APPROVED by Resolution No. 1098
of the Government of the Republic of Lithuania
of 21 July 2010

NEMUNAS 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 the Water Framework Directive (hereinafter – WFD), the key EU legal act in the field of water policy, the Environmental Protection Agency, in cooperation with the Lithuanian Geological Survey, has drawn up this Nemunas 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 administrative boundaries. 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 river basin.

Seeking to facilitate management of water and water bodies, the Lithuanian river basins were combined into the following four river basin districts (hereinafter – 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 present an overview of the current RBD status and the results of the analysis of impacts of human activity, 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.

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.

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[*] *Valstybės žinios* (official gazette)

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 it 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, e.g. 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.

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

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

CHAPTER II. CHARACTERISTICS OF THE NEMUNAS RIVER BASIN DISTRICT

SECTION I. SURFACE WATER BODIES

2. The Nemunas River Basin District (RBD) comprises the Lithuanian parts of the Nemunas and Prieglius River basins and of the Curonian Lagoon (*Kuršių marios*), as well as the Lithuanian Coastal Rivers Basin, plume of the Curonian Lagoon in the Baltic Sea, and coastal waters of the Baltic Sea. The Lithuanian Coastal Rivers Basin and the Prieglius River Basin were assigned to the Nemunas RBD for the reason of relatively small areas of their catchments as compared to the Nemunas River Basin. It was decided that developing management plans for those small basins and setting appropriate management structures would not be a feasible option. The Lithuanian Coastal Rivers Basin was assigned to the Nemunas RBD and not to the Venta RBD because it affects the quality of the Lithuanian coastal waters in the way the Nemunas River Basin does.

The Nemunas River Basin lies at 56°15‘-52°45‘ N and 22°40‘-28°10‘ E. The total length of the river is 937 km, and the basin area constitutes 97 928 km^2. The Lithuanian part of the basin covers the area of 46 626 km^2. The Nemunas Basin drains the territories of Belarus, Lithuania, Russian Federation (Kaliningrad Region), Latvia (only about 100 km^2), and Poland. The Prieglius River Basin occupies the area of 15 500 km^2, of which only 88.4 km^2 belong to Lithuania. The area of the Lithuanian Coastal Rivers Basin is 1 100 km^2. The resulting total area of the Nemunas RBD in Lithuania (excluding the coastal and transitional waters assigned thereto) is 47 814 km^2.

A one nautical mile wide strip of coastal waters assigned to the Nemunas RBD stretches along 100 km of the Lithuanian coastline. The Curonian Lagoon, a freshwater coastal lagoon in the southeast of the Baltic Sea, is also assigned to the Nemunas RBD as transitional waters. Lithuania owns the northern part of the lagoon which comprises the water area of 402.03 km^2 (26.1 % of the total area). The remaining part of the lagoon (1 181.97 km^2) belongs to the Russian Federation. The length of the coastline of the lagoon in the Lithuanian territory is about 200 km. In addition, the transitional waters also include the waters of the so-called plume of the Curonian Lagoon in the Baltic Sea, which is characterised by mixture, under certain climatic conditions, of saline water of the Baltic Sea and freshwater of the Curonian Lagoon. The plume occupies the area of approximately 112.98 km^2. The total area of the coastal and transitional waters is 629.75 km^2, where Klaipėda Strait occupies 6.59 km^2.

3. The total area of the Nemunas RBD, including the transitional and coastal waters, is 48 443.7 km^2.

The longest and the largest (by their catchment size) tributaries of the Nemunas in Lithuania are the Merkys, Neris, Nevėžis, Dubysa, Šešupė, Jūra, and the Minija. The lengths and sizes of the main rivers in the Nemunas RBD which flow in Lithuania are provided in Table 1. The names of these rivers are also the names of 10 sub-basins within the Nemunas River Basin District (including the Nemunas Small Tributaries Sub-basin and the Nemunas River itself) (Figure 1):

Table 1. River lengths and catchment sizes

River	**Length, total**	**Length in Lithuania, km**	**Catchment size, total, km^2**	**Catchment size in Lithuania, km^2**
Merkys	203	185.2	4 415.7	3 798.73
Neris	509.5	228	24 942.3	4 266.79
Dubysa	139	139	1 965.9	1 965.9
Šešupė	297.6	157.5	6 104.8	4 769.75
Jūra	171.8	171.8	4 005.06	4 005.06
Nevėžis	208.6	208.6	6 140.5	6 140.42
Minija	201.8	201.8	2 939.97	2 939.97
Šventoji	246	246	6 789.18	6 789.18
Žeimena	79.6	79.6	2 775.25	2 775.25

4. In addition, the Nemunas RBD also comprises:

4.1. the Lithuanian Coastal Rivers Basin,
4.2. the Lithuanian part of the Prieglius Basin.

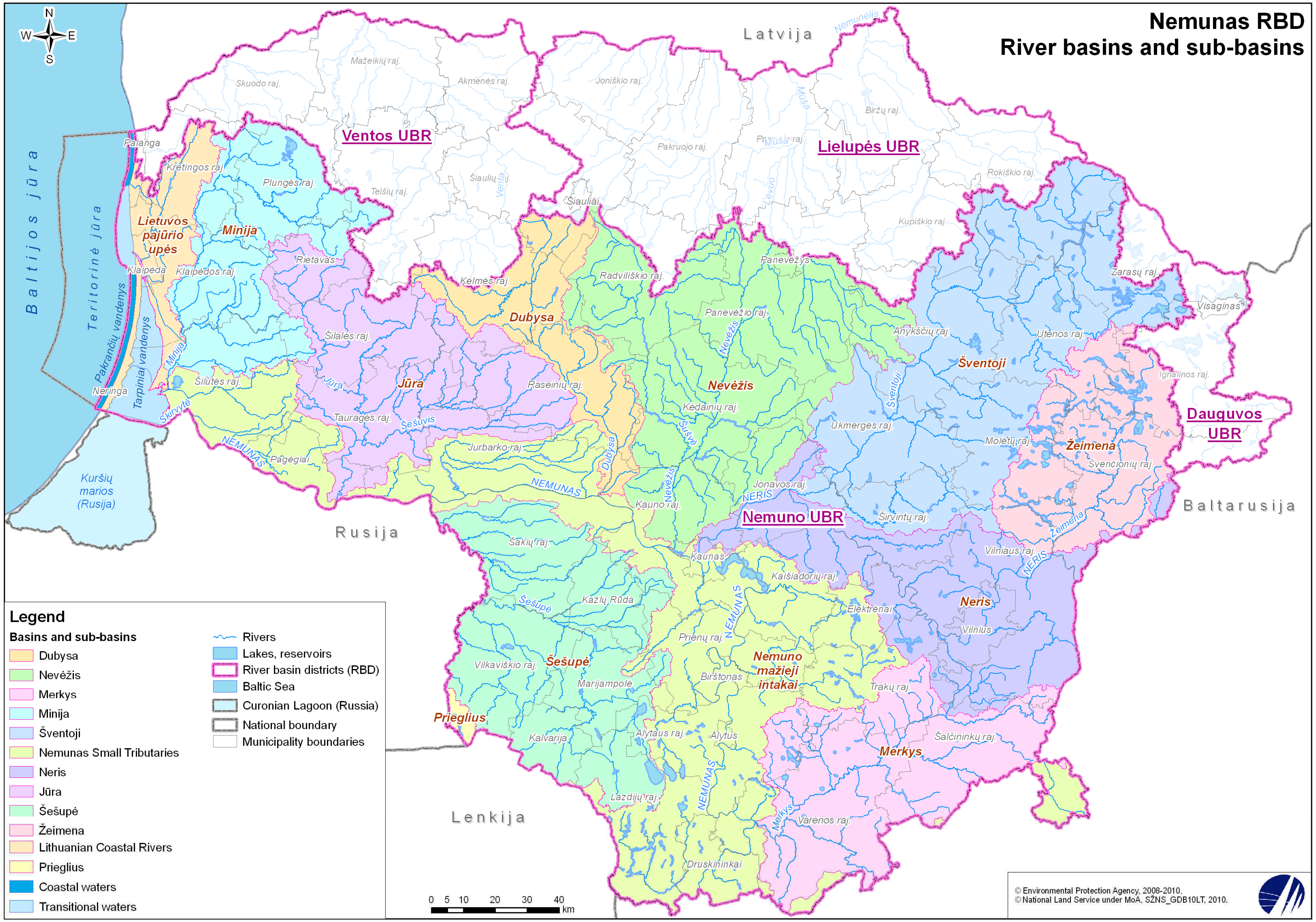


Figure 1. Sub-basins and basins within the Nemunas RBD

Characterisation of water bodies

Water bodies

5. Water bodies within the Nemunas River Basin District are assigned to the following categories: rivers, lakes, transitional waters (Curonian Lagoon, plume of the Curonian Lagoon in the Baltic Sea), coastal waters of the Baltic Sea (coastal waters are territorial waters extending one nautical mile from the shore), artificial and heavily modified water bodies. Various rivers, lakes, water areas of transitional and coastal waters differ in their individual characteristics, such as river size and slope, lake depth, salinity in transitional waters, soil composition in the coastal zone of the Baltic Sea, etc. 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, all surface water categories were further differentiated according to type taking into account the variety of natural characteristics of surface waters and the resulting differences in aquatic communities.

After the identification of the surface water types, assessment of pressures from human economic activities, and evaluation of the status of water bodies, the smallest administrative units were identified for the water management purposes – bodies of water. These are the units for which water protection objectives shall be set. It was decided that the category of rivers shall include rivers with the catchment size larger than 50 km^2. Hydrologically connected (that is, uninterrupted) stretches of the same type and status of one river were aggregated into one body of water. Stretches of one and the same river and of the same type and status situated on both sides of ponds or lakes separating these stretches were also aggregated into one body of water.

It should be noted that small bodies of water which are not included among the bodies attributed to different types – water management administration units (that is, those which are not subject to the typology of water bodies, e.g. lakes with an area less than 0.5 km^2, or rivers with a catchment area less than 50 km^2) – are also assigned to water bodies where good status shall be assured.

However, the characteristics of certain natural bodies of water have been strongly modified due to continuous pressures from human economic activities. As a result, good status of aquatic organisms in such bodies of waters cannot be achieved, unless the human activity is terminated and natural physical characteristics are restored. Should restoration of natural physical characteristics to such water body have significant negative social or economic consequences, or if the benefits of the altered characteristics of a water body cannot be achieved (due to technical or economic reasons) by way of other measures which are more advanced from the environmental point of view, such body of water is deemed to be a heavily modified water body (hereinafter – HMWB). The requirements for the status of aquatic organisms in such water bodies may be reduced; however, measures shall still be provided for aiming at improvement, or prevention, as a minimum, of any further deterioration in the status.

At present, heavily modified water bodies within the Nemunas RBD include 1 173 km of rivers and canals comprising 54 bodies of water, and 42 ponds/reservoirs larger than 0.5 km^2 with the total area of 115.6 km^2. Klaipėda Strait was also designated as a heavily modified water body. As many as 52 water bodies out of the 54 ones listed in the category of heavily modified rivers and canals were assigned to this group due to the straightening of their river beds. One heavily modified water body (a stretch of the

Merkys downstream of the Merkys-Vokė Canal) was identified as such because of its continuously reduced flow, and another one (a section of the Nemunas downstream of Kaunas Hydropower Plant) – due to significant fluctuation of the water level as a result of the operation of the hydropower plant, artificial formation and maintenance of the shoreline (dams, embankments), and dredging for navigation purposes.

The Nemunas RBD contains not only natural or heavily modified water bodies but also artificial water bodies, which also require ensuring good status. An artificial water body (hereinafter – AWB) is a body of surface water created by humans, with the exception of water storages where water is separated from the natural soil with the help of impermeable materials (e.g. pools, tanks, etc.). To date, 40.2 km of artificial river beds (that is, canals and pilot ditches) comprising four water bodies, and one quarry with the area of 1.2 km^2 were assigned to artificial water bodies in the Nemunas RBD.

Surface waters within the Nemunas RBD were divided into 866 bodies of water (including HMWB and AWB), 584 of which are designated as rivers and canals, 276 – as lakes and ponds, 4 – as transitional waters, and 2 – as coastal waters.

Neris Small Tributaries (the Neris included) Sub-basin

6. The boundaries of the Neris Small Tributaries (the Neris River included) Sub-basin and the municipalities situated within the sub-basin are demonstrated in Figure 2. Information on the share of the area of the municipalities in the sub-basin is provided in the table under the said figure.

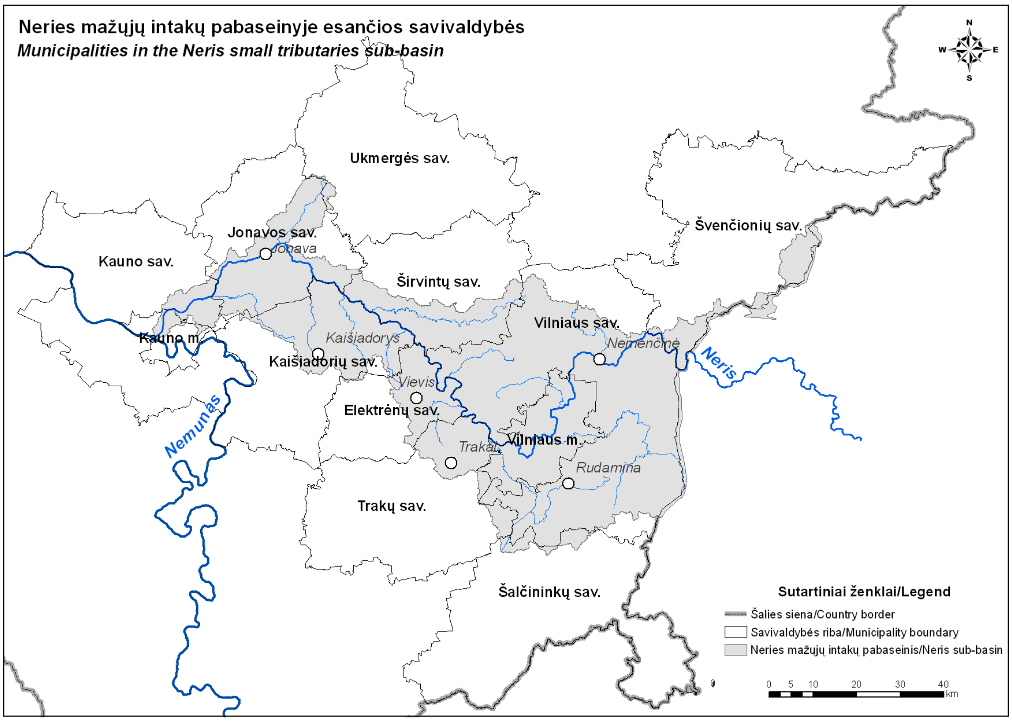


Figure 2. Neris Small Tributaries Sub-basin and municipal boundaries

Municipality	Area in the Neris Small Tributaries Sub-basin, %
Jonava munic.	48.2
Kaunas munic.	6.0
Širvintos munic.	37.3
Vilnius munic.	85.2
Kaišiadorys munic.	42.7
Kaunas city munic.	20.8
Elektrėnai munic.	38.0
Vilnius city munic.	100.0
Ukmergė munic.	0.8
Švenčionys munic.	9.7
Šalčininkai munic.	4.2
Trakai munic.	19.9

The Neris River is the largest tributary of the Nemunas. It rises in the northern part of Minsk Upland (*Minsko aukštuma*) situated in Belarus and flows westwards. From the springhead, the Neris flows over the territory of Belarus for 234.5 km, then its stretch from 234.5 km to 228 km coincides with the Lithuanian-Belarusian border, with the remaining 228 km flowing in Lithuania. 56 % of the total area of the sub-basin is situated in Lithuania.

In general, relatively permeable grounds dominate in the sub-basin, the wood density is 37 %, bogs, marshes and swamps cover about 0.8 % and lakes – 2.4 % of the total area of the sub-basin. The average annual runoff rate in the Lithuanian part of the sub-basin is 7.8 l/s per km^2. The average annual discharge at the mouth is about 180 m^3/s. The river network in the Neris Small Tributaries Sub-basin consists of 214 rivers longer than 3 km and 870 rivers that are shorter than 3 km. The density of the rivers longer than 3 km is nearly 0.44 km/km^2, and that of the smaller ones (that is, shorter than 3 km) – 0.46 km/km^2. The total length of the rivers is 3 825 km.

Taking into account the types of water objects and pressures from human economic activities on their status, 45 water bodies in the category of rivers and 20 water bodies that belong to the category of lakes were identified in the Neris Small Tributaries Sub-basin. The total number and length of water bodies of different types in the category of rivers within the Neris Small Tributaries Sub-basin are provided in Table 2 and the number and area of water bodies in the category of lakes are given in Table 3.

Table 2. The number and length of water bodies in the category of rivers in the Neris Small Tributaries Sub-basin

<table>
<tr><th rowspan="2">Type</th><th colspan="2">Water bodies in the category of rivers</th><th colspan="2">of which HMWB</th><th colspan="2">of which AWB</th></tr>
<tr><th>No. of water bodies</th><th>Length, km</th><th>No. of water bodies</th><th>Length, km</th><th>No. of water bodies</th><th>Length, km</th></tr>
<tr><td>1</td><td>30</td><td>443.9</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>2</td><td>3</td><td>11.6</td><td>0</td><td>0</td><td>1</td><td>3.9</td></tr>
<tr><td>3</td><td>9</td><td>191.0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>4</td><td>1</td><td>38.8</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>5</td><td>2</td><td>176.2</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Total:</td><td>45</td><td>861.5</td><td>0</td><td>0</td><td>1</td><td>3.9</td></tr>
</table>

Table 3. The number and area of water bodies in the category of lakes in the Neris Small Tributaries Sub-basin

Type	Water bodies in the category of lakes		of which HMWB	
	No. of water bodies	Area, km^2	No. of water bodies	Area, km^2
1	8	6.9	1	0.5
2	5	3.2	0	0
3	7	14.3	0	0
Total:	**20**	**24.4**	**1**	**0.5**

Merkys Sub-basin

7. The boundaries of the Merkys Sub-basin and the municipalities situated within the sub-basin are demonstrated in Figure 3. Information on the share of the area of the municipalities in the sub-basin is provided in the table under the said figure.

The Merkys is a right tributary of the Nemunas and the longest river in the south-eastern part of Lithuania. The upper reaches of the Merkys in Belarus drain a periphery edge of Ašmena Upland (*Ašmenos aukštuma*), some of its right tributaries – the foots of Dzūkai Upland (*Dzūkų aukštuma*). However, the largest part of the sub-basin stretches over the sandy plains of Dainava and of the middle reaches of the Vokė-Merkys. Due to the sandy surface of the area (sands cover 67 % of the area of the sub-basin), the predominant species is pine (wood density is about 51 %). The largest forest arrays are forests Rūdninkų Giria and Gudų Giria. 175 lakes in the sub-basin are larger than 0.005 km^2 (the lake percentage is 0.9 %). The highest lake percentage is observed in the catchment of the Varėnė, a right tributary of the Merkys River (the lake percentage is 2.6 %), were the lake district Daugų Ežerynas is situated. Bogs, marshes and swamps comprise 1.4 % of the area of the sub-basin. The largest bogs are: Čepkeliai Marsh (*Čepkelių Raistas*) (58.6 km^2), Rūdninkų Bog (5 km^2), Kernavės Bog (9 km^2). Permeable grounds dominate in the sub-basin. The total length of the rivers in the Merkys Sub-basin is 2 968 km. The river network is comprised of 130 rivers longer than 3 km and 530 rivers shorter than 3 km. The density of the smaller rivers is nearly 0.4 km/km^2, and that of the longer ones (longer than 3 km) – 0.39 km/km^2.

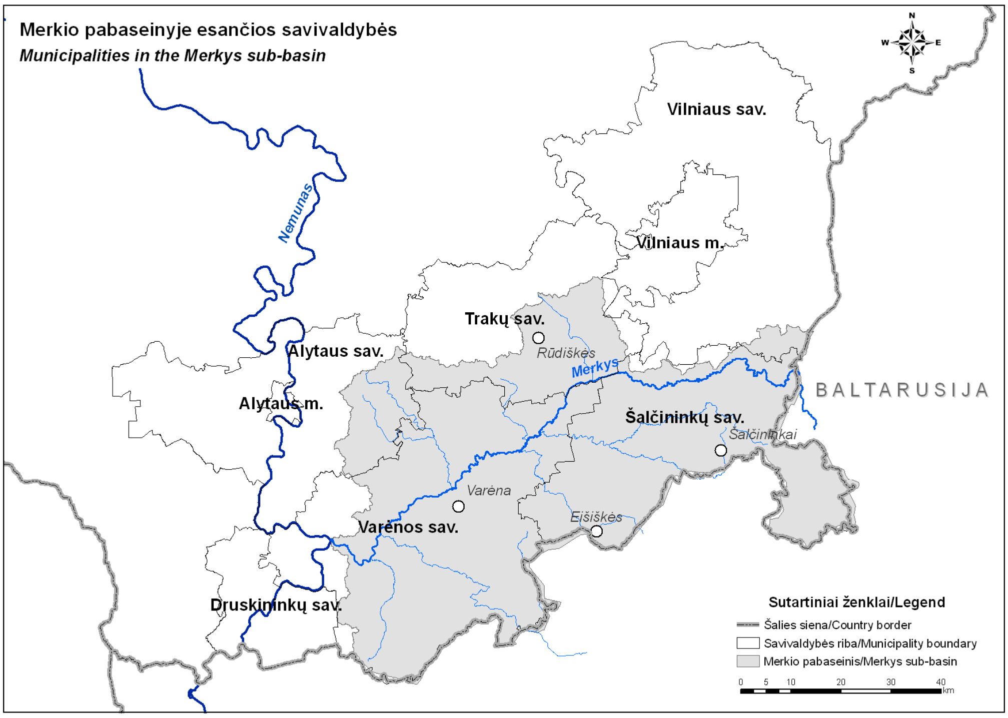


Figure 3. Merkys Sub-basin and municipal boundaries

Municipality	Area in the Merkys Sub-basin, %
Vilnius munic.	2.7
Alytus munic.	18.1
Varėna munic.	82.1
Šalčininkai munic.	78.6
Trakai munic.	40.5

Following the typology and status of water bodies determined by economic activity, the water objects in the Merkys Sub-basin were grouped as follows: 50 water bodies were assigned to the category of rivers, and 19 – to the category of lakes. The total number and length of water bodies of different types in the category of rivers within the Merkys Sub-basin is provided in Table 4 and the number and area of water bodies in the category of lakes is given in Table 5.

Table 4. The number and length of water bodies in the category of rivers in the Merkys Sub-basin

Type	Water bodies in the category of rivers		of which HMWB	
	No. of water bodies	Length, km	No. of water bodies	Length, km
1	35	422.7	5	81.9
2	7	132.7	1	23.3
3	6	194.5	0	0
4	0	0	0	0
5	2	84.8	0	0
Total:	**50**	**834.7**	**6**	**105.2**

Table 5. The number and area of water bodies in the category of lakes in the Merkys Sub-basin

	Water bodies in the category of lakes			
Type	No. of water bodies	Area, km^2	of which HMWB	
			No. of water bodies	Area, km^2
1	7	7.9	2	1.0
2	11	18.3	1	1.4
3	1	0.7	0	0.0
Total:	**19**	**26.9**	**3**	**2.4**

Nemunas Small Tributaries (including the Nemunas) Sub-basin

8. The boundaries of the Nemunas Small Tributaries (the Nemunas River included) Sub-basin and the municipalities situated within the sub-basin are demonstrated in Figure 4. Information on the share of the area of the municipalities in the sub-basin is provided in the table under the said figure.

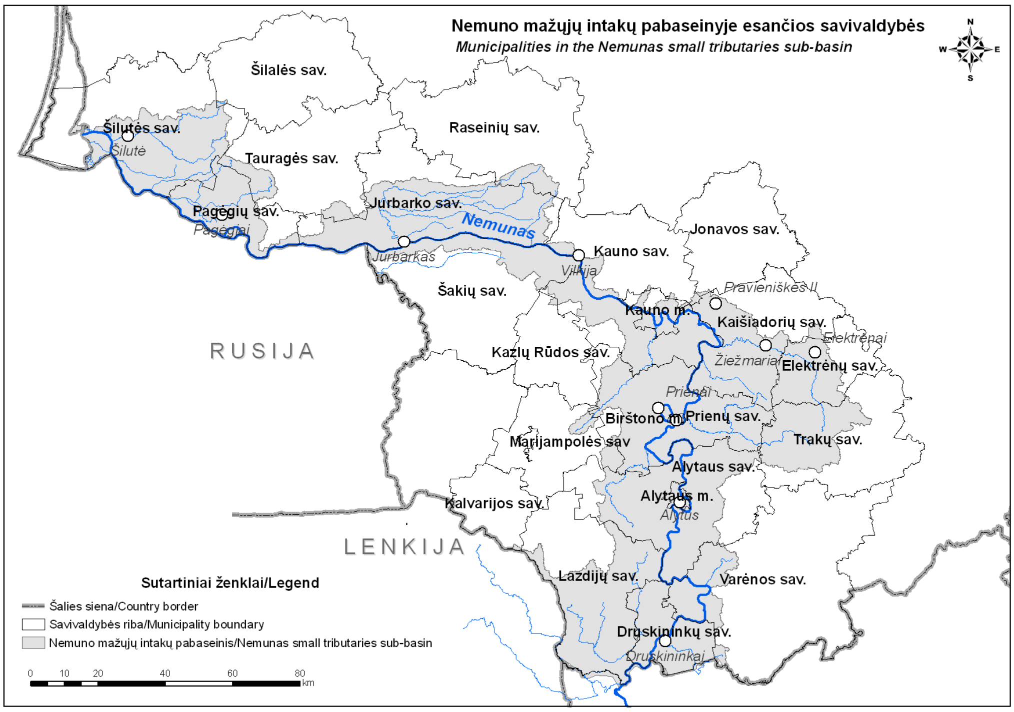


Figure 4. Nemunas Small Tributaries Sub-basin and municipal boundaries

Municipality	Area in the Nemunas Small Tributaries Sub-basin, %
Pagėgiai munic.	79.5
Birštonas town munic.	100.0
Šilutė munic.	47.5
Raseiniai munic.	5.8
Tauragė munic.	12.3
Jurbarkas munic.	70.8
Kaunas munic.	41.3
Kaišiadorys munic.	57.3

Municipality	Area in the Nemunas Small Tributaries Sub-basin, %
Prienai munic.	89.4
Marijampolė munic.	10.3
Alytus munic.	71.9
Varėna munic.	17.7
Alytus town munic.	100.0
Šalčininkai munic.	16.9
Trakai munic.	39.5
Lazdijai munic.	66.8

Municipality	Area in the Nemunas Small Tributaries Sub-basin, %		Municipality	Area in the Nemunas Small Tributaries Sub-basin, %
Kaunas city munic.	70.0		Šakiai munic.	23.8
Kazlų Rūda munic.	0.9		Druskininkai munic.	99.7
Elektrėnai munic.	62.0			

The springhead of the Nemunas is a symbolic one because a much larger and aqueous river, the Usa (the length 104 km, the area of the catchment 1316 km^2), flows into the upper reaches of a rivulet called Nemunas since old days from the right side at the 25th km from the springhead (the area of the catchment 121 km^2). The Nemunas is the most aqueous river in Lithuania – its average multi-annual discharge at Sovetsk (Tilžė) is 612 m^3/s.

The wood density in the Nemunas Small Tributaries Sub-basin is 30 %, bogs, marshes and swamps cover 0.7 % and lakes – 1.5 % of the total area of the sub-basin. 530 rivers in the sub-basin are longer than 3 km and 2 126 are smaller ones, shorter than 3 km. The total length of the rivers is 8 590 km, the density of the river network is about 1.03 km/km^2.

Following the typology and status of water objects, 110 water bodies were identified in the category of rivers and 66 ones – in the category of lakes in the Nemunas Small Tributaries Sub-basin. The total number and length of water bodies of different types in the category of rivers within the Nemunas Small Tributaries (the Nemunas included) Sub-basin is provided in Table 6 and the number and area of water bodies in the category of lakes is given in Table 7.

Table 6. The number and length of water bodies in the category of rivers in the Nemunas Small Tributaries Sub-basin

Type	Water bodies in the category of rivers		of which HMWB	
	No. of water bodies	Length, km	No. of water bodies	Length, km
1	79	992.5	2	29.4
2	14	183.3	2	17.4
3	12	171.8	0	0
4	4	430.8	1	224.9
5	1	31.3	0	0
Total:	**110**	**1 811.3**	**5**	**271.7**

Table.7. The number and area of water bodies in the category of lakes in the Nemunas Small Tributaries Sub-basin

Type	Water bodies in the category of lakes		of which HMWB	
	No. of water bodies	Area, km^2	No. of water bodies	Area, km^2
1	17	21.0	5	4.9
2	38	133.7	4	66.0
3	11	14.4	0	0.0
Total:	**66**	**169.1**	**9**	**70.9**

Žeimena Sub-basin

9. The boundaries of the Žeimena Sub-basin and the municipalities situated within the sub-basin are demonstrated in Figure 5. Information on the share of the area of the municipalities in the sub-basin is provided in the table next to the said figure.

The formal source of the Žeimena is Lake Žeimenys. The river flows over the sandy plain of Žeimena, and the upper reaches of its tributaries drain foots of Aukštaičiai Upland (*Aukštaičių aukštuma*) and Švenčionys Upland (*Švenčionių aukštuma*). The Žeimena Sub-basin is notable for a particularly high number of lakes: there are 479 lakes with an area larger than 0.005 km^2, their total area is 180 km^2 (the lake percentage is 6.4 %). Meanwhile the density of the river network is rather low – only 0.67 km/km^2. The river network consists of 524 rivers, of which 104 ones are longer than 3 km. The total length of the rivers in the sub-basin is 1 882 km. Natural conditions are favourable for groundwater formation: the wood density is 51 %, light-textured soils cover 76 % of the surface of the sub-basin. Bogs, marshes and swamps constitute 1.3 % of the total area of the Žeimena Sub-basin.

Though the Žeimena Sub-basin makes up 11 % of the area of the Neris Basin, it accounts for about 25 % of the annual flow. The annual runoff rate in the upper reaches of the Žeimena is 7.1 l/s/km^2, and the runoff rate in the lower reaches is 8.2 l/s/ km^2.

Municipality	Area in the Žeimena Sub-basin, %
Zarasai munic.	0.9
Utena munic.	24.5
Ignalina munic.	29.3
Molėtai munic.	37.1
Vilnius munic.	9.1
Švenčionys munic.	73.1

Figure 5. Žeimena Sub-basin and municipal boundaries

Following the types of water objects and their status determined by human activities, the water objects in the Žeimena Sub-basin were grouped into 26 water bodies in the category of rivers and 62 ones – in the category of lakes. The total number and length of water bodies of different types in the category of rivers within the Žeimena Sub-basin is provided in Table 8 and the number and area of water bodies in the category of lakes is given in Table 9.

Table 8. The number and length of water bodies in the category of rivers in the Žeimena Sub-basin

Type	Water bodies in the category of rivers		of which HMWB	
	No. of water bodies	Length, km	No. of water bodies	Length, km
1	19	207.4	1	13.8
2	4	76.6	0	0
3	1	29.8	0	0
4	1	17.4	0	0
5	1	51.9	0	0
Total:	**26**	**383.1**	**1**	**13.8**

Table 9. The number and area of water bodies in the category of lakes in the Žeimena Sub-basin

Type	Water bodies in the category of lakes		of which HMWB	
	No. of water bodies	Area, km^2	No. of water bodies	Area, km^2
1	12	18.4	0	0
2	38	75.0	0	0
3	12	45.0	0	0
Total:	**62**	**138.4**	**0**	**0.0**

Šventoji Sub-basin

10. The boundaries of the Šventoji Sub-basin and the municipalities situated within the sub-basin are demonstrated in Figure 6. Information on the share of the area of the municipalities in the sub-basin is provided in the table next to the said figure.

