RBD is mainly related to the second and third reasons.

115. An analysis in the Venta RBD established the following uncertainties:

115.1. uncertainty about the status of water bodies in the category of rivers and lakes;

115.2. uncertainty about the impact of certain risk factors on water bodies;

115.3. uncertainty about the causes of poor status.

116. It is proposed to postpone the achievement of water protection objectives in water bodies where there is uncertainty about the status assessment results until more data verifying the status of such water bodies and enabling identification of significant pollution sources as well as assessment of the demand of supplementary measures is obtained. The status is not clear in three rivers of the total number of 50 river water bodies at risk and one lake.

117. River stretches affected by hydropower plants are designated as water bodies at risk. However, in many cases there is no data which would verify a negative impact of hydromorphological alterations on the status of water bodies. Hence, it is not absolutely clear whether pressures from these factors always determine lower than good ecological status/potential of a water body. Uncertainty about impacts of hydropower plants was established in respect of six water bodies in the category of rivers.

118. Mathematical modelling results showed that certain point pollution sources may be exerting a significant impact on the status/potential of receiving water bodies but the monitoring data proving such impact is not sufficient in all water bodies. Also, data is lacking to be able to identify the pollution source which exerts a significant impact. Only a few economic entities (in this case – certain urban wastewater treatment facilities) which are preliminary suspected to be preventing respective water bodies from the achievement of good ecological status by 2015 have been identified in the Venta RBD. However, significance of their impact has not been verified by any actual measurement data, so it is necessary to make sure that these entities can have a significant negative impact on respective water bodies before revising corresponding permits issued to thereto. To this end, investigative measures have been provided for in the Programme of Measures. Conditions of permits (in this instance – integrated pollution prevention and control permits) could be tightened only in the event of a significant impact, taking into account self-cleaning/dilution possibilities of receiving water bodies, even in cases when all formal treatment requirements laid down in relevant EU legislation are currently met at these entities.

119. Straightened rivers need to be mentioned separately. It is commonly agreed that river straightening deteriorates the ecological status of rivers and so such rivers are designated either as water bodies at risk or heavily modified water bodies. However, impacts of the straightening on the ecological status of water bodies have not been analysed in detail yet, therefore it is recommended to postpone the achievement of the objectives due to uncertainty about such impact. In addition, even if the cause was clear, the acceptability by the society and inability to afford renaturalisation of rivers would be a sufficient reason for the extension of the deadline for achieving good ecological status. There are 36 such water bodies within the Venta RBD.

120. Sources of pollution are not clear in four lakes and one pond. Also, technical feasibility of the problem solution are not clear in one of these lakes, which is a heavy modified water body due to changes in the hydrological regime (Lake Biržulis).

121. Operational or investigative monitoring has been envisaged for all risk factors the impact of which is not known yet or raises doubts. It is proposed to extend the deadline for achieving water protection objectives in these water bodies until more data proving a significant impact of the risk factors on the status/potential of the water bodies is obtained.

Disproportionate costs of status improvement within the established timescale

122. The question of whether the costs of a measure intended for the achievement of good ecological status in a water body are disproportionate and whether such costs may serve as a basis for derogation is a decision based on economic information. Such decision needs comparing relevant costs and benefits.

The principle of disproportionate costs, i.e. a cost-benefit comparison was not required in any case of extension of the deadline for the attainment of environmental objectives within the Venta RBD. All cases of extension are based either on technical uncertainties already discussed or on affordability, which will be addressed in the section below. The latter is in a way a component of the principle of disproportionate costs.

123. Out of the total number of 50 water bodies at risk in the category of rivers within the Venta RBD, as many as 36 water bodies were designated as such either due to straightening or because of both straightening and other risk factors. According to expert judgement, stretches situated in the upper reaches of the rivers should be left for natural renaturalisation. Renaturalisation is recommended for the straightened river stretches which are located in areas with a clear public demand (settlements, parks, etc.) as well as in places where renaturalisation can have a significant impact on the minimisation of floods, retention of pollutants and enhancement/restoration of biodiversity (habitats of plants and animals). The renaturalisation of these stretches, i.e. attainment of good ecological status in water bodies at risk, would require LTL 20.4 million by 2015.

Such measure would have to be implemented by respective municipalities or by the state using their own funds or EU assistance funds. As compared to the expenditure in the water sector during the last few years, the said amount is not very large; however, no additional funding sources can be found because all available ones already have their investment objects planned. At present, the state would not be able to afford such measure. Besides, impacts of the remeandering on the ecological status of specific streams are not known yet. Consequently, first of all a pilot project should be carried out (such project has been planned for the Nemunas RBD), and only then further actions should be taken on the basis of the project results.

Besides, renaturalisation of rivers may be unacceptable to the society because, in the context of lack of funds for such areas as education, health protection and creation of job vacancies, it may be seen as a “luxury” measure.

Natural conditions which prevent attainment of water protection objectives

124. Four standing-water and low-drainage lakes and ponds at risk due to impacts of diffuse pollution will not be able to achieve good ecological status and good ecological potential during the first cycle of the implementation of the Management Plan because even if pollutant input to water bodies is stopped, good ecological status/potential may be unattained due to resuspension of pollutants accumulated in bottoms sediments. Self-cleaning processes in standing waters and low-drainage water bodies are much slower than in the ecosystems of flowing water bodies. Self-restoration of more inert biological quality elements, such as macrophytes and fish, is an especially slow process. Accordingly, it is proposed to postpone the achievement of environmental objectives under the Law of the Republic of Lithuania on Water, which provides for a possibility to extend the deadline for achieving the objectives when the achievement is prevented by natural conditions. The water bodies within the Venta RBD where such extension would be required are Lake Paežerių ežeras and Ubiškės, Kivylių and Mosėdžio ponds.

The scheme for assessing the degree of achievement of good ecological status in all 60 water bodies at risk is demonstrated in Figure 38. The number of water bodies where the achievement of good ecological status is to be postponed is provided in Tables 88 and 89.

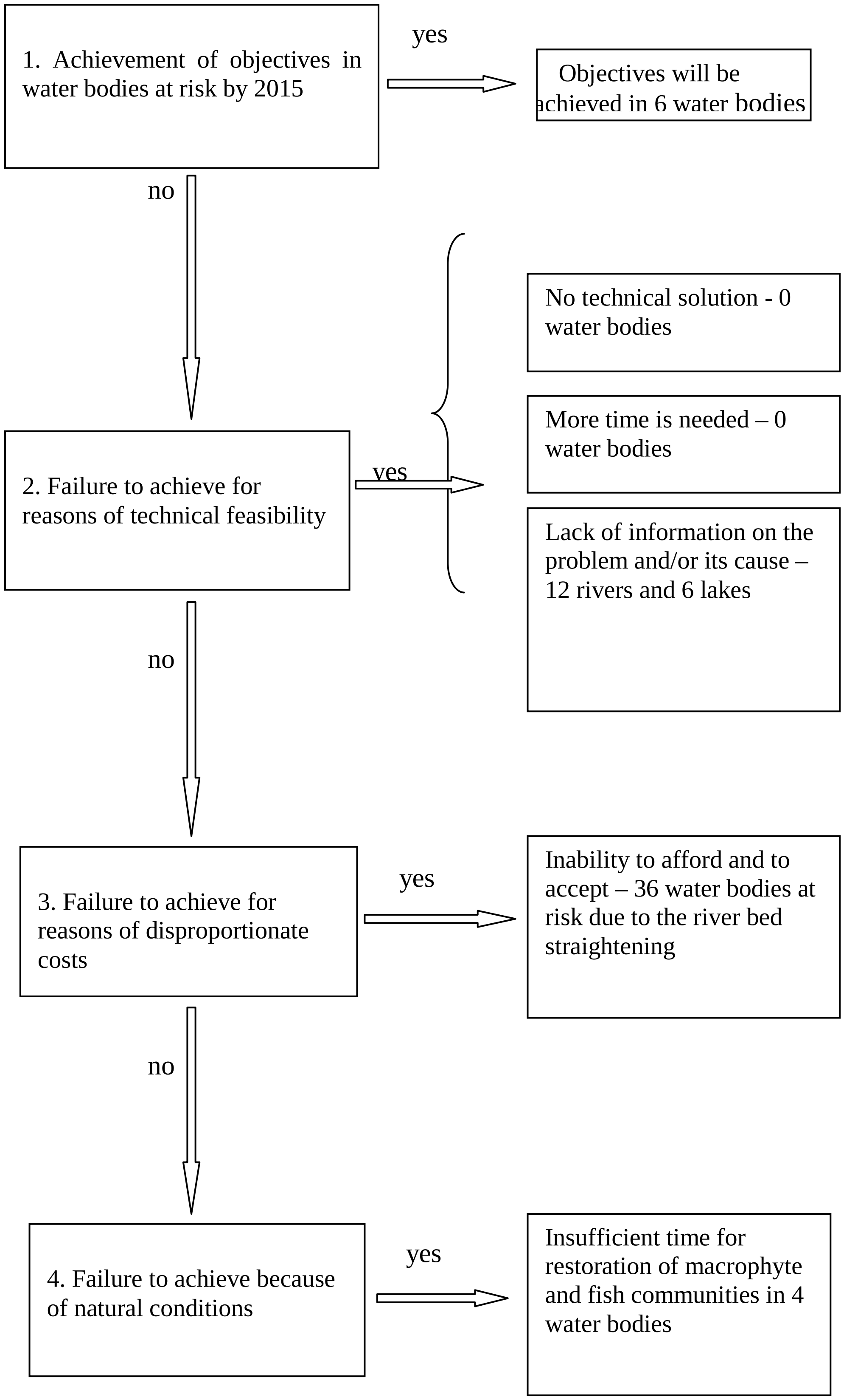


Figure 38. Steps of the deadline extension for achieving good ecological status in water bodies at risk

Note: Achievement of good status in a water body can be postponed due to several reasons, therefore the number of the water bodies given in the scheme does not coincide with the number of the water bodies at risk.

Transboundary pollution

126. Venta RBD is a transboundary river basin district hence a relevant issue here is transboundary pollution. Pollution loads generated on the territory of Lithuania are transported to Latvia by the rivers Venta and Bartuva. The average annual amounts transported from Lithuania to the neighbouring country by the Venta are estimated at about 2 313 tonnes of BOD_7, 118 tonnes of ammonium nitrogen, 2 756 tonnes of nitrate nitrogen and 10 tonnes of total phosphorus, and those transported by the Bartuva are about 370 tonnes of BOD_7, 10 tonnes of ammonium nitrogen, 385 tonnes of nitrate nitrogen, and 12 tonnes of total phosphorus.

There are seven river water bodies within the Venta RBD which flow out to the Latvian territory or flow along the Lithuanian-Latvian border. These are transboundary water bodies. Transboundary water bodies have been identified the rivers Venta, Vadaksnis, Lūšis, Šventoji, Bartuva and Apšė. None of these has been identified as a water body at risk. Two transboundary water bodies are at high ecological status, five ones are at good ecological status. One is a water body at risk because of pollution with hazardous substances. During the study “Screening of substances dangerous for the aquatic environment in Lithuania” (2006), concentrations of di(2-ethylhexyl) phthalate (DEHP) were found to be exceeding the established norms in a water body identified in the Šventoji. Concentrations of DEHP and trichloromethane exceeding the MAC were also found in the Venta at the border. It is believed that pollution with hazardous substances could have been transported to the Venta by the Varduva River. A separate water body in the Venta below the Varduva has not been distinguished because of a short distance; however, pollution in Lithuania can significantly affect the chemical status of the Venta on the Latvian territory. It should be noted that concentrations of hazardous substances exceeding the MAC were detected during one-time measurements, therefore additional analyses have been planned to identify the level of pollution with hazardous substances more accurately. Objectives of the achievement of good chemical status are postponed until more data on the level and source of pollution with hazardous substances is collected.

Transboundary water bodies and achievement of water protection objectives therein is provided in Tables 88 and 89 and demonstrated in Figure 39.

Table 87. Measures and extension of the deadline for achievement of water protection objectives in water bodies in the Venta RBD (water bodies in bold italics are transboundary water bodies)

WB code	***Basin***	***River***	***Length of WB, km***	***Type***	***HMWB***	***Achievement of water protection objectives***	***Envisaged supplementary measures for achievement of water protection objectives***	***Reasons of deadline extension***					
								Uncertainty about status	***Uncertainty about the impact of river bed straightening and lack of affordability***	***Uncertainty about the impact***			***Uncertainty about technical feasibility to reduce diffuse pollution***
										HPP	***Water abstraction***	***Point pollution***	
300100011	Venta	Venta	11.6	1	0	Deadline extended			1				
300100013	Venta	Venta	5.8	1	0	Deadline extended			1	1			
300100014	Venta	Venta	20.2	2	0	Deadline extended			1				
300100702	Venta	Varmė	8.0	1	0	Deadline extended			1				
300100902	Venta	Knituoja	7.1	1	0	Deadline extended			1				
300101301	Venta	Gansė	9.0	1	0	Deadline extended			1				
300101302	Venta	Gansė	10.3	1	0	Deadline extended			1		1		
300101742	Venta	Šatrija	11.0	1	0	Deadline extended			1				
300102102	Venta	Šona	8.8	1	0	Deadline extended			1				
300103801	Venta	Ringuva	22.2	1	1	Until 2015	1						
300103802	Venta	Ringuva	9.0	2	0	Until 2015	1						
300104801	Venta	Žižma I	12.2	1	0	Deadline extended			1				
300104871	Venta	Upyna	4.0	1	0	Deadline extended			1				
300105801	Venta	Avižlys	8.5	1	0	Deadline extended			1				
300105901	Venta	Uogys	15.1	1	0	Deadline extended			1				
300106101	Venta	Dabikinė	12.5	1	1	Until 2015	1						
300106102	Venta	Dabikinė	12.3	3	0	Deadline extended		1	1	1			
300106103	Venta	Dabikinė	8.0	3	0	Deadline extended		1					
300106281	Venta	Šventupis	17.1	1	0	Deadline extended			1				
300106282	Venta	Šventupis	6.4	1	0	Until 2015	1						
300106651	Venta	Pragalvys	25.7	1	0	Deadline extended			1				
300107401	Venta	Virvytė	6.4	3	0	Deadline extended			1				
300107431	Venta	Nakačia	20.9	1	0	Deadline extended			1				

WB code	Basin	River	Length of WB, km	Type	HMWB	Achievement of water protection objectives	Envisaged supplementary measures for achievement of water protection objectives	Reasons of deadline extension					
								Uncertainty about status	Uncertainty about the impact of river bed straightening and lack of affordability	Uncertainty about the impact			Uncertainty about technical feasibility to reduce diffuse pollution
										HPP	Water abstraction	Point pollution	
300107621	Venta	Druja	5.1	1	0	Deadline extended			1				
300107711	Venta	Rešketa	19.3	1	0	Deadline extended			1				
300107911	Venta	Upyna	14.4	1	0	Deadline extended			1				
300108253	Venta	Patekla	5.2	2	0	Deadline extended				1			
300108321	Venta	Tausalas	10.3	1	1	Deadline extended						1	
300108441	Venta	Gervainys	6.8	1	0	Deadline extended			1				
300108443	Venta	Gervainys	5.0	1	0	Deadline extended			1				
300108731	Venta	Bugenis	9.1	1	0	Deadline extended			1				
300108811	Venta	Trimesėdis	7.4	1	0	Deadline extended			1				
300109701	Venta	Pievys	19.1	1	0	Deadline extended			1				
300110401	Venta	Viešetė	6.4	1	0	Deadline extended			1				
300110901	Venta	Šerkšnė	5.6	1	0	Deadline extended			1				
300111811	Venta	Agluona	14.1	1	1	Deadline extended						1	
300112361	Venta	Ašva	16.7	1	0	Deadline extended			1				
300112362	Venta	Ašva	8.4	1	0	Until 2015	1						
300112363	Venta	Ašva	7.7	1	0	Until 2015	1						
300113104	Venta	Varduva	55.4	3	0	Deadline extended				1			
300113262	Venta	Sruoja	9.1	1	0	Deadline extended				1			
300113264	Venta	Sruoja	10.6	3	0	Deadline extended			1				
300113271	Venta	Lūšinė	6.0	1	0	Deadline extended			1				
300113511	Venta	Kvistė	11.0	1	0	Deadline extended			1				
300114301	Venta	Lūšis	8.0	1	0	Deadline extended			1				
700108102	Šventoji	***Šventoji***	69.9	2	0	Deadline extended		1					
800120102	Bartuva	Bartuva	24.0	3	0	Deadline extended				1			
800121101	Bartuva	Luoba	7.8	1	0	Deadline extended			1				

WB code	***Basin***	***River***	***Length of WB, km***	***Type***	***HMWB***	***Achievement of water protection objectives***	***Envisaged supplementary measures for achievement of water protection objectives***	***Reasons of deadline extension***					
								Uncertainty about status	***Uncertainty about the impact of river bed straightening and lack of affordability***	***Uncertainty about the impact***			***Uncertainty about technical feasibility to reduce diffuse pollution***
										HPP	***Water abstraction***	***Point pollution***	
800121271	Bartuva	Šata	5.7	1	0	Deadline extended			1				
800121701	Bartuva	Apšė	7.2	1	0	Deadline extended			1				

* Supplementary measures:

1 – National agricultural pollution reduction measures:

- manure management in small farms,
- fertilisation plans in farms with more than 10 ha of utilised land,
- revision of the manure absorption capacity coefficient;

2 – More favourable conditions to use support schemes under the RDP;

3 – Compensatory scheme for the application of fertilisation norms 20% lower than the optimal one;

4 – Compensatory scheme for the sowing of sandy and mixed soils with catch crops.