Municipality	Area in the Šventoji Sub-basin, %
Rokiškis munic.	48
Kupiškis munic.	18
Zarasai munic.	55
Anykščiai munic.	72
Utena munic.	73
Ignalina munic.	3
Molėtai munic.	61
Jonava munic.	13
Širvintos munic.	63
Vilnius munic.	3
Ukmergė munic.	86

Figure 6. Šventoji Sub-basin and municipal boundaries

The Šventoji is the largest tributary of the Neris. The sub-basin extends from the northeast to the southwest, including Zarasai Upland (*Zarasų aukštuma*), Utena Upland (*Utenos aukštuma*) and Molėtai Upland (*Molėtų aukštuma*), which are noted for a high percentage of lakes (25 % of the area of the sub-basin), Svėdasai Plateau (*Svėdasų plynaukštė*) and Širvintos Plateau (*Širvintų plynaukštė*) (54 %), and part of the Central Lithuanian Lowland (*Vidurio Lietuvos žemuma*) (21 %). The dominant surface soils are medium clay loams (63 % of the area of the sub-basin), with the rest of the area covered with sand and gravel (27 %). The wood density is 26 %, bogs, marshes and swamps cover 0.7 % and lakes – 3 % of the total territory of the sub-basin. The river network in the Šventoji Sub-basin contains 1 885 rivers, only 375 of which are longer than 3 km. The density of the small rivers' network is 0.54 km/km^2, and that of longer ones – 0.47 km/km^2. The total length of the rivers is – 6 477 km. The annual runoff rate in the upper reaches is 7 l/s/km^2, in the middle reaches – 7.3-7.4 l/s/km^2, and in the lower reaches – 8.2 l/s/ km^2.

Taking into account the types of water objects and their status determined by human activities, 83 water bodies in the category of rivers and 66 water bodies that belong to the category of lakes were identified in the Šventoji Sub-basin. The total number and length of water bodies of different types in the category of rivers within the Šventoji

Sub-basin is provided in Table 10 and the number and area of water bodies in the category of lakes is given in Table 11.

Table 10. The number and length of water bodies in the category of rivers in the Šventoji Sub-basin

Type	Water bodies in the category of rivers		of which HMWB	
	No. of water bodies	Length, km	No. of water bodies	Length, km
1	60	568.8	2	30.1
2	9	166.7	0	0
3	10	245.9	0	0
4	1	54.7	0	0
5	3	86.8	0	0
Total:	**83**	**1 122.9**	**2**	**30.1**

Table 11. The number and area of water bodies in the category of lakes in the Šventoji Sub-basin

Type	Water bodies in the category of lakes		of which HMWB	
	No. of water bodies	Area, km^2	No. of water bodies	Area, km^2
1	20	19.1	4	3.9
2	40	105.1	3	16.5
3	6	23.8	0	0
Total:	**66**	**148.0**	**7**	**20.5**

Nevėžis Sub-basin

11. The boundaries of the Nevėžis Sub-basin and the municipalities situated within the sub-basin are demonstrated in Figure 7. Information on the share of the area of the municipalities in the sub-basin is provided in the table under the said figure.

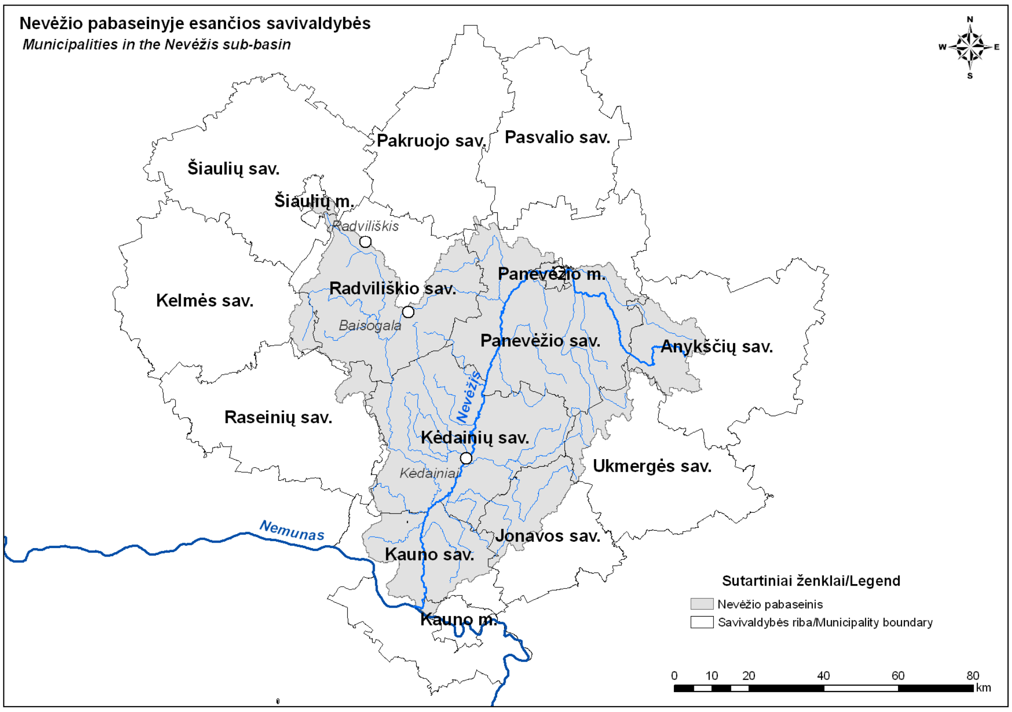


Figure 7. Nevėžis Sub-basin and municipal boundaries

Municipality	Area in the Nevėžis Sub-basin, %
Šiauliai city munic.	15.8
Kėdainiai munic.	98.3
Šiauliai munic.	0.5
Panevėžys munic.	73.9
Radviliškis munic.	71.0
Kelmė munic.	4.7
Panevėžys city munic.	90.9
Anykščiai munic.	18.6
Raseiniai munic.	4.9
Jonava munic.	38.7
Kaunas munic.	40.3
Kaunas city munic.	9.3
Ukmergė munic.	13.2

The Nevėžis Sub-basin extends over the Central Lithuanian Lowland (*Vidurio Lietuvos žemuma*), and the catchment of its largest tributary Šušvė drains the foots of the Samogitian Upland (*Žemaičių aukštuma*). The surface is dominated by heavier-textured carbonaceous soils, 10 % of the surface of the sub-basin is covered with sands. Most of the bogs, marshes and swamps are concentrated in the upper reaches of the river and their average percentage in the sub-basin is 0.6 %. Forests occupy 25 % of the area of the sub-basin. There are 89 lakes in the sub-basin with the aggregate area of 5.28 km^2 only, so the lake percentage is very low (0.09 %); the largest lake is Lėnas (2.08 km^2). However, there are many ponds (76 in total). The river network in the Nevėžis Sub-basin contains 422 rivers longer than 3 km and 1 710 ones shorter than 3 km. The total length of the rivers is 8 162 km. The density of the river network is 1.33 km/km^2. The Nevėžis receives part of its waters from the rivers Lėvuo and Šventoji. The annual runoff rate in the Nevėžis Sub-basin is 1.9 l/s/km^2.

Following the types of water objects and the results of a human impact analysis, 71 water bodies in the category of rivers and 14 water bodies that belong to the category of lakes were identified in the Nevėžis Sub-basin. The total number and length of water bodies of different types in the category of rivers within the Nevėžis Sub-basin is provided in Table 12 and the number and area of water bodies in the category of lakes is given in Table 13.

Table 12. The number and length of water bodies in the category of rivers in the Nevėžis Sub-basin

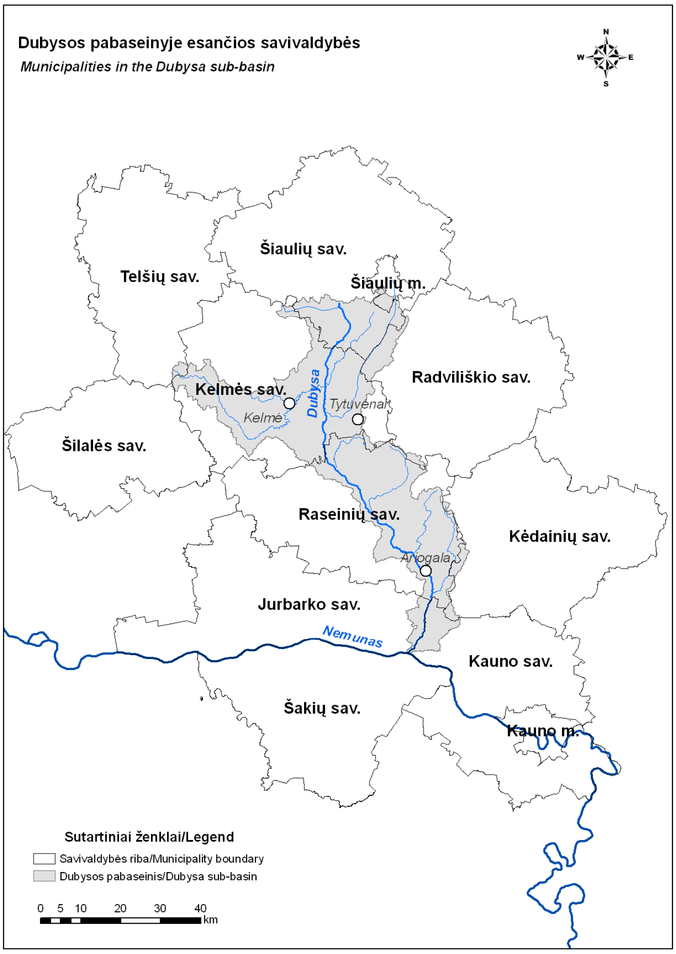
Type	Water bodies in the category of rivers		of which HMWB		of which AWB	
	No. of water bodies	Length, km	No. of water bodies	Length, km	No. of water bodies	Length, km
1	47	803.4	16	319.4	2	13.3
2	11	169.7	3	68.7	0	0
3	10	220.5	1	42.0	0	0
4	1	87.0	0	0	0	0
5	2	81.9	0	0	0	0
Total:	**71**	**1 362.5**	**20**	**430.1**	**2**	**13.3**

Table 13. The number and area of water bodies in the category of lakes in the Nevėžis Sub-basin

Type	Water bodies in the category of lakes		of which HMWB		of which AWB	
	No. of water bodies	Area, km^2	No. of water bodies	Area, km^2	No. of water bodies	Area, km^2
1	6	6.1	4	2.4	1	0.1
2	8	9.6	8	9.6	0	0
3	0	0	0	0	0	0
Total:	**14**	**15.7**	**12**	**12.1**	**1**	**0.1**

Dubysa Sub-basin

12. The boundaries of the Dubysa Sub-basin and the municipalities situated within the sub-basin are demonstrated in Figure 8. Information on the share of the area of the municipalities in the sub-basin is provided in the table next to the said figure.



Municipality	Area in the Dubysa Sub-basin, %
Šiauliai city munic.	3.0
Kėdainiai munic.	1.7
Šiauliai munic.	13.0
Telšiai munic.	0.7
Radviliškis munic.	4.5
Kelmė munic.	46.5
Raseiniai munic.	45.2
Jurbarkas munic.	2.6
Kaunas munic.	4.9

Figure 8. Dubysa Sub-basin and municipal boundaries

The Dubysa Sub-basin is narrow (50 km width in its broadest place; its length – about 90 km) because the river bumps into the eastern edge of the Samogitian Upland (*Žemaičių aukštuma*) instead of flowing in the direction of the surface gradient towards the Central Lithuanian Lowland (*Lietuvos žemuma*) and Karšuva Lowland (*Karšuvos žemuma*). The surface of the sub-basin is dominated by medium soils (70 % of the sub-basin area), 11 % of the surface of the sub-basin is covered with sands, 9 % – with heavy clay loam. Forests occupy 25 % of the area, the highest forest concentration is in the upper reaches of the river. Large swamps and marshes, such as the Didysis Tyrulis

Marsh (38 km^2), Praviršulio Marsh (32 km^2), Tytuvėnų Tyrelis Marsh, Šiluvos Tyrelis Marsh, are situated in the inter-ridges and potholes of the sub-basin. The swamp percentage of the Dubysa Sub-basin is 1.6 %. There are 40 lakes with the area larger than 0.005 km^2; however, their total area is only 5.5 km^2, that is, the majority of the lakes are small so the lake percentage is only 0.27 %. The area of ponds is larger than that of the lakes and totals to about 10 km^2. The river network in the Dubysa Sub-basin contains 774 rivers, of which 154 rivers are longer than 3 km. The total length of the rivers is 2 439 km, and the density of the river network is 1.24 km/km^2.

The average annual runoff rate in the Dubysa Sub-basin is 7 l/s/km^2, the runoff rate in the upper reaches of the Dubysa is 6.8 l/s/ km^2, in the upper reaches of the Kražantė catchment – 11.2 l/s/km^2, and the one in the lower reaches of the Kražantė catchment – 9.3 km^2. The average discharge at the mouth of the Dubysa is 14.2 m^3/s.

Following the typology of water objects and their status determined by human activities, the water bodies in the Dubysa Sub-basin were grouped into 24 water bodies in the category of rivers and 3 ones in the category of lakes. The total number and length of water bodies of different types in the category of rivers within the Dubysa Sub-basin is provided in Table 14 and the number and area of water bodies in the category of lakes is given in Table 15.

Table 14. The number and length of water bodies in the category of rivers in the Dubysa Sub-basin

Type	**Water bodies in the category of rivers**		**of which HMWB**	
	No. of water bodies	**Length, km**	**No. of water bodies**	**Length, km**
1	17	240.4	1	11.3
2	2	56.2	1	24.7
3	4	80.7	0	0
4	0	0	0	0
5	1	97.9	0	0
Total:	**24**	**475.2**	**2**	**36**

Table 15. The number and area of water bodies in the category of lakes in the Dubysa Sub-basin

Type	**Water bodies in the category of lakes**		**of which HMWB**	
	No. of water bodies	**Area, km^2**	**No. of water bodies**	**Area, km^2**
1	1	0.7	0	0
2	2	1.9	0	
3	0	0	0	0
Total:	**3**	**2.6**	**0**	**0**

Šešupė Sub-basin

13. The boundaries of the Šešupė Sub-basin and the municipalities situated within the sub-basin are demonstrated in Figure 9. Information on the share of the area of the municipalities in the sub-basin is provided in the table under the said figure.

The Lithuanian part of the Šešupė Sub-basin contains 80 % of its total area and 53 % of the length of the river bed. The upper reaches of the Šešupė (27 km, the area of the catchment 287 km^2) are in Poland, the western part of the middle and lower reaches (62 km, 919 km^2) lie in Kaliningrad Region. For 52 more kilometres, the river flows along the border between Lithuania and Kaliningrad Region. In Lithuania, the Šešupė flows over Užnemunė Lowland (*Užnemunės žemuma*), and its own upper reaches and the upper reaches of its tributaries drain Sūduva Upland (*Sūduvos aukštuma*). The surface of the sub-basin is dominated by medium and heavy clay loams. The wood density is 17 %, the largest forest array – the woods of Kazlų Rūda. Bogs, marshes and swamps comprise 1.6 % of the area of the sub-basin; most of them are situated in the south-eastern part of the sub-basin. The largest bogs are: Žuvintas Bog (68.5 km^2), Amalvas Bogs (34.1 km^2), Ežerėlio Bog (20 km^2). The lake percentage in the Šešupė Sub-basin is 1.1 % (269 lakes larger than 0.005 km^2, with the total area of 68.2 km^2); however, more that 60 % of the total area of the lakes is situated in the catchment of the right tributary of the Šešupė – the Dovinė catchment (its lake percentage is 7.3 %). The largest lakes are Dusia (23.3 km^2) and Žuvintas (10.3 km^2). The density of the river network totals to 1.12 km/km^2. Its major part consists of small rivulets shorter that 3 km and land reclamation ditches, the total number of which is 1 140, meanwhile the number of rivers longer than 3 km is only 282. The total length of the river beds in the sub-basin is 5 492 km.

The average annual runoff rate in the sub-basin is 5.6 l/s/km^2; it is higher in the hilly upper reaches of the river (6.6 l/s/km^2) and lower in the lowland (3.9 l/s/km^2). The average discharge at the mouth of the Šešupė is 34.2 m^3/s.

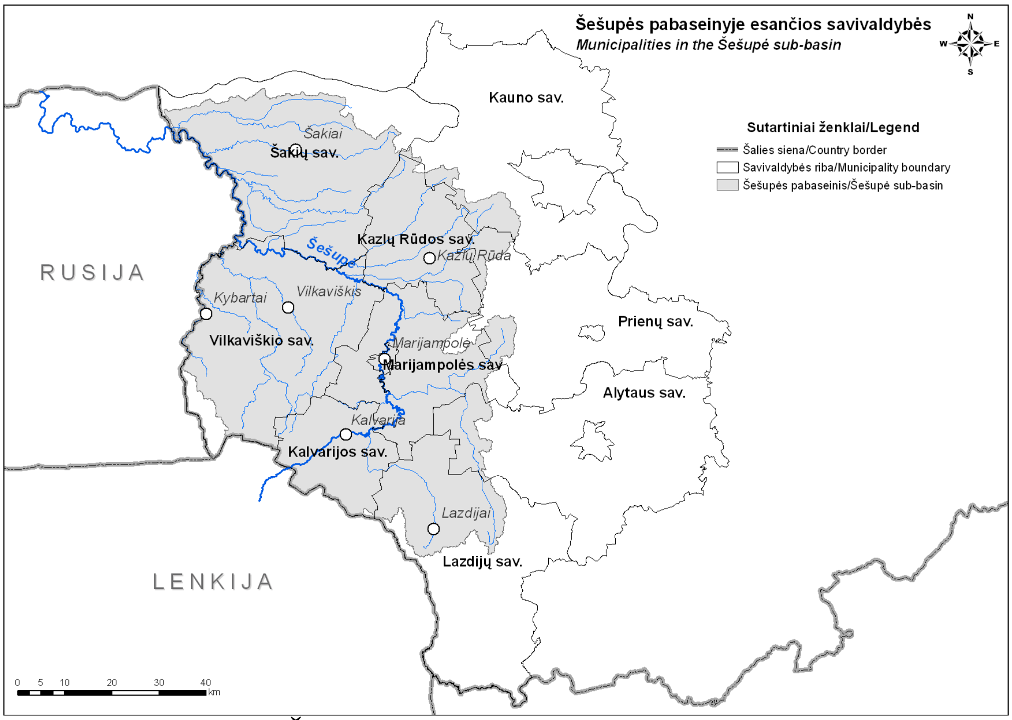


Figure 9. Šešupė Sub-basin and municipal boundaries

Municipality	Area in the Šešupė Sub-basin, %
Marijampolė town munic.	100.0
Kalvarija munic.	99.3
Kaunas munic.	7.5
Kazlų Rūda munic.	99.1
Prienai munic.	10.6
Vilkaviškis munic.	100.0

Municipality	Area in the Šešupė Sub-basin, %
Marijampolė munic.	89.7
Alytus munic.	10.0
Lazdijai munic.	33.1
Šakiai munic.	76.2

Taking into account the typology of water objects and following the results of a human impact analysis, 70 water bodies in the category of rivers and 14 water bodies that belong to the category of lakes were identified in the Šešupė Sub-basin. The total number and length of water bodies of different types in the category of rivers within the Šešupė Sub-basin is provided in Table 16 and the number and area of water bodies in the category of lakes is given in Table 17.

Table 16. The number and length of water bodies in the category of rivers in the Šešupė Sub-basin

Type	Water bodies in the category of rivers		of which HMWB	
	No. of water bodies	Length, km	No. of water bodies	Length, km
1	45	676.1	10	185.6
2	14	228.8	1	13.9
3	8	183.7	0	0
4	1	51.8	0	0
5	2	64.4	0	0
Total:	**70**	**1 204.8**	**11**	**199.5**

Table 17. The number and area of water bodies in the category of lakes in the Šešupė Sub-basin

Type	Water bodies in the category of lakes		of which HMWB	
	No. of water bodies	Area, km^2	No. of water bodies	Area, km^2
1	9	23.6	3	2.0
2	2	1.6	1	0.8
3	3	26.4	0	0
Total:	**14**	**51.6**	**4**	**2.8**

Jūra Sub-basin

14. The boundaries of the Jūra Sub-basin and the municipalities situated within the sub-basin are demonstrated in Figure 10. Information on the share of the area of the municipalities in the sub-basin is provided in the table under the said figure.

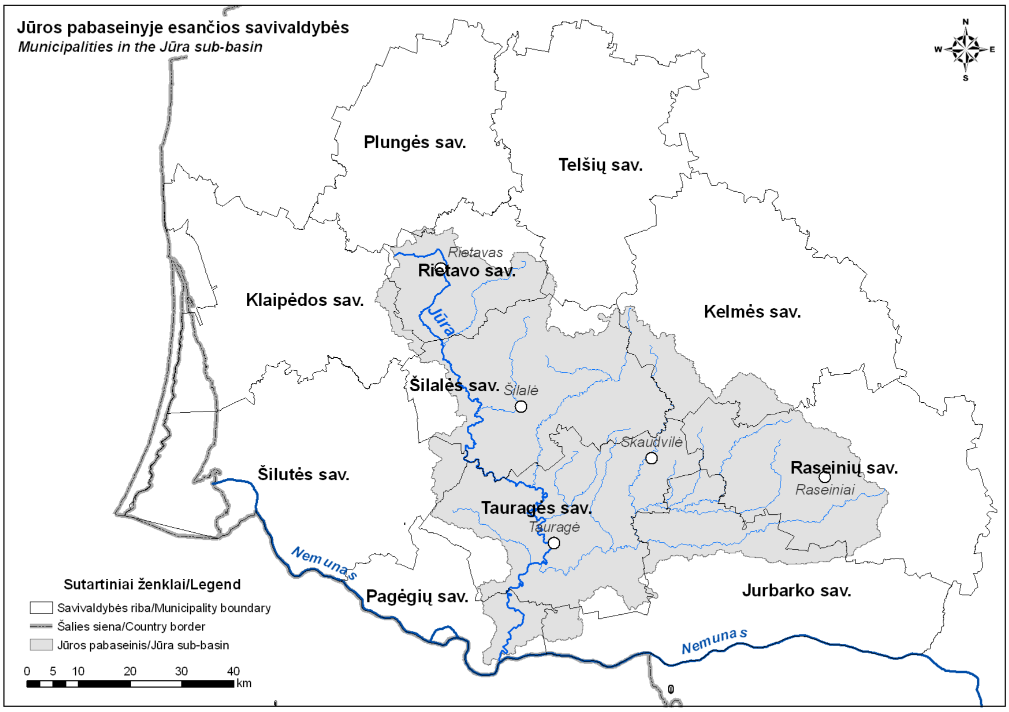


Figure 10. Jūra Sub-basin and municipal boundaries

Municipality	Area in the Jūra Sub-basin, %
Pagėgiai munic.	20.3
Plungė munic.	0.4
Telšiai munic.	0.6
Klaipėda munic.	3.0
Kelmė munic.	13.9
Rietavas munic.	69.7
Šilalė munic.	85.2
Šilutė munic.	3.3
Raseiniai munic.	44.1
Tauragė munic.	87.7
Jurbarkas munic.	26.7

The springs of the Jūra are located in Rietavas Plain (*Rietavo lyguma*). In the upper reaches, it flows over the western slopes of the Samogitian Upland (*Žemaičių aukštuma*), then turns to Karšuva Lowland (*Karšuvos žemuma*) and crosses the moraine ridge of Vilkyškiai in the very lower reaches. In the upper reaches and middle reaches, about 80 % of the area of the sub-basin is covered with medium clay loams. Heavier clay loams and areas covered with clay become more dominant towards the lower reaches. Sand zones account for 10 % of the sub-basin area. The wood density is about 27 %, bogs, marshes and swamps cover about 0.5 % of the sub-basin. The average density of the river network in the sub-basin is 1.43 km/km^2. The river network consists of 1 674 rivers, of which 334 are longer than 3 km. The total length of the rivers is 5 724 km. The lake percentage is extremely low – only 0.04 % (there are 20 lakes larger than 0.005 m^2, with the total area 1.75 km^2). A much larger area, about 16 km^2, is occupied by ponds.

The average annual runoff rate in the Jūra Sub-basin is 9.6 l/s/km^2. The stream flow rate is highest in the upper reaches of the Jūra (13.8 l/s/km^2), and the lowest water content is measured in the catchment of the Jūra tributary Šešuvis (8.2 l/s/km^2). The average discharge at the mouth of the Jūra is about 38 m^3/s.

Following the typology of water objects and impacts of human economic activities on their status, the water bodies in the Jūra Sub-basin were categorised into 52 rivers and 4 lakes and ponds. The total number and length of water bodies of different types in the category of rivers within the Jūra Sub-basin is provided in Table 18 and the number and area of water bodies in the category of lakes is given in Table 19.

Table 18. The number and length of water bodies in the category of rivers in the Jūra Sub-basin

Type	**Water bodies in the category of rivers**		**of which HMWB**	
	No. of water bodies	**Length, km**	**No. of water bodies**	**Length, km**
1	34	522.1	2	35.6
2	2	53.6	0	0
3	12	371.4	0	0
4	1	36.5	0	0
5	3	81.3	0	0
Total:	**52**	**1 064.9**	**2**	**35.6**

Table 19. The number and area of water bodies in the category of lakes in the Jūra Sub-basin

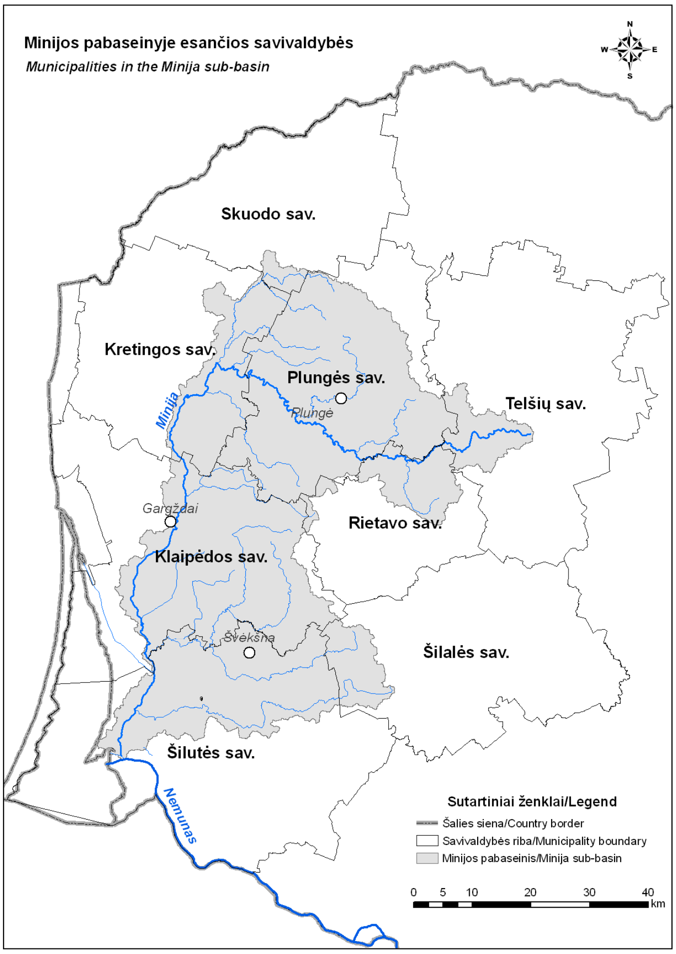
Type	**Water bodies in the category of lakes**		**of which HMWB**	
	No. of water bodies	**Area, km^2**	**No. of water bodies**	**Area, km^2**
1	3	0.2	2	0.1
2	1	0.3	1	0.3
3	0	0	0	0
Total:	**4**	**0.5**	**3**	**0.4**

Minija Sub-basin

15. The boundaries of the Minija Sub-basin and the municipalities situated within the sub-basin are demonstrated in Figure 11. Information on the share of the area of the municipalities in the sub-basin is provided in the table next to the said figure.

The major part of the sub-basin is situated in the Coastal Lowland (*Pajūrio žemuma*), the upper reaches of the river – in the Samogitian Upland (*Žemaičių aukštuma*). The network of the rivers in the Minija Sub-basin consists of 1 359 rivers, of which 269 are longer than 3 km. The total density of the river network is 1.53 km/km^2, the length of the river beds – 4 508 km. The number of lakes is comparatively small (39), the average lake percentage is 0.6 %. The Babrungas catchment accounts for the highest lake concentration (lakes occupy 5.5 % of the area of the catchment), including Lake Plateliai (12 km^2). The wood density is about 32 %. Bogs, marshes and swamps take up approximately 1 % of the sub-basin (these are mainly raised bogs). The most important are Reiskių Tyras Marsh (8.75 km^2) and Aukštumala Bog (about 30 km^2).

The average annual runoff rate in the Minija Sub-basin is as high as 13.1 l/s/km^2. The runoff rate is a little lower in the upper reaches of the Minija (11.8 l/s/km^2), meanwhile in the Veiviržis catchment it amounts to 14.3 l/s/km^2. The average discharge at the mouth of the Minija is about 38.5 m^3/s. However, not all water of the Minija flows into the distributaries of the Nemunas delta: Klaipėda Canal branches off at the distance of 18.4 from the mouth of the Minija, a canal downstream of Minija village enters Lake Krokų Lanka, and another distributary falls directly into the Curonian Lagoon.



Municipality	Area in the Minija Sub-basin, %
Skuodas munic.	3.4
Kretinga munic.	31.5
Plungė munic.	83.0
Telšiai munic.	8.2
Klaipėda munic.	58.0
Rietavas munic.	27.0
Šilalė munic.	9.7
Šilutė munic.	29.9

Figure 11. Minija Sub-basin and municipal boundaries

Following the typology of water objects and impacts of human economic activities thereon, the water bodies in the Minija Sub-basin were categorised into 40 rivers and 5 lakes. The total number and length of water bodies of different types in the category of rivers within the Minija Sub-basin is provided in Table 20 and the number and area of water bodies in the category of lakes is given in Table 21.

Table 20. The number and length of water bodies in the category of rivers in the Minija Sub-basin

Type	Water bodies in the category of rivers		of which HMWB	
	No. of water bodies	Length, km	No. of water bodies	Length, km
1	29	584.9	0	0
2	1	21.5	0	0
3	8	199.8	0	0
4	1	52.7	0	0
5	1	49.9	0	0
Total:	**40**	**908.8**	**0**	**0**

Table 21. The number and area of water bodies in the category of lakes in the Minija Sub-basin

Type	Water bodies in the category of lakes		of which HMWB	
	No. of water bodies	Area, ha	No. of water bodies	Area, ha
1	0	0	0	0
2	4	3.2	1	0.7
3	1	12.1	0	0
Total:	**5**	**15.2**	**1**	**0.7**

Prieglius Basin

16. The boundaries of the Prieglius Sub-basin and of Vilkaviškis municipality situated within the sub-basin are demonstrated in Figure 12. Information on the share of the area of Vilkaviškis municipality in the sub-basin is provided in the table under the said figure.