Table 88. Achievement of water protection objectives in water bodies at risk in the category of lakes and ponds in the Venta RBD

WB code	**Basin**	**Lake/pond**	**Length of WB, km**	**Type**	**HMWB**	**Achievement of water protection objectives**	**Reasons of deadline extension**			
							Uncertainty about status	**Uncertainty about pollution sources**	**Uncertainty about achievement of good status after the removal of impact**	**Uncertainty about technical feasibility to reduce impact**
330030014	Venta	Lake Gludas	0.533	1	0	Deadline extended	1			
330030140	Venta	Lake Alsėdžių ežeras	0.905	1	0	Deadline extended		1		
330040090	Venta	Lake Mastis	2.717	1	0	Deadline extended		1		
330040095	Venta	Lake Tausalas	1.905	2	0	Deadline extended		1		
230050140	Venta	Sablauskių	1.116	1	1	Deadline		1		

WB code	Basin	Lake/pond	Length of WB, km	Type	HMWB	Achievement of water protection objectives	Reasons of deadline extension			
							Uncertainty about status	Uncertainty about pollution sources	Uncertainty about achievement of good status after the removal of impact	Uncertainty about technical feasibility to reduce impact
		pond				extended				
330040050	Venta	Lake Paežerių ežeras	1.514	1	0	Deadline extended			1	
230050271	Venta	Kivylių pond	0.768	1	1	Deadline extended			1	
230050180	Venta	Ubiškės pond	0.754	2	1	Deadline extended			1	
330040060	Venta	Lake Biržulis	1.19	1	1	Deadline extended		1		1
230050100	Bartuva	Mosėdžio I pond	0.542	1	1	Deadline extended			1	

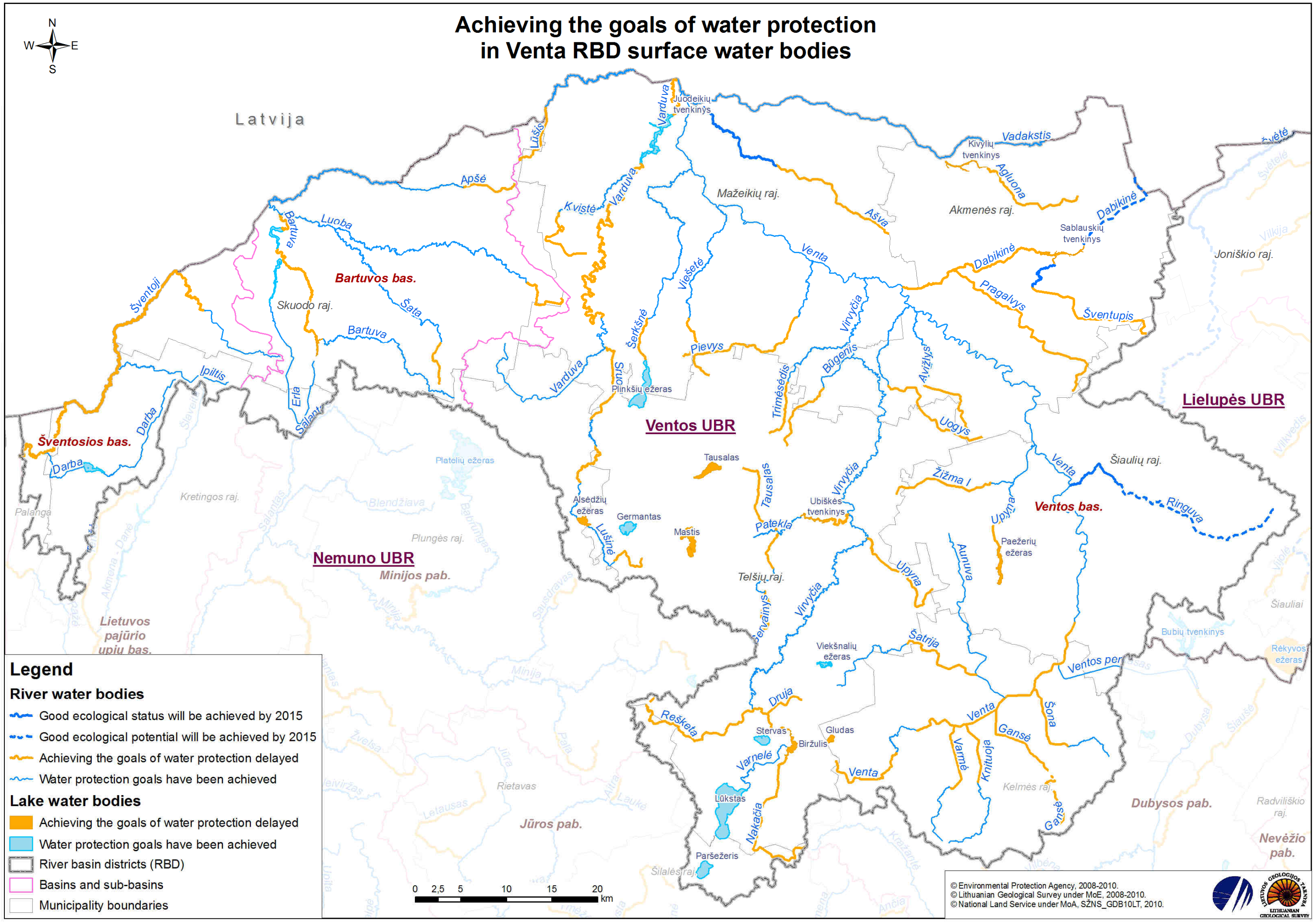


Figure 39. Achievement of water protection objectives in surface water bodies in the Venta RBD

CHAPTER VII. SUMMARY ECONOMIC ANALYSIS OF WATER USE

SECTION I. GENERAL OVERVIEW OF THE SITUATION

1267. With the area of 6 277 km^2, the Venta RBD constitutes 9.6% of the total area of the country and is the third largest river basin district in Lithuania. The Venta RBD consists of the Venta, Bartuva and Šventoji basins. The Venta Basin takes up 82% (5 138 km^2) of the total area of the RBD. The remaining area is shared by the Bartuva Basin (749 km^2) and Šventoji Basin (390 km^2). Most of the population (188 thousand) live in the Venta Basin and the total number of the population in the Venta RBD is 220 thousand, which is 6.5% of the total population in the country. The density of the population varies from 37 inhabitants per km^2 in the Venta Basin to 28 inhabitants per km^2 in Bartuva Basin or 29 inhabitants per km^2 in the Šventoji Basin.

The Šventoji Basin situates 50% of Palanga town municipality, 13.7% of Skuodas district municipality and 22.8% of Kretinga district municipality (by area). The latter municipality constitutes almost 58% of the total area of the Šventoji Basin. The largest share of the Bartuva Basin is taken by Skuodas district. 76% of Skuodas district municipality is situated in this basin. Municipalities situated in the Venta Basin are as follows: 98% of Akmenė district municipality, 99% of Mažeikiai district municipality, 90% of Telšiai district municipality, 49% of Šiauliai district municipality, 35% of Kelmė district municipality and a few other municipalities. The largest area in the Venta Basin is occupied by Telšiai district and Mažeikiai district municipalities (25.3% and 23.5% respectively).

Table 89. Comparison of the general indicators in four RBD, 2008

	Venta RBD	**Venta RBD**	**Venta RBD**	**Nemunas RBD**	**Lithuania**
Area, km^2	6 277.3	8 949.1	1 870.8	48 202.8	65 300
Share of the area from the total area of Lithuania, %	9.6%	13.7%	2.9%	73.8%	100%
Number of population	220 000	387 271	57 534	2 710 813	3 375 618
Density of population	35	43	31	56	52
Share of the total number of population in Lithuania, %	6.5%	11.5%	1.7%	80.3%	100%
Total GDP, LTL million	5 935.07	9 114.13	1 629.02	81 460.48338	98 138.7
Share of GDP in the RBD from the national GDP	6.0%	9.3%	1.7%	83.0%	100%
GDP per capita, LTL	26 978	23534	28 314	30 050	29 073
Average disposable monthly income per household member	884	882	869	1013	987
Working-age population	130 725	230 375	37 149	1 811 276	2 209 525
Registered unemployed population (April 2010)	22 251	32 193	5 500	247180	307 124
Share of registered unemployed population from working-age population	17.0%	14.0%	14.8%	13.6%	13.9%
Total water consumption, thousand m^3, 2009	11 304	10 658	1 916 758	3 390 993	5 329 713

Source: Statistics Lithuania, the data recalculated by experts for the RBD following population distribution in individual RBD

The data in Table 89 demonstrates that GDP in the Venta RBD in 2008 totalled to LTL 5 935 million, which accounted for 6% of the national GDP. The GDP share per capita was LTL 26 978, which is a little lower than the Lithuanian average, excluding the large cities (these are situated in the Nemunas RBD). The indicator is lower in the Venta Basin – a little less than LTL 26 thousand per capita, in the Bartuva and Šventoji basins – around LTL 33 thousand per capita.

The average monthly disposable income per household member in the Venta RBD in 2008 was the lowest in the RBD and totalled to LTL 874, meanwhile in the Šventoji and Bartuva basins it was LTL 942. The national average in 2008 was LTL 987 per household member. Registered unemployed population in the Venta RBD in 2008 accounted for 17.5% of the total working-age population; the national figure was 13.9%.

The annual water consumption in the Venta RBD in 2008 totalled to 11 303.5 thousand m^3, which is 0.2% of the total water consumption in Lithuania. Apart from the water volume consumed for energy purposes, the water consumption in the Venta RBD accounts for 4.2% of the total consumption in Lithuania. The highest consumption is registered in the household sector. The distribution of water consumption by sectors is provided in Figure 40 below.

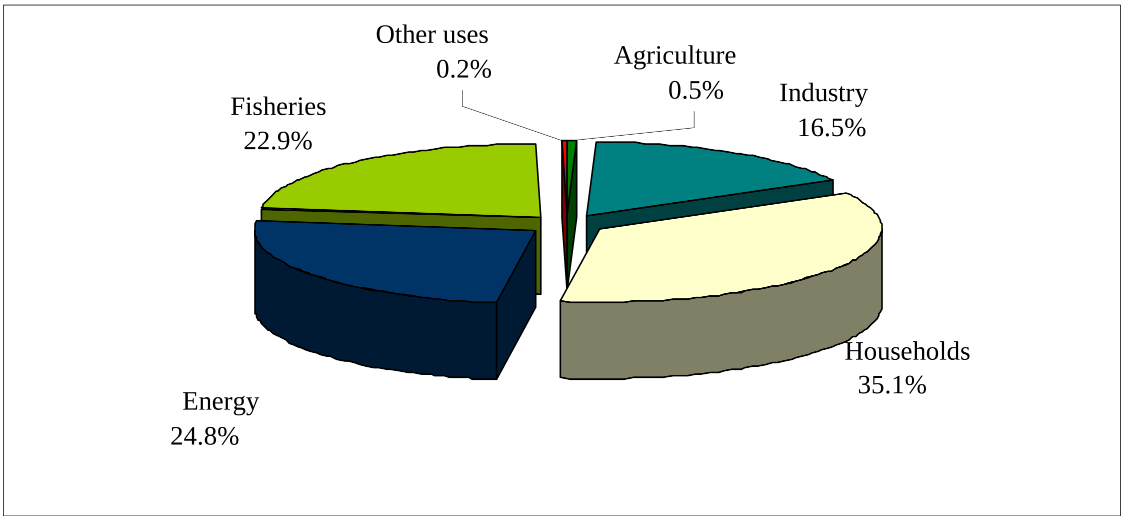


Figure 40. Water consumption in the Venta RBD in 2009
Source: Statistics Lithuania. The chart was drawn by the Expert

Differently from the data on water consumption, information on the wastewater treatment level is given on the basis of the information on municipalities provided by the Statistics Lithuania instead of observing the proportions of the population number in the RBD basins.

There is no untreated wastewater discharged in five major municipalities within the Venta RBD (Akmenė, Telšiai, Mažeikiai, Skuodas and Palanga) (the respective national figure is 0.3%); however, the treatment quality is insufficient: almost 57% of wastewater is treated below the established standards meanwhile in Lithuania this figure is 27% (excluding wastewater which is generally not subject to treatment).

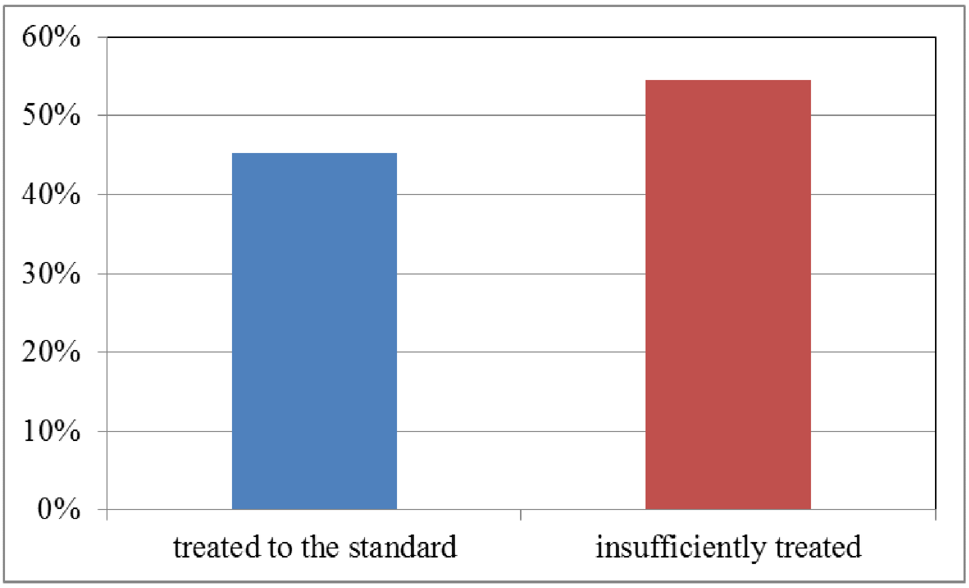


Figure 41. Level of treatment in five municipalities in the Venta RBD in 2008
Source: Statistics Lithuania. The chart was drawn by the Expert.

SECTION II. ANALYSIS OF ECONOMIC SECTORS

127. An analysis of sectors related to and affecting the use of water resources demonstrated that the main drivers of the major pressures on surface water bodies include households, industry, energy, agriculture and fisheries. The main source of pollution identified in the Venta and Bartuva basins is agricultural pollution.

Five HPP of 28, which are currently operating in the Venta RBD, are not likely to have any major impact on the river stretches downstream of the dams (provided that turbines are operated at the most efficient mode, so that the hydrological regime in the tail bay is close to the natural one to the maximum extent). Other two HPP (Leckava HPP and Kernai HPP) are standing very close to the river mouth (no measures will be effective, their significance on the overall ecological status of water bodies is very low within a wider context) hence the river stretches below the said HPP should not be designated as water bodies subject to a significant impact. The remaining 21 HPP do exert a significant impact on the river stretches downstream of the dams, 10 of them have been constructed on the Virvytė, a heavily modified water body as a result of the HPP operation. Turbines which significantly injure fish and do not conform to the runoff regime should be replaced with environmentally friendlier ones in four HPP in the Venta RBD. Five water bodies which are affected by hydrological fluctuations conditioned by HPP have been designated as HMWB.

In addition, two water bodies (rivers Varduva and Šventoji) are classified as being at risk due to hazardous substances. The length of hydromorphologically altered rivers as a result of straightening, which was carried out back in Soviet times, totals to almost 560 km. The sectors which generate major loads on water bodies are discussed in more detail below.

Differently from countries with insufficient water resources, Lithuania little depends on water resources, which do not have any significant influence on the selection of an economic activity (except for activities directly connected with water resources, such as hydropower and navigation) or place of residence. The analysis of pressures given above, economic activities and supplementary measures required in the Venta RBD as described further in the text demonstrated that the input of agriculture, which generates relatively higher loads on water bodies, to the GDP is lower than the input of industry, which has a lower impact on water resources. Pollution generated in the process of other activities is more or less proportionate to the economical product produced thereby.

Households

128. The household sector is one of the most important users of water resources. In 2008, the average consumption of water by one member of a household connected to a centralised network in Lithuania was 63 litres per day[3]. The consumption in Akmenė district was 46 litres per day, in Telšiai district – 56, in Mažeikiai district – 66, in Skuodas district – 49, in Palanga town – 78. The average daily consumption by one inhabitant serviced by five water supply companies totalled to 66 litres in 2008.

Implementation of the LGS project "Assessment of groundwater resources in Lithuania" included development of forecasts for groundwater abstraction and demand of water supply for public purposes in Lithuanian regions in 2015 and 2025 (Source: Report on the development of forecasts for groundwater abstraction and demand of water supply for public purposes in Lithuanian regions in 2015 and 2025. The implementer of the project – UAB SWECO-Lietuva. Vilnius, Lithuanian Geological Fund, 2007). Today, the daily abstraction of groundwater is 20 933 m^3 on average, which constitutes 23.4% of the amount of surveyed and approved groundwater resources. Daily abstraction in 2015 in this RBD is forecasted to total to 34 300 m^3 accounting for 38.3% of the volume of the surveyed and approved groundwater resources.

The precise figure on wastewater discharges by households and by industries cannot be provided because the majority of industries emit their wastewater to the same wastewater treatment facilities. The analysis was conducted on the assumption that wastewater volumes discharged by households and industries are proportionate to the amounts consumed by these sectors. Comparison of households and industry shows that consumption by households within the Venta RBD account for 33% and industry – for 35% of the total volume consumed in the Venta RBD. The share of industry in all districts of the Venta RBD is practically equal to the share consumed by households, except for Mažeikiai district where consumption by industry is 1.5 times higher than by households.

There are five major water supply companies in the Venta RBD. In addition, there are a number of small ones, although these should cease to exist having in mind the legal provision to have one public water supplier per municipality.

The number of people in households connected to water supply networks by the main water supply companies within the Venta RBD is provided in Table 90.

[3] Report of the National Control Commission for Prices and Energy, 2008

Table 90. Percentage of population connected to water supply and sewerage networks in the Venta RBD, 2009

Water supply company	Percentage share of population connected to water supply networks in the areas serviced by water supply companies	Percentage share of population connected to sewerage networks in the areas serviced by water supply companies
Palangos vandenys	97	94
Skuodo vandenys	80	51
Mažeikių vandenys	78	70
Telšių vandenys	71	55
Akmenės vandenys	76	68
In Venta RBD on average	**77**	**66**

Source: Water Suppliers' Association

For the purpose of implementing the strategic goal to achieve that 95% of the population becomes able to use water supply and wastewater management services, it has been planned to allocate funds for four municipalities out of five main ones in the Venta RBD from the Financial Perspective 2007-2013. However, since 50% of the area of Palanga town belongs to the Nemunas RBD and the wastewater discharger is located in this RBD, the information provided in Table 91 covers the investments of only three projects.

Table 91. National projects in the Venta RBD in 2007-2013

Water supply company	Settlement	Planned works							Project value, LTL million
		New WWTP, unit	Renovated WWTP, unit	New sewerage networks, km	Renovated sewerage networks , km	New water supply networks, km	Renovated water supply networks, km	New/renovated water supply networks, km	
Akmenės vandenys	Akmenė	1		7.2		6.8			31.7
	Venta	1		10.9		7.6			
Mažeikių vandenys	Mažeikiai			10.2		11.8			28.04
	Viekšniai			8.5		8.5			
Telšių vandenys	Telšiai			9.2		7.7			11.83
Total in Venta RBD		**2**	**1**	**46**	**0**	**42.4**	**0**	**0**	**71.57**

Notes: 1) An investment project for Kuršėnai is not included in the table because the major part of the projects will be implemented in the Lielupė RBD; 2) The length of sewerage and water supply networks may be different if construction prices change.
Source: List of National Projects No. 1 under Measure No VP3-3.1-AM-01-V "Renovation and development of water supply and wastewater management systems"

One of the most important factors determining the use of water services by households is the price. At present, different municipalities have set different prices of the water services.

The prices of water supply and wastewater management of the main water suppliers in the Venta RBD are given in Table 92 below.

Table 92. Prices of water supply and wastewater management in the Venta RBD, 2010, LTL/m^3, incl. VAT

Water supply company	Price of water supply		Price of wastewater management		Total price	
	for customers	for subscribers	for customers	for subscribers	for customers	for subscribers
Palangos vandenys*	3.21	3.15	4.55	4.45	7.76	7.60
Skuodo vandenys	2.02	1.96	3.94	3.81	5.96	5.77
Mažeikių vandenys	2.81	2.69	2.96	2.84	5.77	5.53
Telšių vandenys	2.46	2.42	2.98	2.89	5.44	5.31
Akmenės	2.76	2.71	4.39	4.3	7.15	7.01

* There is also a higher tariff for seasonal subscribers.

Source: Water supply companies

Industry

129. Industries in the Venta RBD consume abut 30% of the total volume consumed in this river basin district. Almost half of this amount is used up by companies in Mažeikiai district. Most of the companies discharge their effluents to centralised sewerage networks. Four companies emit wastewater directly into water bodies. Also, there are many outlets of surface runoff (23), including surface runoff from industrial areas.

The highest percentage of companies (excluding public institutions, trade companies, companies providing other services, or similar companies) is operating in manufacturing – almost 10% (Figure 42). According to the data provided by Statistics Lithuania by counties and adjusted for municipalities, about 3 800 companies were operating in Akmenė, Mažeikiai, Telšiai and Skuodas district and Palanga town in the Venta RBD in 2008.

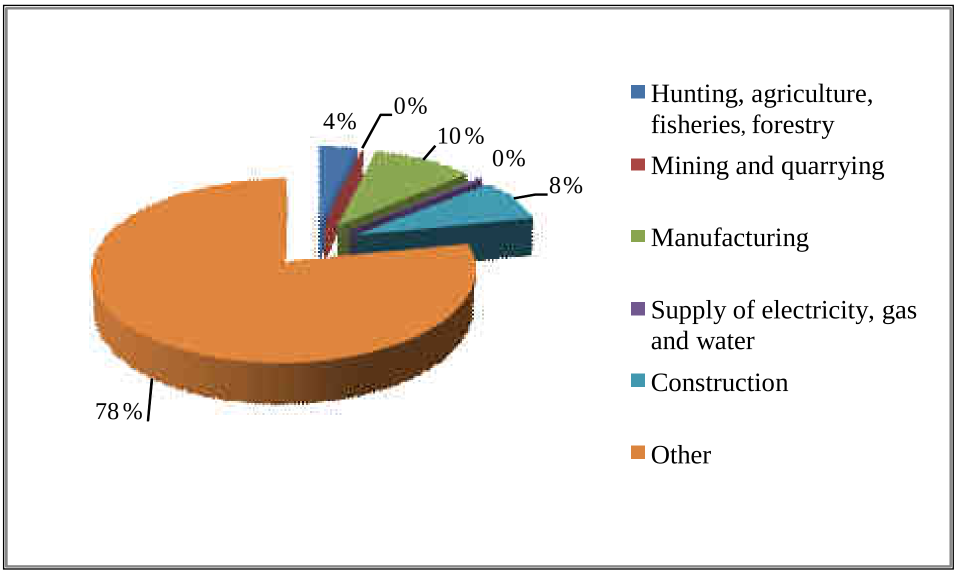


Figure 42. Distribution of companies by industries in the Venta RBD, 2008

Source: Data of Statistics Lithuania by counties, revised by the Expert

During the project “Identification of substances dangerous for the aquatic environment in Lithuania” carried out in 2006, examination of hazardous substances discharged with wastewater was performed in various wastewater treatment facilities. The findings revealed that a few hazardous substances of concern, namely, phenols and their ethoxylates, polycyclic aromatic hydrocarbon, organotin compounds and phtalates (in addition to those which are monitored under the National Monitoring Programme) were detected in wastewater treatment plants of a few towns. In the Venta RBD, hazardous substances were examined in effluents discharged from Mažeikiai WWTP. No exceedance were detected. However, di(2-ethylhexyl)phthalate was detected in the Šventoji, but no source was identified.

There are 16 companies in the Venta Basin and 1 company in the Bartuva Basin which have been issued integrated pollution prevention and control (IPPC) permits. The total number of IPPC companies in 2008 was 17. Table 93 below specifies the number of installations subject to the IPPC requirements by individual types specified in the IPPC legislation.

Table 93. Number of companies with IPPC permits by types of installations in the Venta RBD, 2008

Installation type	Number of installations
Venta Basin	
Large combustion installations with a rated thermal input exceeding 50 MW	1
Mineral oil and gas refineries	1
Installations for the production of cement clinker in rotary kilns with a production capacity exceeding 500 tonnes per day or lime in rotary kilns with a production capacity exceeding 50 tonnes per day or in other furnaces with a production capacity exceeding 50 tonnes per day	2
Chemical installations for the production of oxygen-containing hydrocarbons such as alcohols, aldehydes, ketones, carboxylic acids, esters, acetates, ethers, peroxides, epoxy resins	1
Installations for the disposal or recovery of hazardous waste, with a capacity exceeding 10 tonnes per day	1
Landfills receiving more than 10 tonnes per day or with a total capacity exceeding 25 000 tonnes, excluding landfills of inert waste	3
Treatment and processing of milk, the quantity of milk received being greater than 200 tonnes per day (average value on an annual basis)	1
Installations for the intensive rearing of poultry with more than 40 000 places for poultry	4
Installations for the intensive rearing of pigs with more than 2 000 places for production pigs (over 30 kg), or 750 places for sows	2
Bartuva Basin	
Installations for the intensive rearing of poultry with more than 40 000 places for poultry	1

Source: Data of regional environmental protection departments. Distribution by sub-basins was carried out by the Expert.

The amount of charges for pollution of the environment and changes therein illustrate the magnitude of pollution and its change.

The number of payers of charges for water pollution and the payable amounts are given in Table 94 below. Both the number of payers and the amounts paid in 2008 went down as compared to the figures of 2007.

Table 94. Payments of the water pollution charge in the Venta RBD

District	Number of payers		Payable amounts, LTL (rounded up)	
	2007	2008	2007	2008
Akmenė distr.	11	8	54 000	27 000
Telšiai distr.	18	15	107 000	53 000
Mažeikiai distr.	18	16	200 000	120 000
Skuodas distr.	10	8	9 000	4 820
Palanga town	10	9	62 000	50 000
Total	**67**	**56**	**432 000**	**255 000**

Source: Database of pollution charges of the Ministry of Environment

Energy and dams

130. Rivers in the Venta RBD are noted for their high hydropower generation capacity (43 MWh/km^2) in the country. There are 28 HPP on the rivers in this river basin district. The area of the ponds of five of these HPP (aggregate capacity 1737 kW) is larger than >0.5 km^2.

The largest number of HPP have been constructed on the Virvytė River and operation thereof exerts a significant impact on the aquatic environment of the river. 17% of all water abstracted in the Venta Basin is used for power generation.

Also, Mažeikiai oil refinery has its own fuel combustion facilities with a nominal thermal capacity higher than 50 MW.

Agriculture[4]

131. Agriculture uses (affects) water resources directly by consuming water and indirectly by polluting water bodies. Major pressures (indirect use of water resources) also include river straightening used to be performed for land reclamation purposes.

Annual water consumption for agricultural purposes in Lithuania is comparatively insignificant – in 2009 the consumed amount totalled to 1 381 thousand m^3, which makes up 0.03% of the total water consumption. Even excluding water consumption for energy purposes from the total water consumption, the share for agriculture would still be as low as 0.7%.

[4] The majority of the data in the analysis of the agricultural sector, such as distribution of agricultural holdings, water consumed for agricultural purposes, agricultural production, was recalculated observing the proportions of the distribution of agricultural land in districts and respective basins and sub-basins.

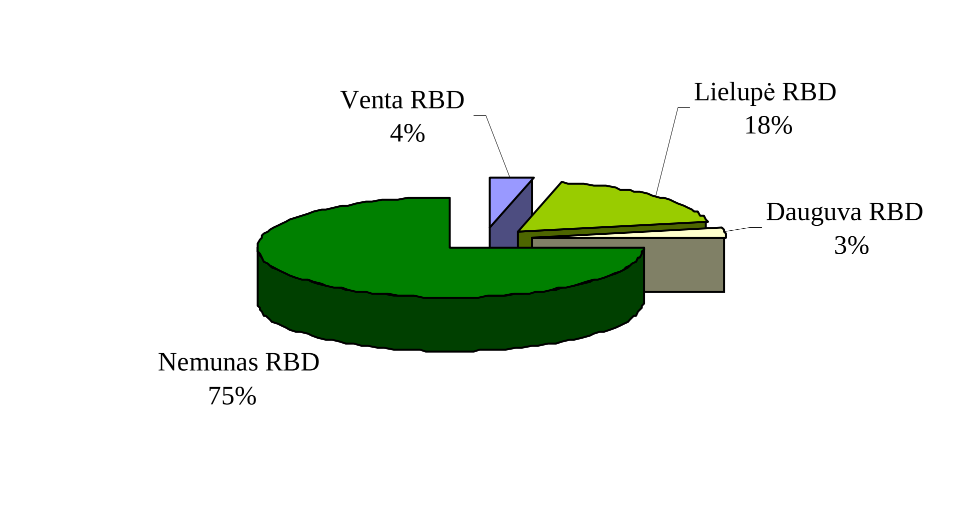


Figure 43. Water consumption for agricultural purposes in different RBD, 2009

Source: Environmental Protection Agency, the chart was drawn by the Expert

The amount of water consumed for agricultural purposes in the Venta RBD, like in other river basin districts, totals to less than 0.1% of the total consumption in Lithuania. Consequently, the sector of agriculture does not have any significant impact on the amount of water resources in the Venta RBD. According to the Land Reclamation Cadastre, areas potentially subject to irrigation in the Venta RBD totalled to more than 500 ha. Not all of these are suitable for use. No significant abstraction of surface water for agricultural purposes is forecasted for the coming 5-10 years in Lithuania due to poor technical state of irrigation systems and natural and economic conditions.

The amount of water consumed for agricultural purposes in the Venta RBD totals to 52 thousand m^3, which accounts for 0.5% of the total consumption in the RBD (including the energy sector).

Table 95. Water consumption for agricultural purposes in the Venta RBD, 2009

	Venta RBD			**Lithuania**
	Šventoji Basin	Bartuva Basin	Venta Basin	
Consumption for agricultural purposes, thou. m^3	4,53	1,24	45,97	1381,30
Consumption for agricultural purposes per 1 ha of utilised agricultural land, thou. m^3	0,30	0,03	0,20	0,54
Consumption for agricultural purposes per LTL 1 of gross agricultural production, m^3/1000Lt	0,1329	0,0132	0,0897	0,19

Source: Environmental Protection Agency, experts' estimations

One hectare of agricultural land in the Venta RBD consumes 0.18m^3/ha, which is less than the national average (0.54 m^3/ha). The most intensive consumption of water is observed in the Šventoji Basin (0.3 m^3/ha of agricultural land). In the Venta Basin, this indicator is 0.2 m^3, in the Bartuva Basin – as low as 0.03 m^3/ha of agricultural land.

Diffuse pollution and hydromorphological changes (for purposes of land reclamation) constitute indirect use of water resources for agricultural needs. The major share of diffuse pollution loads generated in agriculture is pollution entering the soil with animal manure and mineral fertilisers. The amount of mineral nitrogen fertilisers used in the

Venta RBD is comparatively large (24.1 kg/ha). An estimated demand of mineral phosphorus fertilisers in the Venta RBD is low as compared to other river basin districts and does not exceed 5 kg/ha.

The loads of animal pollution are proportionate to the animal density, which is lower in the Venta RBD as compared to the national average (0.5 LSU/ha) and totals to 0.4 LSU/ha.

Morphological changes in the Dauguva RBD, as in all other RBD, are significant. The share of regulated rivers in the river network makes up about 72%[5], the total drained area is larger than the total agricultural area. It was calculated that straightened rivers in the Venta Basin total to 560 km. Of these, about 80 km are situated in protected areas.

Fisheries

132. The most common type of fisheries in Lithuania is pond fisheries breeding mainly carps. The fisheries (aquaculture) sector covers special ponds which are considered to be merely industrial objects and not bodies of water that must achieve good water status.

According to the data of the Fisheries Department of the Ministry of Agriculture, there are 26 companies in Lithuania breeding fish in ponds the total area of which makes around 10 000 ha. The number of live marketable fish grown in these ponds in 2008 totalled to about 3.76 thousand tonnes. It is forecasted that the number of ponds will not be increasing because they need land and other large investments, and in future this number is likely to go down a little. Such assumption was made taking into account the current tendency of decrease of fish farms in Lithuania. At present, there is no reliable data on any negative impact of fisheries on bodies of surface water, thus this sector is not included among significant pressures.

Fish farming results highly depend on natural conditions. In 2008, natural conditions were moderately favourable for fish breeding and growing. For the purpose of achieving high production indicators, all measures intended for intensifying fish breeding were used, such as feeding, pond fertilisation, preventive maintenance, etc. In 2008, fish consumed 10 255 tonnes of fish feed, including 3 352 tonnes of ecological feed. The average yield in feeding ponds totalled to 853 kg/ha. The production of aquaculture is expected to grow in future.

The ponds of aquaculture companies are old, constructed 30-40 and more years ago. The actual cubic volume of water in the ponds makes up only about 40-50% of the design capacity. Such situation has been determined by the technical design projects of certain ponds providing for that the ponds may be filled with 105 million m^3 of water only with the help of pumps. However, due to economical considerations, water is supplied by pumps only in urgent cases. After the increase of electricity prices, a number of companies completely stopped using pumps. For the purpose of reduction of electricity consumption, a number of the pumping stations have been undergoing reconstruction financed from the EU Structural Funds.

[5] The study “Preparation of a feasibility study on the restoration of morphological and ecological conditions close to the natural ones in straightened rivers and streams and development of practical recommendations for the activities to restore the said conditions” (EPA).