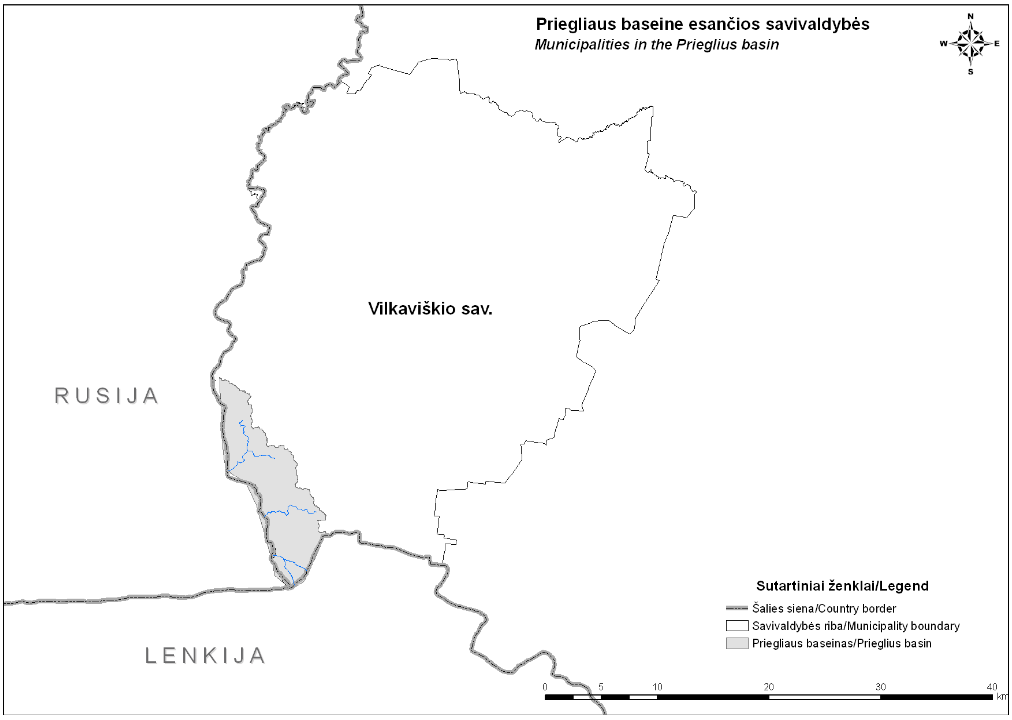


Figure 12. Prieglius Basin

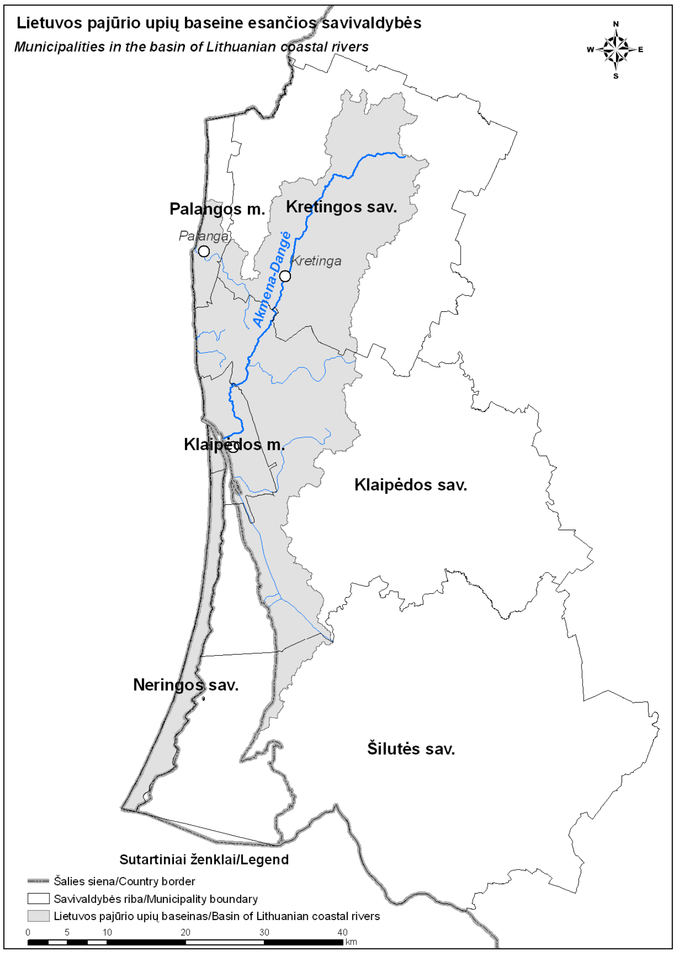
Municipality	Area in the Prieglius Basin, %
Vilkaviškis munic.	6

The Prieglius Basin is the smallest river basin in Lithuania, with the area of only 88.4 km^2. It mainly covers the area drained by Lake Vištytis and the latter's tributaries. The entire Lithuanian part of the basin belongs to Vilkaviškis municipality. The territory of the Prieglius Basin lies in the western periphery of the Baltic Uplands (*Baltiškosios aukštumos*), with dominating cretaceous geological formations. The thickness of quaternary sediments exceeds 180 m. The dominating type of soil is podzols. The density of the river network is 0.63 km/km^2, where 4 rivers are longer than 3 km and 16 ones – shorter than 3 km, with the aggregate length of 41 km. The lake percentage in the basin is 0-2 %. The average annual runoff rate is 6-7 l/s/km^2. The wood density is less than 10 %.

There are no water bodies in the category of rivers in the Prieglius Basin. The category of lakes comprises one water body with the area of 0.4 km^2.

Lithuanian Coastal Rivers Basin

17. The boundaries of the Lithuanian Coastal Rivers Basin and the municipalities situated within the sub-basin are demonstrated in Figure 13. Information on the share of the area of the municipalities in the basin is provided in the table next to the said figure.



Municipality	Area in the Lithuanian Coastal Rivers Basin, %
Šilutė munic.	2.9
Klaipėda city munic.	89.9
Klaipėda munic.	31.4
Kretinga munic.	41.7
Neringa munic.	99.4
Palanga town munic.	49.0

Figure 13. Lithuanian Coastal Rivers Basin and municipal boundaries

The whole of the Lithuanian Coastal Rivers Basin is situated in the Coastal Lowland (*Pajūrio žemuma*). The largest river in this basin is the Akmena-Danė, which flows out of the Coastal Lowland and enters the Baltic Sea via Klaipėda Strait. From the springs to the town of Kretinga, the river is called Akmena, and further – Danė. The average annual runoff rate is 13.1 l/s/km^2, the average discharge at the mouth of the river is about 7.6 m^3/s. The wood density in the Lithuanian Coastal Rivers Basin is 27 %, bogs, marshes and swamps occupy 2.3 % of the area of the basin. The river network consists of 161 rivers longer than 3 km and 650 rivers shorter than 3 km, with the aggregate length totalling to 2 774 km. The density of the river network is 1.6 km/km^2.

Following the results of a human impact analysis and the typology of water objects, the water bodies in the Lithuanian Coastal Rivers Basin were categorised into 13 rivers and 2 lakes. The total number and length of water bodies of different types in the category of rivers within the Lithuanian Coastal Rivers Basin is provided in Table 22 and the number and area of water bodies in the category of lakes is given in Table 23.

Table 22. The number and length of water bodies in the category of rivers in the Lithuanian Coastal Rivers Basin

Type	Water bodies in the category of rivers		of which HMWB		of which AWB	
	No. of water bodies	Length, km	No. of water bodies	Length, km	No. of water bodies	Length, km
1	10	119.1	5	50.7	1	23.0
2	2	28.4	0	0	0	0
3	1	19.7	0	0	0	0
Total:	**13**	**167.2**	**5**	**50.7**	**1**	**23**

Table 23. The number and area of water bodies in the category of lakes in the Lithuanian Coastal Rivers Basin

Type	Water bodies in the category of lakes		of which HMWB	
	No. of water bodies	Area, km^2	No. of water bodies	Area, km^2
1	2	1.6	2	1.6
2	0	0	0	0
3	0	0	0	0
Total:	**2**	**1.6**	**2**	**1.6**

In addition to rivers and lakes, the Nemunas RBD also covers the Lithuanian part of the Curonian Lagoon, the plume of the Curonian Lagoon in the Baltic Sea (transitional waters) and the coastal waters of the Baltic Sea (see Figure 1). The transitional waters comprise four water bodies (one of them, Klaipėda Strait, belongs to the category of heavily modified water bodies), and the coastal waters are grouped into two bodies of water.

The Curonian Lagoon is a lagoon in the southwest of the Baltic Sea, with the area of 1 584 km^2. The lagoon is separated from the Baltic Sea by the Curonian Spit. Only the northern part of the Curonian Lagoon (402.03 km^2) belongs to Lithuania, meanwhile the southern part lies in Kaliningrad Region. From North to South, the lagoon stretches 93.5 km, and its widest zone in the southern part is 46.5 km, the coastline makes up 324 km. The Curonian Lagoon is a shallow body of water, with the largest natural depth of only 5.8 m and the average depth – 3.8 m. However, the prevailing depth of the Lithuanian part of the lagoon is 1.8 – 2.6 m. The water volume of the lagoon is 6 km^3. At its northern end, the Curonian Lagoon is connected to the Baltic Sea by Klaipėda Strait (the narrowest place between piers is 390 m).

25 rivers and streams enter the Curonian Lagoon, the largest of which are: the Atmata, Skirvytė, Gilija, Vorusnė, and the Pakalnė (all these are branches of the Nemunas delta); the Danė, Nemunynas, and the Deimena. The catchment area of the Curonian Lagoon totals to 100 500 km^2, 98 % of which belongs to the Nemunas.

The plume of the Curonian Lagoon in the Baltic Sea occupies the area of about 112.98 km^2. As a result the intermixture of fresh and sea water, the water salinity at Melnragė, which is located at Klaipėda port entrance, sometimes is even less than 1 %, meanwhile the water salinity some nautical miles away is 7 %. Amounts of phosphorus and nitrogen go up 3-5 times due to the lagoon water rich in biogenic matter. The waters of the Curonian Lagoon extend as far as 16-20 km from the shore during spring tides and up to 5 km during the summer.

The area of the coastal waters is 114.7 km^2, the total length of the shoreline of these waters is about 60 km. The Lithuanian coastal waters correspond to mesohaline waters (with the salinity of 6-7 %). Continuous pressures from winds, waves and currents create a hydrodynamic environment which prevents a lack of oxygen and any significant vertical oxygen gradient. Affected by waves, biotopes of the bottom substratum and benthic communities change in the depth of up to 20 m.

The Curonian Lagoon borders the municipalities of Šilutė, Klaipėda city, Klaipėda district and Neringa, and the territory of the Baltic coast lies within the municipalities of Klaipėda city, Klaipėda district, Palanga and Neringa towns, and Kretinga district. The status of the coastal and transitional waters has been affected by human economic activities carried out not only in the neighbouring territories but also within the entire Nemunas RBD.

Typology of water bodies

18. As already mentioned, water bodies within the Nemunas River Basin District are assigned to the following categories: rivers, lakes, transitional waters (the Curonian Lagoon and the plume of the Curonian Lagoon in the Baltic Sea) and coastal waters of the Baltic Sea. In addition, artificial and heavily modified water bodies are distinguished. Various rivers, lakes, water areas of transitional and coastal waters differ in their individual characteristics, such as river size and slope, lake depth, salinity in transitional waters, soil composition in the coastal zone of the Baltic Sea, etc. The variety of such natural characteristics also affects aquatic communities: the species composition of aquatic organisms, as well as relative parameters of various species in communities, largely depends on natural conditions. Therefore, all surface water categories 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), that is, 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 sub-sections provide information on the types of rivers, lakes, transitional and coastal waters identified within the Nemunas RBD and discuss the natural factors characterising these types.

Rivers

19. Five river types were identified in the Nemunas RBD which differ in the characteristics of their aquatic communities (mainly fish communities). 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, in accordance with the WFD, 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 according to the catchment size the rivers are divided into four groups. Rivers with the catchment size larger than 100 km^2 were additionally divided into types by the criterion of the bed slope. The river types of the Nemunas RBD and the corresponding characterising factors are provided in Table 24, and Figure 14 demonstrates the river types.

Table 24. The typology of rivers in the Nemunas RBD

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

Lakes

20. Three main types of lakes were identified in the Nemunas RBD. The major factor that determines the most significant differences between the communities of aquatic organisms (fish and macrophytes) 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, that is, also belong to one type. All lakes are classified into one group of lakes larger than 0.5 km^2 (according to the WFD, only the lakes with an area >0.5 km^2 shall be classified) because no material differences in the structure and composition of the communities of aquatic organisms were identified in the lakes larger than 0.5 km^2. By the average depth, the lakes are differentiated into three groups: lakes with the average depth less than 3 m, within the range of 3-9 m, and more than 9 m.

The types of the lakes in the Nemunas RBD and the factors characterising the types are presented in Table 25, and the lake typology – in Figure 15.

Table 25. The typology of lakes in the Nemunas RBD

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

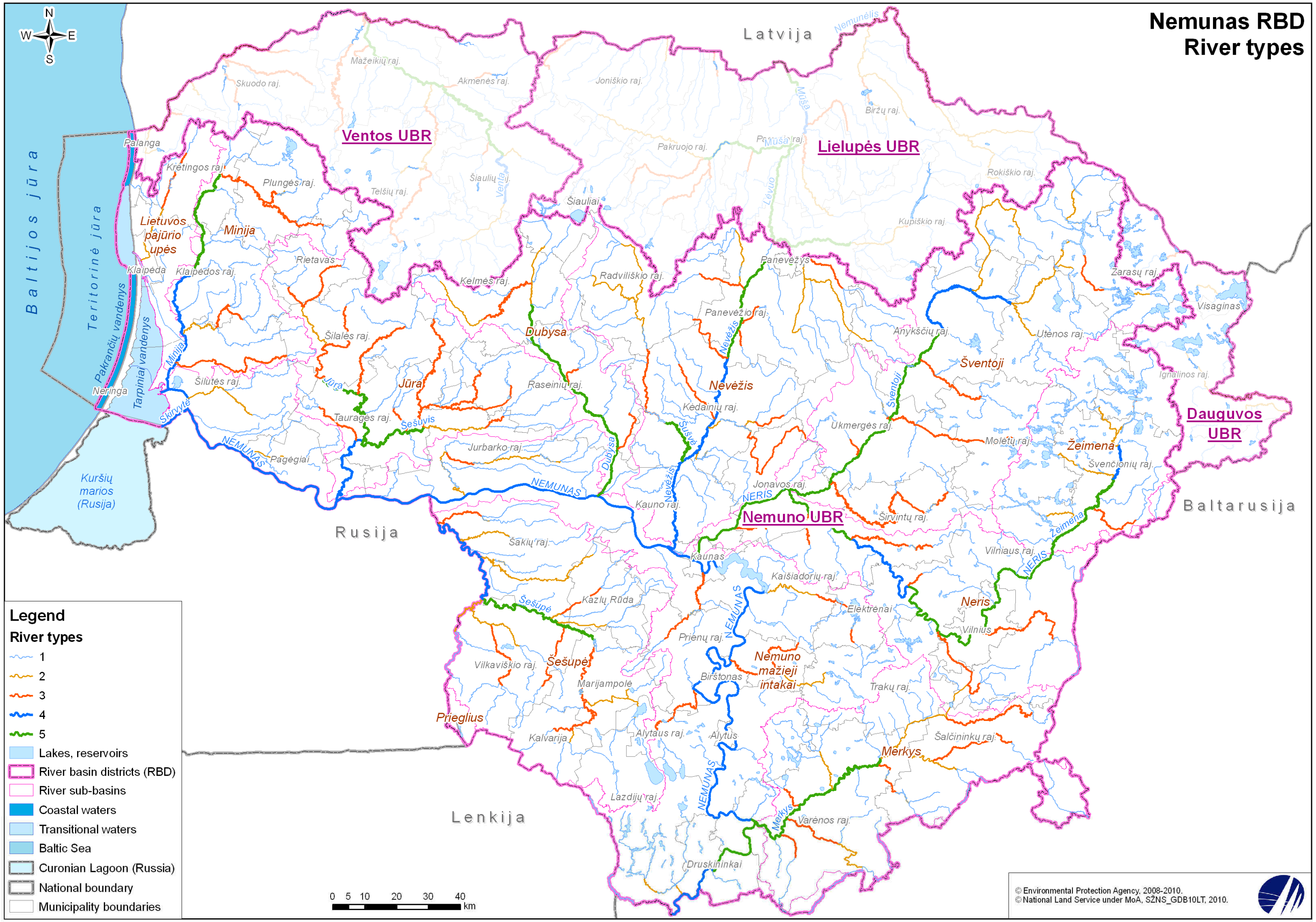


Figure 14. Types of rivers in the Nemunas RBD. This and other figures given in the Management Plan are also provided in an interactive map at http://gis.gamta.lt/baseinuvaldymas

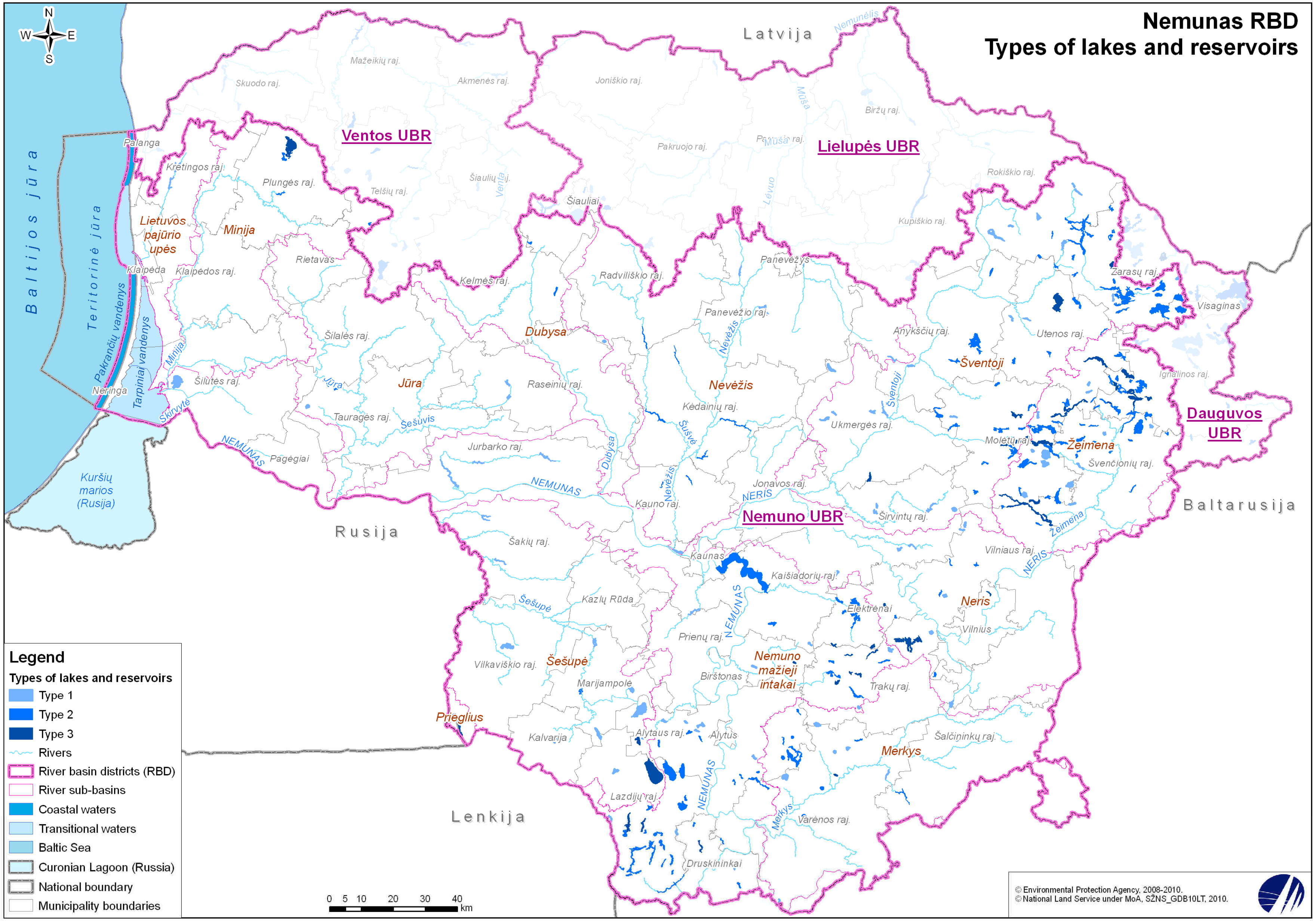


Figure 15. Types of lakes and ponds in the Nemunas RBD

Transitional and coastal waters

21. Transitional waters within the Nemunas RBD are differentiated into three types on the basis of the following ecologically relevant factors: wave exposure and average structure of substrate (Table 26). The tidal range was not considered as an appropriate factor for identifying water types. Salinity, wave exposure and average structure of substrate are used for separating the plume of the Curonian Lagoon in the Baltic Sea in the open coastal waters from other two transitional water types.

Table 26. The typology of transitional water bodies in the Nemunas RBD

	Types of transitional waters		
	1	2	3
Descriptors	Northern part of the Curonian Lagoon	Central part of the Curonian Lagoon	Plume of the Curonian Lagoon in the Baltic Sea
Salinity (%, psu)	<0.5 - 5	<0.5	0.5 - 18
Wave exposure	Highly protected	Highly protected	Open
Average structure of substrate	Sand, silt	Sand, silt	Sand, rocks

The Lithuanian coastal waters of the Baltic Sea assigned to the Nemunas RBD are divided into two types, using the average structure of substrate as an optional factor (Table 27). The average structure of substrate is the main element for differentiating the two types of the coastal waters. Wave exposure on shores, water mixing characteristics, depth and tidal regime are not suitable for the typology of the coastal waters of Lithuania.

Table.27. The typology of coastal waters in the Nemunas RBD

	Types of coastal waters	
	1	2
Descriptors	Open sandy coast of the Baltic Sea (coast of the Curonian Spit)	Open stony coast of the Baltic Sea (continental part of the coast)
Salinity (%, psu)	5 - 18	5 - 18
Average structure of substrate	sand	sand-gravel, stones

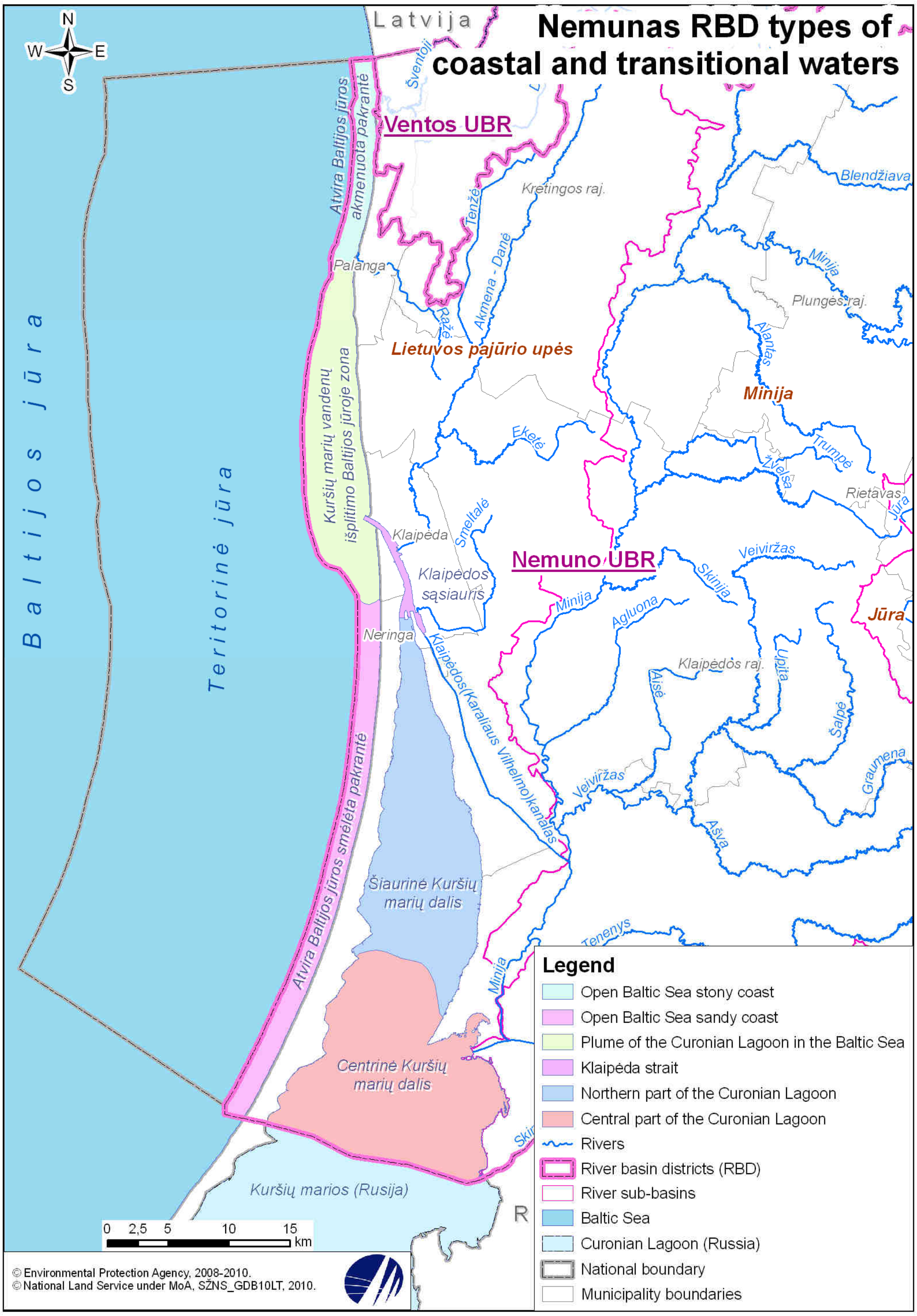


Figure 16. Types of transitional and coastal waters in the Nemunas RBD

Heavily modified water bodies

22. The characteristics (hydrological, morphological) of certain natural bodies of water have been strongly modified due to an impact of human economic activities. As a result, good status of aquatic organisms in such bodies of waters often cannot be achieved, unless the human 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 bodies of water include Klaipėda Strait, which is the place of concentrated activities of Klaipėda State Seaport. The natural shore in the eastern part and in the major area of the western part was replaced with port embankments. The hydrodynamic and outwash material transportation regime in the strait was altered by construction and, later, reconstruction of the port entrance as well as by the dredging of the water area since the year 1925, which has resulted in the present depth of 14 meters as compared to mere 8 m in certain places of Klaipėda Strait in 1928. Due to the said reasons, Klaipėda Strait was assigned to HMWB (Figure 17).

Heavily modified water bodies also include ponds with the area larger than 0.5 km^2 where the conditions typical of rivers have turned into those typical of lakes due to an impact of the head, as well as river stretches where the natural flow is continuously lower more than 30 % due to water transfer to the catchment of another river. Available research data on communities of aquatic organisms indicate that such reduction of the flow has a significant negative impact on the status of the communities. Only one water body in the Nemunas RBD – a stretch of the Merkys downstream of the Merkys-Vokė Canal – was classified as a HMWB due to the said impact. More than 80 % of the discharge of the Merkys River accounts for the maintenance of Lake Papis (a NATURA 2000 site), which belongs to the basin of the Vokė River. The group of HMWB also includes a stretch of the Nemunas downstream of Kaunas Hydropower Plant, which was designated as such taking into account significant fluctuation of the water level due to the operation of the hydropower plant, artificial formation and maintenance of the shoreline (dams), and dredging of the bed for navigation purposes.

The available data on aquatic communities shows that water bodies may be of good status by the parameters indicative of physico-chemical quality elements, but the status of aquatic organisms in straightened rivers is lower than good. If straightened sections are not continuously maintained, in the long run they can remeander naturally. However, the process of natural restoration of river beds to a very large extent depends on the river bed slope, substrate 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 velocity, 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 lowlands of the Nemunas RBD. Artificial restoration of the river beds is hardly possible, especially in urbanised territories where remeandering possibilities are very limited. Hence, straightened rivers with low bed slopes flowing over urbanised territories of the Nemunas RBD were designated as HMWB.

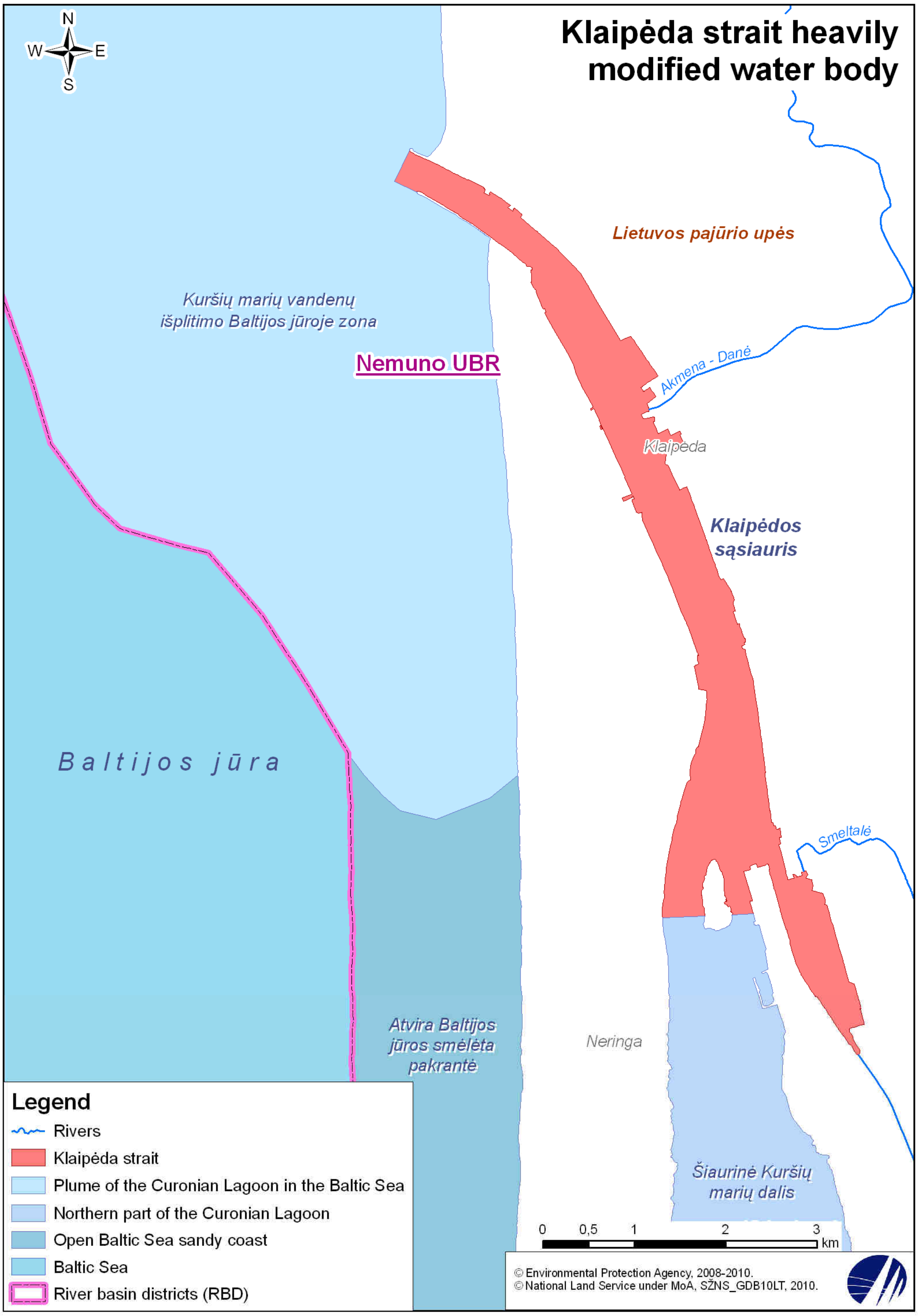


Figure 17. Klaipėda Strait – a heavily modified water body

The designation of water bodies as HMWB was conducted following the WFD CIS Guidance Document[1] and some feedback from foreign experience[2].
The designation process aims at justifying the reason of why the pre-designated HMWB should be finally classified as HMWB and hence should have less stringent objectives in terms of ecological 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 user(s) do not have any alternative means to achieve the same benefits as those offered by a respective water body under the category of HMWB.

23. The HMWB designation process[3] consisted of following steps:

23.1. Pre-designation: identification of the location, size, etc. of the water body, description of the hydromorphological changes and ecological alteration(s);
23.2. Characterisation of the user(s) benefiting from the changes.;
23.3. Identification of measures to restore good ecological status of the water body (hydromorphological characteristics);
23.4. Description of the impacts of the measure(s) on the user(s) and on the wider environment;
23.5. Test: Are the impacts significant?
23.6. Identification of potential alternative means for the user to achieve the same function;
23.7. Test: Are these alternative means feasible technically, economically and environmentally?

24. Having completed the steps listed in paragraph 23, the following water bodies were designated as HMWB within the Nemunas RBD:

24.1. Klaipėda Strait;

24.2. Ponds/reservoirs larger than 0.5 km^2 – in total 42 water bodies with the aggregate area of 115.6 km^2;

24.3. A stretch of the Merkys downstream of the Merkys-Vokė Canal (discharge decreased by 80 %); this stretch comprises one body of water with the aggregate length of 23.3 km;

24.4. The Nemunas River below Kaunas Hydropower Plant down to the mouth; this stretch comprises one body of water with the aggregate length of 225 km;

24.5. Straightened rivers with a low bed slope in urbanised territories of the Nemunas RBD; such rivers comprise 52 bodies of water with the aggregate length of 925 km.