No major reconstruction of the ponds was carried during the period 2000-2005. A renovation programme is planned for 2007-2013 using the assistance from the EU Fisheries Fund.

The aquaculture sector is dominated by micro and small companies. Also, there are more than 50 farms in Lithuania which engage in commercial aquaculture growing fish in their ponds. Profitability of such companies is low (only 2-3 %) due to out-of-date and inefficient technologies used and a short vegetation period. Many ponds are filled up using electricity which significantly increases expenses of the fish farming companies. Decrease of resources, seasonal fishery, prohibition to fish during certain periods do not ensure a sufficient level of income for the fishermen. The owners of aquaculture companies lack their own funds for acquisition of modern equipment, upgrading of hydro-technical equipment, application of fish disease control and elimination, planting and growing of new fish species. Another problem to be addressed is organic pollution by the ponds of aquaculture companies. In 2010, certificates of ecological fishery were issued to 15 farms with 5 040 ha (the area of the stocked ponds – 4 940 ha).

Currently, the Lithuanian fisheries sector is undergoing the Action Programme 2007-2013. One of the most important axes of the Programme is “Aquaculture, fishing in internal waters, processing and marketing of fishery and aquaculture products”; however, water resources can be affected by measures under other axes as well. The Programme includes such objectives as development of the aquaculture sector, upgrading of aquaculture companies and of inland water vessels.

There are two commercial pond fish farming companies in the Venta RBD.

According to the data of the EPA, the quality parameters ($BOD_{7,}$ N_{total} and P_{total}) of water released from fishery ponds seldom exceed the permitted norms.

Recreation

133. There are 6 lakes and ponds larger than 0.5 km^2 in the Venta RBD. Most of them are used for fishing and/or bathing. There are 9 bathing waters officially designated pursuant to Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC (OJ 2006 L 64, p. 37-51) (Bathing Waters Directive): Lake Germantas in Telšiai district, Lake Lūkstas in Varniai (Telšiai district) Lake Paršežeris in Laukuva (Šilalė district), Lake Plinkšių ežeras in Seda (Mažeikiai distr.), Pragalvys River in Akmenė district, Sablauskių pond (Dabikinė area, Akmenė district), Skuodo pond in Skuodas, Venta River in Akmenė, Vent River in Mažeikiai[6].

Up to 12 thousand people can use eight largest ponds with an area larger than 0.5 km^2 (Juodeikių, Karnų, Kivylių, Lazdininkų, Mosėdžio I, Sablauskų, Skuodo and Ubiškės) for recreation purposes. The estimation is based on the assumption that about 55 % of the local population use water bodies for recreation[7].

[6] Source: Report on the implementation of the Bathing Waters Directive to the European Commission (MS Excel file).

[7] Willingness to Pay Study in the Neris and Nevėžis sub-basins carried out by the Centre for Environmental Policy. The study revealed that about 55 % of the local population use water bodies for recreation in one or another way..

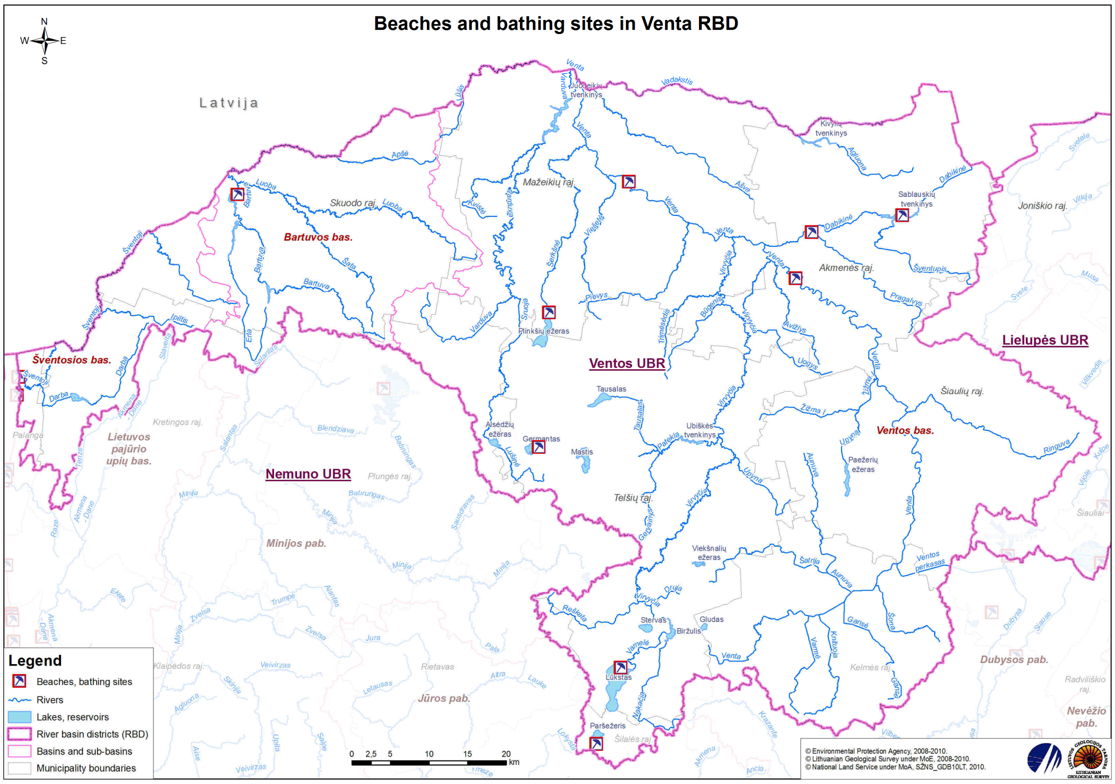


Figure 44. Beaches and bathing sites in the Venta RBD

No National Water Tourism Routes[8] have been planned for the Venta RBD.

Economic and social importance of sectors

134. A brief description of the main sector which can exert a negative impact on water resources in the Venta RBD demonstrates that there is no one specific sector which would be exerting a more significant impact on water bodies than others. Industry in the Venta RBD consumes a little more water than other branches because a few large industrial entities are situated in this river basin district. 11 river water bodies in the category of rivers are water bodies at risk due to agricultural pressures. Household pollution has significantly went down as a result of the implementation of the basic measure. Still, the achievement of good ecological status can be prevented by pollution dilution capacities of small rivers.

Economic importance of the said sectors is in a way characterised by such indicators as the number of employees in the sector and value added. Indicators characterising the importance of each sector are provided in Tables 96 and 97.

[8] Special Plan of the National Water Tourism Routes approved by Order No. 4-67 of the Minister of Economy of the Republic of Lithuania of 23 February 2009 (Žin., 2009, No. 27-1075). The Plan was commissioned by the State Tourism department and prepared by Vilnius Gediminas Technical University.

Table 96. Employed population in the Venta RBD, 2008

Municipality	Employed population, thousand								
	Total	Hunting, agriculture, fisheries, forestry	%	Indus try	%	Constru ction	%	Servi ces	%
Akmenė distr.	12.59	1.95	15.5	2.28	18.1	1.41	11.2	6.95	55.2
Mažeikiai distr.	26.32	2.37	9.0	6.42	24.4	4.02	15.3	13.52	51.4
Telšiai distr.	22.13	1.99	9.0	5.40	24.4	3.38	15.3	11.37	51.4
Skuodas distr.	10.57	0.87	8.2	2.56	24.2	1.04	9.8	6.11	57.9
Total/on average	71.62	7.17	10.0	16.65	23.3	9.84	13.7	37.95	53.0

Source: Statistics Lithuania and experts' calculations

Table 97. Value added in the Venta RBD by industries, 2008

Municipality	GDP and value added, LTL million									
	Total	Per capita LTL thousand	Hunting, agricultur e, fisheries, forestry	%	Indus try	%	Constr uction	%	Services, etc	%
Akmenė distr.	590.6	23.8	64.5	10.9	117.2	19.8	57.0	9.6	351.9	59.6
Mažeikiai distr.	1585.5	27.2	66.5	4.2	511.2	32.2	277.3	17.5	730.5	46.1
Telšiai distr.	1333.1	27.2	55.9	4.2	429.8	32.2	233.1	17.5	614.3	46.1
Skuodas distr.	707.7	33.1	19.7	2.8	165.8	23.4	69.6	9.8	452.6	64.0
Total/on average	4216.9	27.5	206.7	4.9	1224	29.0	637	15.1	2149.3	51.0

Source: Statistics Lithuania and experts' calculations

The figures in the tables above demonstrate that the most important sector by employment, excluding the sector of services, is industry. The value added created in the sector of industry, which employs 23% of all labour force, totals to almost 30% of the total value added in the Venta RBD.

The economic importance of agriculture in Lithuania is significantly lower than that of manufacture, trade, construction and some other sectors. The number of population working in the sector of agriculture makes up around 13% of all working-age population, creating more than 5% of the value added created in this river basin district. Agricultural companies supply a significant share of everyday products to tradesmen or processers and production of an in-kind economy is highly important for the Lithuanian countryside. Agricultural land utilised by agricultural companies makes up as little as 0.1% of the total area of utilised agricultural land in Lithuania. Animals kept within the Venta RBD account for 11% of the total number of animals in the country.

Agricultural land in the Venta RBD makes up more than 46% of the total area of the river basin district and is larger than in other river basin districts (Lithuanian average is 39%). The largest area of agricultural land is situated in the Bartuva Basin – more than 60% and the smallest one is in the Šventoji Basin – less than 40%. The share of gross agricultural production in the Venta RBD in the total amount of Lithuanian production is 20%, of which 69% is plant-growing production and over 30% – animal husbandry production.

The value of gross agricultural production produced in one hectare of agricultural land within the Venta RBD is around LTL 2 236 per hectare, which is lower than the Lithuanian average (LTL 2 865 per hectare of utilised agricultural land). The value of agricultural production in this RBD totals to LTL 641 million, which constitutes about 8.7% of the value of the total agricultural production produced in Lithuania.

In some areas, agriculture is important from the social point of view. For example, in the share of population working in the agricultural sector in the Bartuva Basin, where agricultural land makes up over 60% of all land and is dominated by small farms (there are no farms larger than 500 ha), constitutes about 24% of all working-age population and this percentage is higher than the national average (8.1%). A relatively large number of animals (12%) are kept in large farms with more than 300 LSU in the Bartuva Basin. Animal husbandry production makes up LTL 1 340 per one hectare of utilised agricultural land (the national figure is LTL 1 255 / ha) in the Venta Basin where agricultural land constitutes 44% of the total area and the number of working-age population in agricultural is 12%. The largest number of large plant-growing farms are situated in this Basin. The share of working-age people who work in the sector of agriculture in the Šventoji Basin, where agricultural land accounts for 39.4% of the total area, is only 6.7%. As in the Bartuva Basin, the majority of farms in this basin are small farms.

CHAPTER VIII. SUMMARY PROGRAMME OF MEASURES

SECTION I. INTRODUCTION

135. The programme of measures for improving the status of water bodies in a river basin district is one of the pillars of the river basin management planning. Having summed up the available information on the scope of planned pollution reduction measures, water quality monitoring data and mathematical modelling results, water bodies have been identified which will fail to conform to the good water status criteria after the implementation of the main (basic) measures (i.e. the requirements laid down in the key water directives). With a view to improve, where possible, the status of such surface water bodies, packages of supplementary measures which are most effective from both environmental and economic point of view have been proposed. An integrated programme of measures consists of specific measures or studies suggested for the selection of supplementary measures during later stages.

SECTION II. BASIC MEASURES

136. Following Part A of Annex VI to the WFD, the basic measures are the ones which must be implemented in order to meet the requirements of the following directives:

136.1. Bathing Waters Directive;

136.2. Birds Directive;

136.3. Drinking Water Directive;

136.4. Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances (OJ 2004 special edition, Chapter 5, Volume 2, p. 410) (Major Accidents Directive);

136.5. Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment (OJ 2004 special edition, Chapter 15, Volume 1, p. 248) as amended by Directive 2009/31/EC of the European

Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No. 1013/2006 (OJ 2009 L 140, p. 114-135) (Environmental Impact Assessment Directive);

136.6. Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture (OJ 2004 special edition, Chapter 15, Volume 1, p. 265) (Sewage Sludge Directive);

136.7. Urban Wastewater Treatment Directive;

136.8. Council Directive 91/414/EEC concerning the placing of plant protection products on the market (OJ 2004 special edition, Chapter 3, Volume 11, p. 332) as amended by the Commission Directive 2010/42/EU of 28 June 2010 amending Council Directive 91/414/EEC to include FEN 560 (fenugreek seed powder) as active substance (OJ 2006 L 161, p. 6-8) (Plant Protection Products Directive);

136.9. Nitrates Directive;

136.10. Habitats Directive;

136.11. Directive 2008/1/EC of the European Parliament and of the Council concerning integrated pollution prevention and control (OJ 2008 L 24, p. 8-29), as last amended by Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No. 1013/2006 (OJ 2009 140, p. 114-135) (IPPC Directive).

137. Seven directives out of the eleven ones the implementation of which also means introduction of the basic measures are related to high costs. The implementation of the remaining directives – the Birds Directive, Environmental Impact Assessment Directive, Plant Protection Products Directive, and Habitats Directive – means establishment of relevant legal, institutional, procedure, and other measures which do not require any investments.

Measures required for implementing the transposed Community legislation for protection of water

138. Measures required for implementing the Community legislation for protection of water transposed into the Lithuanian acquis are provided in Table 98 below.

Table 98**.** Measures required for implementing the Community legislation for protection of water

	Key legislation of the Republic of Lithuania transposing the EU directive	**Measure**	**Implementation costs at the national level**
Environmental Impact Assessment Directive	Law on Environmental Impact Assessment of the Proposed Economic Activity (Žin., 1996, No. 82-1965; 2005, No. 84-3105).	Environmental impact assessment in all relevant cases	No need of supplementary investments; annual costs estimated according to the number of potential EIA total to LTL 280 thousand
IPPC	Rules for the Issuing, Renewal and	Application of IPPC	Acc. to preliminary

	Key legislation of the Republic of Lithuania transposing the EU directive	Measure	Implementation costs at the national level
Directive	Revocation of Integrated Pollution Prevention and Control Permits approved by Order No. 80 of the Minister of Environment of the Republic of Lithuania of 27 February 2002 (Žin., 2002, No. 85-3684; 2005, No. 103-3829)	permits in all relevant cases; implementation of BAT	estimates in 2000, implementation costs of the IPPC Directive in Lithuania must have ranged from LTL 1 200 to 2 000 million. The demand of one-time costs until 2015 is estimated to be LTL 100 thousand according to the number of potential IPPC permits.
Major Accidents Directive	Regulations of the Prevention, Response to and Investigation of Industrial Accidents approved by Resolution No. 966 of the Government of the Republic of Lithuania of 17 August 2004 (Žin., 2004, No. 130-4649; 2008, No. 109-4159); Programme on the Inspection of Dangerous Installations of the Republic of Lithuania approved by Order No. 1-528 of the Director of the State Fire and Rescue Department of 29 December 2006 (Žin., 2007, No. 3-143) List of Potentially Dangerous Installations approved by Order No. 539 of the Minister of Environment of the Republic of Lithuania of 11 October 2002 (Žin., 2002, No. 111-4929; 2005, No. 58-2025)	Development of safety reports and emergency plans; measures for accident prevention	No need of supplementary investments. One-time expenditure until 2015 estimated on the basis on the potential number of relevant documents to be prepared totals to LTL 200 thousand
Plant Protection Products Directive	Law of the Republic of Lithuania on Plant Protection (Žin., 1995, No. 90-2013; 2010, No. 13-620). List of Active Substances which May Be Contained in Plant Protection Products approved by Order No. 3D-187 of the Minister of Agriculture of the Republic of Lithuania of 19 April 2004 (Žin., 2004, No. 60-2145).	Control of the use of plant protection products; application of the Code of Good Practice for Plant Protection; studies and analyses of impacts of plant protection products; withdrawal/banning of harmful substances	Investment costs until 2015 estimated on the basis on the number of the existing plant protection products and their potential demand total to LTL 1.46 million. Annual operating costs total to LTL 12.5 thousand.
Bathing Water Directive	Lithuanian Hygiene Norm HN 92:2007 “Beaches and Bathing Water Quality” approved by Order No. V-1055 of the Minister of Health of the Republic of Lithuania of 21 December 2007 (Žin., 2007, No. 139-5716); Bathing Water Quality Monitoring Programme for 2009-2011 approved by Resolution No. 668	Monitoring of bathing water quality; provision of information to the public on bathing water quality. Official designation of bathing sites, improvement of water quality, restoration of poor water quality to good status,	Costs of implementation of the Bathing Water Monitoring Programme for 2006–2008 were estimated at about LTL 3 200 thousand, including water sampling, analysis and training (LTL 2 700 thousand), public information measures

	Key legislation of the Republic of Lithuania transposing the EU directive	Measure	Implementation costs at the national level
	of the Government of the Republic of Lithuania of 25 June 2009 (Žin., 2009, No. 80-3344)	development of an information system.	and reporting to the Commission (LTL 500 thousand). Maintenance of bathing sites in the Venta RBD in 2010-2015 will annually require around LTL 50 thousand.
Birds Directive	Law of the Republic of Lithuania on Protected Areas (Žin., 1993, No. 63-1188; 2001, No. 108-3902) General Regulations of Areas of Importance for the Conservation of Habitats or Birds approved by Resolution No. 276 of the Government of the Republic of Lithuania of 15 March 2004 (Žin., 2004, No. 41-1335). Criteria for the Screening of Areas of Importance for the Conservation of Birds approved by Order No. D1-358 of the Minister of Environment of the Republic of Lithuania of 2 July 2008 (Žin., 2008, No. 77-3048)	Establishment of sites important for the conservation of birds, development and implementation of management plans for protected areas	Required investment costs for the management of bird habitats until 2015 total to ca. LTL 666 thousand and operating costs – ca. LTL 344 thousand.
Habitats Directive	Law of the Republic of Lithuania on Protected Areas Regulations of Areas of Importance for the Conservation of Habitats or Birds Criteria for the Screening of Areas of Importance for the Conservation of Habitats approved by Order No. 219 of the Minister of Environment of the Republic of Lithuania of 20 April 2001 (Žin., 2001, No. 37-1271; 2008, No. 87-3495)	Establishment of sites important for the conservation of habitats; development of protected area management plans	Required investment costs for the establishment and management of habitats until 2015 total to ca. LTL 180 thousand, operating costs – ca. LTL 496 thousand.
Sewage Sludge Directive	Regulatory document LAND 20-2005 “Requirements for the use of sewage sludge for fertilisation and recultivation” approved by Order No. 349 of the Minister of Environment of the Republic of Lithuania of 28 June 2001 (Žin., 2001, No. 61-2196; 2005, No. 142-5135) (LAND 20-2005)	Development of fertilisation plans; analysis and accounting of sewage sludge; withdrawal/banning of dangerous substances	According to the Study on Development of an Investment Programme for Sludge Management in Lithuania prepared by SWECO BKG, the required total costs are estimated at about LTL 300 million. The amount planned to be invested in the Venta RBD until 2013 totals to about LTL 50 million. Annual operating costs – LTL 1.5 million.

	Key legislation of the Republic of Lithuania transposing the EU directive	Measure	Implementation costs at the national level
Urban Wastewater Treatment Directive	The Directive has to be implemented in 2010, Law of the Republic of Lithuania on Water (Žin., 2001, No. 64-2327); Law of the Republic of Lithuania on Drinking Water Supply and Wastewater Management (Žin., 2006, No. 82-3260) Wastewater Management Regulation	Assurance of centralised wastewater treatment in agglomerations larger than 2 000 p.e.	Investment costs for 2003-2009 are estimated at about LTL 1 billion. In 2007-2013, about LTL 2.1 billion are planned to be allocated for the development and rehabilitation of water supply, wastewater collection and sludge management infrastructures in settlements larger than 2000 p.e. in Lithuania. . Such measures (together with drinking water supply development measures) in the Venta RBD will require about 80 million for investments until 2015; operating costs – LTL 1.6 million.
Nitrates Directive	National Programme on the Reduction of Water Pollution from Agricultural Sources approved by Resolution No. 1076 of the Government of the Republic of Lithuania of 26 August 2003 (Žin., 2003, No. 83-3792)	Construction of manure and slurry storages on farms having more than 10 LSU; regulation of crop rotation and fertilisation, promotion of ecological farming, establishment and control of water protection belts, restoration and establishment of wetlands. Continuously.	Investment costs at 2002 prices were estimated at ~ LTL 320 million for Lithuania. The amount needed for the implementation of these requirements in the Venta RBD until 2015 totals to ca. LTL 82 million of investment costs and ca. LTL 800 thousand of annual operating costs
Drinking Water Directive	Law of the Republic of Lithuania on Water Law of the Republic of Lithuania on Drinking Water Supply and Wastewater Management Wastewater Management Regulation State Procedure for Drinking Water Control approved by Order No. 643 of the Director of the State Food and Veterinary Service of the Republic of Lithuania of 10 December 2002 (Žin., 2002, No. 3-99); Lithuanian Hygiene Norm HN 24:2003 “Drinking water safety	Drinking water quality surveillance and control; expansion of fields with multi-annual crops; monitoring of agricultural activities; application of the Code of Good Agricultural Practice	According to estimates in 2001, costs of addressing problems of fluoride and iron totalled to ca. LTL 100 million. However, removal of iron, as of an indicative parameter, is not obligatory under the Drinking Water Directive. Costs for the expansion and rehabilitation of drinking water supply systems in the Venta RBD from 2007 have been planned together with wastewater management costs and

	Key legislation of the Republic of Lithuania transposing the EU directive	Measure	Implementation costs at the national level
	and quality requirements" approved by Order No. V-455 of the Minister of Health of the Republic of Lithuania of 23 July 2003 (Žin., 2003, No. 79-3606); Lithuanian Hygiene Norm HN 44:2006 "Delineation and maintenance of sanitary protection zones of wellfields" approved by Order No. V-613 of the Minister of Health of the Republic of Lithuania of 17 July 2006 (Žin., 2006, No. 81-3217)		total to LTL 80 million; annual operating costs – LTL 1.6 million.

Practical steps and measures for application of the principle of water costs recovery as laid down in Article 9 of the WFD

139. Practical steps and measures for application of the principle of water costs recovery as laid down in Article 9 of the WFD and in the Law of the Republic of Lithuania on Water are given in Table 99.

Table 99. Practical steps and measures for application of the principle of water costs recovery as laid down in Article 9 of the WFD

Relevant legislation	Measures
Methodology for the Pricing of Drinking Water Supply and Wastewater Management Services approved by Order No. 03-92 of the National Control Commission for Prices and Energy of 21 December 2006 (Žin., 2006, No. 143-5455). Law of the Republic of Lithuania on Water Law of the Republic of Lithuania on Drinking Water Supply and Wastewater Management Law of the Republic of Lithuania on Charges for State Natural Resources (Žin., 1991, No. 11-274; 2006, No. 65-2382); Law of the Republic of Lithuania on Environmental Pollution Charge (Žin., 1999, No. 47-1469; 2002, No. 13-474).	The key measure for implementing Article 9 of the WFD is introduction of the cost recovery principle for all consumers. Such principle has already been enacted in the Law of the Republic of Lithuania on Water and the Methodology for the Pricing of Drinking Water Supply and Wastewater Management Services approved by the National Control Commission for Prices and Energy. In addition, an informal working group for coordinating development of the water management system, consisting of representative of the Ministry of Environment, Association of Local Authorities in Lithuania, Lithuanian Water Suppliers Association and the National Control Commission for Prices and Energy, was established in March 2010 on the initiative of the Ministry of Environment. It is proposed to discuss issues regarding accounting of depreciation of donated assets related to cost recovery in this group. The cost recovery level in the sector of public water supply and wastewater management in the Venta RBD estimated by way of direct comparison of income and expenses totals to ca. 93%.

140. The main reason of the failure to fully implement the cost recovery principle in many water supply companies is delay by municipalities to approve tariffs covering the costs.

141. Environmental costs are included in the cost recovery mechanisms through charges for state natural resources and for pollution of the environment.
Municipalities are currently preparing Water Supply and Wastewater Management Infrastructure Development Plans. 25 such plans were prepared until 2010, 26 were being prepared and the remaining 9 municipalities were only planning to develop of such plans. One of the components of the plans is assessment of the forthcoming tariffs and affordability, hence these plans are believed to have enhanced and to enhance capacities of decision makers in the municipalities. In this way the approval of tariffs based on the cost recovery principle will become more effective.

Table 100. Recovery of water supply and wastewater management costs in individual water supply companies in the Venta RBD in 2008 and 2009, %

Aggregate Water supply and wastewater management costs and income	Water supply companies					**Venta RBD**
	1	2	3	4	5	
2008	**80**	**66**	**94**	**90**	**73**	**85**
2009	**98**	**76**	**93**	**97**	**83**	**93**

Source: experts' estimations on the basis of prices and cost prices of water supply companies

142. The two main reasons of the failure to fully implement the cost recovery principle in the sector of industry are subsidies and failure to reflect the actual industrial pollution of water resources in the tariffs of charges for state natural resources and for pollution of the environment. Companies usually finance investments to the water sector with their own funds and bank credits. The amount of subsidies to the water sector in Lithuania is rather small.

Until 2007, EU structural support was granted to business (industry included) under the Single Programming Document 2004–2006 (SPD). More than LTL 1.13 billion of the support administered by the Ministry of Economy was allocated for the implementation of 333 projects during that period. None of these, however, was related to the water sector. Accordingly, the only source of importance for the assessment of cost recovery is subsidies granted by the Lithuanian Environmental Investments Fund (LEIF).

Only about LTL 1 million of the annual amount of LTL 13 million received from the LEIF was granted to industrial and construction companies for the water sector in 2008 and about LTL 1.7 million – in 2007. As a result of the poor financial situation, only one application of an industrial enterprise was approved for the funding of the water sector in 2009.

Having in mind that industry creates more than LTL 20 billion of the value added, internalisation of LTL 1-2 million (which is the amount of subsidies granted during a more favourable period 2007-2008), i.e. inclusion of such amount into the polluter's costs, does not have any effect on the cost recovery level in the sector of industry.

Today, no reliable data is available on which companies are responsible for discharge of certain hazardous substances to rivers, and to what extent. For this reason, the costs of supplementary measures (if any) for the sector of industry cannot be compared to the "external" pollution costs at the moment[9].

[9] Deterioration of the environmental status is treated as "external costs" in our economic system. External costs appear when action or failure to act one individual or a group of individuals has a damaging effect on other individuals or groups. Pollution means negative "external costs". For example, when a factory

Following the afore-said assumption that charges for state natural resources and for pollution of the environment reflect the external environmental costs, it can be maintained that the cost recovery level in the sector of industry is 100%.

143. The cost recovery estimation method used for the public sector cannot be applied for agriculture. The sector of agriculture is not an important direct user of water in Lithuania, the Venta RBD included. An important component for estimations is diffuse agricultural pollution which is not included in water or any other costs.

It is very difficult to assess costs of the environment, resources and other expenditure due to agricultural pressures (there are no studies and data available on how much the "value" of water bodies is reduced due to agricultural pollution) hence another estimating method could be applied. In such case it should be assumed that "external" costs are approximately equal to the agricultural pollution removal costs. This amount in the Venta RBD during the first stage of the Management Plan will total to about LTL 3.511 million every year until 2015. LTL 59 thousand of this amount will have to be borne by the state for measures of control. Farmers will have to fund the major part of the costs – LTL 3.44 million. Such agricultural pollution reduction measures would cut down agricultural pollution in areas where it exerts a significant impact. Since there are no water bodies which require supplementary measures to be financed with state funds within this RBD, it is believed that the polluter pays principle will be implemented and the cost recovery level will reach 100% by 2015, on condition that the established measures will be introduced.

However, this is only an a priori assessment meanwhile the actual cost recovery level in agriculture will be identified only in 2015 upon evaluation of farmers' contribution to the implementation of the measures.

Measures to meet the requirements of Article 7 of the WFD

144. Measures required to meet the requirements of Article 7 of the WFD are given in Table 101.

Table 101. Measures to meet the requirements of Article 7

Relevant legislation	**Measure**
Regulations of the Register of the Earth Entrails approved by Resolution No. 584 of the Government of the Republic of Lithuania of 26 April 2002 (Žin., 2002, No. 44-1676; 2006, No. 54-1961); Procedure for Groundwater Monitoring by Economic Entities approved by Order No. 1-190 of the Director of the State Geological Survey of 24 December 2009 (Žin., 2009, No. 157-7130)	Monitoring of water bodies where abstraction exceeds 100 m3 per day Relevant protection of water bodies

pollutes a river with untreated wastewater, the downstream water users incur expenses related to health or water treatment. The English equivalent "externality" is sometimes used in other economic areas. It means an external impact, i.e. a benefit or cost caused by an action or process and incurred by a party not related to that action or process.

Controls over abstraction and impoundment of water and measures aimed at economical and sustainable use of water

145. Controls over abstraction and impoundment of water and measures aimed at economical and sustainable use of water are provided in Table 102.

Table 102. Controls over abstraction and impoundment of water and measures aimed at economical and sustainable use of water

Relevant legislation	Measure
Water abstraction Building Technical Regulation STR 2.02.04:2004 "Water Abstraction, water preparation. Basic provisions" approved by Order No. D1-156 of the Minister of Environment of the Republic of Lithuania of 31 March 2004 (Žin., 2004, No. 104-3848) Rules of the Issuing, Renewal and Revocation of Integrated Pollution Prevention and Control Permits	Water abstracting entities report information on the abstraction volume. The EPA stores information received in its data bases. Companies which abstract, use or supply groundwater or surface water are subject to relevant permits. Permits shall specify the water source, yielding capacity of the water abstraction facilities m^3/s, the volume of water abstracted, presence of water accounting facilities, etc. and provide for measures for rational water use and protection.
Regulations of the Register of the Earth Entrails Resources Order No. 1-10 of the Director of the State Geological Survey of 19 February 2003 on the approval of Form 1-PV for quarterly reports on groundwater abstraction (Žin., 2003, No. 19-849)	All economic entities which abstract more than 10 m^3 of groundwater per day for the purposes of drinking water supply or industrial needs shall provide quarterly water abstraction reports to the State Geological Survey.
Water impoundment: Law of the Republic of Lithuania on Water	The Law on Water defines both preventive and hard control measures for impoundment. The Minister of Environment lays down a procedure for use and maintenance of ponds by issuing relevant legislation.
Standard Rules for the Use and Maintenance of Ponds (LAND 2-95) approved by Order No. 33 of the Minister of Environment of the Republic of Lithuania of 7 March 1995 (Žin., 1997, No. 70-1790; 2004, No. 96-3563; 2006, No. 101-3915);	A separate part of the Rules is devoted HPP ponds. The latest amendment of the Rules sets a deadline for the introduction of automatic devices measuring and registering the water level in HPP and requires performing measurements of discharges and water levels.
Resolution No. 1144 of the Government of the Republic of Lithuania of 8 September 2004 on the approval of the List of Ecologically or Culturally Valuable Rivers or River Stretches (Žin., 2004, No. 137-4995)	The Resolution prohibits impoundments for any purposes in 169 rivers and their stretches.

Measures intended to prevent or control potential discharge of pollutants from diffuse pollution sources

146. Lithuanian legislation provides for general requirements for the protection of surface water bodies and groundwater bodies against pollution from diffuse sources. These requirements are regularly revised and updated, if necessary.

Measures which prohibit unauthorised discharges of pollutants directly into groundwater

147. The Lithuanian Geological Survey issues permits for discharging pollutants directly into groundwater bodies. The permitting procedure is regulated observing the Procedure for the Inventory of Discharges of Hazardous Substances into Groundwater and Collection of Information Thereon approved by Order No. 1-06 of the Director of the Lithuanian Geological Survey under the Ministry of Environment of 3 February 2003 (Žin., 2003 No.17-770).

The Lithuanian Geological Survey issues permits for companies extracting hydrocarbons in Western Lithuania. Water is discharged into the same geological strata from which hydrocarbons have been extracted, ensuring that these strata will never be suitable for any other purpose due to natural reasons. Such discharges should not contain any other substances but those which are formed during the said activity.

Summary of controls over point source discharges and other activities with an impact on the status of water

148. Pollution from point sources is regulated by the Wastewater Management Regulation, Rules of the Issuing, Renewal and Revocation of Integrated Pollution Prevention and Control Permits, and the Surface Runoff Management Regulation approved by Order No. D1-193 of the Minister of Environment of the Republic of Lithuania of 2 April 2007 (Žin., 2007, No. 42-1594).

Flood control measures

149. Activities of preparation for floods and elimination of consequences thereof are carried out observing the Civil Protection Law of the Republic of Lithuania (Žin., 1998, No. 115-3230) and the Procedure for Flood Risk Assessment and Management approved by Resolution No. 1558 of the Government of the Republic of Lithuania of 25 November 2009 (Žin., 2009 No.144-6376).

Pursuant to the said Resolution, the Ministry of Environment has to:

149.1. draw up and approve preliminary flood risk assessment reports not later than by 22 December 2011;

149.2. discuss and approve, if required, preliminary flood risk assessment reports and amendments thereof not later than by 22 December 2018, and afterwards – every six years;

149.3. draw flood threat maps and flood risk maps and submit these to the Government of the Republic of Lithuania for approval not later than by 22 June 2013;

149.4. prepare flood risk management plans and submit these to the Government of the Republic of Lithuania for approval not later than by 22 June 2015.