Artificial water bodies

25. The category of artificial water bodies contains water bodies formed in places where they had not existed before, without having modified the existing water bodies. AWB

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[1]Common Implementation Strategy for the Water Framework Directive, Guidance No. 4: Identification and Designation of Heavily Modified and Artificial Water Bodies, 2003.
[2] Including the conclusions from a workshop in Brussels *Heavily Modified Water Bodies: Information Exchange on Designation, Assessment of Ecological Potential, Objective Setting and Measures*, 3 March 2009.
[3] The methodology and procedure of the designation of HMWB is described in Annex 7 to the Report on the Assessment of Surface Water Bodies.

also include large quarries (>0.5 km^2) as well as artificial canals dug for diverting part of the river water flow to other rivers, or for other purposes (King Wilhelm Canal).

26. Bodies of water identified as artificial water bodies (Figure 18):

26.1. Quarries (>0.5 km^2) – one such quarry with the area of 1.2 km^2 in the Nemunas RBD;

26.2. Flow diversion canals (the Merkys-Vokė Canal, the Šventoji-Nevėžis Canal, and the Lėvuo-Nevėžis Canal) constituting three bodies of water with the aggregate length of 17.2 km;

26.3. King Wilhelm Canal, which was identified as one body of water with the length of 23.04 km.

Reference conditions of surface water bodies

27. 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, that is, 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.

The reference conditions of water bodies described in this section were established by way of analyses of various characteristics of the parameters for quality elements in specially selected water bodies with a minimum impact by human economic activities, as well as application of other methods used for selection of reference sites in the Baltic Ecoregion, and coordination of the criteria for the identification of reference sites with other EU Member States. It should be noted that so far reference values were established not for all water quality elements listed in the directive due to shortage of data required for reliable values.

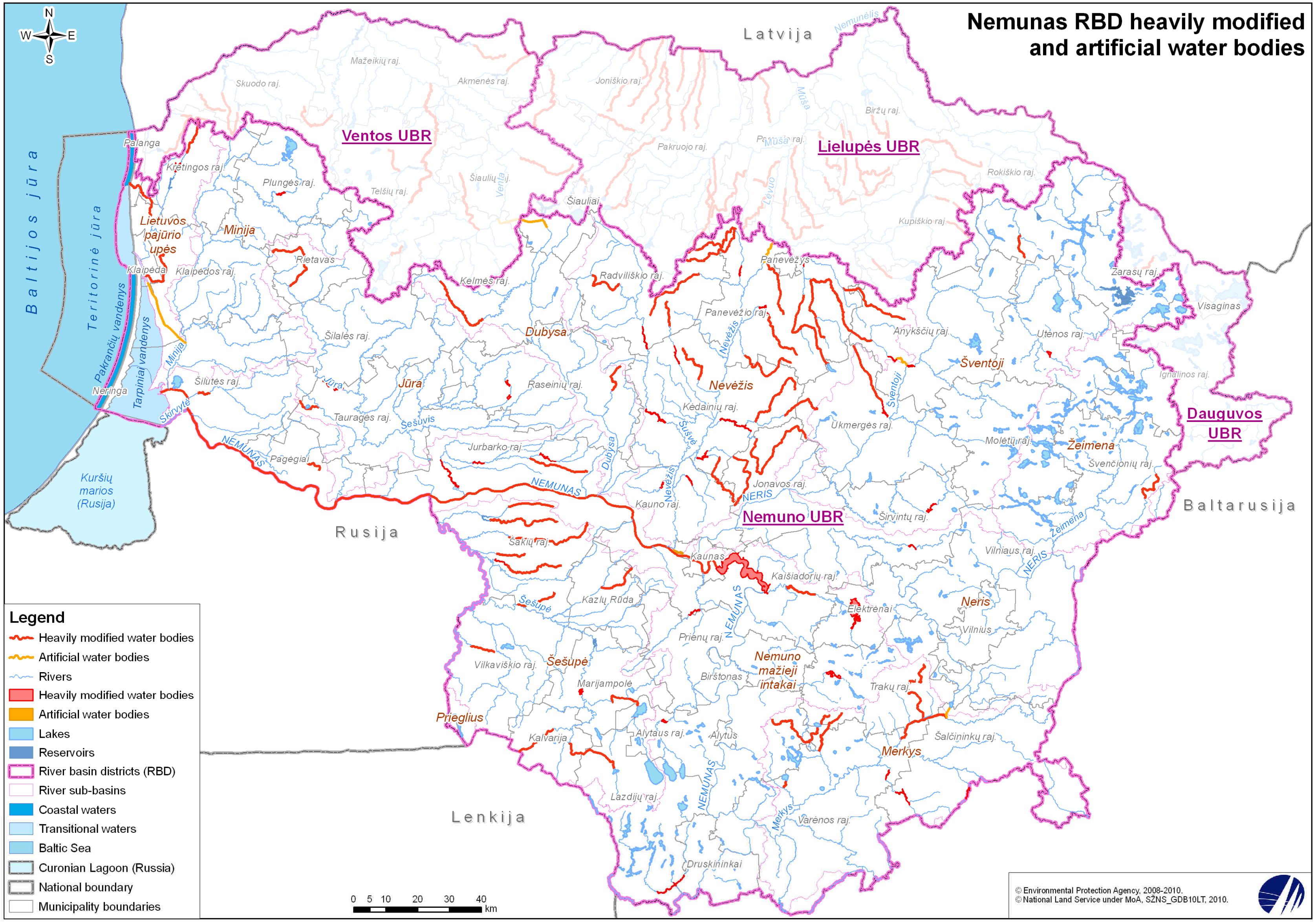


Figure 18. Heavily modified and artificial water bodies

Rivers

28. In rivers, values of reference conditions for biological elements were established only for parameters for fish and benthic invertebrate fauna (no reference conditions were established for macrophyte parameters due to shortage of data). Values of parameters indicative of physico-chemical quality elements characterising the quality of water, which ensure reference conditions for biological elements, were established as well. Reference conditions for rivers were also characterised in accordance with hydromorphological and chemical status criteria. Characterisation of reference conditions for river sites and values of parameters for water quality elements are provided in Table 28.

Table 28. Parameters for reference condition river sites and their characterisation

REFERENCE CONDITIONS		
Parameters	Spatial assessment scale	Characterisation
BIOLOGICAL		
Lithuanian Fish Index (LFI)	monitoring site	LFI value - 1
Danish Stream Fauna Index (DSFI)	monitoring site	DSFI value - 7
PHYSICO-CHEMICAL		
General water quality parameters (average annual values)	monitoring site	$BOD_7 \leq 1.8$ mg/l; O_2 >8.5 mg/l (Type-2 rivers) and ≥9.5 mg/l (rivers of other types); $N_{total} \leq 1.4$ mg/l; NH_4-N ≤ 0.06 mg/l; NO_3-N ≤ 0.9 mg/l; PO_4-P ≤ 0.03 mg/l; $P_{total} \leq 0.06$ mg/l.
HYDROMORPHOLOGICAL		
Structure of the river bed	stretch*	Natural bed (unregulated, no shore embankments).
Length and width of natural riparian vegetation	stretch*	The zone of natural riparian vegetation (forests) covers at least 70 % of the length of the bank of the river bed. The width of the forest zone must be at least 50 m.
River continuity	stretch*	There are no artificial barriers for fish migration.
Quantity of water flow	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 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).
CHEMICAL STATUS		
Hazardous substances and other pollutants	Monitoring site	Concentrations of specific pollutants are below the detection limit (pollutants are not detected by most advanced analytical methods). Concentrations of other regulated substances which are naturally found in the nature do not exceed the natural level.

* 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; rivers with the catchment area >1000 km^2 – 5 km upstream and 5 km downstream of the monitoring site.

Lakes

29. In lakes, values of parameters for reference conditions for biological elements were specified only for the parameter for phytoplankton meanwhile reference values established for parameters for other biological elements are only preliminary ones, with the parameters currently being tested. Values of parameters for reference conditions will have to be specified when more data is available. Also, values of parameters indicative of physico-chemical elements characterising the quality of water, which should ensure reference conditions for biological elements, were established, and parameters for hydromorphological quality elements and criteria for chemical status were characterised. Parameters for reference conditions of lakes and their values are given in Table 29.

Table 29. Parameters for reference conditions in lakes and their characterisation

REFERENCE CONDITIONS	
Parameters	Characterisation
BIOLOGICAL (parameter for phytoplankton)	
Chlorophyll *a* (annual average)	Type-1, 2 lakes: ≤2.5 µg/l; Type-3 lakes: ≤2 µg/l
Chlorophyll *a* (maximum value)	Type-1, 2 lakes: ≤5 µg/l Type-3 lakes: ≤4 µg/l
PHYSICO-CHEMICAL	
Water quality parameters (average annual values)	Type-1, 2 lakes: N_{total} ≤1 mg/l; P_{total} ≤0.02 mg/l Type-3 lakes: N_{total} ≤0.75 mg/l; P_{total} ≤0.015 mg/l
HYDROMORPHOLOGICAL	
Changes in the shoreline	The shoreline is natural (not straightened, no shore embankments), or changes are insignificant (≤5 % of the lake shoreline).
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.
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 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.
CHEMICAL STATUS	
Hazardous substances and other pollutants	Concentrations of specific pollutants are below the detection limit (pollutants are not detected by most advanced analytical methods). Concentrations of other regulated substances which are naturally found in the nature do not exceed the natural level.

Unnatural changes in the water level should be taken into account only in case of pressures from human activities which would result in change 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.

Transitional and coastal waters

30. Quality elements characterising reference conditions were established taking into account all national monitoring data collected during the period from 1992 through 2007, historical data provided in literary sources, and modelling results. Parameters for reference conditions for transitional waters and their values are given in Table 30.

Reference conditions for the plume of the Curonian Lagoon in the Baltic Sea depend on salinity, therefore the reference condition values for the northern part of the Curonian Lagoon should be used when salinity is lower than 2 practical salinity units (psu), and the values for coastal waters should be applied when salinity is higher than 4 psu. Only preliminary values of reference conditions were established for parameters for certain biological elements (e.g. the total biomass of phytoplankton), the parameters are currently being tested. Also, values of parameters for physico-chemical elements characterising the quality of water, which should ensure reference conditions for biological elements, were established and criteria for chemical status were characterised.

Table 30. Parameters for reference conditions in transitional waters and their values

REFERENCE CONDITIONS			
Parameters	Plume of the Curonian Lagoon in the Baltic Sea *	Northern part of the Curonian Lagoon	Central part of the Curonian Lagoon
BIOLOGICAL			
Chlorophyll a (average value of June-September), µg/l	<26.4*; <14.2**; <2.0***	<26.4	<37.0
Maximum depth of occurrence of *Potamogetonaceae* (*Potamogeton*), m	-	>3.6	>3.6
Maximum depth of occurrence of the red seaweed, m	≥18.0	-	-
Average number of macro-zoobenthos species, unit/sample	>12	>24	>22
Average abundance of the gudgeon, unit/100 m^2	-	-	>250
PHYSICO-CHEMICAL			
Total nitrogen (average value of June-September), mg/l	<0.75*; <0.33**; 0.10***	<0.75	<0.76
Total phosphorus (average value of June-September), mg/l	<0.047*; <0.029**; <0.011***	<0.047	<0.048
CHEMICAL STATUS			
Specific synthetic and other pollutants	Concentrations of specific pollutants are close to zero (pollutants are not detected by most advanced analytical methods). Concentrations of other regulated substances which are naturally found in the nature do not exceed the natural level.		

* when water salinity in the water body is < 2 practical salinity units;
** when water salinity in the water body is 2-4 psu practical salinity units;
*** when water salinity in the water body is > 4 psu practical salinity units.

The criteria characterising the quality of coastal water bodies were agreed with the criteria for transitional waters observing the relevant assessment period (Table 31).

Only preliminary values of reference conditions were established for parameters indicative of certain biological elements (e.g. the total biomass of phytoplankton), the parameters are currently being tested. Also, values of parameters indicative of physico-chemical elements characterising the quality of water, which should ensure reference conditions for biological elements, were established and criteria for chemical status characterised.

Table 31. Parameters for reference conditions in coastal waters and their values

REFERENCE CONDITIONS		
Parameters	Open sandy coast of the Baltic Sea	Open stony coast of the Baltic Sea
BIOLOGICAL		
Chlorophyll *a* (mean value of June-September), µg/l	<2.0	<2.0
Maximum depth of occurrence of the red seaweed, m	-	≥ 20.0
Average number of macro-zoobenthos species, unit/sample	>14	>18
PHYSICO-CHEMICAL		
Total nitrogen (average value of June-September), mg/l	<0.10	<0.10
Total phosphorus (average value of June-September), mg/l	<0.011	<0.011
Average water transparency in summer time, m	≥7.2	≥7.2
CHEMICAL STATUS		
Specific synthetic and other pollutants	Concentrations of specific pollutants are close to zero (pollutants are not detected by most advanced analytical methods). Concentrations of other regulated substances which are naturally found in the nature do not exceed the natural level.	

Maximum ecological potential of artificial and heavily modified water bodies

31. Hydrological and morphological characteristics in artificial (AWB) and heavily modified (HMWB) water bodies directly depend on the objectives of the formation or modification of such water bodies. Any change in hydromorphological characteristics results in corresponding changes in aquatic communities which live in 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 hydromorphological conditions of such water bodies often do not allow attainment of the same status of aquatic organisms as in natural water bodies, less stringent requirements may be set for parameters indicative of biological elements. However, if hydromorphological conditions occurring in AWB and HMWB are identical to conditions in natural water bodies of a respective type, the maximum ecological potential of aquatic communities is considered to be corresponding to high ecological status, that is, it has to conform to the same criteria. The requirements for parameters indicative of physico-chemical water quality elements and chemical status (priority, hazardous and other specific substances) 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 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), that is, measures which will not have any negative impact on anthropogenic objectives pursued when constructing an artificial water body or heavily 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

32. As already said, artificial water bodies are classified into two groups which have similar hydromorphological characteristics: (1) quarries and (2) flow diversion canals (the Merkys-Vokė, the Šventoji-Nevėžis, the Venta-Dubysa, the Lėvuo-Nevėžis) and King Wilhelm Canal.

On the basis of their ecological qualities, quarries are comparable to natural lakes of a respective type. Their hydromorphological characteristics are considered to be consistent with the requirements set for maximum ecological potential on condition that the values of hydromorphological elements at high status have been met. Accordingly, the maximum ecological potential for biological and physico-chemical quality elements must also conform to the criteria for high ecological status established for the lakes of such type. These criteria are set out in Table 32.

By their ecological characteristics, artificial canals are similar to rivers of a respective type. High ecological status according to biological quality elements cannot be achieved due to the absence of certain specific habitats and changes in the natural hydrological regime. Monitoring data showed that the maximum ecological potential of biological quality elements has to conform to the values of the criteria for good ecological status, which are applied to natural rivers, that is, DSFI EQR $\geq$0.64, and LFI $\geq$0.71.

Requirements for water quality indicators (parameters indicative of physico-chemical elements) and chemical status (priority, hazardous and other specific substances) remain the same as those in respect of natural rivers.

Heavily modified water bodies

33. HMWB in the Nemunas RBD include ponds larger than 0.5 km^2, the stretch of the Merkys River from the Merkys-Vokė Canal to the mouth of the Cirvija River (discharge reduced by 80 %), the Nemunas River downstream of Kaunas Hydropower Plant, rivers with straightened beds in the lowlands of the Nemunas region, and the water area of Klaipėda Seaport.

Hydromorphological conditions formed in ponds larger than 0.5 km^2 as well as aquatic communities therein should be consistent with those in natural lakes, with the exception of ponds of hydropower plants with unnatural fluctuation of the water level. However, in the event of ensuring water levels the limit values of which are provided in the Regulations on Use and Maintenance of Ponds (LAND 2-95) approved by Order No. 33 of the Ministry of the Environment of the Republic of Lithuania of 7 March 1995 (Žin., 1997, No. 70-1790; 2004, No. 96-3563; 2006, No. 101-3915) (fluctuation of the water level is within the limits of the minimum and maximum water level in natural lakes; during the spawning period, fluctuation is close to zero), fluctuation of levels does not have any significant impact on the status of aquatic communities, that is, the hydrological characteristics are deemed to be close to natural ones. Hence the maximum ecological potential of biological, physico-chemical and hydromorphological quality elements in such water bodies should also conform to the high ecological status criteria applicable for natural lakes (Table 32).

Table 32. Characterisation of the maximum ecological potential in ponds (with unregulated water level) and quarries which are designated as artificial and heavily modified water bodies

<table>
<tr><th colspan="4">Maximum ecological potential</th></tr>
<tr><td colspan="4">Parameter for phytoplankton:</td></tr>
<tr><td colspan="3">Chlorophyll a (mean value of the EQR of the average annual value and the EQR of the maximum value)</td><td>>0.67</td></tr>
<tr><td colspan="4">Parameters for physico-chemical quality elements:</td></tr>
<tr><td colspan="3">Water quality parameters (average annual values)</td><td>Type-1, 2 ponds and quarries: N_{total} ≤1 mg/l; P_{total} ≤0.02 mg/l
Type-3 ponds and quarries: N_{total} ≤0.75 mg/l; P_{total} ≤0.015 mg/l</td></tr>
<tr><td colspan="4">Parameters for hydromorphological elements:</td></tr>
<tr><td>Hydrological regime</td><td>Quantity and dynamics of water flow</td><td>Changes in the water level</td><td>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.</td></tr>
<tr><th colspan="4">Maximum ecological potential</th></tr>
<tr><td rowspan="2">Morphological conditions</td><td rowspan="2">Structure of the shore of the water body</td><td>Changes in the shoreline</td><td>The shoreline is natural (not straightened, there are no shore embankments), or changes are insignificant (≤5 % of the shoreline of the water body).</td></tr>
<tr><td>Length of the natural riparian vegetation zone</td><td>The zone of natural riparian vegetation (forests) covers at least 70 % of the length of the shoreline of the water body.</td></tr>
</table>

Parameters for hydromorphological elements of ponds with a regulated level (hydropower plants) are considered to be failing the characterisation of maximum ecological potential.

The ecological potential of the heavily modified stretch of the Nemunas should be defined following the criteria applicable for Type-4 rivers, that is, the ones with the catchment size larger than 1 000 km^2 and low flow. High ecological status according to biological quality elements cannot be achieved in this stretch due to the modification of the river bed, form of the shoreline, and significant modification of the hydrological regime. The current ecological status is considered to be poor/moderate. Hence it is believed that the maximum potential of biological quality elements should correspond, as a minimum, to the good ecological status criteria applicable in natural Type-4 rivers, that is, DSFI EQR ≥ 0.64 and LFI ≥ 0.71.

The ecological potential of heavily modified rivers with straightened beds should be assessed using the criteria applicable for the evaluation of types of rivers with corresponding catchment areas and slopes. High ecological status according to biological quality elements cannot be achieved due to absence of certain specific habitats and changes in the natural hydrological regime. Monitoring data showed that the maximum ecological potential of biological quality elements has to conform to the values of the good ecological status criteria which are applied to natural rivers of a type in question, that is, DSFI EQR ≥0.64, and LFI ≥0.71 (Table 33). The maximum ecological potential of hydromorphological elements should meet the good ecological status requirements. Requirements for physico-chemical water quality elements remain the same as those in respect of rivers with natural beds.

The ecological potential of the heavily modified stretch of the Merkys should be established observing the criteria applicable for the assessment of the types of rivers with a respective catchment size and slope (Type 2 in accordance with the data on the catchment size and bed slope). High ecological status according to biological quality elements cannot be achieved due to the absence of certain specific habitats and changes in the natural hydrological regime, hence maximum ecological potential should correspond to the values of the good ecological status criteria applicable in natural Type-2 rivers, that is, DSFI EQR ≥ 0.64 and LFI ≥ 0.71. Requirements for physico-chemical water quality elements remain the same as those in respect of rivers with natural beds.

The parameters and their values consistent with the maximum ecological potential of the artificial canals, heavily modified stretches of the Nemunas and the Merkys, and the heavily modified rivers with straightened beds are given in Table 33 below.

Table 33. Characterisation of the maximum ecological potential in rivers which are designated as heavily modified water bodies and in canals

<table>
<tr><th colspan="5">Maximum ecological potential</th></tr>
<tr><td colspan="5">Parameters for biological quality elements:</td></tr>
<tr><td colspan="4">Lithuanian Fish Index (LFI)</td><td>LFI value ≥ 0.71</td></tr>
<tr><td colspan="4">Danish Stream Fauna Index (DSFI)</td><td>EQR of the DSFI value ≥ 0.64</td></tr>
<tr><td colspan="5">Parameters for physico-chemical quality elements (annual average values):</td></tr>
<tr><td colspan="4">BOD_7</td><td>< 2.3 mg/l;</td></tr>
<tr><td colspan="4">O_2</td><td>> 8.5 mg/l (Type-1,3-5 water bodies)
> 7.5 mg/l (Type-2 water bodies)</td></tr>
<tr><td colspan="4">N_{total}</td><td>< 2.0 mg/l</td></tr>
<tr><td colspan="4">NH_4-N</td><td>< 0.1 mg/l</td></tr>
<tr><td colspan="4">NO_3-N</td><td>< 1.3 mg/l</td></tr>
<tr><td colspan="4">PO_4-P</td><td>< 0.05 mg/l</td></tr>
<tr><td colspan="4">P_{total}</td><td>< 0.1 mg/l</td></tr>
<tr><td colspan="5">Parameters for hydromorphological quality elements:</td></tr>
<tr><td>Hydrological regime</td><td>Quantity and dynamics of water flow</td><td>Flow rate</td><td>Monitoring site</td><td>There are no changes in the natural flow rate or fluctuations in natural flow due to human activities (operation of HPP) are ≤30 % of the average flow during a period in question. However, the flow may not be less than the minimum natural flow during the dry period (average of 30 days).</td></tr>
<tr><td colspan="2">River continuity</td><td>River continuity</td><td>Stretch *</td><td>There are no artificial barriers for fish migration.</td></tr>
<tr><td rowspan="2">Morphological conditions</td><td rowspan="2">Shore structure</td><td>Structure of the river bed</td><td>Stretch *</td><td>The shoreline is meandrous, there are shallow and deep places in the bed determining changes in the flow velocity and soil composition.</td></tr>
<tr><td>Length of the natural riparian vegetation zone</td><td>Stretch *</td><td>The zone of natural riparian vegetation (forests) covers at least 50 % of the length of the shoreline of the water body.</td></tr>
</table>

* 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.

The parameters for the assessment of the ecological potential of Klaipėda Strait are the same as those for coastal and transitional waters using, however, the quality element parameters established in water only: average concentration of chlorophyll *a*, total phosphorus and total nitrogen. The maximum ecological potential of biological and physico-chemical quality elements should conform to the values of good ecological status established for the closest water bodies taking into account the measured water salinity. Assessments of ecological potential observing the established rules should bear in mind the altered hydromorphology of the strait.

Requirements for chemical status (priority, hazardous and other specific substances) of water bodies remain the same as those in respect of natural ones. The values of the parameters indicative of the maximum ecological potential in Klaipėda Strait are provided in Table 34.

Table 34. Parameter values for Klaipėda Strait indicative of maximum ecological potential

Maximum ecological potential	
Parameter for phytoplankton:	
EQR of the values of chlorophyll *a* (summer average)	>0.83*; >0.84**; >0.83***
Parameters for physico-chemical quality elements:	
N_{total} (summer average), mg/l	<0.93*; <0.42**; <0.12***
P_{total} (summer average), mg/l	<0.059*; <0.036**; <0.014***

* when water salinity in the water body is < 2 practical salinity units;
** when water salinity in the water body is 2-4 psu practical salinity units;
*** when water salinity in the water body is > 4 psu practical salinity units.

Methodology for identifying the status of surface water bodies

Criteria for assessing the ecological status of rivers

34. The ecological status of rivers is assessed on the basis of physico-chemical, hydromorphological and biological quality elements. Physico-chemical quality elements are parameters which characterise general conditions (nutrients, organic matter, oxygenation): nitrate nitrogen (NO_3-N), ammonium nitrogen (NH_4-N), total nitrogen (N_t), phosphate-phosphorus (PO_4-P), total phosphorus (P_t), biochemical oxygen demand in seven days (BOD_7), and the amount of dissolved oxygen in water (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 35).

Table 35. 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 data	Nutrients	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_t, 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_t, 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

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 (shore 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 36). 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 36. 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 status of rivers according to parameters indicative of hydromorphological quality elements
1	Hydrological regime	Quantity and dynamics of water flow	Flow rate	monitoring site	There are no alterations in the quantity of the natural flow due to human activities (water intake, operation of a 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).
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 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.

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 the Lithuanian Fish Index (LFI). Observing the average annual value of LFI, water bodies are assigned to one of five ecological status classes (Table 37).

Table 37. Ecological status classes of rivers according to the 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

The indicator used to assess the ecological status of rivers according to the taxonomic composition and abundance of zoobenthos is the Danish Stream Fauna Index (DSFI). Observing the average annual value of the ecological quality ratio (EQR) of DSFI, water bodies are assigned to one of five ecological status classes (Table 38).

Table 38. Ecological status classes of rivers according to the 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

Criteria for assessing the ecological status of lakes

35. 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_t) and total phosphorus (P_t). 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 39).

Table 39. Ecological status classes of lakes according to parameters indicative of physico-chemical quality elements

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 conditions	Nutrients	N_t, mg/l	1, 2	1.00	<1.30	1.30-1.80	1.81-2.30	2.31-3.00	>3.00
2			N_t, mg/l	3	0.75	<0.90	0.90-1.20	1.21-1.60	1.61-2.00	>2.00
3			P_t, mg/l	1, 2	0.020	<0.040	0.040-0.060	0.061-0.090	0.091-0.140	>0.140
4			P_b, mg/l	3	0.015	<0.030	0.030-0.050	0.051-0.070	0.071-0.100	>0.100

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 shore): 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 of high ecological status according to hydromorphological quality elements (Table 40). 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 hydromorphological quality elements.

Table 40. Characterisation of high status of lakes according to parameters indicative of quality hydromorphological elements

No.	Quality element		Parameter	Characterisation of high 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 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.
2	Morphological conditions	Shore 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.

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: average annual and 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 41).

Table 41. Ecological status classes of lakes according to the 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)	1-3	>0.67	0.67-0.33	0.32-0.14	0.13-0.07	<0.07

Criteria for assessing the ecological status of transitional water bodies

36. The ecological status of transitional water bodies is assessed on the basis of physico-chemical and biological quality elements.

The parameters characterising general conditions (nutrients), which is a physico-chemical element, are as follows: total nitrogen (N_t) and total phosphorus (P_t). 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 during the summer time (June-September) (Table 42).

Table 42. Ecological status classes of transitional water bodies according to parameters indicative of physico-chemical quality elements

No.	Quality element		Parameter	Type of transitional waters	Parameter value for reference conditions	Criteria for ecological status classes of transitional water bodies according to parameter values for physico-chemical quality elements				
						High	Good	Moderate	Poor	Bad
1	General conditions	Nutrients	N_t, mg/l	1, 3*	<0.75	0.75-0.93	0.94-1.08	1.09-1.23	1.24-1.41	>1.41
2			N_t, mg/l	2	<0.76	0.76-0.94	0.95-1.07	1.08-1.17	1.18-1.26	>1.26
3			N_t, mg/l	3**	<0.33	0.33-0.42	0.43-0.67	0.68-0.81	0.82-1.00	>1.00
4			N_t, mg/l	3***	<0.10	0.10-0.12	0.13-0.25	0.26-0.40	0.41-0.60	>0.60
5			P_t, mg/l	1, 3*	<0.047	0.047-0.059	0.060-0.080	0.081-0.136	0.137-0.312	>0.312
6			P_t, mg/l	2	<0.048	0.048-0.060	0.061-0.079	0.080-0.130	0.131-0.278	>0.278
7			P_t, mg/l	3**	<0.029	0.029-0.036	0.037-0.053	0.054-0.084	0.085-0.175	>0.175
8			P_t, mg/l	3***	<0.011	0.011-0.014	0.015-0.026	0.027-0.033	0.034-0.039	>0.039

* when water salinity in Type-3 transitional waters is < 2 practical salinity units
** when water salinity in Type-3 transitional waters is 2-4 practical salinity units
*** when water salinity in Type-3 transitional waters is > 4 practical salinity units

The ecological status of transitional water bodies is assessed on the basis of the following biological quality elements: taxonomic composition, abundance and biomass of phytoplankton, taxonomic composition and abundance of macroalgae and angiosperms, taxonomic composition and abundance of zoobenthos, taxonomic composition and abundance of fish fauna.

The parameter for assessing the ecological status of transitional waters according to the taxonomic composition, abundance and biomass of phytoplankton is the average summer (June-September) value of chlorophyll *a*. Observing the EQR of the average summer value of the parameter, water bodies are assigned to one of five ecological status classes (Table 43).

Table 43. Ecological status classes of transitional water bodies according to the taxonomic composition, abundance and biomass of phytoplankton

No.	Quality element	Parameter	Type of transitional waters	Criteria for ecological status classes of transitional water bodies according to the EQR of parameter values for phytoplankton				
				High	Good	Moderate	Poor	Bad
1	Taxonomic composition, abundance and biomass of phytoplankton	Chlorophyll *a* (average summer value)	1, 3*	>0.83	0.83-0.57	0.56-0.39	0.38-0.29	<0.29
2		Chlorophyll *a* (average summer value)	2	>0.83	0.83-0.68	0.67-0.51	0.50-0.41	<0.41
3		Chlorophyll *a* (average summer value)	3**	>0.84	0.84-0.55	0.54-0.38	0.37-0.28	<0.28
4		Chlorophyll *a* (average summer value)	3***	>0.83	0.83-0.42	0.41-0.28	0.27-0.21	<0.21

* when water salinity of Type-3 transitional waters is < 2 practical salinity units
** when water salinity of Type-3 transitional waters is 2-4 practical salinity units
*** when water salinity of Type-3 transitional waters is > 4 practical salinity units

The parameter for assessing the ecological status of Type-1 and Type-2 transitional water bodies according to the taxonomic composition and abundance of angiosperms is the maximum depth of occurrence of *Potamogenotaceae* (*Potamogeton*). The parameter for assessing the ecological status of Type-3 transitional water bodies by the taxonomic composition and abundance of macroalgae is the maximum depth of occurrence of the red seaweed *Furcellaria lumbricalis* (Huds.). Observing the EQR of the annual average value of the parameter, water bodies are assigned to one of five ecological status classes (Table 44).

Table 44. Ecological status classes of Type-1 and Type-2 transitional water bodies according to the taxonomic composition and abundance of angiosperms and ecological status classes of Type-3 transitional water bodies according to the taxonomic composition and abundance of macroalgae

No.	Quality element	Parameter	Type of transitional waters	Criteria for ecological status classes of transitional water bodies according to the EQR of parameter values for angiosperms and macroalgae				
				High	Good	Moderate	Poor	Bad
1	Taxonomic composition and abundance of angiosperms and macroalgae	Maximum depth of occurrence of *Potamogenotaceae* (*Potamogeton*)	1, 2	>0.83	0.83-0.28	0.27-0.19	0.18-0.14	<0.14
2		Maximum depth of occurrence of the red seaweed	3	>0.94	0.94-0.78	0.77-0.50	0.49-0.22	<0.22

The parameter for assessing the ecological status of transitional water bodies according to the taxonomic composition and abundance of zoobenthos is the average number of species in a sample taking into account the species composition of the community. Observing the EQR of the annual average value of the parameter, water bodies are assigned to one of five ecological status classes (Table 45).