Summary of measures implemented under Article 16 on priority substances

150. Summary of measures implemented under Article 16 on priority substances is provided in Table 103.

Table 103. Summary of measures implemented under Article 16 on priority substances

Relevant legislation	Measure
Wastewater Management Regulation Programme on the Reduction of Pollution of Waters with Hazardous Substances approved by Order No. D1-71 of the Minister of Environment of 13 February 2004 (Žin., 2004, No. 46-1539)	Regulation of maximum allowable concentrations of dangerous and priority dangerous substances Self-regulation of dangerous and priority dangerous substances in wastewater

Measures which prevent or reduce impacts of accidental pollution incidents

151. Measures which prevent or reduce impacts of accidental pollution incidents are provided in Table 104.

Table 104. Measures which prevent or reduce impacts of accidental pollution incidents

Relevant legislation	Measure
Regulations on the Prevention, Response to and Investigation of Industrial Accidents Programme on the Inspection of Dangerous Installations of the Republic of Lithuania approved by Order No. 1-528 of the Director of the State Fire and Rescue Department of 29 December 2006 (Žin., 2007, No. 3-143)	Development of industrial accidents prevention and liquidation plans and emergency reports

152. Legislation provides for measures required to prevent leakage from technical installations as well as to prevent and reduce impacts of pollution due to accidental incidents. Accidental incidents include storms, floods, chemical spills and transport accidents in the air, on land and in the sea. Accident prevention and liquidation plans have to provide for systems of warning about accidents and measures for reduction of risk for water bodies.

Measures which ensure that hydromorphological conditions of water bodies are consistent with good ecological status, or good ecological potential in artificial or heavily modified water bodies

153. So far, a potential impact of hydro technical constructions (dams) and other morphological alterations on river ecosystems and river bed processes has not been adequately studied in Lithuania. Measures for today which would ensure better ecological conditions in hydromorphologically altered water bodies include construction of fish by-passes, which are regulated by Order No. 3D-427 of the Minister of Agriculture of the Republic of Lithuania of 25 September 2007 on the approval of the List of Dams where Facilities for Fish Migration are Required and of the List of Former Dam Remains where Barriers for Fish Migration Have to Be Removed (Žin., 2007, No. 102-4180).

Controls over artificial recharge or augmentation of groundwater bodies

154. These measures are not relevant for Lithuania because there is no artificial recharge/augmentation of groundwater in our country.

Measures for water bodies which are unlikely to achieve the environmental objectives set out under Article 4

155. Lithuanian legislation provides for certain derogations for water bodies where water protection objectives cannot be achieved or are disproportionally expensive:

155.1. postponing of an objective (maximum until 2027) if accomplishment thereof is prevented by technical possibilities, disproportionate costs or natural conditions;

155.2. in the procedure laid down by the Minister of Environment, water bodies heavily modified by anthropogenic activities may be subject to less stringent water protection objectives ensuring that less stringent objectives will not deteriorate the status of a water body in question.

156. Derogations may be applied only in rare cases, upon performance of an economic analysis and well-founded proof of the necessity of the derogation.

Details of supplementary measures identified as necessary to meet the environmental objectives

157. Supplementary measures will be proposed for water bodies which will fail good water status requirements after the implementation of the basic measures, and environmental and economic efficiency of these measures will be evaluated. Supplementary measures have been defined for the reduction of point and diffuse pollution, improvement of hydromorphological status and reduction of the impact of recreation.

Details of measures to avoid increase in pollution of marine waters

158. This provision is more relevant for water bodies within the Nemunas RBD. All basic measures which improve the status of inland waters also have a positive impact on the status of sea waters. These include implementation of the requirements of the Urban Wastewater Treatment Directive and the Nitrates Directive and HELCOM recommendations. As part of the implementation of the HELCOM Baltic Sea Action Plan and Directive 2008/56/EC of 17 June 2008 establishing a framework for Community action in the field of marine environmental policy (OJ 2008 L 164, p. 19-40) (Marine Strategy Framework Directive)**,** a national strategy on protection of the marine environment of the Baltic Sea and an action plan for the implementation thereof are planned to be developed in 2010.

Measures to mitigate temporary deterioration in the status of water bodies if this is the result of circumstances of natural cause or force majeure which could not have been foreseen

159. Measures for the prevention and mitigation of pollution arising from unforeseen accidents (which are always unpredictable) have been provided for in the following legislation:

159.1. Regulations on the Prevention, Response to and Investigation of Industrial Accidents, and

159.2. Programme on the Inspection of Dangerous Installations.

Emergency plans envisage ensuring protection of people and the environment in the event of emergencies as well as mitigation of negative impacts of accidents on people and the environment.

Other programmes attributed to the basic measures

160. The following available programmes which are currently implemented can be classified as basic measures:

160.1. Programme on the Reduction of Agricultural Pollution of Waters approved by Order No. 3D-686/D1-676 of the Minister of Agriculture and the Minister of Environment of the Republic of Lithuania of 9 December 2008 (Žin., 2008, No. 143-5741);

160.2. Strategy for the Use and Protection of Groundwater for 2002–2010 approved by Resolution No. 107 of the Government of the Republic of Lithuania of 25 January 2002 (Žin., 2002, No. 10-362);

160.3. Programme on the Assessment and Use of Groundwater Resources for Drinking Water Supply for 2007–2025 approved by Resolution No. 562 of the Government of the Republic of Lithuania of 8 June 2006 (Žin., 2006, No. 66-2436);

160.4. Development Strategy for Drinking Water Supply and Wastewater Management for 2008–2015 approved by Resolution No. 832 of the Government of the Republic of Lithuania of 27 August 2008 (Žin. 2008, No. 104-3975);

160.5. National Strategy for the Implementation of the United Nations Framework Convention on Climate Change by 2012 approved by Resolution No. 94 of the Government of the Republic of Lithuania of 23 January 2008 (Žin., 2008, No. 19-685);

160.6. Lithuanian Rural Development Programme for 2007-2013 (RDP) approved at the EU Rural Development Committee on 19 September 2007;

160.7. Cohesion Promotion Action Programme approved by the Commission Resolution of 30 July 2007.

Effect of implementation of the basic measures

161. The implementation of the basic measures will have a modest but nevertheless a positive impact on the status of water bodies. Decrease of point pollution in relation to the implementation of the Urban Wastewater Treatment Directive can be expected only in the Venta Basin meanwhile point pollution loads in the Bartuva and Šventoji basins are not likely to change. The decrease in the BOD_7 loads in the Venta RBD is expected to be very low – only around 3%. The loads of total nitrogen should go down by up to 20% and those of total phosphorus – by up to 33%. The decrease of pollution loads in the Venta Basin as compared to 2009 will be determined by the reconstruction of Kuršėnai and Telšiai WWTP and construction of new wastewater treatment facilities in Akmenė and Naujoji Akmenė.

The data available and the analyses findings show that four water bodies in the Venta RBD identified in the rivers Dabikinė, Tausalas and Agluona will still be failing the requirements for good ecological status/potential due to the point pollution impact even after the implementation of the basic measures under the Urban Wastewater Treatment Directive. These water bodies have been designated as water bodies at risk which will require supplementary measures in order to achieve their good ecological status/potential.

The implementation of the Nitrates Directive will also reduce point pollution loads because pollution with nitrogen compounds from animal farms with manure storages will go down. Experience of other countries and estimation results demonstrate that pollution with nitrogen compounds by farms where manure storages will be constructed is likely to go down by 20-30%. Consequently, pollution by animal husbandry farms in the Venta RBD could go down by about 9-13% as a result of the implementation of the basic measures under the Nitrates Directive. Reduction of pollution loads in the Venta Basin could total to about 8-13%, in the Bartuva Basin – to 10-15% and in the Šventoji Basin – to 8-12%.

After the implementation of the basic measures under the Nitrates Directive, 11 water bodies in the Venta RBD identified in the rivers Ringuva, Dabikinė, Šventupis, Agluona and Ašva will still be failing the requirements for good ecological status/potential by concentrations of nitrate nitrogen. These water bodies have been designated as water bodies at risk and will require supplementary diffuse agricultural pollution reduction measures in order to achieve their good ecological status/potential.

The implementation of other directives discussed will have a less significant effect on the status of water bodies because their requirements are only indirectly related to the improvement of water status.

Table 105. Implementation costs of the key water legislation from 2010 through 2015 in the Venta RBD, LTL

Directive	Costs		
	Investment costs	Operating costs,	Annual costs,
Bathing Water Directive	0	50 000	50 000
Birds Directive *	666 000	344 000	434 000
Drinking Water Directive	together with the costs of the Nitrates Directive		
Major Accidents Directive *	200 000	0	27 000
Environmental Impact Assessment Directive	0	280 000	280 000
Sewage Sludge Directive **	51 317 000	1 539 500	6 013 500
Urban Wastewater Treatment Directive **	81 090 000	1 621 800	8 691 800
Plant Protection Products Directive	1 460 000	12 500	261 500
Nitrates Directive **	82 360 000	823 600	8 004 600
Habitats Directive *	180 000	496 000	520 000
IPPC Directive*	100 000	0	14 000
Total ~	**217 400 000**	**5 200 000**	**24 300 000**

Notes:
* Estimations of annual (annualised) costs were based on a 10 years service life.
** Estimations of annual (annualised) costs were based on a 20 years service life.
Operating costs were estimated applying the following investment percentage: Sewage Sludge Directive – 3%, Urban Wastewater Directive – 2%, Nitrates Directive – 1%.

SECTION III. SUPPLEMENTARY MEASURES

162. Supplementary measures have been proposed for the bodies of water which will be failing the good status requirements after the implementation of the basic measures, and their environmental and economic efficiency has been assessed.

Supplementary measures to reduce the impact of point pollution sources and their costs

163. The data available and the analyses findings show that four water bodies within the Venta RBD identified in the rivers Dabikinė, Tausalas and Agluona will still be failing the requirements for good ecological status/potential due to the significant impact of

point pollution even after the implementation of the basic measures under the Urban Wastewater Treatment Directive. All these water bodies are small and their pollution accumulation potential is too low to be able to receive pollution from the neighbouring town even when wastewater treatment facilities are operating efficiently and the quality of discharges complies with the requirements of the Urban Wastewater Treatment Directive.

One of the pollution sources exerting a significant impact on the Agluona River is Naujoji Akmenė WWTP. A new relatively efficient WWTP is already operating in this town therefore there is no need to recommend supplementary measures for reducing point pollution from wastewater treatment facilities.

Findings of the study “Preparation of a feasibility study on the construction of stormwater management systems in selected problematic settlements and development of recommendations for the construction of such systems in individual typical cases” demonstrated that the Agluona River may be significantly affected not only by domestic wastewater but also by surface (stormwater) runoff. Therefore the measures for reducing pollution with surface (stormwater) runoff provided for in the said study, i.e. construction of wastewater collection and treatment system in Naujoji Akmenė, are recommended in order to achieve good ecological status of the Agluona. Following the feasibility study on stormwater treatment, the demand of investments totals to around LTL 2 740 000. Such amount will not be available until 2015. Hence it is suggested postponing the achievement of water protection objectives in the Agluona River. Instead, it is recommended to conduct operational monitoring downstream of Naujoji Akmenė.

No supplementary measures are recommended for WWTP in Telšiai because this town faces industrial pollution problem. According to preliminary assessments, about half of pollution loads come to Telšiai WWTP from the milk processing company Žemaitijos pienas. Hence it is not worthwhile improving the efficiency of the WWTP operation due to such significant amounts from this industrial enterprise. To reduce the pollution loads, first of all the share of pollution coming to the WWTP from the company Žemaitijos pienas should be reduced. In addition, despite the identification of the key source of pollution of the Tausalas River, data on its impact is still insufficient. Consequently, it is recommended to postpone the achievement of the water protection objectives in the Tausalas River and to perform operational monitoring in this river to specify pollution reduction objectives in more detail.

Estimations show that pollutant concentrations in the Dabikinė River should be no longer exceeding the threshold values of good ecological status after the implementation of the Urban Wastewater Treatment Directive. However, measurements performed at the water company Akmenės vandenys demonstrate significant pollution of the river even after having transferred pollution of Naujoji Akmenė to the Agluona River. The water quality of the Dabikinė may be seriously affected by households whose wastewater is not subject to centralised collection and treatment, therefore this river has been designated as a water body at risk and its status should be monitored in order to establish the demand of supplementary pollution reduction measures. If the monitoring results demonstrate that the implemented basic measures under the Urban Wastewater Treatment Directive did not lead to good ecological status of the river, supplementary pollution reduction measures will have to be planned in future. It is suggested to postpone achievement of the water protection objectives in the water bodies identified in the Dabikinė River until a sufficient amount of data is collected to be able to establish the demand and implementation scope of supplementary measures.

Measures to reduce diffuse pollution

164. Diffuse agricultural pollution prevents good water status in a number of water bodies within the Venta RBD. This problem is relevant only for the Venta Basin where nitrogen leaching into water bodies has to be reduced in the area of 1 167.8 km^2 (Figure 45), which situates 8 problematic catchments (units used for the assessment of agricultural pollution in a mathematical model). It was estimated that pollution loads leached out into water bodies have to be reduced by 1.2 kg/ha – in total 141 tonnes of total nitrogen. Good ecological status/potential of water bodies in the Venta RBD can be achieved by introducing diffuse pollution reduction measures common for the whole of Lithuania, a number of which have been adopted in the Programme of Measures for Achieving Water Protection Objectives within the Nemunas River Basin District approved by Resolution No. 1098 of the Government of the Republic of Lithuania of 21 July 2010.

165. Supplementary measures to reduce diffuse pollution are as follows:

165.1. validated maximum allowable amounts of nitrogen and phosphorus fertilisers per hectare, irrespective of whether organic or mineral fertilisers are used;

165.2. a revised and validated mandatory methodology for the development of fertilisation plans;

165.3. an obligation to develop fertilisation plans for farms utilising 10 ha of land and more;

165.4. an obligation to manage manure in line with the recommendations set forth in the Good Farming Rules and Guidelines and in compliance with the Environmental Requirements for Manure Management for farms with less than 10 LSU (i.e. farms which are not subject to the requirements of the Nitrates Directive). The Good Farming Rules provide for that solid manure may be temporarily stored in field heaps in accordance with the said Guidelines;

165.5. revised Environmental Requirements for Manure and Slurry Management approved by Order No. D1-608/3D-651 of the Minister of Environment and the Minister of Agriculture of the Republic of Lithuania of 14 July 2010 to include the obligation to keep documents which prove legal use, handover or sales of manure and/or slurry at least two years for farms with 50 and more LSU;

165.6. controls over the afore-listed measures. It is recommended to carry out additional control of 5% of all small farms in Lithuania which have less than 10 LSU, 10% of farms with 10 ha of land and more (which will also have to develop fertilisation plans observing the present Management Plan) where supplementary measures are required to reduce agricultural pollution, and 2% of farms of the latter size in the remaining area of Lithuania;

165.7. information campaigns for the implementers of the programmes of measures on measures against diffuse pollution. The main areas of information and training are as follows:

165.7.1. information campaigns for farmers on the maximum allowable fertilisation norms, procedure of the development of fertilisation plans and benefits of the plans;

165.7.2. information campaigns and trainings for small farms on manure and slurry management;

165.7.3. trainings for developers of fertilisation plans.

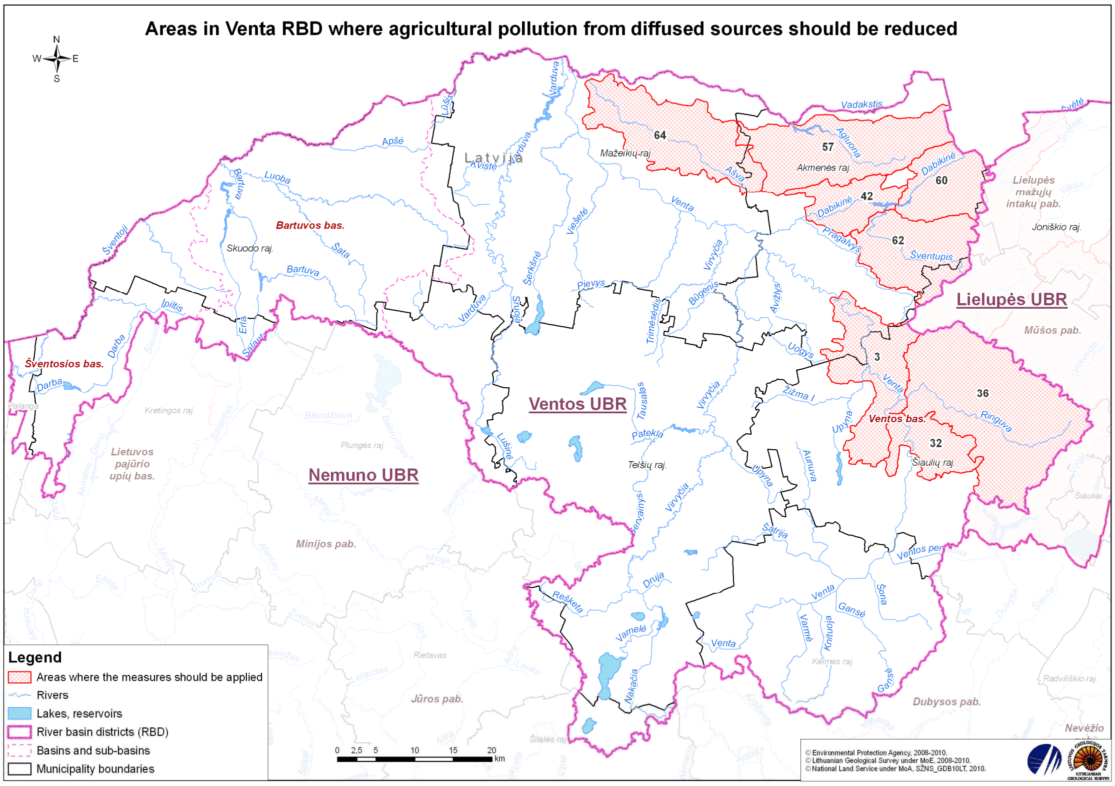


Figure 45. Areas in the Venta RBD where diffuse pollution has to be reduced

Application of supplementary measures to reduce diffuse pollution

166. The application of the afore-listed measures would result in decrease of diffuse pollution to the required level within the whole Venta RBD. An assessment of the effect and costs of the supplementary measures for reducing agricultural impact is provided in Tables 106 to 109.

Table 106. Measures to reduce diffuse pollution in the Venta Basin and their costs

Measures for Venta Basin	Measure application scope, ha/LSU/unit	Effect of the measure on N reduction, kg/year	Annual costs, LTL
Manure management on small farms	29 004 LSU	52 169	290 000
Fertilisation plans on farms ≥ 10 ha	186 408 ha	269 289	2 310 000
Additional control	-	-	48 000
Total:	269 289	321 458	2 650 000

Table 107. Measures to reduce diffuse pollution in the Šventoji Basin and their costs

Measures for Šventoji Basin	Measure application scope, ha/LSU/unit	Effect of the measure on N reduction, kg/year	Annual costs, LTL
Manure management on small farms	2 341 LSU	0	23 400
Fertilisation plans on farms ≥ 10 ha	11 692 ha	0	178 000
Additional control		-	2 600
Total:		0	204 000

Table 108. Measures to reduce diffuse pollution in the Bartuva Basin and their costs

Measures for Bartuva Basin	Measure application scope, ha/LSU/unit	Effect of the measure on N reduction, kg/year	Annual costs, LTL
Manure management on small farms	7 021 LSU	0	70 200
Fertilisation plans on farms ≥ 10 ha	35 194 ha	0	571 500
Additional control		-	8 000
Total:		0	649 700

Table 109. Measures to reduce diffuse pollution in the Venta RBD their effect and costs

Measures for Venta RBD	Measure application scope, ha/LSU/unit	Effect of the measure on N reduction, kg/year	Annual costs, LTL
Manure management on small farms	38 367 LSU	up to 52 169	383 670
Fertilisation plans on farms ≥ 10 ha	142 305 ha	up to 269 289	3 056 940
Additional control		-	58 600
Total ~:	323 000	up to 321 000	3 500 000

The annual costs of the measures required to reduce diffuse pollution in the Venta RBD would total to LTL 3.5 million. Farmers with more than 10 ha of land who will have to develop fertilisation plans would have to spend LTL 3 million and farmers who keep up to 10 LSU – about LTL 384 thousand. The burden to the state would total to LTL 59 thousand for the control of the implementation of the measures.

Measures to reduce pollution with hazardous and priority hazardous substances

167. During the project “Identification of substances dangerous for the aquatic environment in Lithuania”, concentrations of di(2-ethylhexyl) phthalate (DEHP) were found to be exceeding the established norms in the Šventoji at the border; allowable concentrations of DEHP and trichloromethane were exceeded in the Venta, also at the border. The sources of hazardous substances and their routes to the rivers have not been identified yet. A potential source of these substances in the Venta is the oil refinery Mažeikių nafta, wastewater from which is transported to the Venta by the Varduva River. Therefore the stretch of the Varduva downstream of the discharger of the oil refinery has been identified as a water body which fails good chemical status. The entire stretch of the Šventoji flowing along the Lithuanian-Latvian border has been designated as a water body at risk.

Concentrations of hazardous substances exceeding the MAC were detected in the said water bodies during one-time measurements, therefore these concentrations will be analysed in the intensive monitoring sites located at the mouth of the rivers Varduva and Šventoji in order to identify the actual pollution level. It is proposed to postpone the achievement of water protection objectives in the water bodies identified in the Varduva and Šventoji and to perform intensive surveillance monitoring therein until sufficient data is collected proving a significant level of pollution with hazardous substances and allowing planning pollution reduction measures.

Measures to improve hydromorphological status

168. The main reasons which determine hydromorphological changes in water bodies and thus prevent the achievement of good ecological status in some bodies of water are related to:

168.1. artificial barriers (disruption of river continuity),
168.2. hydropower plants,

168.3. straightened rivers.

169. To eliminate these causes or mitigate their impact, the following measures are proposed:

169.1. restoring/ensuring river continuity and flow,
169.2. reduction of the impact of hydropower plants,
169.3. renaturalisation of river beds.

Construction of fish bypass facilities

170. The most important measure which allows mitigating impacts of disruption of river continuity is construction of fish bypass facilities. 25 fish migration facilities were constructed in Lithuania until 2010: sluices, rock channels with weirs, and vertical-slot pool fish passes.

171. Five fish migration facilities were constructed in the Venta RBD on the Venta and Šventoji during the last couple of years: fish bypasses in Jautakiai (2004), Rudikiai (2002), Kuodžiai (2005) and Viekšniai (2008), Laukžemė (2009).

Fish bypass facilities should be first of all constructed in rivers which are most important for fish migration. Such place in the Venta RBD is Bugeniai dam.

Construction of fish bypass facilities should be based on specific feasibility studies selecting the most suitable technological solution for the bypass. The construction should also be supplemented with monitoring data both prior and after the construction in order to be able to assess an impact of such facility of the ecological status of the river and to select the best alternative. However, no such information is available in Lithuania hence the impact analysis should be postponed for the second stage of the development of the plan for the Venta RBD, i.e. the planning cycle from 2015.

172. Taking into account the information provided on the List of Dams where Facilities for Fish Migration are Required and on the List of Former Dam Remains where Barriers for Fish Migration Have to Be Removed as well as expert judgement, the fish bypass facilities required and the barriers to be removed in the Venta RBD are as follows:

Table 110. Fish bypass channels required and dam remains to be removed in the Venta RBD and their costs, LTL

River	Dam	Measure****	District	Investment costs, 2009*, LTL
Fish bypass facilities				
Šerkšnė	Bugeniai dam***	Fish pass (2)	Mažeikiai distr.	151 500
Barriers to be removed				
Šerkšnė	Rock weir	to remove the rock weir (1)	Mažeikiai distr.	24 200
Šata	Rock weir	to remove the rock weir (2)	Skuodas distr.	24 000**
Total:				200 000

Source: List of Dams where Facilities for Fish Migration are Required and List of Former Dam Remains where Barriers for Fish Migration Have to Be Removed, and expert judgement.

* Costs taken from the study "Improvement of fish migration conditions in ichtiologically important rivers" (Gedilieta and Institute of Ecology, 2001).

** Removal costs of the rock weir on the Šata have not been analysed in previously conducted detailed studies therefore the same costs are proposed as the costs for the Šerkšnė River.

*** On the Šerkšnė, first, the rock weir downstream of Bugeniai dam should be removed and only then a fish pass at Bugeniai dam should be built.

**** (1) a higher priority measure, (2) a lower priority measure

173. Construction of one fish bypass and removal of two old dam remains will require around LTL 200 thousand of investment costs. If this amount is distributed evenly on a yearly basis from 2011 until 2015, the annual demand would be about LTL 40 thousand.

Replacement of HPP turbines

174. River stretches downstream of hydropower plants are proposed to be assigned to water bodies at risk due to unnatural fluctuation of their water level and runoff. Besides, turbines of certain types injure by-passing fish. Such impact can be mitigated by replacing old-type turbines with modern ones which are more environmentally friendly.

There are 28 HPP in the Venta RBD. There is no need to replace turbines in newly built HPP; however, when such need arises, HPP owners should be obligated to replace the old turbine with an environmentally friendly one.

175. Assuming that the owners of small HPP will be able to make use of the EU support for the introduction of environmentally friendly turbines most likely only after 2013, the following priority turbines of importance for fish resources will have to be replaced:

175.1. HPP in Rudikiai – 40 kW,
175.2. HPP in Viekšniai – 90 kW,
175.3. HPP in Alsėdžiai – 75 kW,
175.4. HPP in Leckava – 125 kW.

176. The total costs of the replacement of turbines with modern ones in the Venta RBD are estimated at about LTL 1 320 thousand because the cost of a new turbine is about LTL 4 000 per one kW.

177. Order No. 68 of the Minister of the Environment of the Republic of Lithuania of 23 February 2000 on fish protection measures in small hydropower plants (Žin., 2000 No. 19-471; 2003, No. 78-3583) recommends that electricity generators select turbines with the minimum potential impact on hydrobionts when constructing new or reconstructing old hydropower plants. Additional fish protection measures can include fish diversion screens with 100-150 mm spacing between the wires, electric field barriers and other effective measures which repel or protect fish, and stopping hydropower plants which are operated only in the daytime for the night until the sunset (especially during the period of peak fish migration in spring from 1 April to 1 June).

Renaturalisation of rivers

178. The length of straightened rivers and streams in the Venta RBD, established using GIS methods, totals to 560 km. 36 water bodies (with the total length of 385 km) in the Venta RBD have been identified as water bodies at risk due to a significant impact of straightening. 11 water bodies (more than 170 km) have been assigned to heavily modified water bodies.

179. The main principles of naturalisation of regulated river beds are as follows:

179.1. to restore the original cross-section of the bed,

179.2. to ensure its stability, and

179.3. to restore the original functions of the bed (biological productivity, transformation of substances, habitats for water and land life).

180. Naturalisation methods can differ a lot depending on a specific river or river stretch and are applied according to the existing conditions and targets set. However, all these methods can be grouped as follows:

180.1. Remeandering of straightened river stretches;

180.2. Formation of meanders in straightened river stretches and ditches;

180.3. Reformation (re-profiling) of the cross-section of the river bed by application of various measures;

180.4. Restoration or formation of the heights and slopes of the river bed bottom;

180.5. Reinforcement of river banks;

180.6. Restoration and formation of small bays and coves in the neighbourhood of the river bed and in the floodplain;

180.7. Restoration and/or increasing abundance of flora and fauna.

181. Remeandering is an expensive process which is so far unacceptable to people Hence, the following has been proposed in the Programme of Measures for the Venta RBD:

181.1. to leave the stretches of rivers flowing in the upper reaches of rivers, in hilly, springy, laky and protected areas which already are in the process of the natural regaining of their original state for complete self-naturalisation;

181.2. to perform renaturalisation of rivers only in areas with a clear public demand (settlements, parts, etc.) as well as in places where the naturalisation can have a significant effect of minimising floods, capturing pollutants and increasing/restoring biodiversity (habitats of plants and animals);

181.3. to leave the stretches of rivers in non-agricultural areas for self-naturalisation controlling this process with regard to drainage needs in the upstream and downstream areas.

182. An additional source for renaturalisation are not clear. Practically all available ones for 2007-2013 already have their investment objects planned. At present, the state would not be able to afford such measure. Besides, impacts of the remeandering on the ecological status of specific streams are not known yet. Consequently, first of all a pilot project should be carried out until 2015. No pilot projects have been envisaged for the Venta RBD, such project has been planned for the Nemunas RBD.

183. According to rough estimates, the investment demand for one kilometre totals to LTL 100 000. The total length of straightened rivers in the Venta RBD is estimated at 560 km, of these 204 km are water bodies at risk flowing over plains. Remeandering of these river stretches would cost about LTL 20.4 million. The operating costs can be equated to zero. The total annual costs would be about LTL 1.6 million.

Summary costs of mitigation of hydromorphological changes

Measures for mitigating the impact of hydromorphological changes and their total costs are provided in Table 111.

Table 111. Measures for mitigating the impact of hydromorphological changes in the Venta RBD

Measure	Amount	Investment costs	Operating costs	Total annual costs
Fish passes and removal of dam remains	1 pass and 2 dam remains	200 000	4 500	17 000
Modern HPP turbine	4 HPP, 330 kW	1 320 000	40 000	80 000
Remeandering	204 km	20 400 000	0	1 300 000
Total ~:		22 000 000	44 000	1 400 000

Source: experts' estimations

Supplementary measures for recreation

184. Although recreation has not been included among the drivers of significant pressures on the ecological status of water bodies, it is suggested that part of funds allocated for the development of recreation and already provided for in respective governmental documents are put aside for measures intended for the enhancement of the ecological status. This means that creation of any new object of infrastructure related to recreation should be permitted only in the event that measures to counterbalance the ecological damage done by such objects have been provided for.

Such measures should also be envisaged for the implementation of the National Special Plan of Water Tourism Routes which has already been prepared and which aims at expanding knowledge-oriented and recreational water tourism as well as the infrastructure of tourism and recreation. No water body of the Venta RBD is included among water tourism routes.

185. There are nine official bathing waters in the Venta RBD. Two of them are established at ponds larger than 0.5 km^2 – at the Venta in Akmenė district and at the Bartuva in Skuodas District. At the moment, municipalities are not planning establishment of new bathing sites hence no supplementary measures related to the monitoring of bathing waters have been provided for. If municipalities decide to designate new bathing waters, monitoring costs may go up.

186. Countryside tourism, as a separate load type, is not expected to have any negative impact on the environment. Countryside tourism farmsteads are subject to regulations on treatment of household wastewater. Farmsteads should be regarded as point pollution sources which have treatment facilities and which are supposed to treat effluents at least to the following standards: $BOD_{7\ p}$ – 29 mg/l, P_{total} – 10 mg/l, and N_{total} – 40 mg/l. When issuing permits to these objects, the status of a receiving water body in question should be taken into account.

187. Supplementary measures also cover amendment of the legislation in force, which will have a positive impact on the improvement of status of water bodies not only within the Venta RBD but also in the entire country (Table 112).

Table 112. Recommended amendments of relevant legislation

Legislation and recommended amendment	Responsible implementer	Implementation deadline	Demand of funding
To draft a Government resolution on amendment of the Special Conditions for the Use of Land and Forest approved by Resolution No. 343 of the Government of the Republic of Lithuania of 12 May 1992 (Žin., 1992, No. 22-652) enacting new sizes of sanitary protection zones of wastewater treatment facilities taking into account the level of modern treatment technologies	Ministry of Health of the Republic of Lithuania Ministry of Environment of the Republic of Lithuania	2011-2012	No funds will be needed
To amend the Standard Rules for the Use and Maintenance of Ponds (LAND 2-95) approved by Order No. 33 of the Minister of Environment of the Republic of Lithuanian of 7 March 1995 as follows: - to obligate the owners of HPP with the capacity of 100 kW and more to ensure hourly automatic transmission of water level measurements to the data base of the Environmental Protection Agency; - to obligate HPP owners to develop and annually revise downstream discharge rating curves for the dry season; - to introduce the requirement to select suitable start-up power and number of regulated turbines in newly built hydropower plants with a view to reduce a negative impact of hydropower plants on the status of water bodies.	Ministry of Environment of the Republic of Lithuania Environmental Protection Agency	2011-2012	No funds will be needed
To develop a methodology for the assessment of damage done by hydropower plants for water bodies as a result of failure to observe the established environmental requirements	Ministry of Environment of the Republic of Lithuania	2014-2015	LTL 30 thousand from the state budget

Research and educational projects

188. Although there are water bodies in the Venta River Basin District which may be suffering from pollution from both point and diffuse pollution sources, no specific data thereon is available at the moment.

The problematic water bodies whose pollution causes have to be identified are discussed below.

Pollution load models suggest that the ecological status of Lake Mastis should be high; however, according to both monitoring data and lake study findings, the ecological status of the water body is lower than good. It should be noted that, following the modelling data, point pollution in Lake Mastis accounted for 45% (although as such it should not be exerting a significant impact). The status of Lake Mastis may be materially affected by pollutants transported with surface runoff from the urban areas. Also, it is highly likely that the lake is being polluted with wastewater discharged from households illegally connected to the surface runoff collection system. Hence inventory of pollution sources and investigative monitoring are required in order to identify the causes determining poor status of this lake. At the same time, analysis of hazardous substances and heavy metals in the lake water and sediments is required. A lake study findings indicate that the lake used to be polluted with industrial wastewater, pollutants from diffuse pollution sources continue entering the lake. Such studies would enable more precise identification of the chemical status of the lake (to date, no monitoring data on the chemical status of the lake is available).

Lake Biržulis, which has significantly sunk and which suffers from pollution, as well as the wetlands which have opened up after the lowering of the lake water level practically are not suitable either for farming or recreational purposes. However, this is an area important for the conservation of birds. Continued changes in the lake and riparian wetlands can have a negative impact on the birds and aquatic communities therein. In addition, the ecological potential of Lake Biržulis may be affected by resuspension of biogenic substances accumulated in bottom sediments into the water as well as by diffuse pollution (the modelling results suggest that the lake is subject to certain pollution loads but its ecological status should still be good).

It is recommended to study changes in the physico-chemical and morphometric parameters of the lake in more detail (to conduct more intensive – investigative monitoring, including checks of pollution sources situated around the lake and assessing changes of the morphometric parameters of the lake). Such studies would enable evaluating possibilities to stabilise the ecological potential of the lake.

Causes conditioning poor ecological status of Lake Gludas are not known. Mathematical pollution load modelling results indicate that the status of the lake should be high. However, following the lake study findings, sometimes fish deaths occur in this lake during prolonged ice cover periods. No monitoring data is available on the quality parameters of this lake. Hence, monitoring of the quality parameters is required (within investigative monitoring) to establish whether the lake should really be designated as a water body at risk.