Table 45. Ecological status classes of transitional water bodies according to the taxonomic composition and abundance of zoobenthos

No.	Quality element	Parameter	Type of transitional waters	Criteria for ecological status classes of transitional water bodies according to the EQR of parameter values for zoobenthos				
				High	Good	Moderate	Poor	Bad
1	Taxonomic composition and abundance of zoobenthos	Average number of zoobenthos species	1	>0.83	0.83-0.71	0.70-0.17	0.16-0.04	<0.04
2		Average number of zoobenthos species	2	>0.82	0.82-0.68	0.67-0.32	0.31-0.05	<0.05
3		Average number of zoobenthos species	3	>0.83	0.83-0.58	0.57-0.42	0.41-0.25	<0.25

The parameter for assessing the ecological status of Type-2 transitional water bodies according to the taxonomic composition and abundance of fish fauna is the average abundance (units/100 m^2) of the gudgeon (*Gobio gobio*), which is a species of the family Cyprinidae, in a relevant year. Observing the EQR of the annual average value of the parameter, water bodies are assigned to one of five ecological status classes (Table 46).

Table 46. Ecological status classes of Type-2 transitional water bodies according the taxonomic composition and abundance of fish fauna

Quality element	Parameter	Type of transitional waters	Criteria for ecological status classes of transitional waters according to the EQR of parameter values for fish fauna				
			High	Good	Moderate	Poor	Bad
Taxonomic composition and abundance of fish fauna	Average abundance of the gudgeon (*Gobio gobio*)	2	>0.8	0.8-0.4	0.39-0.08	0.07-0.04	<0.04

Criteria for assessing the ecological status of coastal water bodies

37. The ecological status of coastal water bodies is assessed on the basis of physico-chemical and biological quality elements.

The parameters characterising physico-chemical quality elements, such as general conditions (nutrients and transparency), are as follows: total nitrogen (N_t), total phosphorus (P_t) and transparency of water. Water bodies are assigned to one of five ecological status classes on the basis of measurements of water transparency and the average summer values (June-September) of total phosphorus and total nitrogen measured in samples of the surface water layer (Table 47).

Table 47. Ecological status classes of coastal water bodies according to parameters indicative of physico-chemical quality elements

No.	Quality element		Parameter	Type of coastal waters	Parameter value for reference conditions	Criteria for ecological status classes of coastal water bodies according to parameter values for physico-chemical quality elements				
						High	Good	Moderate	Poor	Bad
1	General conditions	Nutrients	N_t, mg/l	1, 2	<0.10	0.10-0.12	0.13-0.25	0.26-0.40	0.41-0.60	>0.60
2			P_t, mg/l	1, 2	<0.011	0.011-0.014	0.015-0.026	0.027-0.033	0.034-0.039	>0.039
3		Transparency	Water transparency, m	1, 2	≥ 7.2	7.1-6	5.9-5.0	4.9-3	2.9-1.8	<1.8

The ecological status of coastal waters is assessed on the basis of the following biological quality elements: taxonomic composition, abundance and biomass of phytoplankton, taxonomic composition and abundance of macroalgae, taxonomic composition and abundance of zoobenthos.

The parameter for assessing the ecological status of coastal water bodies by the taxonomic composition, abundance and biomass of phytoplankton is the average summer (June-September) value of chlorophyll *a*. Observing the EQR of the average summer value of the parameter, water bodies are assigned to one of five ecological status classes (Table 48).

Table 48. Ecological status classes of coastal water bodies according to the taxonomic composition, abundance and biomass of phytoplankton

Quality element	Parameter	Type of coastal waters	Criteria for ecological status classes of coastal water bodies according to the EQR of parameter values for phytoplankton				
			High	Good	Moderate	Poor	Bad
Taxonomic composition, abundance and biomass of phytoplankton	Chlorophyll *a* (average summer value)	1, 2	>0.83	0.83-0.42	0.41-0.28	0.27-0.21	<0.21

The parameter for assessing the ecological status of Type-2 coastal water bodies according to the taxonomic composition and abundance of macroalgae is the maximum depth of occurrence of the red seaweed *Furcellaria lumbricalis* (Huds.). Observing the EQR of the annual average value of the parameter, water bodies are assigned to one of five ecological status classes (Table 49).

Table 49. Ecological status classes of Type-2 coastal water bodies according to the taxonomic composition and abundance of macroalgae

Quality element	Parameter	Type of coastal waters	Criteria for ecological status classes of coastal water bodies according to the EQR of parameter values for macroalgae				
			High	Good	Moderate	Poor	Bad
Taxonomic composition and abundance of macroalgae	Maximum depth of occurrence of the red seaweed	2	>0.90	0.90-0.75	0.74-0.45	0.44-0.25	<0.25

The parameter for assessing the ecological status of coastal water bodies according to the taxonomic composition and abundance of zoobenthos is the average number of species in a sample taking into account the species composition of the community. Observing the EQR of the annual average value of the parameter, water bodies are assigned to one of five ecological status classes (Table 50).

Table 50. Ecological status classes of coastal water bodies according to the taxonomic composition and abundance of zoobenthos

No.	Quality element	Parameter	Type of coastal waters	Criteria for ecological status classes of coastal water bodies according to the EQR of parameter values for zoobenthos				
				High	Good	Moderate	Poor	Bad
1	Taxonomic composition and abundance of zoobenthos	Average number of zoobenthos species	1	>0.86	0.86-0.71	0.70-0.43	0.42-0.21	<0.21
2		Average number of zoobenthos species	2	>0.83	0.83-0.67	0.66-0.33	0.32-0.17	<0.17

Criteria for assessing the ecological potential in artificial and heavily modified water bodies

38. The ecological potential of canals and of rivers designated as heavily modified water bodies 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 canals and of rivers designated as heavily modified water bodies are as follows: nitrate nitrogen (NO_3-N), ammonium nitrogen (NH_4-N), total nitrogen (N_t), phosphate-phosphorus (PO_4-P), total phosphorus (P_t), biochemical oxygen demand in seven days (BOD_7), and the amount of dissolved oxygen in water (O_2). Water bodies are assigned to one of five ecological potential classes on the basis of the average annual values of each parameter (Table 51).

Table 51. Ecological potential classes of canals and of rivers designated as heavily modified water bodies 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 conditions	Nutrients	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_t, 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_t, 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	1-5	<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

The ecological potential of canals and of rivers designated as heavily modified water bodies 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 (shore 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 52). 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 the maximum ecological potential according to the hydromorphological quality elements.

Table 52. Characterisation of the maximum ecological potential of canals and of rivers designated as heavily modified water bodies by parameters indicative of hydromorphological quality elements

No.	Quality element		Parameter	Spatial assessment scale	Characterisation of maximum ecological potential by parameters for hydromorphological quality elements
1	Hydrological regime	Quantity and dynamics of water flow	Flow rate	monitoring site	There are no alterations in the quantity of the natural flow due to human activities (operation of a 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 shore.

* 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.

The ecological potential of canals and of rivers designated as heavily modified water bodies 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 canals and of rivers designated as heavily modified water bodies according to the taxonomic composition, abundance, age structure of fish fauna is the Lithuanian Fish Index (LFI). Water bodies are assigned to one of five ecological status classes on the basis of the average annual value of LFI (Table 53).

Table 53. Ecological potential classes of canals and of rivers designated as heavily modified water bodies according to the 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

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 EQR of the DSFI (Table 54).

Table 54. Ecological potential classes of canals and of rivers designated as heavily modified water bodies 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

The ecological potential of ponds and quarries designated as artificial and heavily modified water bodies 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 ponds and quarries designated as artificial and heavily modified water bodies are as follows: total nitrogen (N_t) and total phosphorus (P_t). Water bodies are assigned to one of five ecological potential classes on the basis of the average annual values of each parameter (Table 55).

Table 55. Ecological potential classes of ponds and quarries designated as artificial and heavily modified water bodies 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 conditions	Nutrients	N_t, mg/l	1, 2	<1.30	1.30-1.80	1.81-2.30	2.31-3.00	>3.00
2			N_t, mg/l	3	<0.90	0.90-1.20	1.21-1.60	1.61-2.00	>2.00
3			N_t, mg/l*	1, 2, 3	<2.00	2.00-3.00	3.01-6.00	6.01-12.00	>12.00
4			P_t, mg/l	1, 2	<0.040	0.040-0.060	0.061-0.090	0.091-0.140	>0.140
5			P_t, mg/l	3	<0.030	0.030-0.050	0.051-0.070	0.071-0.100	>0.100
6			P_t, mg/l*	1, 2, 3	<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 drainage lakes (water circulation ratio, that is, the ratio of the quantity of the annual river flow to the volume of the pond, K>100).

The ecological potential of ponds (where the water level is not regulated) and quarries designated as artificial and heavily modified water bodies 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 (shore structure of the water body): changes in the water level, changes in the shoreline, 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 56). 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. Parameters for the hydromorphological quality elements in ponds with a regulated water level (HPP) are deemed to be failing the characterisation of maximum ecological potential.

Table 56. Characterisation of the maximum ecological potential of ponds (with an unregulated water level) and quarries designated as artificial and heavily modified water bodies 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	Shoreline structure of the water body	Changes in the shoreline	The shoreline is natural (not straightened, there are no shore embankments), or changes are insignificant (≤ 5 % of the 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.

The parameter for assessing the ecological potential of ponds and quarries designated as artificial and heavily modified water bodies by the biological quality element – 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*, water bodies are assigned to one of five ecological potential classes (Table 57).

Table 57. Ecological potential classes of ponds and quarries designated as artificial and heavily modified water bodies according to the 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

The ecological potential of Klaipėda Strait is assessed on the basis of physico-chemical and biological quality elements.

The parameters for the physico-chemical quality element – general conditions (nutrients) – used to assess the ecological potential of Klaipėda Strait are as follows: total nitrogen (N_t) and total phosphorus (P_t). Water bodies are assigned to one of five ecological potential classes on the basis of the average summer values (June-September) of each parameter measured in samples of the surface water layer (Table 58).

Table 58. Ecological potential classes in Klaipėda Strait according to parameters indicative of physico-chemical quality elements

No.	Quality element		Parameter	Criteria for ecological potential classes according to parameter values for physico-chemical quality elements				
				Maximum	Good	Moderate	Poor	Bad
1	General conditions	Nutrients	N_t, mg/l*	<0.93	0.93-1.08	1.09-1.23	1.24-1.41	>1.41
2			N_t, mg/l**	<0.42	0.42-0.67	0.68-0.81	0.82-1.00	>1.00
3			N_t, mg/l***	<0.12	0.12-0.25	0.26-0.40	0.41-0.60	>0.60
4			P_t, mg/l*	<0.059	0.059-0.080	0.081-0.136	0.137-0.312	>0.312
5			P_t, mg/l**	<0.036	0.036-0.053	0.054-0.084	0.085-0.175	>0.175
6			P_t, mg/l***	<0.014	0.014-0.026	0.027-0.033	0.034-0.039	>0.039

* when water salinity of the water body is < 2 practical salinity units
** when water salinity of the water body is 2-4 practical salinity units
*** when water salinity of the water body is > 4 practical salinity units

The parameter for the biological quality element – the taxonomic composition, abundance and biomass of phytoplankton – used to assess the ecological potential of Klaipėda Strait is the average summer (June-September) value of chlorophyll *a*. Water bodies are assigned to one of five ecological status classes on the basis of the EQR of the average summer value of the parameter (Table 59).

Table 59. Ecological potential classes in Klaipėda Strait according to the taxonomic composition, abundance and biomass of phytoplankton

No.	Quality element	Parameter	Criteria for ecological potential classes according to the EQR of parameter values for phytoplankton				
			Maximum	Good	Moderate	Poor	Bad
1	Taxonomic composition, abundance and biomass of phytoplankton	Chlorophyll *a* (average summer value)*	>0.83	0.83-0.57	0.56-0.39	0.38-0.29	<0.29
2		Chlorophyll *a* (average summer value)**	>0.84	0.84-0.55	0.54-0.38	0.37-0.28	<0.28
3		Chlorophyll *a* (average summer value)***	>0.83	0.83-0.42	0.41-0.28	0.27-0.21	<0.21

* when water salinity of the water body is < 2 practical salinity units
** when water salinity of the water body is 2-4 practical salinity units
*** when water salinity of the water body is > 4 practical salinity units

Criteria for assessing the chemical status of surface waters

39. “Good surface water chemical status” means the chemical status required in order to meet the environmental objectives for surface waters established in Article 4(1)(a) of the WFD, that is, 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 at the Community level.

The chemical status of surface waters is divided only into two quality classes. Where a body of water achieves compliance with all environmental quality standards established under relevant Community and 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 Regulation on Wastewater Management approved by Order No. D1-236 of the Minister of the

Environment of the Republic of Lithuania of 17 May 2006 (Žin., 2006, No. 59-2103; 2007, No. 110-4522) in receiving waters (Table 60).

Table 60. Maximum allowable concentrations (MAC) of priority hazardous, hazardous and other regulated substances in receiving water bodies

Substance	CAS number[1]	Unit of measurement	MAC, mg/l in a receiving water body
Priority hazardous substances:			
Mercury and its compounds	CAS 7439-97-6	µg/l	1[2]
Cadmium and its compounds	CAS 7440-43-9	µg/l	5[2]
Hexachlorocyclohexane (HCH)*	CAS 608-73-1 CAS 58-89-9	µg/l	0.1[2]
Tetrachloromethane (CCl_4, carbon tetrachloride)	CAS 56-23-5	µg/l	12
DDT	CAS 50-29-3	µg/l	10
Pentachlorophenol (PCP)	CAS 87-86-5	µg/l	2
Aldrin	CAS 309-00-2	µg/l	0.01
Dieldrin	CAS 60-57-1	µg/l	0.01
Endrin	CAS 72-20-8	µg/l	0.005
Isodrin	CAS 465-73-6	µg/l	0.005
Hexachlorobenzene (HCB)	CAS 118-74-1	µg/l	0.03
Hexachlorbutadiene (HCBD)	CAS 87-68-3	µg/l	0.1
Trichloromethane (chlorophorm)	CAS 67-66-3	µg/l	12
1,2-dichloroethane (EDC)	CAS 107-06-2	µg/l	10
Trichloro-ethylene (TRI)	CAS 79-01-6	µg/l	10
Perchloro-ethylene (PER)	CAS 127-18-4	µg/l	10
Trichloro-benzenes (TCB)**	CAS 12002-48-1, CAS 120-82-1, CAS 87-61-1, CAS 180-70-3	µg/l	0.4
Pentabromo-biphenyl ethers	CAS 32534-81-9	µg/l	0.1
Tributyltin compounds (Tributyltin-cations)	CAS 688-73-3 (CAS 36643-28-4)	µg/l	0.001
Benzo(a)pyrene	CAS 50-32-8	µg/l	0.05
Benzo(b)fluor-anthene	CAS 205-99-2	µg/l	0.04
Benzo(g,h,i)-perylene	CAS 191-24-2	µg/l	0.03
Benzo(k)fluor-anthene	CAS 207-08-9	µg/l	0.04
Indeno(1,2,3-cd)-pyrene	CAS 193-39-5	µg/l	0.04
Simazine	CAS 122-34-9	µg/l	1
Trifluralin	CAS 1582-09-8	µg/l	0.1
Nonylphenols (4-(para)-Nonylphenol)	CAS 25154-52-3 (CAS 104-40-5)	µg/l	1
Octylphenols (para-tertiary-octylphenols)	CAS 1806-26-4 (CAS 140-66-9)	µg/l	1
Hazardous substances:			
Benzene	CAS 71-43-2	mg/l	0.002
C10-13- Chloroalkanes[3]	CAS 85535-84-8	µg/l	0.01
Methylene chloride (Dichloromethane)	CAS 75-09-2	mg/l	0.01
Monochloroacetic acid	CAS 79-11-8		-
Brominated diphenylethers[3]			-
Pentachloro-benzene	CAS 608-93-5	µg/l	0.03
3,4-dichloroaniline	CAS 95-76-1		-
Lead and its compounds***	CAS 7439-92-1	mg/l	0.005
Nickel and its compounds	CAS 7440-02-0	mg/l	0.01
Anthracene ***	CAS 120-12-7	µg/l	0.01
Fluoranthene	CAS 206-44-0	µg/l	0.3

Substance	CAS number[1]	Unit of measurement	MAC, mg/l in a receiving water body
Priority hazardous substances:			
Naphtalene ***	CAS 91-20-3	mg/l	0.001
Alachlor	CAS 15972-60-8	µg/l	0.01
Atrazine ***	CAS 1912-24-9	mg/l	0.001
Chlorfenvinphos	CAS 470-90-6	µg/l	0.01
Chlorpyrifos ***	CAS 2921-88-2	µg/l	0.0001
Diuron ***	CAS 330-54-1	µg/l	0.1
Endosulfan ***	CAS 115-29-7	µg/l	0.001
Endosulfan (alfa-)***	CAS 959-98-8	µg/l	0.001
Isoproturon ***	CAS 34123-59-6	µg/l	0.32
Di(2-ethylhexyl)phthalate ***	CAS 117-81-7	µg/l	0.1
Dibutyl phthalate	CAS 84-74-2		-
Ethylenediaminetetraacetate	CAS 60-00-4		-
Tetrasodium ethylenediaminetetraacetate	CAS 64-02-8		-
Metals:			
Chromium - total	CAS 7440-47-3	mg/l	0.4
Chromium – hexavalent		mg/l	0.04
Copper	CAS 7440-50-8	mg/l	0.4
Tin	CAS 2406-52-2	mg/l	1
Zinc	CAS 7440-66-6	mg/l	0.6
Vanadium	CAS 7440-62-2	mg/l	2
Aluminium	CAS 7429-90-5	mg/l	0.4
Arsenic	CAS 7440-38-2	mg/l	0.03

[1] CAS – Registration number by Chemical Abstracts Service
[2] Total concentration of substance (MAC) in inland surface waters
[3] Group of substances
* HCH means isomers of 1,2,3,4,5,6-hexachlorocyclohexane (CAS 608-73-1); product containing at least 99 percent of 1,2,3,4,5,6-hexachlorocyclohexane g-isomer, is called lindane (CAS 58-89-9).
** TCB may occur as one of the following three isomers: 1, 2, 3-TCB (CAS 87/61-6); 1, 2, 4-TCB (CAS 120-82-1); 1, 3, 5-TCB (CAS 180-70-3).
*** the EC may reconsider this substance, and it can be identified among priority hazardous substances.

Status classification rules for surface water bodies

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

40.1. 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.

40.2. The ecological status of rivers, lakes, coastal and transitional water bodies shall be classified into five classes: high, good, moderate, poor and bad. The level of confidence in the assessment of the ecological status may be high, medium and low.

40.3. 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.

40.4. 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.

40.5. When parameters indicative of biological and/or physico-chemical quality elements fail the criteria for high ecological status, assessment of the ecological status of the water body shall not consider parameters for hydromorphological quality elements, except in the case specified in paragraph 40.6.3.

40.6. 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:

40.6.1. 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;

40.6.2. when only one parameter indicative of biological quality elements fails the criteria for high ecological status but the relative deviation (%) of its value from the lowest value in the range of the criteria for good ecological status is equal to or higher than 50 % of the value 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 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;

40.6.3. when only one parameter indicative of biological quality elements fails the criteria for high ecological status but the relative deviation (%) of its value from the lowest value in the range of the criteria for good ecological status is lower than 50 % of the value 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;

40.6.4. when only one parameter for physico-chemical quality elements fails the criteria for high ecological status but the relative deviation (%) of its value from the lowest value in the range of the criteria for good ecological status is equal to or lower than 25 % of the value 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 % of the value 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 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;

40.6.5. when only one parameter for physico-chemical quality elements fails the criteria for high ecological status but the relative deviation (%) of its value from the lowest value in the range of the criteria for good ecological status is higher than 25 % of the value 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 % of the value 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;

40.6.6. 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;

40.7. 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 meet the criteria for good ecological status, the ecological status of the water body shall be assessed as follows:

40.7.1. 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;

40.7.2. when only one parameter for biological quality elements fails the criteria for good ecological status but the relative deviation (%) of its value from the lowest value in the range of the criteria for moderate ecological status is equal to or higher than 50 % of the value 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;

40.7.3. when only one parameter indicative of biological quality elements fails the criteria for good ecological status but the relative deviation (%) of its value from the lowest value in the range of the criteria for moderate ecological status is lower than 50 % of the value 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;

40.7.4. when only one parameter for physico-chemical quality elements fails the criteria for good ecological status but the relative deviation (%) of its value from the lowest value in the range of the criteria for moderate ecological status is equal to or lower than 25 % of the value 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 % of the value 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;

40.7.5. when only one parameter for physico-chemical quality elements fails the criteria for good ecological status but the relative deviation (%) of its value from the lowest value in the range of the criteria for moderate ecological status is higher than 25 % of the value 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 % of the value 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;

40.7.6. 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.

40.8. 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 poorer than indicated by the values of the parameters for biological quality elements (or any of the parameters for biological quality elements which shows a poorer status) and the level of confidence in the status assessment shall be low.

40.9. 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:

40.9.1. 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;

40.9.2. 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 shows 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 such 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 more than one class poorer by one parameter, or medium if the ecological status is more than one class poorer by several parameters.

40.10. 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:

40.10.1. 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 the parameter values and the level of confidence in the status assessment shall be high;

40.10.2. when the ecological status is one status class poorer by at least one parameter 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;

40.10.3. when the ecological status is two status classes poorer by at least one parameter indicative of physico-chemical quality elements than by parameters for 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;

40.10.4. 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:

40.10.4.1. when only one parameter indicative of biological quality elements fails the criteria for moderate ecological status but the relative deviation (%) of its value from the lowest value in the range of the criteria for poor ecological status is equal to or higher than 50 % of the value 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;

40.10.4.2. when only one parameter indicative of biological quality elements fails the criteria for moderate ecological status but the relative deviation (%) of its value from the lowest value in the range of the criteria for poor ecological status is lower than 50 % of the value 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;

40.10.4.3. 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;

40.10.4.4. when only one parameter indicative of biological quality elements fails the criteria for poor ecological status but the relative deviation (%) of its value from the lowest value in the range of criteria for bad ecological status is equal to or higher than 50 % of the value 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;

40.10.4.5. when only one parameter indicative of biological quality elements fails the criteria for poor ecological status but the relative deviation (%) of its value from the lowest value in the range of the criteria for bad ecological status is lower than 50 % of the value 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;

40.10.4.6. 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.

40.11. 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:

40.11.1. 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;

40.11.2. 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.

40.12. The ecological potential of artificial and heavily modified water bodies shall be classified into maximum, good, moderate, poor and bad potential. The level of confidence in the assessment of the ecological potential shall be determined observing the classification rules for the ecological status of rivers, lakes and transitional waters given in paragraphs 40.3-40.1.

40.13. 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 hazardous substances do not exceed the maximum allowed concentrations. A surface water body shall be deemed to be failing good chemical status when a concentration of at least one hazardous substance exceeds the maximum allowed concentration.

SECTION II. GROUNDWATER BODIES

Status of groundwater wellfields

41. For drinking purposes, Lithuania uses groundwater only, which is extracted from aquifers of various age and lithological composition. Hydro-geologically, the territory of the Nemunas RBD belongs to the central part of the Baltic Artesian Basin, which is characterised by a rather complex geological composition. The layers of fresh groundwater used for individual and centralised supply of drinking water to inhabitants lie in the depth ranging from several (shallow groundwater) to several hundreds (confined groundwater) meters. The first layer of shallow groundwater occurring below the Earth’s surface is usually less protected from impacts of human economic activities and so its quality is often poor. Shallow groundwater is mostly used in rural areas, extracting it in dug wells. A mixture of shallow groundwater and water from Wilhelm Canal is supplied only by the wellfield Klaipėda III. Confined (artesian) groundwater occurs deeper below the Earth’s surface and is less subject to pollution from economic activities. Hence the quality of confined groundwater is usually good and it is used for public water supply, extracting water with the help of bore-wells and setting up water extraction sites for central water supply.

Evaluation and maintenance of groundwater resources fall under the responsibility of the Lithuanian Geological Survey (LGS).

Pursuant to the requirements of the WFD 2000/60/EC and the Law of the Republic of Lithuanian on Water, the LGS classified the groundwater resources into groundwater bodies and sub-bodies. Later, however, the concept of sub-bodies was withdrawn.

42. The groundwater bodies (GWB) were identified on the following assumptions:

42.1. GWB consist of hydraulically closely connected aquifers – hydrodynamic systems;

42.2. systems or layers are divided by clearly identifiable confining layers;

42.3. GWB boundaries are natural contours of the pinchout of aquifers, or those of water quality;

42.4. GWB consist of aquifers which are used most intensely;

42.5. although any groundwater body can be situated in several river basin districts, for management purposes the groundwater bodies were assigned to a specific river basin district.

43. The groundwater bodies were identified using the digital database of the Lithuanian Geological Survey, topographic and geological maps as well as material of various geological and hydro-geological research, and relevant literary sources.

Pursuant to Order No. 707 of the Minister of the Environment of the Republic of Lithuania on assignment of groundwater wellfields to river basin districts (Žin., 2004, No. 21-654), the following groundwater bodies were assigned to the Nemunas River Basin District for management purposes: GWB of Upper-Lower Cretaceous deposits, GWB of Quaternary deposits of South-Eastern Lithuania and GWB of Western Samogitian Quaternary deposits, and the southern part of the GWB of Upper-Middle Devonian deposits (Figure 19).

In total, 20 groundwater bodies were identified in Lithuania. The Nemunas RBD comprises 12 groundwater bodies. The identification of the GWB was carried out taking into account the conditions of occurrence of groundwater as well as lithological, hydrodynamic and hydrochemical differences of the aquifers, and use of groundwater in a body in question (Table 61, Figure 19).

Table 61. Groundwater bodies within the Nemunas RBD

No.	**Groundwater body**	**Code of the GWB**	**Area of the GWB, km^2**
1	GWB of Quaternary deposits of South-Eastern Lithuania (Nemunas)	LT005001100	19 818.35
2	GWB of Upper-Middle Devonian deposits (Nemunas)	LT001001100	11 089.08
3	GWB of Upper-Lower Cretaceous deposits	LT004001100	8 388.32
4	GWB of Western Samogitian Quaternary deposits	LT006001100	4 082.63
5	Stipinai GWB of Upper Devonian deposits (Nemunas)	LT002001100	3 425.42
6	GWB of Permian-Upper Devonian deposits (Nemunas)	LT003001100	1 010.58
7	GWB of the Curonian Spit and littoral zone	LT004011100	486.67
8	Suvalkija GWB	LT004031100	1 518.98
9	GWB of the sandy south-eastern plain	LT005051100	3 384.52
10	Kėdainiai – Dotnuva GWB	LT001031100	1 112.98
11	GWB of the middle reaches of the Neris (Vilnius)	LT005031100	798.71
12	GWB of the Nemunas and the Neris, and of the lower reaches of the Nevėžis (Kaunas)	LT005021100	332.18

All groundwater bodies are equally important from the point of view of water use because their water is used for supply of inhabitants and industrial enterprises with drinking water (Table 62).

The quality of water in the groundwater bodies is usually good. Three water bodies potentially at risk where the chemical composition of drinking water in the wellfields fails to conform to the requirements of the established drinking water standards due to natural reasons and sometimes because of environmental criteria (350 and 500 mg/l respectively for chlorides and sulphates, which are problematic parameters) were identified in the Nemunas RBD: Stipinai GWB of Upper Devonian deposits, Suvalkija GWB and Kėdainiai-Dotnuva GWB. Since no clear trends of deterioration in water quality as a result of human activities have been identified yet, it is suggested that additional extended monitoring of the problematic areas is carried out during the next planning period (2010–2015) as well as impacts of exploitation of groundwater on changes in the water quality is analysed.

Table 62. Demand and resources of groundwater

Groundwater body	Volume of groundwater extracted in 2008, thousand m^3/day	Demand of groundwater for 2015, thousand m^3/day*	Groundwater resources surveyed and approved, thousand m^3/day
GWB of Permian-Upper Devonian deposits (Nemunas)	22.97 (24.8)	33.51 (36.1)	92.78
GWB of Upper-Lower Cretaceous deposits	36.07 (20.1)	74.53 (41.4)	179.82
GWB of Western Samogitian Quaternary deposits	8.97 (23.8)	17.19 (45.7)	37.63
Stipinai GWB of Upper Devonian deposits (Nemunas)	6.11 (13.2)	16.86 (36.4)	46.25
GWB of Upper-Middle Devonian deposits (Nemunas)	48.27 (18.9)	69.82 (27.3)	255.89
GWB of Quaternary deposits of South-Eastern Lithuania (Nemunas)	227.28 (21.4)	249.9 (23.6)	1060.47
Total:	349.67 (20.9)	461.81 (27.6)	1672.94

** Data provided by SWECO-BKG-LSPI; figure in brackets represents percentage from the volume of the approved resources.*

The impact of diffuse and point pollution on the quality of groundwater wellfields and interaction of groundwater and surface water was assessed using mathematical modelling techniques. The models cover shallow groundwater in individual groundwater bodies, surface water bodies and deeper confined aquifers. Upon assessment of the anthropogenic load on shallow and confined water in the models, digital projects and maps of the hydro-dynamic and hydro-chemical parameters of all aquifers exploited, and of the level, pressure and quality of water contained therein were developed. The results of the mathematical modelling, expert judgements and maps of the quality of shallow groundwater demonstrate good status of groundwater in Lithuania – in respect of both quality and quantity.

Although certain indicative parameters of the groundwater quality do exceed the allowed norms, this does not have any negative impact on the general status of groundwater. Apart from the said chlorides and sulphates, such parameters include natural iron and manganese compounds. Concentrations of iron in about 90 % of groundwater resources used for drinking exceed the norm of 0.2 mg/l, which is permitted by the drinking water standards. Neither iron nor manganese present in water poses a health hazard. In addition, they are relatively easily removed from water by such treatment methods as water aeration, filtration and cations exchange, less often – lime addition, chlorination and ozonation. Many Lithuanian water supply companies and individual consumers have some kind of water de-ironing equipment. Also, there are certain methodologies and technologies of iron removal directly in the aquifer by way of oxygenation. Thus the problems related to excessive iron in groundwater are easily solved by way of technical means.

More complex technical solutions are required for removal of fluorides from drinking water. In western Lithuania – Kretinga, Skuodas, Klaipėda, Telšiai, and Kelmė districts – natural anomalies of a toxic chemical element fluoride occur in Upper Permian and, partially, Upper Devonian aquifers exploited by the majority of the wellfields in this area.

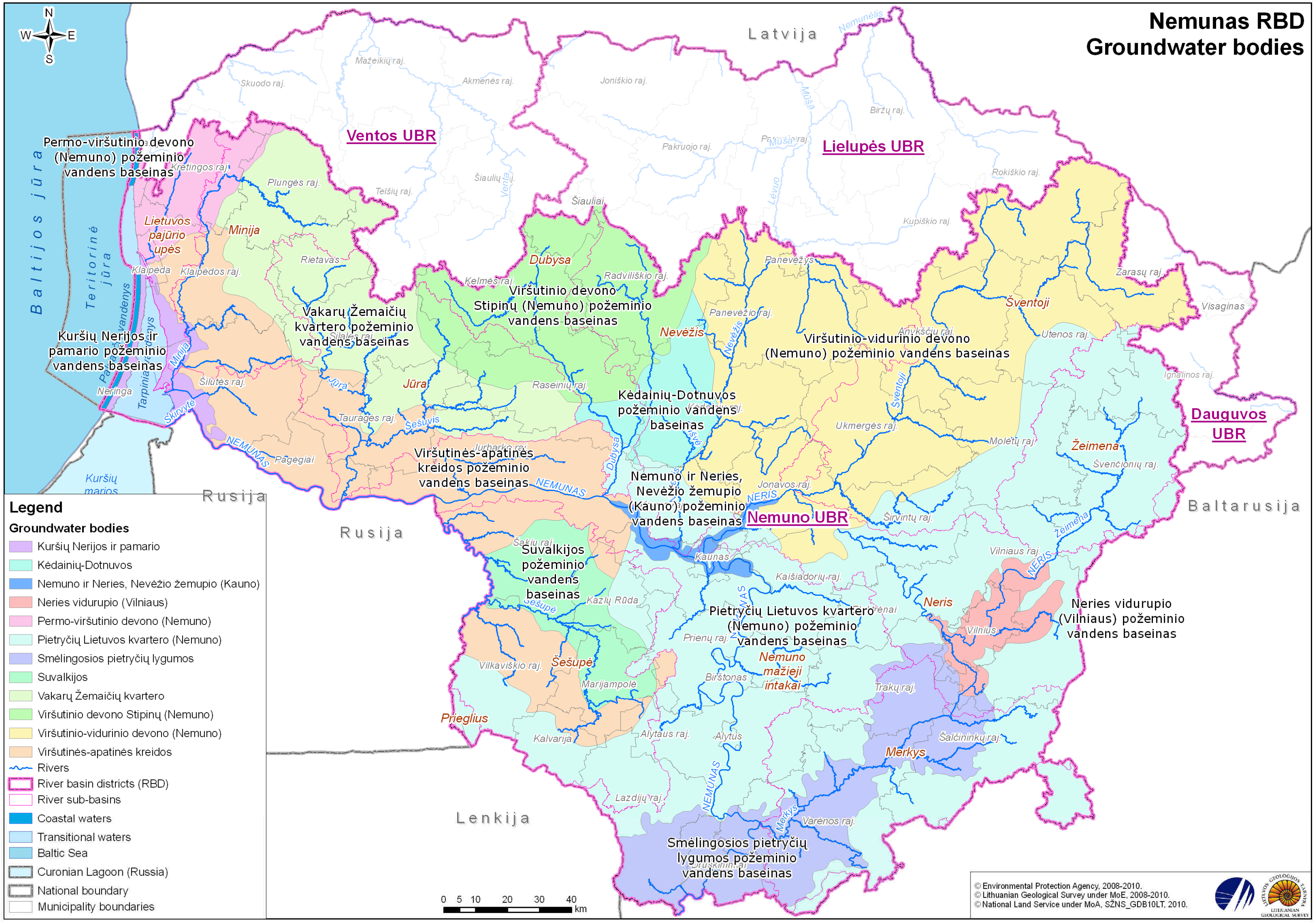


Figure 19. Groundwater bodies within the Nemunas RBD

Here the maximum concentration of this ion is close to or even exceeds 6 mg/l (MAC is 1.5 mg/l). Technologies of removal of fluoride from drinking water have been well known for a long time; however, so far they have been introduced only in Palanga wellfield. Pursuant to the Lithuanian Law on Drinking Water, supply of population with drinking water of good quality and implementation of the Drinking Water Directive falls under the responsibility of municipalities. If the requirements of the Law on Drinking Water (the basic measure of the WFD) were implemented, all groundwater quality problems would be solved.

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

44. Future climate changes are mainly related to changing concentrations of greenhouse gases. In 2000, the Intergovernmental Panel on Climate Change (IPCC) released a special report on potential scenarios of emissions of greenhouse gases and other gases important for the development of climatosphere, which are based on social and economic forecasts of human social and economic development (Table 63).

Table 63. Selected indicators of the social and economic scenarios (based on the Special Report on Emissions Scenarios, 2000).

	A1				A2			
	1990	**2020**	**2050**	**2080**	**1990**	**2020**	**2050**	**2080**
Population number, million	5262	7493	8704	8030	5282	8206	11 29 6	13 828
Gross product, trillion $	20.9	56.5	181.3	377.4	20.1	40.5	81.6	159.3
Energy consumption, EJ	285	532	1002	1550	257	488	779	1120
	B1				**B2**			
	1990	**2020**	**2050**	**2080**	**1990**	**2020**	**2050**	**2080**
Population number, million	5280	7618	8708	8142	5262	7672	9367	10 158
Gross product, trillion $	21.0	52.6	135.6	249.7	20.9	50.7	109.5	186.3
Energy consumption, EJ	289	462	608	544	275	429	654	848

The said report was prepared on the basis of the output data of three emission scenarios (A1, A2 and B1) upon application of the global climate change simulation models ECHAM5 and HadCM3, which are the most appropriate to reflect relevant processes and feedback under Lithuanian conditions.

During the study, climate forecasts were developed for five places (which have operating meteorological stations) in the Lithuanian part of the Nemunas Basin: the towns of Vilnius, Kaunas, Utena, Lazdijai, and Raseiniai. Prognostic values of the weather temperature, precipitation amount, and sunshine duration for the years 2001-2010 and 2011-2020 were estimated and compared to the climate norm values (1971-2000).

Also, forecasts based on the WatBal (water balance) hydrological model were prepared for eleven sub-basins which are comparatively evenly distributed in the entire Nemunas RBD and which are rather different in respect of both their size and landscape characteristics. A potential impact of climate on lakes was evaluated on the basis of expert judgement.

Summing up, the analysis of a potential impact of climate change on water bodies by 2020 showed that the period in question is too short to expect any significant changes. In the event of minor climate changes, the forecasted alterations are often determined by local physical-geographical factors, which is especially characteristic of the basins in the hydrological area of South Eastern Lithuania. Speaking about general tendencies in the river water flow forecasts for 2020, earlier beginning of spring floods should be mentioned. It can also be maintained that in 2020 spring floods in the larger part of the sub-basin of the Nemunas RBD situated in Western and Middle Lithuania will be less intensive than they are now, meanwhile those in the eastern part of the Nemunas RBD will remain more or less the same, or even become more intense than today. The summer and autumn flow in the entire territory of the Nemunas RBD will be much more even as compared to the present day (an impact of high waters will be less significant).

No major changes are forecasted in the balance of lake water by 2020 either. It is likely that lake water supplies will be replenished earlier during snow melting, but the level will be lower. However, during the sinking period in summer and autumn, the level will slightly increase. Accordingly, the annual amplitude of the water level is expected to be lower than at the end of the 20th century. The general change of water supplies in lakes will be rather insignificant and will differ depending on the geographical location of a lake in question, physical and geographical characteristics of a respective basin and the relative size of the basin. As a result of the expected rise of weather temperature, an ice cover on lakes is likely to be formed later than today and last for a shorter time than at the end of the 20th century. Years with a highly unstable ice cover might occur much more frequently because the average weather temperature in winters will be gradually approaching 0^{o} C under the most scenarios. Higher temperature of the warm season should determine increase of the lake water temperature, which would be most noticeable in thermally shallow and non-stratified lakes.

Changes in the thermal and ice regime of lakes can affect intensity and eutrophication processes as well as water quality of the lakes. Changes in the composition of the specific ecosystem of lakes are likely to start occurring. A larger amount of primary production, more intensive denitrification, changes in the phosphorus–nitrogen ratio are expected due to a longer vegetation period and rising water temperature. No major impact of the changes brought about by climate change on eutrophication of lakes and water quality is expected.

A very similar impact of climatic factors is also expected in respect of the Curonian Lagoon – processes in the lagoon are regarded to be changes in the system of a lagoon-type lake. Its shallow depth which prevents thermal stratification can determine a slightly higher water temperature in summer time in future than it is today. This can increase the amount of primary production (however, this would not be a key factor). In winter time, the ice cover on the Curonian Lagoon will be even more unstable.

During the last couple of decades, summer droughts were registered in 1992, 1994, 2002 and 2006. Despite forecasted slight changes in average irrigation conditions, the likelihood of droughts during the coming twelve years might increase. A preliminary forecast of irrigation conditions in individual months during the period from May through August showed that dry months can be expected in 20-25 % of cases. Meanwhile very dry months (severe droughts) can occur once in 3-4 years. There is a shortage of data to maintain that droughts in Lithuania will have a significant impact on the water flow of rivers.

The assessment results indicate that, following the current forecasts, the climate changes during the period in question (by 2002) will not be too significant to prevent achievement of water protection objectives. More intensive climate change processes in Lithuania are forecasted for later future, that is, after the year 2020.

CHAPTER III. IMPACTS OF ECONOMIC ACTIVITIES: A SUMMARY

SECTION I. SIGNIFICANT IMPACTS ON RIVERS AND LAKES

45. A significant impact is an impact of an economic activity which results in a (potential) failure to meet the requirements for good ecological and chemical status. Drivers of significant impacts include loads from one pollution source or aggregate pollution, as well as hydromorphological changes of water bodies due to the straightening of river beds and an impact of HPP.

Significant impacts of pollution

46. Sources exerting significant impacts are those which individually or together determine lower than good ecological status of water bodies. The following physico-chemical parameters were used to asess good ecological status:

46.1. For rivers:

46.1.1. Average annual concentration of BOD7 $\leq$3.3 mgO2/l;

46.1.2. Average annual concentration of ammonium nitrogen $\leq$0.2 mg/l;

46.1.3. Average annual concentration of nitrate nitrogen $\leq$2.3 mg/l;

46.1.4. Average annual concentration of total phosphorus $\leq$ 0.14 mg/l;

46.2. For lakes:

46.2.1. Average annual concentration of total phosphorus ≤ 0.060 mg/l in lakes with a depth < 9 m;

46.2.2. Average annual concentration of total phosphorus ≤ 0.050 mg/l in lakes with a depth ≥ 9 m.

47. For the purpose of identifying water bodies suffering from the most significant pressures in the Nemunas RBD, all most important sources of pollution were identified and their pollution loads quantified. MIKE BASIN model was used to assess impacts of point and diffuse pollution sources on rivers in the Nemunas RBD, as well as to calculate pollutant concentrations in the main rivers and identify the input of individual pollution sources into the pollution of the rivers. The assessment of the quality of lakes and ponds and of impacts thereon by different pollution sources was carried out on the basis of the mathematical modelling results using an empirical GIS spreadsheet. The MIKE BASIN modelling results were also used for assessing pollution loads transported by rivers into the Curonian Lagoon. The identification of water bodies which suffer from significant pressures also included analysis of the water quality monitoring data of 2008.

48. The analysis of pollution sources and assessment of their impact revealed the following key factors which affect the ecological status of water bodies in the Nemunas RBD:

48.1. diffuse pollution, the main driver of which is agricultural pollution loads;

48.2. point pollution, which consists of loads from dischargers of WWTP, stormwater (surface) runoff, and industrial wastewater in towns and settlements;

48.3. transboundary pollution, which consists of pollution loads coming from the neighbouring countries.

Impacts of diffuse agricultural pollution

49. Research results showed that diffuse agricultural pollution is one of the most important and significant factors affecting the quality of water bodies in the Nemunas RBD. Diffuse agricultural pollution is one of the major sources of pollution with nitrate nitrogen. Diffuse agricultural pollution in basins and sub-basins of the Nemunas RBD may account for 45-80 % of the total loads of nitrate nitrogen entering the water bodies. Agriculture accounts for the largest share of diffuse pollution with nitrate nitrogen in the Nevėžis, Šešupė and Dubysa sub-basinswhere as much as 75-80 % of nitrate nitrogen enters the water bodies due to agricultural pressures.

Impacts of agricultural activities on the water bodies of the Nemunas RBD are different, depending mainly on the intensiveness of agricultural activities. The largest impact is made in Central Lithuania and the lowest impact is observed in the south-eastern part of the country. Following the data on the area of declared agricultural land (see Table 64), arable land in the Nevėžis and Šešupė sub-basins constitute as much as half of the total area of each sub-basin. In the Dubysa and Jūra sub-basins, agricultural land accounts for more than 40 % of the area, meanwhile in the Šventoji, Nemunas Small Tributaries and Minija sub-basins as well as in the Lithuanian Coastal Rivers and Prieglius basins agricultural lands occupy 30-40 % of their total area. The smallest area of agricultural land is situated in the Žeimena, Neris Small Tributaries and Merkys sub-basins – only 17-22 %.

Diffuse agricultural pollution consists of loads of organic matter, nitrogen and phosphorus compounds which enter soil with manure and mineral fertilisers.

The highest animal density (in respect of the total area of the sub-basin) is observed in the Šešupė and Jūra sub-basins (Table 65), where it totals to almost 0.2 LSU/ha. In the Nevėžis, Dubysa and Minija sub-basins, the animal density is a little lower – 0.15 LSU/ha, in the Nemunas Small Tributaries Sub-basin and Prieglius Basin – 0.12-0.13 LSU/ha, meanwhile the density in the Šventoji, Neris Small Tributaries, Žeimena, Merkys sub-basins and Lithuanian Coastal Rivers Basin is as low as 0.06-0.1 LSU/ha and is up to twice lower than in other sub-basins of the Nemunas RBD.

So far there is no data on the actual consumption of mineral fertilisers in Lithuania. Hence the loads of mineral fertilisers were assessed on the basis of the crop area, structure and the optimal fertilising norms to be used for crops.

Summary data on diffuse agricultural loads (Table 64) show that the highest pollution impacts are observed in the Nevėžis, Šešupė, Dubysa, and Jūra sub-basins.

Table 64. Intensity of agricultural activities in sub-basins of the Nemunas RBD

Basin/sub-basin	Area of the basin/sub-basin, km^2	Area of declared utilised agricultural land, km^2			Area of utilised agricultural land in the basin/sub-basin, %
		TOTAL	of which arable land km^2	of which meadows and pastures, km^2	
Žeimena	2 775.25	479.6	160.2	319.4	17
Šventoji	6 789.2	2 352.8	973.2	1 379.6	35
Neris Small Tributaries	4 266.8	785.05	346	439.05	18

Basin/sub-basin	Area of the basin/sub-basin, km^2	Area of declared utilised agricultural land, km^2			Area of utilised agricultural land in the basin/sub-basin, %
		TOTAL	of which arable land km^2	of which meadows and pastures, km^2	
Nevėžis	6 140.4	3 073.85	2 303.9	769.95	50
Merkys	3 798.7	821.3	471.1	350.2	22
Nemunas Small Tributaries	9 174.9	3 088.8	1 424.9	1 663.9	34
Dubysa	1 965.9	894.8	477.9	416.9	45.5
Šešupė	4 769.75	2 419.6	1 608.6	811.0	51
Jūra	4 005.1	1 868.0	686.1	1 181.9	47
Minija	2 940	1 150.7	348.4	802.3	39
Lithuanian Coastal Rivers	1 100	325.9	185.7	140.2	30
Prieglius	88.4	33.4	11.6	21.8	38

Table 65. Livestock units and density in sub-basins of the Nemunas RBD

Basin/sub-basin	Area of the basin/sub-basin, km^2	LSU	LSU density, 1/ha
Žeimena	2 775.3	15 798	0.06
Šventoji	6 789.2	66 429	0.10
Neris Small Tributaries	4 266.8	32 842	0.08
Nevėžis	6 140.4	91 630	0.15
Merkys	3 798.7	24 717	0.07
Nemunas Small Tributaries	9 174.9	115 758	0.13
Dubysa	1 965.9	29 107	0.15
Šešupė	4 769.8	90 246	0.19
Jūra	4 005.1	70 757	0.18
Minija	2 940.0	45 489	0.15
Lithuanian Coastal Rivers	1 100	10 403	0.09
Prieglius	88.4	1 028	0.12

Table 66. Agricultural loads in sub-basins of the Nemunas RBD

Basin/sub-basin	BOD_7, kg/ha	N_{total}, kg/ha	P_{total}, kg/ha
Žeimena	31.1	13.0	2.2
Šventoji	53.4	26.5	4.5
Neris Small Tributaries	41.7	15.7	2.7
Nevėžis	81.5	46.5	9.3
Merkys	35.5	15.6	2.8
Nemunas Small Tributaries	68.7	28.3	5.0
Dubysa	80.8	39.1	7.2
Šešupė	103.3	47.2	9.2
Jūra	96.5	39.7	7.0
Minija	84.5	33.1	5.6
Lithuanian Coastal Rivers	53.3	26.4	4.9
Prieglius	73.0	33.7	5.5

Mathematical modelling results and water quality monitoring data revealed that the highest impacts of diffuse agricultural pollution are observed in the Nevėžis Sub-basin. A significant impact of diffuse pollution here is determined both by intensive agricultural activities as well as hydrological and physico-geographical conditions of the sub-basin. The rivers in the Nevėžis Sub-basin are characterised by low flow quantity, a large area of the sub-basin has been drained, which affects transportation of nitrogen compounds to bodies of waters. Due to drainage systems, the time of transportation of nitrates to water bodies decreases and possibilities of pollutant capture/decay are highly reduced. Soluble nitrates do not decay in drainage systems and are quickly transported into bodies of water.

Accordingly, concentrations of nitrate nitrogen fail to conform to the good ecological status requirements nearly in all rivers in the Nevėžis Sub-basin. These concentrations do conform to the established requirements only in a few rivers (the upper reaches of the Juosta, in the Urka and Gynia) which flow over the lands of less intensive agricultural activities. In other rivers of the Nevėžis Sub-basin, concentrations of nitrate nitrogen correspond to moderate or poor ecological status. Mathematical modelling and water quality monitoring results indicate that concentrations of nitrate nitrogen in the Šušvė and its tributaries correspond to moderate ecological status. Moderate ecological status in respect of nitrate nitrogen is also characteristic to all rivers in the upper reaches of the Nevėžis Sub-basin. Meanwhile many rivers in the middle part of the sub-basin (the Aluona, Barupė, Dotnuvėlė, Kiršinas, Kruostas, Laukesa, Liaudė, Linkava, Liūlys, Obelis, Šuoja-Kūrys, Žąsinas) are at poor ecological status. Here the threshold value of good ecological status (2.3 mg/l) might be exceeded more than twice. Concentrations of nitrate nitrogen in different stretches of the Nevėžis vary from 3 to 4 mg/l, and the concentration in the largest tributary of the Nevėžis, the Šušvė, total to about 2.7 mg/l.

The Šešupė Sub-basin accounts for one of the biggest diffuse pollution loads in the entire Nemunas RBD. However, calculations showed that not all rivers in this sub-basin are significantly affected by diffuse agricultural pollutions in respect of their ecological status. The Šešuvė itself is not polluted with nitrate nitrogen and concentrations of this pollutant in the upper reaches of the river correspond to the high ecological status requirements. From the inflow of the river Dovinė, high ecological status changes into good. Though the Šešupė itself does not feel any significant diffuse agricultural pollution pressures, a large number of its tributaries are polluted, that is, concentrations of nitrate nitrogen fail to conform to the good ecological status requirements. It should be noted, however, that these concentrations in the tributaries of the Šešupė are not as high as in the Nevėžis Sub-basin with similar intensive agricultural activities, and there are no rivers with poor ecological status in the Šešupė Sub-basin. The mathematical modelling results show that agricultural pollution may determine moderate ecological status of the Rausvė, Orija and Paikis, were concentrations of nitrate nitrogen are close to about 3.8 mg/l. Moderate ecological status by the indicator of nitrate nitrogen as a result of agricultural pollution may be observed in the Aukspirta, Jotija, Milupė, Nopaitis, Nova, Sasna, Sūduonioja, Šeimena, Širvinta, and Vilkauja. The exceedance of the threshold value of good ecological status in many of these rivers is very small (concentrations are from 2.4 to 3 mg/l). The ecological status of other rivers in the Šešupė Sub-basin corresponds to the good ecological status requirements.

Mathematical modelling results show that the threshold concentrations of nitrate nitrogen required for good ecological status may be exceeded, due to diffuse agricultural pollution, in the tributaries of the Dubysa and in a few rivers of the Šventoji, the Neris Small Tributaries and the Jūra sub-basins. The threshold value of good ecological status (2.3 mg/l) may be slightly exceeded in the rivers of the Dubysa Sub-basin – the Šiaušė, Gryžuva, Kirkšnovė, Gynėvė, and Lazduona, where the average annual concentrations of nitrate nitrogen is expected to be as high as 2.6 mg/l. In the Jūra Sub-basin, minor exceedance of the good ecological status requirements can be expected in the upper reaches of the Šaltuona and Šlyna. In the Šventoji Sub-basin, significant impacts of agricultural pollution are detected in the Mūšia and Armona, and in the Nemunas Small Tributaries Sub-basin a significant impact is made on the ecological status of the Lokys and Lomena.

Although the most significant impact of agricultural pollution is observed in respect of concentrations of nitrate nitrogen, estimations show that agricultural loads can also contribute to concentrations of BOD_7 in the Jiesia (the Nemunas Small Tributaries Sub-basin), which are higher than the ones established for good ecological status. It should be noted, however, that such elevated concentrations occur not only as a result of agricultural pollution, but also due to loads from fishery ponds. BOD_7 concentrations in the Šeimena River are close to the threshold value for good ecological status due to the aggregate impact of diffuse and point pollution.

Analysis shows that about 2 136 km of water bodies in the category of rivers and 24 lakes fail to conform to the good status requirements in the Nemunas RBD due to impacts of agricultural activities. Consequently, agricultural activities were identified as one of the factors which exert a significant impact on the quality of water bodies. The major part of diffuse pollution loads affecting the quality of lakes and ponds is attributed to the current or historical agricultural pollution.

Impacts of drainage systems on the leaching-out of pollution generated by diffuse sources

50. Lithuania is situated in the zone of surplus humidity hence drainage systems were constructed to remove this surplus from cultivated land. The most intensive drainage of wetlands in Lithuania was performed during the period from 1955 through 1980 when the area drained totalled to 2.6 million ha of utilised agricultural land, which is about 80 % of cultivated land [Dumbrauskas et al, 1998; Dumbrauskas et al, 2000]. Drained areas change their landscape structure, with decreasing mosaic design of the elements of land use, heterogeneity and biological variety, and increasing uniformity.

The most significant impact of the drainage systems within the Nemunas RBD is noticed on the rivers in the Nevėžis and Šešupė sub-basins where high concentrations of nitrate nitrogen failing the good ecological status requirements are observed. The drained area in the Nevėžis Sub-basin totals to 78.5 % and in the Šešupė Sub-basin – 70 %, the larger part of the area was drained using drainage systems [Lukianas, 2007]. According to farmers' declarations of 2008, the area of cultivated land in the Nevėžis Sub-basin accounted for 50 % and in the Šešupė Sub-basin – for 51 % of the total respective basin areas. Since the drained areas in both sub-basins are even larger than the cultivated land, it is likely that all land which is presently cultivated has been drained. Following mathematical modelling results (MIKE BASIN), the average annual amount of nitrate nitrogen leached out from cultivated agricultural land in the Nevėžis Sub-basin totals to 12 kg/ha (3 656 t/year), in the Šešupė Sub-basin – about 7.6 kg/ha (1 832 t/year). Since all cultivated land has been drained, almost all loads of nitrate nitrogen leached out therefrom may be transported by drainage systems. Mathematical modelling results (MIKE BASIN) indicate that the total average annual amount of nitrate nitrogen transported by the Nevėžis may be 4 245 tonnes and the one transported by the Šešupė (excluding the load generated in Kaliningrad) – 2 385 tonnes. This would mean that the drainage systems in the Nevėžis Sub-basin transport up to 86 %, in the Šešupė Sub-basin – up to 77 % of the total load of nitrate nitrogen. These figures are similar to the share of the pollution load in drainage systems identified during field research in Central Lithuania (in the Graisupis catchment). Consequently, summing up the results, it can be maintained that the amount of nitrate nitrogen leached out from drainage systems into water bodies in sub-basins with intensive agricultural activities and a high percentage of drained cultivated land in Central Lithuania may be accounting for about 80 % of the total load of nitrate nitrogen. The amount may differ in individual areas of the sub-basins depending on the activity type and scope.

Impacts of point pollution

51. During the last few years, problems of the quality of water bodies as a result of point pollution have been significantly decreasing due to continuously improved operation of wastewater treatment plants (WWTP). In many cases, stretches where the water quality parameters still exceed the threshold values for good ecological status are rather small. Studies of impacts of wastewater discharges on the ecological status of water bodies revealed that often problems related to point pollution are due to insufficient dilution of pollution when wastewater is discharged in the upper reaches of rivers. It has also been noticed that a significant impact on the main rivers is usually exerted by WWTP of lager cities, meanwhile pollution by WWTP located in smaller towns and settlements is rather low and its impact is limited to the location of the WWTP in question. The reason of that is a small amount of wastewater discharged from WWTP in small towns, so that even high concentrations of pollutants, which is often the case, present in the effluents do not have any significant impact on the status of water bodies. Accordingly, it can happen that in future the impact of pollution will go up when more inhabitants are connected to WWTP of small settlements and towns.

Calculations show that, as a result of point pollution, the good status requirements might not be met in more than 700 km of water bodies under the category of rivers. Part of the pollution sources have not been identified yet.

In 2007, there were 1 412 wastewater outlets in the Nemunas RBD discharging municipal, industrial wastewater and surface (stormwater) runoff. Wastewater from 1 342 outlets was discharged into rivers and lakes. 70 outlets account for direct discharges into transitional and coastal waters (65 – into the Curonian Lagoon and 5 – into the Baltic Sea).

The data on point pollution loads in 2007-2008 shows that the annual amount of BOD_7 which enters the water bodies of the Nemunas RBD from wastewater dischargers totals to 2.6 thousand tonnes, the amount of total nitrogen is 2.5 thousand tonnes and that of total phosphorus – 284 tonnes, of which about 2.2 thousand tonnes of BOD_7, 2.17 thousand tonnes of total nitrogen and 232 tonnes of total phosphorus are emitted into rivers and lakes. The largest amounts of wastewater enter the water bodies from large agglomerations (where pollution loads exceed more than 2 000 p.e). Dischargers in such agglomerations emit about 69 % of the total wastewater volume. Thus, about 57 % of the total BOD_7, 58 % of total phosphorus and 64 % of total nitrogen enter the water bodies in the Nemunas RBD from the dischargers of large agglomerations. The second largest group of polluters is outlets of surface (stormwater) runoff, which account for about 22 % of the total load of BOD_7 coming from point pollution sources, 23 % of total phosphorus and 16 % of total nitrogen. It should be noted, however, that various outlet groups provide different inputs into the aggregate load of point pollution in individual basins or sub-basins of the Nemunas RBD (Table 67).

Table 67. Pollution loads from point pollution dischargers in the Nemunas RBD by discharger types

Basin / sub-basin	**Sources of point pollution**														
	Dischargers in agglomerations with a p.e. more than 2000 p.e.			**Dischargers in other settlements and rural areas**			**Industrial dischargers**			**Dischargers of surface (stormwater) runoff**			**Other dischargers (mainly emitting untreated household wastewater)**		
	BOD_7, t/year	N_{total}, t/year	P_{total}, t/year	BOD_7, t/year	N_{total}, t/year	P_{total}, t/year	BOD_7, t/year	N_{total}, t/year	P_{total}, t/year	BOD_7, t/year	N_{total}, t/year	P_{total}, t/year	BOD_7, t/year	N_{total}, t/year	P_{total}, t/year
Žeimena	36.7	19.8	5.1	1.62	2.43	0.37	1.10	0.29	0.05	0.56	0.60	0.13	22.06	9.30	0.35
Šventoji	45.9	48.9	7.3	5.33	7.46	1.40	1.42	1.33	0.21	23.03	18.99	2.60	31.85	11.75	0.97
Neris Small Tributaries	242.1	478.7	36.9	38.66	26.58	3.60	21.03	16.39	2.56	66.25	45.33	6.04	97.38	171.83	7.02
Merkys	45	31.3	4.9	10.55	6.59	1.55	0.09	0.05	0.00	10.53	12.63	3.16	62.04	13.73	0.80
Nevėžis	80.8	138.4	7.4	13.28	20.20	2.89	10.67	33.30	4.99	34.32	29.29	4.25	6.16	8.26	0.11
Šešupė	39.2	70.7	8.5	2.76	1.05	0.19	1.15	4.61	0.74	16.48	14.99	2.41	22.55	13.76	0.41
Dubysa	2.8	6.8	1.1	1.55	1.85	0.03	0	0	0	0.30	0.28	0.05	1.42	1.51	0.61
Jūra	19.6	45.9	10.6	1.77	3.44	0.66	1.16	1.88	0.31	3.79	3.61	0.64	6.52	5.37	0.58
Minija	34.6	19.9	3.2	6.01	11.58	1.98	0	0	0	5.75	4.82	0.76	14.55	14.48	0.45
Lithuanian Coastal Rivers	15.4	20.4	1.4	3.47	7.31	1.36	3.86	5.50	0.47	162.66	131.92	17.21	1.00	1.94	0.33
Nemunas Small Tributaries	730.6	473.6	51.3	15.72	25.40	2.57	5.15	2.45	1.15	141.70	103.49	13.87	44.88	22.61	4.01
Prieglius	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Curonian Lagoon	188.3	194.2	8.6	1.47	3.23	0.59	11.08	4.40	0.78	101.30	37.78	6.56	26.9	8.84	1.36
Baltic Sea	11	42.4	3	0.00	0.00	0.00	0	0	0	1.21	1.43	0.30	0	0	0
Total:	**1 492**	**1 591**	**149.3**	**102.2**	**117.1**	**17.2**	**56.7**	**70.2**	**11.3**	**567.89**	**405.15**	**57.98**	**337.3**	**283.4**	**17.0**

The study revealed that significant impacts on the rivers in the Nemunas RBD can be expected from 106 sources of point pollution – individually or together with other dischargers and pollution sources. 17 dischargers that are likely to exert a significant impact emit wastewater generated in larger cities (where loads exceed 2 000 p.e.), 21 outlets discharge effluents from smaller settlements and rural areas. There are 61 dischargers of surface (stormwater) runoff which can have a significant impact, though pollution by individual dischargers is not significant. Dischargers of surface runoff simply contribute to the pollution impact of other large dischargers (e.g. 35 dischargers located in Utena town contribute to the pollution by Utena WWTP, and 21 dischargers in Vilkaviškis town add up to the pollution by Vilkaviškis WWTP), or exert aggregate significant impact (e.g. pollution by dischargers of stormwater runoff have a significant impact on the Smeltalė and those in Palanga town – on the river Ražė; the most significant impact is made by five outlets in the large group of dischargers of surface runoff). Speaking about industrial enterprises, there are three industrial WWTP dischargers which exert a significant impact.

Surface water bodies suffering from a significant impact of point pollution

52. In the Žeimena Sub-basin, a significant impact on the quality of the Mera-Kūna is exerted by pollution from Švenčionys WWTP, where the concentration of total phosphorus exceeds the threshold value for good ecological status below the discharger. The water quality problem in the Mera-Kūna is determined by the fact that the discharger of Švenčionys WWTP is situated in the upper reaches of the river where pollution dilution possibilities are rather low due to a small runoff collection area. In the lower reaches of the river, where the catchment area is larger and possibilities to dilute pollution are higher, the pollution problem is no longer relevant and phosphorus concentrations in the water of the Mera-Kūna at the mouth even conform to the good ecological status requirements.

53. In the Šventoji Sub-basin, point pollution makes a significant impact on the ecological status of the Vyžuona River. The main source of pollution emitting the largest pollutant loads into the Vyžuona is Utena WWTP. However, there are at least 35 other dischargers in the territory of Utena town, wastewater from which enters the Vyžuona either directly or through small tributaries. The mathematical modelling results show that concentrations of total phosphorus in the Vyžuona are likely to fail to conform to the good ecological status criteria due to the aggregate impact of pressures from Utena WWTP and other dischargers located in Utena.

54. Water quality monitoring data of 2008 shows that concentrations of BOD_7 fail the good status requirements in the Mūšia River; however, no source of the pollution has been identified so far. It may be that pollution comes from the WWTP of Taujėnai town.

55. In the Merkys Sub-basin, a significant impact of point pollution results in failure of the quality of the Šalčia to conform to the good ecological status requirements by BOD_7, ammonium nitrogen and total phosphorus. The main source of pollution here is Šalčininkai WWTP which discharges effluents in the very upper reaches of the river. One of the reasons of the pollution impact is low dilution of pollution in the discharge place; however, the current pollutant concentrations in the wastewater discharged from Šalčininkai WWTP are among the highest concentrations in comparison to the quality of wastewater discharged from other agglomerations of a similar size (that is, 2 000-10

000 p.e.). In 2008, the average concentration of BOD_7 in effluents was 80.4 mgO_2/l, ammonium nitrogen – 30.3 mg/l, and total phosphorus – 6.65 mg/l.

56. In the Neris Small Tributaries Sub-basin, point pollution loads from Kaišiadorys WWTP make an especially significant impact on the Lomena, because wastewater is discharged in the upper reaches of the river with low possibilities to dilute pollution. Pollution loads from Kaišiadorys WWTP determine that concentrations of ammonium nitrogen in the Lomena downstream of the discharger exceed the good ecological status requirements more than ten times. Concentrations of total phosphorus in the Lomena also fail to conform to the good ecological status criteria: downstream of Kaišiadorys WWTP, the concentrations are 2.5 times higher that the threshold value for good ecological status.