Pollution load modelling results suggest high ecological status of Sablauskių pond; however, according to monitoring data, it is lower than good. It should be noted that, following the modelling data, point pollution in this pond accounts for 47% of the pollution load therein (although as such it should not be exerting a significant impact). Hence inventory of pollution sources and investigative monitoring are required in order to identify the causes determining poor ecological potential of this pond.

Lower than good ecological status of Lake Alsėdžių ežeras and Lake Tausalas could be determined by historic pollution (modelling results suggest high status of these lakes). To be able to identify the origin of pollution of these lakes lake at risk (to find out whether they suffer from anthropogenic pressures due to historic or present pollution), detailed studies (investigative monitoring, including monitoring of the near-bottom layer of the lake, checks of the pollution sources around the lake) are required.

The research required is summarised in Table 113 below.

Table 113. Studies and educational measures required in the first implementation stage of the Programme of Measures for the Venta RBD

Study or educational measure	Required costs		
	Investment/ one-time, LTL	Operating, LTL/year	Annual, LTL/year
Inventory of morphometric, physico-chemical and biological parameters and sources and analysis of identified pollution sources in Lake Biržulis	18 000		2 000
Investigative monitoring, including monitoring of the near-bottom layer, and inventory of pollution sources in Lake Alsėdžių ežeras and Lake Tausalas	35 000		5 000
Investigative monitoring and inventory of pollution sources in Lake Mastis and Sablauskių pond	105 000		14 000
Information campaigns for implementers of the Programme of Measures and for the general public		10 000	10 000
Total	**158 000**	**10 000**	**31 000**

Source: experts' estimations

Summary costs of supplementary measures

189. Summary information on the costs required for the implementation of the supplementary measures is given in Tables 114 and 115. Since it recommended to identify a demand of river renaturalisation in an area selected for a pilot project which has been proposed only for the Nemunas RBD, no costs of this measure are provided in Table 114. Also, this table does not include surface runoff management and turbine replacement costs because funds for these measures potentially can be available only after 2013.

Table 114. Costs of measures for the Venta RBD

Group of measures	Investment costs, LTL	Operating costs, LTL/year	Annual costs, LTL/year
Point pollution	2 740 000	140 000	320 000
Diffuse pollution	0	3 500 000	3 500 000
Hydromorphological changes	21 920 000	44 000	1 395 000
Research and education	158 000	10 000	31 000
Total ~	**24 820 000**	**3 690 000**	**5 250 000**

Table 115. Preliminary costs of measures for the Venta RBD, excluding measures which shall not be implemented during the first stage

Measures, excl. reduction of point pollution, renaturalisation of river beds and replacement of turbines	Investment costs, LTL	Operating costs, LTL/year	Annual costs, LTL/year
Diffuse pollution	0	3 500 000	3 500 000
Hydromorphological changes	200 000	4 500	17 100
Research and education	158 000	10 000	31 000
Total ~	**360 000**	**3 510 000**	**3 550 000**

Source: experts' estimations

190. The total costs of the whole Programme of Measures, including both the basic and the supplementary measures, are provided in Table 116 and Figure 46.

Table 116. Implementation costs of the whole Programme of Measures for the Venta RBD until 2015

Group of measures	Investment costs, LTL	Operating costs, LTL/year	Annual costs, LTL/year
Basic measures			
Bathing Water Directive	0	50 000	50 000
Birds Directive	666 000	344 000	434 000
Drinking Water Directive	together with the costs of the Nitrates Directive		
Major Accidents Directive	200 000	0	27 000
Environmental Impact Assessment Directive	0	280 000	280 000
Sewage Sludge Directive	51 317 000	1 539 510	6 013 510
Urban Wastewater Treatment Directive	81 090 000	1 621 800	8 691 800
Plant Protection Products Directive	1 460 000	12 500	261 500
Nitrates Directive	82 360 000	823 600	8 004 600
Habitats Directive	180 230	495 710	519 710
IPPC Directive	100 000	0	14 000
Basic measures in total	**217 370 000**	**5 170 000**	**24 300 000**
Supplementary measures			
Point pollution	0	0	0
Diffuse pollution	0	3 500 000	3 500 000
Hydromorphological changes	200 000	4 500	17 100
Research and education	158 000	10 000	31 000
Supplementary measures in total ~	**360 000**	**3 510 000**	**3 550 000**
Basic and supplementary measures			
GRAND TOTAL ~	**217 730 000**	**8 680 000**	**27 850 000**

Source: experts' estimations

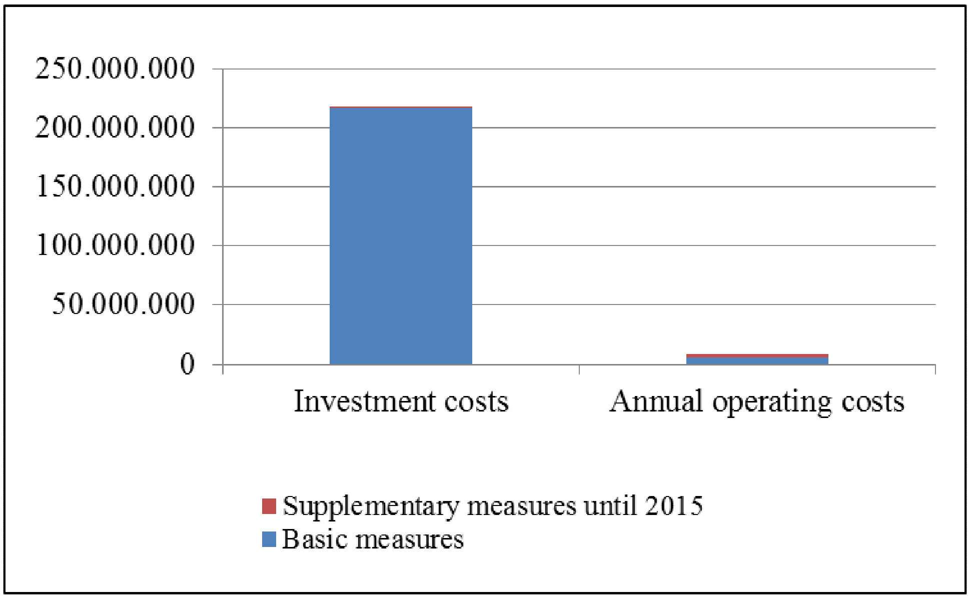


Figure 46. Investment and operating costs of the implementation of the basic and supplementary measures in the Venta RBD until 2015

Source: experts' estimations

SECTION V. BENEFITS OF ACHIEVING GOOD STATUS IN WATER BODIES

191. The benefit which will be obtained upon the implementation of the supplementary measures has been estimated on the basis of the "Study on willingness to pay for improvement of the Nevėžis River water quality to achieve good status" and the "Study on willingness to pay for improvement of the Neris River water quality to achieve good status and remeandering of the Neris". Such relative assessment studies are rather widely used in many countries for the estimating benefits of natural resources (i.e. the benefits which cannot be estimated using conventional economic-commercial methods).

The said two sub-basins are situated in the Nemunas RBD. It is believed that the benefits derived therein may be directly transferred into other Sub-basins in Lithuania due to highly similar geographical and social conditions throughout the country.

It was estimated that a statistically reliable monthly amount which respondents agreed to pay in the Nevėžis Sub-basin is LTL 1.85 per household (including the households which agree to pay 0 litas). Such study was conducted in 2007.

192. The "Study on willingness to pay for improvement of the Neris River water quality to achieve good status" identified four scenarios.

192.1. Willingness to pay for improvement of all water bodies in the Neris Sub-basin to achieve good ecological status;

192.2. Willingness to pay for improvement of all water bodies in the Neris Sub-basin to achieve good ecological status and also for remeandering of straightened rivers;

192.3. Willingness to pay for improvement of the water quality of Lake Riešės ežeras to achieve good ecological status;

192.4. Willingness to pay for improvement of the water quality of Lake Riešės ežeras and Lake Didžiulis to achieve good ecological status.

193. In this way statistically reliable figures illustrating willingness to pay both for individual water bodies and for improvement of all bodies of water in the Neris Sub-basin were derived.

194. In the Neris Sub-basin, the amount agreed to be paid by one household was LTL 40.51 per year, or LTL 3.38 per month only for improvement of the water quality, and LTL 48.18 per year, or LTL 4.01 per month both for improvement of the water quality and remeandering of rivers. In the first case, the amount totals to about 0.29% and in the second case – to 0.36% of the income of the studied households.

In the case of willingness to pay (i.e. to pay more than 0 litas), the payment for improvement of the water quality and remeandering of rivers totals averagely to more than 30% of people's water bills.

Having in mind that the number of population in the Venta RBD totals to about 190 thousand and that the size of one household is 2.4, the benefit in the Venta RBD estimated on the basis of the said Neris study would be around LTL 320 thousand per month, or LTL 3.8 million per year.

At the present stage of the development of the Programme of Measures, the measures selected pursuant to a cost-efficiency analysis are those which will be the most effective during the first cycle of the implementation of the Management Plan. The question of whether the costs of a measure intended for the achievement of good ecological status in a water body are disproportionate and whether such costs may serve as a basis for derogation is a political decision based on economic information. Such decision needs comparing relevant costs and benefits. The principle of disproportionate costs, i.e. cost-benefit comparison was not required in any case of extension of the deadline in the Venta RBD. All cases of extension are based either on technical uncertainties already discussed or on affordability and/or negative attitude (acceptability) of the public to implement such measures until 2015. The latter is in a way a component of the principle of disproportionate costs. Besides, only extension of the deadline for the attainment of environmental objectives is required and no lower objects are proposed. Consequently, a cost-benefit analysis and the figures illustrating the benefit which are given in this section were not required at this stage.

CHAPTER IX. PUBLIC INFORMATION AND CONSULTATION

195. Public participation activities in the management of the Venta RBD commenced in 2005 observing Order No. D1-273 of the Minister of Environment of the Republic of Lithuania of 31 May 2005 on the approval of the Personal Composition of the Coordination Councils of the Nemunas, Venta, Venta and Venta RBD (as amended on 4 September 2008, No. D1-455). The main task of the Venta Coordination Council is to coordinate interests of public authorities, water users, interested non-governmental organisations (NGO) and the public in setting and pursuing water protection objectives.

196. Other public information activities carried out:

196.1. A general Schedule for the Development of the Management Plans for all RBD in Lithuania was approved pursuant to Order No. V-110 of the Director of the Environmental Protection Agency of 25 October 2006 on the approval of the Schedule for the Development of River Basin District Management Plans (not published).

196.2. A few information events were arranged in 2007 for representatives of municipalities, regional environmental protection departments (REPD), Coordination Councils of all four Lithuanian RBD, including the Coordination Council of the Venta RBD. The participants were informed about the progress of the development of Lithuanian RBD management plans.

196.3. Reviews of water protection problems identified in water bodies within the Venta RBD were prepared and placed on the EPA website on 22 December 2007. The general public could provide their comments until 22 June 2008.

196.4. Water protection problems in Lithuanian RBD, including the Venta RBD, were discussed on 26 June 2008 at the EPA with representatives of the RBD Coordination Councils. Mainly general comments and proposals were put forward in relation to the identification and solution of water protection problems.

196.5. A meeting of the Coordination Councils of the Venta, Venta and Venta RBD was held on 25 November 2009 in Šilagalis village to discuss draft management plans and programmes of measures.

196.6. A meeting with representatives of the Water Problems Council under the Academy of Science of the Republic of Lithuania was held on 14 April 2010 at the EPA to discuss Venta RBD, Venta RBD and Dauguva RBD management plans and programmes of measures and relevant comments.

196.7. The progress of the development of the Venta RBD Management Plan was presented on a specially designed website (www.upiubaseinai.lt).

196.8. The general public was informed about the progress of the development of the Management Plan in email newsletters.

196.9. Information about the progress of the river basin management was announced in the media.

196.10. A video film (175 copies) and an information publication (700 copies) about the Venta RBD Management Plan and Programme of Measures were prepared and distributed to the general public.

196.11. An information conference was held on 27 October 2010 at the municipality of Telšiai district where the final drafts of the Venta RBD Management Plan and Programme of Measures were presented.

Comments of the general public on the Venta RBD Management Plan

197. The general public was invited to provide comments on draft managements plans and programmes of measures. The following institutions provided their written comments and questions regarding the draft management plan:

197.1. The National Control Commission for Prices and Energy (Letter No. R2-621 of 19 April 2010) recommended providing reviews on the preparedness of municipalities to implement the provisions of the Law on Drinking Water Supply and Wastewater Management and on the relevant measures available.

Observing this comment, the status of the preparation of municipal water management projects within the Venta RBD was analysed. These projects in a way reflect the implementation status of the Law on Drinking Water Supply and Wastewater Management in municipal territories.

197.2. The Administration of Akmenė district municipality (Letter No. 1-741 of 14 April 2010) provided the following comments:

197.2.1. incorrect length of certain networks planned to be constructed – the inaccuracies were corrected according to the comment;

197.2.2. incorrect water supply and wastewater management tariffs – the inaccuracies were corrected according to the comment;

197.2.3. incorrect provision of surface water users which no longer exist – the inaccuracies were corrected according to the comment;

Editorial inaccuracies specified in the Letter were also corrected.

197.3. The Administration of Palanga town municipality (Letter No. (4.21)D5-418 of 17 February 2010) provided the following comments:

197.3.1. it was proposed to supplement the wastewater treatment chart with information on the level of wastewater treatment in individual municipalities. However, all economic information in this Management Plan as well as in other management plan has been arranged by RBD and not by municipalities.

197.3.2. incorrect data on the employed population in the Venta RBD – the inaccuracies were corrected according to the comment;

197.3.3. it was proposed to include measures to prevent pollution of marine waters. Such measures are provided in the Management Plan for the Nemunas RBD.

197.3.4. information was missing on a constructed fish migration facility – the inaccuracy was corrected by including a fish migration facility constructed at Laukžemė in 2009 into the plan.

197.4. The Administration of Žemaitija National Park (Letter No. S-152-(10.12) of 20 March 2010) provided the following comments:

197.4.1. it was proposed to provide for measures to improve the hydromorphological status of the reclaimed upper reaches of the Varduva River. However, a renaturalisation pilot project at this stage is proposed only for the Nemunas RBD due to lack of funds and information.

197.4.2. it was proposed to envisage wastewater treatment development in Žemaičių Kalvarija settlement. However, an analysis of water bodies showed that this settlement has no significant impact on the Varduva River.

197.4.3. it was proposed to provide for a study on regeneration of Lake Biržulis. A relevant measure is already envisaged in the Programme of Measures for the Venta RBD "To perform extended research of morphometric, physico-chemical and biological parameters and sources and to identify its pollution sources and their impact on Lake Biržulis".

197.5. The State Service for Protected Areas under the Ministry of Environment (Letter No. V3-7.7-1568 of 11 October 2010) pointed out some editorial comments on the Management Plan and Programme of Measures, some inaccuracies related to the number of protected areas and shortage of legislation transposing the provisions of relevant directives.

All comments of the State Service for Protected Areas were taken into account in this Management Plan.

CHAPTER X. COMPETENT AUTHORITIES

198. The role of the Environmental Protection Agency, as specified in its regulations, is to collect, analyse and provide reliable information on the status of the environment, chemical flows and pollution prevention measures as well as to ensure arrangement of water protection and management for the attainment of water protection objectives. The Agency is also responsible for the development and coordination of basin management plans in the entire territory of Lithuania as well as for the reporting to the European Commission.

199. The Lithuanian Geological Survey organises exploration and maintenance of groundwater resources**.** Generally, the Survey organises and performs national exploration of the entrails of the Earth, regulates and controls the use and protection of the entrails of the Earth, collects, stores, and administers state geological information.

200. Regional Environmental Protection Departments are responsible for controls over the implementation of environmental legislation in the respective regions. The

Departments will also be in charge of the controls over the implementation of the WFD requirements in their regions.

Table 117. Competent authorities

Competent authority and its website	Area of responsibility in relation to the Venta RBD	Contact persons, duties, telephone	Details for correspondence		
			by fax	by email	by mail
Environmental Protection Agency www.gamta.lt	Development of the Management Plan and Programme of Measures	Mindaugas Gudas, Head of the Environment Status Assessment Department +370-5-662814	(8~5) 266 2800	M.Gudas@aaa.am.lt	Juozapavičiaus str. 9 LT-09311 Vilnius
Lithuanian Geological Survey www.lgt.lt	Research and maintenance of groundwater resources	Kęstutis Kadūnas, Head of the Hydrogeology Department +370-5-136272	(8 5) 233 6156	Kestutis.Kadunas@lgt.lt	Konarskio str. 35 LT-03123 Vilnius
Environmental Protection Department of Klaipėda Region	Check-up of information on the Venta RBD for purposes of analyses and problem identification and control over the implementation of the management plan	Andrius Kairys Director +370-46 466453	(8-46) 466452	rastine@klrd.am.lt	Birutės 16, Klaipėda
Environmental Protection Department of Šiauliai Region	Check-up of information on the Venta RBD for purposes of analyses and problem identification and control over the implementation of the management plan	Vidmantas Svečiulis Director +370-41 524143	(8-41) 503705	Srd@srd.am.lt	Čiurlionio str. 3, LT-76303, Šiauliai