57. The rivers in the Nevėžis Sub-basin are characterised by low flow, therefore they are particularly sensitive to point pollution. Summary of the mathematical modelling and water quality monitoring results identified as many as ten rivers which feel a significant impact of point pollution in this sub-basin: the Nevėžis, Beržė, Kiršinas, Jaugila, Lankesa, Barupė, Obelis, Gynia, Kruostas, and the Linkava.

The ecological status of the Nevėžis is significantly affected by pollution from Panevėžys and Kėdainiai WWTP. The latest data of 2008 indicates that concentrations of total phosphorus in wastewater discharged from Panevėžys WWTP to Nevėžis are currently only 0.45 mg/l, therefore the average annual concentrations of total phosphorus which are typical of good ecological status under ordinary conditions (0.14 mg/l) should already not be exceeded in the Nevėžis. However, it should be taken into account that the good ecological status criteria set for total phosphorus can be significantly exceeded in the Nevėžis due to pollution loads from Panevėžys and Kėdainiai WWTP under unfavourable hydrological conditions (that is, in the event of a very low river discharge).

The Nevėžis also faces problems of pollution with ammonium nitrogen. Calculations show that the average annual concentrations of ammonium nitrogen downstream of Panevėžys town may be exceeding the threshold value for good ecological status more than twice. Concentrations of ammonium nitrogen may be exceeding the good ecological status requirements in the Nevėžis stretch downstream of Panevėžys WWTP to the confluence with the Liaudė. Further, the concentrations go down to the permitted level and then go up again downstream of the discharger of Kėdainiai WWTP. According to calculations, concentrations of ammonium nitrogen may not be conforming to the good ecological status requirements downstream of the discharger of Kėdainiai WWTP up to the confluence with the Šušvė.

Mathematical modelling results indicate that the problem of pollution with ammonium nitrogen might also be relevant for other rivers of the Nevėžis Sub-basin – the Beržė, Kiršinas, Jaugila, Lankesa, Barupė, and the Gynia. A significant impact of point pollution concentrations of total phosphorus might be failing to conform to the good ecological status requirements in the Kiršinas, Jaugila, Lankesa, Obelis, and the Gynia.

The Kiršinas River is significantly affected by pollution loads from three dischargers: Baisogala, Pakiršinis and Sidabravas WWTP. A significant impact on the quality of the Beržė may be exerted by effluent loads from Linkaičiai WWTP, the Jaugila may be affected by Akademija WWTP, the Laukesa – by Bukonys WWTP, the Barupė – by

Kulva and Batėgala WWTP, the Gynia – by Eigirgala WWTP. The available data indicates potential pollution of a short stretch of the Obelis up to the confluence with the Nevėžis due to the loads of total phosphorus emitted from sedimentation ponds of the company Lifosa.

Water quality monitoring results of 2008 indicate that concentrations of total phosphorus required to meet the good ecological status requirements might be not observed in the Obelis downstream of Šėta, as well as in the Kruostas and Linkava; however, no sources of pollution of these rivers have been identified so far. A cause of the pollution may be undeclared discharges into the rivers. A potential source of pollution in the Obelis may be Šėta settlement, in the Kruostas – Liepos, Beržai and Šlapaberžė WWTP, in the Linkava – Linkaičiai settlement WWTP.

58. Calculations show that there is only one pollution source exerting a significant impact on the receiving waters in the Dubysa Sub-basin – the discharger of Tytuvėnai WWTP. Concentrations of ammonium nitrogen in wastewater discharged from Tytuvėnai WWTP are very high totalling to 59 mg/l, therefore such pollution makes a negative impact on the quality of the Tytuvėnai stream and is further transported to the Lapišė. In the current situation with the existing loads from Tytuvėnai WWTP, concentrations of ammonium nitrogen in the Lapišė downstream of Tytuva may be exceeding the good ecological status requirements five times as compared to the established requirements for good ecological status.

59. In the Šešupė Sub-basin, there are eight rivers where water quality parameters fail to conform to the good ecological status requirements: the Siesartis, Šeimena, Jūrė, Liepona, Širvinta, Raišupis, Nova, and the Jotija. A significant impact on the quality of these rivers is exerted by pollution loads from Šakiai, Vilkaviškis, Kazlų Rūda, Kybartai, and Lazdijai WWTP.

A significant impact on the ecological status of the Siesartis is made by pollution loads from Šakiai WWTP. As a result, concentrations of total phosphorus fail to conform to the good ecological status requirements. Calculations show that the Siesartis might also be facing the problem of undeclared pollution, because it is not always possible to explain the concentrations measured on the basis of declared pollution loads.

22 outlets at Vilkaviškis emit effluents into the Šeimena – either directly or through small tributaries. The most important is the discharger of Vilkaviškis WWTP. Calculations indicate that in the current situation with the existing loads downstream of Vilkaviškis WWTP, the average annual concentrations of ammonium nitrogen may be exceeding the good ecological status requirements more than twice as compared to the established requirements for good ecological status. Concentrations of total phosphorus in the Šeimena downstream of Vilkaviškis also fail to conform to the good ecological status requirements.

As indicated by calculations, the current pollution from Kazlų Rūda WWTP may have a significant impact on the quality of the Jūra. With the present pollution loads (2008), concentrations of ammonium nitrogen in the Jūra downstream of Kazlų Rūda WWTP may be exceeding the good ecological status requirements more than four times, meanwhile concentrations of total phosphorus are likely to be exceeded only to a very small extent.

Pollution loads from Kybartai WWTP exert a significant impact on the quality of the Liepona, where concentrations of ammonium nitrogen downstream of the discharger may be exceeded approximately two times. Pollution of the Liepona with ammonium nitrogen also affects the quality of the Širvinta below the confluence with Liepona, where there is still a possibility of a minor failure to conform to the good ecological status requirements. A minor exceedance of the concentrations of ammonium nitrogen required for good ecological status is also likely in the Raišupis downstream of Lazdijai WWTP.

Water quality monitoring results show that concentrations of BOD_7 and total phosphorus required for good ecological status may be exceeded in the Nova, and those of BOD_7 – in the Jotija, but no pollution sources which could have determined the measured concentrations have been identified yet. A potential source of pollution in the Nova is Griškabūdis town. The available data indicates that there is no wastewater collection system in this town, so the pollution may be caused by illegal discharges into the river. Potential sources of pollution of the Jotija are difficult to identify because there are no larger settlements in the vicinity of the river, therefore it could be that concentrations of BOD_7 increase in this river in the summer time due to natural factors and not as a result of pollution. Since the reasons of the pollution in the Jotija and Nova are still unclear, it is recommended to continue analysis of the status of these rivers, including operational monitoring.

60. The most significant source of point pollution in the Jūra Sub-basin is Raseiniai WWTP. Wastewater from this plant is discharged in the very upper reaches of the river where possibilities of diluting pollution are minor. As a result of the pollution loads from this discharger, the requirements for good ecological status are not met in the Šlyna, which in turn determine that pollutant concentrations are exceeded in the Šaltuona as well. Another potentially significant discharger of point pollution in the Jūra Sub-basin is Adakavas WWTP, discharges from which may be having a significant impact on the Trišiūkštė River.

The latest water quality monitoring data of 2008 indicate that concentrations of BOD_7 are likely to be exceeded in the Agluona and Ančia and thus fail to conform to the good ecological status requirements. No pollution sources were identified during the mathematical modelling. A potential source of pollution in the Agluona may be Vaidilai village and in the Ančia – Skaudvilė town. These rivers may also be facing the problem of undeclared pollution.

61. In the Nemunas Small Tributaries Sub-basin, pollutant concentrations are likely to be exceeded and thus failing to conform to the good ecological status requirements in the Praviena, Šyša, Armena, Liekė, and the Leitė due to pressures from point pollution sources.

The Praviena is significantly affected by the discharger of Pravieniškės WWTP. Mathematical modelling results show that concentrations of ammonium nitrogen downstream of the said discharger may be exceeding the threshold value established for good ecological status four times. Under the current pollution loads, the concentration of total phosphorus in the Praviena may be exceeding the threshold value of good ecological status almost three times. Water quality monitoring results of 2008 indicate that the threshold concentration of BOD_7 required to meet the good ecological status requirements might also be exceeded in the Praviena.

A significant impact on the quality of the Šyša is made by pollution loads from Šilutė WWTP. Yet, mathematical modelling and water quality monitoring results indicate that concentrations of ammonium nitrogen should be exceeded only slightly. According to the latest water quality monitoring data (2008), the threshold values established for good ecological status might be exceeded in respect of BOD_7 and total phosphorus in the Šyša. It is likely that undeclared pollutant loads are entering this river.

A significant impact of point pollution on the ecological status is also observed in the Armena and Liekė. In the Armena, the good ecological status requirements might not be met due to exceeded concentrations of BOD_7, ammonium nitrogen and total phosphorus as a result of pollution loads from Klausučiai WWTP. Concentrations of ammonium nitrogen and total phosphorus might be exceeded in the Liekė due to the impact of Lekėčiai WWTP. It should be noted, however, that the problem of pollution with total phosphorus in this river is urgent only in dry years, meanwhile under usual precipitation conditions concentrations of total phosphorus should not be exceeding the threshold value of good ecological status. Concentrations of ammonium nitrogen in the Liekė may be exceeding the threshold value set for good ecological status about two times.

BOD_7 concentrations required to ensure good ecological status may be exceeded in the Jiesia due to the aggregate impact of point and diffuse pollution.

The water quality monitoring data of 2008 indicate that concentrations of BOD_7 are likely to be slightly exceeded in the Leitė, yet no exceedances were detected during the mathematical modelling, which was carried out on the basis of information on the current pollution loads. Accordingly, no sources determining the pollution in the Leitė have been identified. Potential sources are Leitgiriai and Juknaičiai settlements.

62. In the Minija Sub-basin, point pollution plays a relatively minor role. Lately, pollution from Plungė WWTP has significantly decreased. Under the present pollution loads from the said plant, concentrations of ammonium nitrogen in a short stretch of the Minija downstream of the Mažoji Sruoja to the Babrungas may be balancing between good and moderate status, meanwhile other parameters of water quality do not feel any significant impact of the pollution loads coming from Plungė. If the loads from Plungė WWTP stay at the level of 2008, no significant impact of this discharger on the Minija is predicted. However, if the level of loads goes back to the previous years, there is a risk that the threshold concentrations of ammonium nitrogen and total phosphorus may be exceeded in this river.

Mathematical modelling results indicate that point pollution may be having a significant impact on a short stretch of the Skinija, where the threshold concentration of ammonium nitrogen may be exceeded due to pollution loads from Vėžaičiai WWTP.

63. The most important source of point pollution in the Lithuanian Coastal Rivers Basin is Kretinga WWTP, which discharges effluents into the Tenžė River. In addition, the quality of the Tenžė may also be affected by the outlet of the game company UAB Kretingos žvėrininkystės ūkis. As a result, concentrations of BOD_7, ammonium nitrogen and total phosphorus in the Tenžė fail to conform to the good ecological status requirements. The pollution of the tributary Tenžė determines exceeded concentrations of ammonium nitrogen and total phosphorus in the Akmena-Danė, thus failing to meet good ecological status. The impact of the Tenžė is felt up to the very mouth of the Akmena-Danė, where more than 20 dischargers of surface runoff of Klaipėda town are

situated, thus contributing to the pollution of this river. Consequently, by ammonium nitrogen the ecological status of water at the mouth of the Akmena-Danė fails to conform to the good status requirements, meanwhile by BOD_7 and total phosphorus the ecological status balances on the border between the good and moderate status classes.

Large amounts of surface runoff enter the rivers Smeltalė and Ražė. Calculations show that such pollution is the reason why BOD_7 concentrations may be exceeded in the Smeltalė. Concentrations of ammonium nitrogen and total phosphorus in wastewater are not known but an assessment carried out shows that surface runoff may be exerting a significant impact on concentrations of ammonium nitrogen and total phosphorus in the Smeltalė and on concentrations of ammonium nitrogen in the Ražė. Therefore, it is recommended to continue analyses of these rivers and to identify the scope of pollution with compounds of nitrogen and phosphorus.

64. No significant impact of point pollution has been identified in the Prieglius Basin.

65. The most acute problem related to point pollution is pollution with total phosphorus and ammonium nitrogen. Pressures from point pollution sources determine that about 458 km of the rivers in the Nemunas RBD fail to meet the good status criteria according to total phosphorus (that is, the average annual concentration in these rivers exceeds 0.14 mg/l due to the impact of point pollution), 449 km – according to ammonium nitrogen (that is, the average annual concentration in these rivers exceeds 0.2 mg/l due to the impact of point pollution). The impact of point pollution sources is the reason of potential failure to conform to the good ecological status criteria according to BOD_7 (3.3 mgO_2/l) in 208 km of rivers. BOD_7 concentrations are also affected by the aggregate impact of point and diffuse pollution resulting in failure to meet the good status requirements according to BOD_7 in 21.4 km of rivers. Sources of point pollution have little impact of nitrate concentrations in rivers.

Significant pollution with hazardous and priority hazardous substances

66. Significant pollution with hazardous substances was examined on the basis of the data of water quality monitoring performed during 2005-2008 and taking into account the outputs of the study *Identification of substances hazardous for the aquatic environment in Lithuania* carried out in 2006. The analysis of the data of concentrations of hazardous and priority hazardous substances indicate that the rivers Neris, Nevėžis, Nemunas and Akmena-Danė are suffering from significant pollution with hazardous substances. Both the monitoring data and the project outputs show that allowable concentrations of hazardous or priority hazardous substances are exceeded in these rivers.

A list of places where concentrations of hazardous or priority hazardous substances exceeding the established MAC were detected are provided in Table 68 below.

Table 68. Places where concentrations of priority or priority hazardous substances posing a risk to the aquatic environment were detected (on the basis of monitoring data and outputs of the project *Identification of substances hazardous for the aquatic environment in Lithuania*)

Basin/ sub-basin	**River**	**Monitoring site**	**Hazardous substance detected**
Nemunas Small Tributaries	Nemunas	upstream of Rusnė, upstream of the Leitė	zinc (2007) trichloromethane (2006) chromium (VI) (2006)
Nemunas Small Tributaries	Nemunas	Skirvytė upstream of Rusnė	chromium (VI) (2006)
Nemunas Small Tributaries	Nemunas	at Pagėgiai	trichloromethane (2006) chromium (VI) (2007)
Nemunas Small Tributaries	Nemunas	downstream of Sovetsk	di(2-ethylhexyl) phthalate (2006)
Nemunas Small Tributaries	Nemunas	at Rusnė	di(2-ethylhexyl) phthalate (2006)
Nemunas Small Tributaries	Nemunas	downstream of Kaunas	tributyltin (2006)
Nevėžis	Nevėžis	downstream of Panevėžys	tributyltin (2006)
Nevėžis	Nevėžis	upstream of Raudondvaris	zinc (2007)
Neris Small Tributaries	Neris	at Buivydžiai	di(2-ethylhexyl) phthalate (2006)
Neris Small Tributaries	Neris	upstream of Kaunas	zinc (2007)
Lithuanian Coastal Rivers	Akmena-Danė	at the mouth	di(2-ethylhexyl) phthalate (2006) chromium (VI) (2006) endrine (2006)

Sources of pollution with hazardous substances cannot be identified yet due to a lack of data and, consequently, it is difficult to identify polluted river stretches and their length. Possibly, pollution of the Nevėžis, Nemunas and Akmena-Danė is coming with wastewater discharged from larger cities situated nearby, that is, Panevėžys, Kaunas and Kretinga. Hence it is deemed that pollution of these rivers with hazardous substances starts at wastewater dischargers and assumed that rivers are polluted up to their mouths. Hazardous substances in the Neris were detected at the border with Belarus and thus it is assumed that the entire stretch of the river flowing over the territory of Lithuania suffers from significant pollution. Concentrations of regulated hazardous substances in the Neris may be exceeding the established MAC as a result of transboundary pollution.

Two international projects are currently under way for the purpose of obtaining more information on sources of hazardous substances and revising impacts of pollution of the chemical status of water bodies. Data and information collected during these projects will enable a clearer picture of the current status and tendencies of pollution with hazardous and priority hazardous substances in Lithuania.

The project *Reduction of Pollution of the Baltic Sea with Hazardous Substances* aims to analyse the origin of hazardous substances (according to the lists of the WFD and HELCOM) in wastewater, sewage sludge, surface water, bottom sediments and propose adequate monitoring; to improve IPPC permitting procedures by including a requirement to reduce the use of hazardous substances in the production process; to identify hazardous substances at companies which participate in the project; to improve the REACH system and the mechanism for its use. The project is run from 2009 to 2011.

The goal of the other project, *Control of Hazardous Substances in the Baltic Sea Region*, is to identify the sources of hazardous substances of special concern which are largely unknown (especially in the eastern part of the Baltic Sea), to explore possibilities of establishing limits for effluents on the basis of ecotoxicity assessment results and to establish limit values for the improvement of water quality using biological indicators. The project also aims to collect information on toxicity of wastewater (acute and chronic) in the selected industrial and other municipal objects; to improve knowledge of suitability of various methods for analysis of toxicity of effluents and identification of sources of hazardous substances; to develop procedures regulating discharge of wastewater on the basis of direct assessment of their biological impact; to prepare recommendations and a guide for improvement of water quality by applying toxicity values for wastewater and for its safety factor; to collect information on how to use wastewater ecotoxicity tests and limit values for wastewater monitoring combining this monitoring with chemical monitoring. The project is run from 2009 to 2011.

Impact of transboundary pollution

67. Transboundary pollution in the Nemunas RBD affects the ecological status of the Neris, Nemunas and the Šešupė as well as pollution loads transported into the Curonian Lagoon. Hence the impact of transboundary pollution should be assessed in respect of both rivers and the Curonian Lagoon. In rivers, the main factor which determines the ecological status thereof is concentrations of polluting substances which are generated in water meanwhile the Curonian Lagoon is significantly affected by both pollutants coming from pollution sources and loads transported by rivers.

From Belarus, pollutants are transported into Lithuania by the Nemunas and the Neris. The Šešupė rises in Poland so the ecological status of the upper reaches of the river depends on the impact of pollution in the neighbouring country, meanwhile the lower reaches of the river, downstream of the tributary Širvinta to the fall of the Šešupė into the Nemunas, receive pollution loads from Kaliningrad. Pollutants from towns of Kaliningrad Region (Sovetsk and Neman) also enter the Nemunas River.

68. Impact of transboundary pollution on rivers

Although pollutant concentrations in the water of the Neris and the Nemunas coming from Belarus have decreased during the last couple of years, the latest water quality monitoring data (2008) shows that BOD_7 concentrations in the Nemunas and in the Neris at the border with the neighbouring country still fail to conform to the good ecological status requirements (that is, exceed 3.3 mgO_2/l). When these rivers start flowing over the territory of Lithuania, concentrations of BOD_7 actually remain the same, that is, continue failing the good ecological status requirements and hence both the Neris and the Nemunas were identified as water bodies at risk due to transboundary pollution. It should be noted, however, that it is difficult to say whether high values of BOD_7 in the Neris and Nemunas are determined by pollution with organic substances coming from Belarus, because the values may be increasing in summer time due to natural factors (e.g. abundance of phytoplankton). Eutrophication in large rivers, such as the Nemunas and the Neris, is a natural process due to a slow flow, although, of course, pollution does contribute to its intensity. Hence closer cooperation with environmental specialists from the Republic of Belarus will be sought in order to revise the assessment of the impact of transboundary pollution on the concentrations of BOD_7 in the Neris and Nemunas. Inputs of nitrogen compounds and total phosphorus in the Nemunas and Neris on the territory of Belarus does not have any significant impact on the ecological status of these rivers. The average annual concentration of nitrate nitrogen measured in the Nemunas at the state border in 2008 was 1.16 mg/l, the concentration of total phosphorus was 0.09 mg/l, meanwhile the measured concentration of nitrate nitrogen in the Neris at the border totalled to 0.75 mg/l, and that of total phosphorus – to 0.09 mg/l. Thus, concentrations of nitrogen and phosphorus compounds in water coming from the neighbouring country do not exceed the threshold values established for good ecological status.

Wastewater from Sovetsk and Neman situated in Kaliningrad Region are discharged into the Nemunas. Since there is no data on pollutant dischargers from these cities, estimations can be made only on the basis of modelling results and monitoring data for Lithuania and Kaliningrad. The said data indicates that concentrations of BOD_7 in the Nemunas increase by 15 % as a result of pollution in the above-mentioned cities. The values of water quality indicators according to nitrogen and phosphate compounds in the Lithuanian part of the Nemunas downstream of the dischargers of Sovetsk and Neman remain unchanged due to a large volume of water, prevailing currents and, probably, lower amounts of the said substances. On the other hand, the amounts of these substances in water prevent self-cleaning processes in the river.

The Šešupė flows into Lithuania from Poland. Water quality monitoring results show that the ecological status of the river at the border with Poland is very good, which means that pollution from Poland does not have any significant impact on the Šešupė. According to the water quality monitoring results of 2005–2008, concentrations of total phosphorus are continuously failed in the Šešupė at the border with Kaliningrad Region. Analysis of the monitoring data shows that the concentrations of total phosphorus detected in the border zone are much higher than the ones in the upper reaches or tributaries of the Šešupė, which may be a result of both pollution generated in Lithuanian pollution sources and transboundary pollution. Also, concentrations of nitrate nitrogen in the Šešupė at the border with Kaliningrad Region failed the good status requirements in 2005 – 2007 and the values of BOD_7 in the river failed the good status criteria in 2005 and 2008. Though concentrations of nitrate nitrogen, total phosphorus and BOD_7 are influenced by pollution loads generated on the territory of Lithuania, estimations of loads transported by the tributaries from Kaliningrad Region by modelling methods show that the input of transboundary pollution is also important. Since there is no data on pollution loads entering the Šešupė in Kaliningrad Region, no quantitative assessment of the contribution of transboundary pollution to the pollution of the river can be made.

69. Transportation of pollution to the Curonian Lagoon

Pollutants which enter the rivers Neris, Nemunas and Šešupė in Belarus and Kaliningrad Region are transported to the Curonian Lagoon. Due to a lack of data on pollutant inputs in the Šešupė in Kaliningrad Region, quantitative assessment of loads transported to the Curonian Lagoon can be made only in respect of pollutants transported by the Neris and Nemunas from Belarus and by the Nemunas from Sovetsk and Neman. Calculations show that pollution coming to the Curonian Lagoon from Belarus, Sovetsk and Neman may be accounting for about 42 % of the total amount of ammonium nitrogen, 28 % of nitrate nitrogen and about 51 % of total phosphorus transported by the rivers. It is difficult to assess the transboundary share of BOD_7 loads in the Curonian Lagoon because the results of water quality analysis conducted in Lithuania may reflect not only anthropogenic pollution generated in Belarus but also naturally occurring BOD_7 loads. It is estimated that the input of transboundary pollution in the BOD_7 loads in the Curonian Lagoon may total up to 60 %.

70. The rivers in the Nemunas RBD which feel significant impacts of pollution are given in Table 69 below. The table lists rivers suffering from the significant impact throughout their length or only certain stretches and exceedances of the specified water quality parameters may be observed in different stretches of a river in question.

Table 69. Rivers or their stretches within the Nemunas RBD which are subject to a significant impact of point, diffuse and transboundary pollution. "1" indicates the water quality parameter the good ecological status threshold values of which are exceeded

Basin/ sub-basin	River or its stretch subject to a significant impact	Water quality parameter					The most important pollution sources
		BOD_7	NH_4-N	NO_3-N	P_{total}	HS	
Žeimena	Mera-Kūna	0	0	0	1	0	Švenčionys WWTP
Šventoji	Vyžuona	0	0	0	1	0	Utena WWTP Dischargers located in Utena town (35 in total)
	Armona	0	0	1	0	0	Agriculture
	Mūšia	1	0	1	0	0	Potential source – Taujėnai WWTP (no exact data) Agriculture (NO_3-N)
Neris Small Tributaries	Neris	1	0	0	0	1	Potential source – transboundary pollution (no exact data)
	Lomena	0	1	1	1	0	Kaišiadorys WWTP, Agriculture (NO_3-N)
	Lokys	0	0	1	0	0	Agriculture (NO_3-N)
Merkys	Šalčia	1	1	0	1	0	Šalčininkai WWTP
	Varėnė	1	0	0	0	0	Fishery company UAB Daugų žuvis
Nevėžis	Nevėžis	0	1	1	1*	1	Panevėžys WWTP Kėdainiai WWTP Agriculture (NO_3-N) Unidentified source of hazardous substances
	Beržė	0	1	1	1*	0	Linkaičiai WWTP Agriculture (NO_3-N)
	Kiršinas	0	1	1	1	0	Baisogala WWTP Pakiršinis WWTP Sidabravas WWTP Agriculture (NO_3-N)
	Jaugila	0	1	1	1	0	Akademija WWTP Agriculture (NO_3-N)
	Lankesa	0	1	1	1	0	Bukonys WWTP Agriculture (NO_3-N)
	Barupė	0	1	1	1	0	Kulva WWTP Batėgala WWTP Agriculture (NO_3-N)
	Gynia	0	1	0	1	0	Eigirgala WWTP
	Obelis	0	0	1	1	0	Sedimentation ponds of the company Lifosa Potential source– Šeta

Basin/ sub-basin	River or its stretch subject to a significant impact	Water quality parameter					The most important pollution sources
		BOD_7	NH_4-N	NO_3-N	P_{total}	HS	
							settlement (no exact data) Agriculture (NO_3-N)
	Kruostas	0	0	1	1	0	Agriculture (NO_3-N) Potential sources: Beržai WWTP, Liepos WWTP, Šlapaberžė WWTP (no exact data)
	Linkava	0	0	1	1	0	Agriculture Potential source– Linkaičiai WWTP (no exact data)
	Aluona	0	0	1	0	0	Agriculture
	Alanta	0	0	1	0	0	Agriculture
	Apteka	0	0	1	0	0	Agriculture
	Ažytė	0	0	1	0	0	Agriculture
	Bankas Canal	0	0	1	0	0	Agriculture
	Bikilys	0	0	1	0	0	Agriculture
	Dotnuvėlė	0	0	1	0	0	Agriculture
	Gomerta	0	0	1	0	0	Agriculture
	Juoda	0	0	1	0	0	Agriculture
	Juosta	0	0	1	0	0	Agriculture
	Juostinas	0	0	1	0	0	Agriculture
	Liaudė	0	0	1	0	0	Agriculture
	Liūlys	0	0	1	0	0	Agriculture
	Mėkla	0	0	1	0	0	Agriculture
	Molainia	0	0	1	0	0	Agriculture
	Pienia	0	0	1	0	0	Agriculture
	Sanžilė	0	0	1	0	0	Agriculture
	Smilga	0	0	1	0	0	Agriculture
	Smilgaitis	0	0	1	0	0	Agriculture
	Striūna	0	0	1	0	0	Agriculture
	Šumera	0	0	1	0	0	Agriculture
	Šuoja-Kūrys	0	0	1	0	0	Agriculture
	Šušvė	0	0	1	0	0	Agriculture
	Švėmalis	0	0	1	0	0	Agriculture
	Upytė	0	0	1	0	0	Agriculture
	Žadikė	0	0	1	0	0	Agriculture
	Žąsinas	0	0	1	0	0	Agriculture
Dubysa	Lapišė	0	1	0	0	0	Tytuvėnai WWTP
	Gryžuva	0	0	1	0	0	Agriculture
	Kirkšnovė	0	0	1	0	0	Agriculture
	Šiaušė	0	0	1	0	0	Agriculture
	Gynėvė	0	0	1	0	0	Agriculture
	Lazduona	0	0	1	0	0	Agriculture
Šešupė	Siesartis	0	0	1	1	0	Šakiai WWTP Agriculture (NO_3-N)
	Šeimena	0	1	1	1	0	Vilkaviškis WWTP Other dischargers located in the vicinity of Vilkaviškis (21 in total) Agriculture (NO_3-N)
	Jūrė	0	1	0	1	0	Kazlų Rūda WWTP
	Rausvė	0	0	1	0	0	Agriculture

Basin/ sub-basin	River or its stretch subject to a significant impact	Water quality parameter					The most important pollution sources
		BOD_7	NH_4-N	NO_3-N	P_{total}	HS	
	Liepona	0	1	0	0	0	Kybartai WWTP
	Širvinta	0	1	0	0	0	Tributary Liepona
	Raišupis	0	1	0	0	0	Lazdijai WWTP
	Nova	1	0	1	1	0	Agriculture (NO_3-N) Potential source - Griškabūdis town (no exact data)
	Jotija	1	0	1	0	0	Agriculture (NO_3-N)
	Šešupė	1	0	0	1	0	Potential source – transboundary pollution (no exact data)
	Paikis	0	0	1	0	0	Agriculture
	Širvinta	0	0	1	0	0	Agriculture
	Vilkauja	0	0	1	0	0	Agriculture
	Sasna	0	0	1	0	0	Agriculture
	Sūduonia	0	0	1	0	0	Agriculture
	Milupė	0	0	1	0	0	Agriculture
	Nopaitys	0	0	1	0	0	Agriculture
	Penta	0	0	1	0	0	Agriculture
	Aukspirta	0	0	1	0	0	Agriculture
	Orija	0	0	1	0	0	Agriculture
Jūra	Šlyna	0	1	1	1	0	Raseiniai WWTP Agriculture (NO_3-N)
	Šaltuona	0	1	1	1	0	Tributary Šlyna Agriculture (NO_3-N)
	Trišiūkštė	0	1	0	1	0	Adakavas boarding-house
	Agluona	1	0	0	0	0	Potential source – Vaidilai village (no exact data)
	Ančia	1	0	0	0	0	Potential source – Skaudvilė town (no exact data)
Nemunas Small Tributaries	Jiesia	1	0	0	0	0	Agriculture Fishery ponds
	Nemunas	1	0	0	0	1	Transboundary pollution (no exact data)
	Praviena	1	1	0	1	0	Pravieniškės WWTP
	Šyša	1	1	0	1	0	Šilutė WWTP
	Armena	1	1	0	1	0	Klausučiai WWTP
	Liekė	0	1	0	1*	0	Lekėčiai WWTP
	Leitė	1	0	0	0	0	Potential sources – Juknaičiai and Leitgiriai WWTP (no exact data)
Minija	Minija	0	1	0	0	0	Plungė WWTP
	Skinija	0	1	0	0	0	Vėžaičiai WWTP
Lithuanian Coastal Rivers	Tenžė	1	1	0	1	0	Kretinga WWTP Game company UAB Kretingos žvėrininkystės ūkis
	Akmena-Danė	0	1	0	1	1	Tributary Tenžė, unidentified source of

Basin/ sub-basin	River or its stretch subject to a significant impact	Water quality parameter					The most important pollution sources
		BOD_7	NH_4-N	NO_3-N	P_{total}	HS	
							DS
	Smeltalė	1	1	0	1	0	Dischargers of surface runoff of the water company UAB Klaipėdos vanduo (3)
	Ražė	0	1	0	0	0	Dischargers of surface runoff of the public utilities company UAB Palangos komunalinis ūkis (2)

* A significant impact is felt only in dry years

Hydromorphological changes in water bodies

71. In addition to the impacts of pollution loads, morphological changes of water bodies were analysed. The largest impact on the ecological status of rivers is exerted by the straightening of their beds because specific habitats of water organisms are destroyed thus resulting in decrease in the type variety and abundance of water organisms themselves. Table 70 below provides information on straightened rivers in the Nemunas RBD. The table specifies the total number of kilometres of straightened rivers in each basin and sub-basin.

Table 70. The length of straightened rivers (km) in sub-basins of the Nemunas RBD

Basin / sub-basin	Total length of straightened rivers (km)
Žeimena	86.3
Šventoji (Neris)	266.9
Neris Small Tributaries	225.4
Nevėžis	747.2
Merkys	294.9
Nemunas Small Tributaries	485.9
Dubysa	150.1
Šešupė	490.4
Jūra	195.7
Minija	95.7
Lithuanian Coastal Rivers	80.3
TOTAL in the Nemunas RBD	3 118.8

Impacts of hydropower plants

72. There are 50 HPP currently operating in the Nemunas RBD. Of these, 9 HPP are not likely to have any significant impact on the downstream river stretches (provided that the turbines are operating at the optimal regime). Another 8 HPP might be having a significant impact on the ecological status of the stretches below; however, these HPP are built very close to the river estuaries (which means that no measures will be efficient and the significance for the general ecological status of water bodies in a wider context is very low) hence it is not proposed to designate these stretches as water bodies suffering from a significant impact. The remaining 33 HPP do exert a significant impact on the downstream river stretches. The stretch downstream of Kaunas HPP is a HMWB. The present turbines which considerably damage fish and which fail to conform to the flow regime should be replaced with environmentally friendly ones in 13 HPP in the Nemunas RBD.

The most typical impact of hydropower plants constructed on the river beds are frequent fluctuations of the water level in the river stretches below the HPP. 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 fish and young fish: during the detention of water, spawn and young fish are left on land, and when the turbines are started up, that is, 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 largest fluctuations of the water level occur at the HPP. The length of the 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 on the river stretch downstream of the dam goes down in proportion to the distance from the HPP (the longer the distance, the less intensive fluctuations); fluctuations also significantly decrease upon inflow of water of larger tributaries.

The impact of the HPP is considered insignificant (that is, 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 and which do not inflict damage on fish (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. Hydropower plants (HPP) which exert a significant impact within the Nemunas RBD are listed in Table 71 below.

Table 71. Hydropower plants which exert a significant impact in basins and sub-basins of the Nemunas RBD

Basin/ sub-basin	River	Main river	Name of the HPP pond	Municipality
Šventoji	Nevėža	Virinta	Gabrėlų	Anykščiai distr.
Šventoji	Virinta	Šventoji	Svobiškio	Molėtai distr.
Šventoji	Siesartis	Šventoji	Valtūnų	Ukmergė
Šventoji	Širvinta	Šventoji	Motiejūnų	Širvintos distr.
Šventoji	Širvinta	Šventoji	Širvintų	Širvintos distr.
Šventoji	Šventoji	Nemunas	Kavarsko	Anykščiai distr.
Šventoji	Šventoji	Nemunas	Antalieptės	Zarasai distr.
Neris Small Tributaries	Musė	Neris	Bartkuškio	Širvintos distr.
Merkys	Verseka	Merkys	Eišiškių	Šalčininkai
Merkys	Verseka	Merkys	Krūminių	Varėna distr.
Nevėžis	Šušvė	Nevėžis	Vaitiekūnų	Radviliškis distr.
Nevėžis	Šušvė	Nevėžis	Angirių	Kėdainiai distr.
Nevėžis	Obelis	Nevėžis	Bublių	Kėdainiai distr.
Nevėžis	Obelis	Nevėžis	Juodkiškių	Kėdainiai distr.
Nevėžis	Barupė	Nevėžis	Labūnavos	Kėdainiai distr.
Nemunas Small Tributaries	Strėva	Nemunas	Bagdanonių	Trakai distr.
Nemunas Small Tributaries	Strėva	Nemunas	Būblių	Kaišiadorys distr.
Nemunas Small	Strėva	Nemunas	Elektrėnų	Elektrėnai

Basin/ sub-basin	River	Main river	Name of the HPP pond	Municipality
Tributaries				
Nemunas Small Tributaries	Strėva	Nemunas	Pastrėvio	Kaišiadorys distr.
Nemunas Small Tributaries	Verknė	Nemunas	Jundeliškių	Birštonas
Nemunas Small Tributaries	B. Ančia	Nemunas	Baltosios Ančios	Lazdijai distr.
Nemunas Small Tributaries	Jiesia	Nemunas	Pajiesio	Kaunas distr.
Nemunas Small Tributaries	Mituva	Nemunas	Jurbarkų	Jurbarkas distr.
Dubysa	Gynėvė	Dubysa	Plikių	Raseiniai distr.
Dubysa	Luknė	Dubysa	Kaulakių	Raseiniai r.
Šešupė	Šešupė	Nemunas	Marijampolės II	Marijampolė
Šešupė	Šešupė	Nemunas	Lakinskų	Kalvarija
Šešupė	Šešupė	Nemunas	Antanavo	Marijampolė
Šešupė	Šešupė	Nemunas	Liudvinavo	Marijampolė
Šešupė	Šešupė	Nemunas	Puskelnių	Marijampolė
Jūra	Jūra	Nemunas	Balskų	Tauragė distr.
Minija	Babrungas	Minija	Gondingos	Plungė distr.
Nemunas Small Tributaries	Nemunas	Nemunas	Kaunas HPP	Kaunas city

HPP may affect not only fluctuations of the water level and flow but also parameters indicative of physico-chemical quality elements and transportation of suspended particles. The extent of changes can be identified by measuring the base values of all said parameters upstream of the HP pond (in the river bed upstream of the HPP where the hydrological regime has not changed yet due to the impact of the HPP pond, that is, where the head does not affect the natural flow) and comparing these values with the values identified during operational monitoring in places downstream of the HPP pond (the measurements upstream of the HPP must be taken on the same day and observing the same frequency and regularity as in places of the operational monitoring downstream of the HPP). Measurements of the base values of parameters for quality elements are proposed to be carried out upstream of the below-listed most representative HPP ponds which differ in the water pressure height, flow-through capacity and the ratio between installed discharge and multi-annual discharge (Table 72).

Table 72. HPP where measurements of the base values of quality parameters are proposed

No.	Name	River	The main river	Pressure height of the HPP (m)	Flow-through capacity of the pond (K)	Q installed/ Q multi-annual
1	Gondingos	Babrungas	Minija	11.5	25.7	1.36
2	Antanavo	Šešupė	Nemunas	5.3	203	0.98
3	Balskų	Jūra	Nemunas	14.5	29.2	1.83
4	Būblių	Strėva	Nemunas	7.35	574.5	1.38
5	Jundeliškių	Verknė	Nemunas	6	421.9	0.86
6	Lakinskų	Šešupė	Nemunas	3.4	2696.7	1.02
7	Bartkuškio	Musė	Neris	8	36.3	1.35
8	Kavarsko	Šventoji	Neris	4.3	697.3	1.39
9	Angirių	Šušvė	Nevėžis	14.5	12.2	1.87
10	Motiejūnų	Širvinta	Šventoji	5.3	45.2	2.01

73. From the environmental point of view, all HPP have an adverse impact on the environment: not only they change the hydrological regime and interrupt river continuity but also display other negative characteristics, such as:

73.1. dependency on the capacity of hydropower resources in the area, that is, a HPP must be situated at a water source with a sufficient hydropower potential;

73.2. dependency of energy generation on climatic conditions (in droughts the amount of water decreases directly resulting in reduced energy generation).

74. It should be noted that construction of a HPP inevitably involves construction of an artificial barrier (interruption of river continuity). A negative impact of the artificial barrier is felt not only in the river bed located downstream of the barrier but also in the stretch towards the upper reaches of the river. The impact caused by the artificial barrier is always significant irrespective of whether the barrier has been constructed for energy generation or for other purposes due to the following reasons:

74.1. The artificial barrier and increase of the water level results in flooding large areas of land which alters the lives of people living nearby as well as the flora, fauna and landscape of the area.

74.2. The river stretch affected by the head changes to the extent that its characteristics become more similar of an open lake than of a river and the larger is the area of the pond, the higher is the similarity. Due to such significant changes, the ecological status of the river stretch in the zone of the head impact will always be poor or bad according to the criteria used to characterise the status of rivers.

74.3. Barriers and dams interrupting river continuity and resulting changed hydromorphological characteristics of river above the barrier result either in complete disappearance of migratory fish upstream of the barrier (fish which migrate from the sea to rivers) or significant decrease in resources of certain fish species (fish which migrate within a river basin). Even fish passes do not prevent reduction of migratory fish resources, or complete disappearance thereof, due to disturbed reproduction (loss of spawning grounds and selective let-through capacity of fish passes: not all fish manage to pass both towards the upper and lower reaches of the river). Hence fish passes should be regarded as a measure which only mitigates but does not completely eliminate the impact (restoring river continuity).

SECTION II. ANALYSIS OF ANTHROPOGENIC LOADS AND IMPACTS ON TRANSITIONAL AND COASTAL WATERS

75. An analysis of pollution loads which directly enter the Curonian Lagoon and the Baltic Sea from point pollution sources revealed that the largest amounts are coming from Klaipėda city. In 2008-2009, discharges of biogenic substances by total nitrogen accounted for about 80 %, by total phosphorus – for 60-70 %, and by BOD – for 57-76 %. Significant amounts of biogenic substances were generated in Neringa settlements. In 2007 and 2008, the amounts of organic substances by BOD totalled accordingly to 21 % and 23 %. These amounts are expected to go down by 80 % after the startup of new Neringa WWTP.

The overall status of transitional and coastal waters is determined by diffuse pollution from the basin, mostly the inflow of excessive nitrogen and phosphorus with river waters, mainly the Nemunas. Pollution loads transported by rivers vary from year to year, depending on the water content of the river, so the pollution loads transported to the Curonian Lagoon were calculated under the average discharge conditions during the period 2003-2008, taking advantage of the mathematical modelling method (the calculations employed the average discharge of the period from 2003 through 2008). The results show that the annual average amounts of pollutants transported by the Nemunas and other rivers into the Curonian Lagoon under the average discharge and present pollution loads would be as follows: about 58 129 tonnes of BOD_7, 905 tonnes of ammonium nitrogen, 23 441 tonnes of nitrate nitrogen, and 1751 tonnes of total phosphorus (Table 73).

Pollution transported by rivers determines high eutrophication of transitional waters and Curonian Lagoon characterised by large concentrations of dissolved nitrogen and phosphorus in winter time and intensive water blooming during warm periods. Certain unfavourable climatic conditions (high temperature, calm weather, etc.) result in fish deaths in the lagoon as well as other processes typical of intensive eutrophication and determined by short-term lack of oxygen.

Table 73. Pollution loads entering the Curonian Lagoon from the territory of Lithuania and as a result of transboundary pollution

Sources of pollution	BOD_7, t/year	NH_4-N, t/year	NO_3-N, t/year	P_{total}, t/year
Point sources discharging wastewater directly into the Curonian Lagoon	329.0	248 (total nitrogen)		18.0
Nemunas and other rivers	58 129	905	23 441	1 751
Transboundary pollution transported by the Nemunas and Matrosovka:	35 120	378	6 531	888
Pollution originating on the territory of Lithuania:	23 009	527	16 910	862
Point pollution:	1 940	247	763	208
Diffuse pollution:	5 085	152	10 882	198
Background pollution:	15 985	127	5265	456
Atmospheric precipitation (onto the surface of the lagoon in Lithuania)	-	1 431 * (total nitrogen)		-

* the mean of 1996-2007 (source: EMEP/MSC-W Data Note: Gauss M., Nyıri A., Klein H. Transboundary air pollution by main pollutants (S, N, O3) and PM, Lithuania. Norwegian Meteorological Institute. (reports of 2000-2009).

76. Point pollution with municipal wastewater and surface (stormwater) runoff

According to the latest data, 65 dischargers emit wastewater into the Curonian Lagoon. As many as 51 dischargers emit surface (stormwater) runoff. Municipal wastewater and effluents from settlements are discharged from 3 outlets, industrial wastewater – from 4 dischargers. The input of point pollution emitted directly into the Curonian Lagoon to the total pollution of the lagoon is low. Estimations show that pollution discharged from point sources directly into the Curonian Lagoon may be accounting for up to 0.5 % of the total amount of BOD_7 and nitrate nitrogen entering the Curonian Lagoon, about 7 % of ammonium nitrogen, and around 1 % of total phosphorus. Heavy metals discharged with wastewater directly enter the lagoon only from Klaipėda city. The direct input of pollutants into the Curonian Lagoon during the period 2006–2008 were as follows: 1 027-4 611 t/year of oil products, 622-1034 kg/year of Zn, 103-158 kg/year of Cu, 9-100 kg/year of Ni, 50-123 kg/year of Cr, 16-53 kg/year of Pb, 2.2 kg/year of Hg (only in 2007), 0.6-4.3 kg/year of Cd (in 2007–2008). The amounts of zinc, copper, lead and nickel discharged in 2008 were lower than in 2006. The amount of BOD_7 discharged directly into the coastal waters in 2008 totalled to about 12.2 tonnes, nitrogen accounted for 43.8 tonnes, and phosphorus compounds – for 3.3 tonnes. The annual direct input of oil products into the Baltic Sea from surface runoff dischargers during 2006–2008 totalled to 0.259-0.353 tonnes.

77. Impact of pollution loads transported by rivers on the Curonian Lagoon

Calculations show that the main source of pollution of the Curonian Lagoon is pollution loads transported by the Nemunas and other rivers. The loads directly entering the Curonian Lagoon from point pollution sources amount to 0.5-7 % of the total pollution meanwhile the remaining share is carried by rivers, mainly by the Nemunas. The load transported to the Curonian Lagoon by rivers consists of both pollution generated in Lithuania and transboundary pollution. The latter is pollution which enters the Nemunas and the Neris in Belarus and which gets into the Nemunas from Sovetsk and Neman in Kaliningrad Region. Pollution generated in Kaliningrad Region also enters the Šešupė River but these loads cannot be estimated yet due to a lack of data.

Calculations conducted with the help of MIKE BASIN model show that transboundary pollution may account for roughly 60 % of the total load of BOD_7, 42 % of ammonium nitrogen, 28 % of nitrate nitrogen, and about 50 % of the load of total phosphorus transported by all rivers to the Curonian Lagoon. A major share of the said loads is generated in Belarus. The significant input of transboundary pollution from Belarus is mainly determined by the fact that almost half of the Nemunas discharge is formed on the territory of the neighbouring country. Background pollution generated in Lithuania may be accounting for about 27 % of the BOD_7 load, 14 % of ammonium nitrogen, 22 % of nitrate nitrogen, and 26 % of total phosphorus transported into the lagoon by rivers. The mathematical modelling results indicate that pollution from point sources in Lithuania has only a minor impact on the total load carried by rivers into the Curonian Lagoon. A more significant input comes from pollution with ammonium nitrogen: point pollution sources account for about 27 % of the total load of ammonium nitrogen in the lagoon, meanwhile the load of BOD_7 and nitrate nitrogen makes up only 3 % each, and the load of total phosphorus – 12 % of the total pressures driven by point pollution sources. The input of diffuse pollution is more significant and is mainly determined by agricultural pollution. Diffuse pollution sources account for about 9 % of the total BOD_7 load, around 17 % of ammonium nitrogen, 46 % of nitrate nitrogen, and roughly 11 % of the total load of total phosphorus transported by rivers into the Curonian Lagoon.

After the scope of the implementation of the basic measures in Lithuania had been established and their impact on the ecological status of water bodies evaluated, subsequent calculations demonstrated that the implementation of these measure will have only a minor effect on the pollution loads transported into the Curonian Lagoon. Pollution reduction potential as a result of the implementation of the basic measures in Lithuania is estimated to be very small, therefore no significant decrease in pollution loads generated in our country can be forecasted. Since a large share of pollution loads in the Curonian Lagoon is coming from Belarus where no pollution reduction can be expected, the total decrease in the loads of BOD_7, nitrogen and phosphorus compounds transported by rivers after the introduction of the basic measures is forecasted to be up to 2 %.

The implementation of the basic measures will be followed by the introduction of supplementary pollution reduction measures; however, their impact on the Curonian Lagoon is forecasted to be only minor. Supplementary measures to reduce point pollution are planned in order to solve river pollution problems of a rather local significance and thus will not affect the loads transported into the Curonian Lagoon. Supplementary measures to reduce diffuse agricultural pollution are intended for reduction of pollution with nitrate nitrogen because diffuse pollution with total phosphorus is not relevant for rivers. Nevertheless, the introduction of supplementary diffuse pollution reduction measures will also affect decrease in diffuse pollution with total phosphorus. However, it is clear that these measures will not be sufficient to attain good ecological status in the Curonian Lagoon. Calculations demonstrated that good ecological status in the lagoon might require reduction of the inflow of total phosphorus by 25 %. If transboundary pollution generated in Belarus, which accounts for 50 % of the total pollution load, is not reduced, pollution generated in Lithuania would have to be reduced by half. Unfortunately, this is hardly feasible because, according to calculations, nearly half of the total load of total phosphorus in Lithuania occurs as a natural background and so anthropogenic pollution would have to be subject to radical reduction. Consequently, it will not be possible to attain the environmental objectives in the Curonian Lagoon without having reduced transboundary pollution.

78. Atmospheric pollution

The results of modelling of atmospheric pollution in Lithuania by the Norwegian meteorological institute (EMEP/MSC-W Data Note: Gauss M., Nyıri A., Klein H., reports of 2000 – 2009) show that the average multi-annual amount (1996–2007) of total nitrogen which enters the Curonian Lagoon with precipitation is about 1 431 tonnes/year (Table 73). This amount ranges from 1 109 tonnes (2007) to 1 980 tonnes (2004). According to preliminary data, additional annual amounts of 1.5-20 thousand tonnes of atmospheric nitrogen during individual years may be produced by cyan bacteria during vegetation seasons, which approximately corresponds to the pollution amount generated on the territory of Lithuania.

79. Other potential sources and factors of pollution of transitional and coastal waters include the following:

79.1. navigation;

79.2. port dredging;

79.3. disposal of soil excavated in the port in the sea;

79.4. chemical pollution from Būtingė terminal;

79.5. secondary pollution from bottom sediments.

80. Navigation

Navigation in the Lithuanian part of the Baltic Sea is most intensive along two main navigation routes: navigation lines to/from Klaipėda Seaport and to/from Būtingė oil terminal. The total number of vessels which entered these ports in 2007 and 2008 is respectively 7 963 and 8 438. Though Būtingė terminal handles only tankers, the number of tankers accounts for only 9 % and 17 % of all tankers which entered Klaipėda Seaport in 2007 and 2008 years respectively. The largest number of tankers visited Būtingė terminal in 2003, when 105 vessels were handled.

The last few years saw a significant increase of transportation of oil and other dangerous cargos as well as of the size of freighters. This has resulted in increase of risk of pollution caused by navigation. The greatest risk for the environment is posed by air pollution, illegal, deliberate and accidental spills of oil and other dangerous substances,

dumpings of waste, as well as arrivals of new ones with ballast waters or from ship hulls.
Tanker accidents incur a significant local damage to the marine environment and entire coastal regions as well as to sea-related activities. The most common types of shipping vessel accidents include collision with another vessel and grounding. 54 notifications of pollution have been registered in the Lithuanian part of the Baltic Sea (Curonian Lagoon, Klaipėda Seaport water area, territorial sea, and the exclusive economic zone) since 1999, although not all of them were verified. Most of polluting incidents occur in the water area of Klaipėda Seaport and during the cold season, meanwhile in summer time the number of incidents involving spills of oil or other dangerous substances is much lower due to fishing restrictions and calm sea.

Oil spills can happen, or relevant risks can be posed, due to incidents during ship movement, stevedoring activities, and ship handling and repair.

An analysis of pollution incidents during 2004-2008 showed that their number has remained more or less stable totalling to around 18-19 incidents per year, whereas the number of notifications of pollution has been going down. The largest number of pollution incidents, 85 %, was reported in Klaipėda Seaport, 13 % of which occurred in the Baltic Sea. Though the number of shipping vessels entering Klaipėda and Būtingė ports and cargo capacities (oil included) have been going up during last couple of years, the number of pollution incidents has not increased.

A risk of navigation accidents and, consequently, pollution with oil and other harmful substances in the Baltic Sea is very big and seems to be growing even more due to an increasing amount of freights (especially oil) carried by sea, although not all accidents are necessarily related to spills of polluting substances. Despite the fact that single hull tankers are to be phased out (from 2005 to 2010, according to their respective categories) and transportation of heavy fuel oil by such tankers has been banned in the EU, such prohibition does not ensure complete safety. A risk of navigation-related accidents remains – due to engine failures, crashes and other reasons.

Emissions from ships are also considerable, because of the use of sulphurous fuel oil and heavy fuel oil. Emissions of SO_2 and NOx from ships account for almost one third of all EU land emissions. Approximately 5-20 % of NOx entering the Baltic Sea is generated as a result of atmospheric emissions from ships.

Finally, ships have been identified as the main cause of arrival of new species into waters. The impact of strange species transported to the Baltic Sea with ballast waters and sediments can further disturb the already endangered balance of natural ecosystems.

81. There are 19 large stevedoring companies, ship repair and ship building yards operating within Klaipėda seaport, which provides all types of marine business and cargo handling services. The annual port cargo handling capacity is up to 40 million tonnes.

82. In 1994 port reconstruction and development started in order to increase the port's competitiveness with other states of the Baltic Sea. The main measures for the port development included:

82.1. dredging of the water area;

82.2. reconstruction of the port entrance;

82.3. reconstruction of the current and building of new embankments;

82.4. construction of new terminals and development of port infrastructure.

83. It is difficult to assess a direct impact of the shipping industry in the port and separate it from other factors on the basis of monitoring data alone. Monitoring results show that concentrations of oil hydrocarbons in coastal bottom sediments have a tendency to increase and those in the strait do not go down. The highest concentration of oil hydrocarbons were recorded in 2006 at the port entrance (59 mg/kg of dry sediments). Large concentrations were also detected in the central part of the Curonian Lagoon at Nida. Having in mind movement of water masses, these registered pollution flashpoints do not necessarily indicate places of pollution but rather points with favourable environmental conditions for accumulation of polluting substances.

84. The dredging of the navigation channel alters conditions for water and sediments exchange. These changes are continuously monitored pursuant to the national programme of monitoring of the marine environment of Klaipėda Seaport and the national environmental monitoring programme. However, such monitoring is only partially suitable for concluding which factor – economic activities or climatic conditions – is more significant. Hence modelling of different scenarios was carried out.

85. Impacts of dredging activities in Klaipėda Strait and reconstruction of the port entrance on transitional and coastal waters

The impact on salinity of the Curonian Lagoon was assessed using MIKE two-dimensional hydro-dynamic model, estimations used the climatic conditions of 2004-2006. Two modelling scenarios were applied: at the depth of Klaipėda Strait before the dredging (1987) and after the strait was dredged to 12-14 meters. It was established that the impact of the port reconstruction activities and the dredging of the water area to the depth of 14 m on salinity of coastal waters was minor. In transitional waters, the largest differences in salinity were registered in the plume of the Curonian Lagoon in the Baltic Sea: decrease of salinity was detected south from Klaipėda (up to 13 km) and increase of salinity was registered north of Klaipėda (in a section of about 7 km, except for the closest water area of 2 km northwest from the port entrance). These changes are likely to have been influenced by the reconstruction of the port entrance and not by the dredging of the strait. There is no data proving any impact of such altered salinity on the biological water quality indicators.

No significant impact of the dredging activities was detected in respect of salinity of the Curonian Lagoon, though slight changes are observed in all transitional water bodies. The maximum absolute value of the average change of the salinity is about 0.5 psu; however, the values of difference in salinity (in both scenarios) when the absolute value is higher than 0.3 psu occupy a small area around the port entrance. The average salinity in Klaipėda Strait closer to the port entrance has a tendency to go down due to a higher bottom slope, more rapid water exchange and outflow of marine water masses to the sea. A slight increase of the average salinity is detected in the northern part of the Curonian Lagoon as a result of longer presence of saline water. The same, though less intensive, tendencies are also observed during a vegetation period. Summing up the scenario modelling results, it can be maintained that the increased salinity registered during the monitoring at Juodkrantė and Nida has been determined not only by the dredging activities in the strait but also by climate changes.

86. Dumping of soil excavated in the port into the sea

Soil excavated in the port is dumped into the sea at Juodkrantė in the depth of 40-45 m. The annual volume of excavated soil which is dumped in this zone totals to 0.4–2.5 million m^3, and the amount dumped from 1980 totals to more than 20 million m^3 of soil, 80 % of which is glacial loam.

87. The average annual concentrations of oil hydrocarbons in bottom sediments have a tendency to go up as from 2002 and total to more than 10 mg kg^{-1} of dry soil. Concentrations of copper and cadmium in the bottom sediments in the dumping zone in 2004-2007 were much higher than those in the sandy coast, and concentrations of nickel exceeded the norms of Soil Pollution Class I up to 2.5 times. As in all coastal waters, the latter concentrations were showing a decreasing tendency in 2006-2007 and were close to the norms of Soil Pollution Class I. Concentrations of mercury, which is on the list of priority hazardous substances, were decreasing as from 1995 and were about four times lower in 2006 (about 0.02 mg kg^{-1} of dry soil).

88. Būtingė oil terminal started its operations in summer 1999. Its purpose is to accumulate, store and transport crude oil exported/imported via buoy. A stevedoring design capacity of the terminal is up to 14 million tonnes per year. Būtingė oil terminal is situated to the north of Šventoji settlement, to the west of Būtingė village, 2.3 km from the coast of the Baltic Sea, and 1.2 km from the border with the Republic of Latvia. A single-point mooring buoy intended for the loading of oil is constructed in the sea about 7.3 km away from the coast. The minimum sea depth at the buoy is 20 m (at the lowest water level). The distance from the buoy to the Lithuanian-Latvian border is one nautical mile to the north.

The terminal is able to service tankers with the capacity of up to 150 thousand tonnes. The pumping capacity is up to 5 520 m^3/hour. The volume of crude oil loaded/unloaded in Būtingė oil terminal during January-June in 2008 totalled to 4.38 million tonnes, which is 88.5 % more than during the first half of 2007 when the volume was 2.32 million tonnes.

Despite the modern technologies used in Būtingė terminal, including oil leakage detection system, oil spill accidents do happen anyway. During ten years of operation of the terminal, seven incidents – including five oil spills – took place. Oil spills were prevented during two incidents. The total amount of oil spilled during the said period is about 60 tonnes and the collected volume amounts to approximately 10 tonnes (15 %).

The terminal is subject to a strict environmental monitoring programme developed on the basis of an environmental impact assessment prepared by international companies and Lithuanian scientists. Concentrations of oil hydrocarbons in the zone of Būtingė terminal are higher than in neighbouring monitoring sites and sometimes exceed MAC. The average concentrations of oil hydrocarbons in bottom sediments in 1996-2006 were also higher than in neighbouring areas but were lower than MAC. Multi-annual data of monitoring of the environment of Būtingė oil terminal shows that no impacts of chemical pollution on diversity and abundance of benthic fauna were recorded; however, genotoxic effects of certain types of benthic fauna have been observed.

89. Secondary pollution

The main source of secondary pollution is bottom sediments. Phosphorus bound in iron oxides is released in the event of a lack of oxygen and can significantly speed up water blooming processes upon entry in water masses. Like phosphorus, nitrogen compounds located in bottom sediments can also enter water masses during re-suspension. Upon re-suspension of bottom sediments during the heaving of the sea brought about by wind, concentrations of N-NO_x in the water column can go up 18 times. Loads of secondary pollution in the lagoon have not been measured and their importance can be judged only indirectly, using the data available. A preliminary assessment of the average concentrations of total nitrogen and total phosphorus in surface bottom sediments indicate that the amount of total nitrogen and total phosphorus in potentially re-suspended sediments in the northern and central parts of the lagoon are about 22 thousand and around 6.5 thousand tonnes respectively, thus accounting for more than 75 % of total ammonium and nitrate nitrogen transported by rivers every year, meanwhile the said amount of total phosphorus is more than three times larger than the transported amount of total phosphorus. There is little information about lability of these substances and exchange between bottom sediments and water column, therefore no grounded forecasts regarding decrease of secondary pollution can be made.

SECTION III. OTHER IMPACTS OF HUMAN ECONOMIC ACTIVITIES

90. Other sources of impacts on the aquatic environment include pollution by non-sewered population, use of chemical substances in agriculture, fish ponds, tourism, recreational activities and navigation, all of which are briefly discussed in the sub-sections below.

Pollution loads from non-sewered population

91. Pollution originating from non-sewered population is of a very local character. A much more significant impact can be observed only in small streams located close to non-sewered settlements, so basically the impact of pollution from this source is not significant.

Use of chemical substances in agriculture

920. Statistical data on the use of chemical substances in agriculture is provided in Table 74. In 2007, the area of utilised agricultural land in Lithuania sprayed with plant protection products totalled to 2 567.6 thousand ha, which almost equals to the whole area of declared lands intended for agriculture. Herbicides accounted for 57 % of the amount of the preparations used.

The impact of chemical substances used in agriculture on water bodies depends on the manner and practice of their use. No harmful effect of chemical substances is expected on aquatic ecosystems if the substances are used on demand. However, inadequate use of chemicals may have negative consequences. At present, no reliable data on a negative impact of agricultural chemical on surface water bodies is available therefore such impact is deemed to be significant. In future, however, the scope and significance of this impact will have to be revised upon a more detailed assessment.

Table 74. Use of chemical substances in agriculture (n. a. – data not available)

Chemical substance	2002	2003	2004	2005	2006	2007
Area of agricultural land sprayed, thou. ha:						
TOTAL	**1 711.4**	**1 681.8**	**1 964.5**	**2 238.3**	**2 219.6**	**2 567.6**
Herbicides	859.1	938	1036.1	1251.2	1278.3	1473.0
Fungicides	357.4	292.5	372.3	425.7	364.2	477.4
Insecticides	393.6	327.9	397.9	397.1	402.6	464.6
Growth regulators	98.6	122.7	157.1	161.9	141.5	152.6
Defoliants	2.7	0.4	1.1	2.2	33.0	-
Amount of plant protection products (t, 100 % of the active substance)						
TOTAL	792.2	847.2	1 023.6	1 048.5	1 197.0	n.a.
Herbicides	576.8	579.1	725.2	732.4	858.9	n.a.
Fungicides and pickles	132.7	130.1	155.1	175.2	201.4	n.a.
Insecticides	6.2	7.1	5.7	6.8	7.0	n.a.
Growth regulators	60.2	99.2	110.9	123.3	125.7	n.a.
Defoliants	0.4	0.6	0.6	0.7	-	n.a.
Other preparations	16.3	31.1	26.1	10.1	4.0	n.a.

93. Fish ponds

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 whereof makes around 100 km^2. The number of live marketable fish grown in these ponds in 2007 totalled to about 3.5 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 has been 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 therefore this sector is not included among significant pressures.

94. Tourism and recreation

A situation analysis carried out on the basis of the National Tourism Development Programme for 2007-2010 showed that tourism is regarded a priority development area in many counties and municipalities. The sector of accommodation services, and especially countryside tourism, is among those which experience rapid expansion. The predicted quantitative tourism development results are as follows: growing revenues from tourism (5 % per year) and an increasing number of tourists (7 % per year).

95. Water tourism is one of the priority and fast growing tourism areas in Lithuania. According to the data of 2008, there were almost 52 thousand leisure boats, sailing and motor yachts gliding across inland and coastal waters in Lithuania. In addition, a few thousand unregistered sailing devices (light kayaks, canoes, boats and floats) are used for tourism purposes. The average lifetime of small and leisure boats is 8-10 years and that of inland water vessels – 15-20 years.

A Special Plan of National Water Tourism Routes has been developed aiming at expansion of knowledge-oriented and recreational water tourism as well as the infrastructure of tourism and recreation. A draft of the plan has been submitted to the State Territorial Planning and Construction Inspectorate.

96. The suggested Network of National Water Tourism Routes consists of eight water tourism routes:

96.1. Nemunas tourist route;

96.2. Merkys and Ūla tourist route;

96.3. Neris tourist route;

96.4. Tourist route of the Žeimena and lake district Aukštaitijos Ežerynas;

96.5. Šventoji tourist route;

96.6. Dubysa tourist route;

96.7. Jūra tourist route;

96.8. Minija tourist route.

97. The Operational Programme for Promotion of Cohesion for 2007-2013 provides for four priority development and funding areas. The first priority area includes the tourism sector and is related to local and urban development, preservation of cultural heritage and nature as well as its adaptation for development of tourism. This means that measures will be taken to promote tourism development adequately using natural resources and cultural heritage and creating favourable conditions for active recreation. The Tourism Development Programme and Operational Programme for Promotion of Cohesion forecast further growth of the tourism sector in Lithuania and gradual increase of significance of active recreation in natural and cultural sites.

Municipalities have been planning new investments in the sector of water tourism and the total amount of investment is more than LTL 42 million. The figure indicates rapid expansion of water tourism and suggests that an impact of recreational uses of water on the water status will also be increasing. However, it should be noted that no assessments of the said impact have been carried out yet, so a priority task during the first six years of the implementation of the WFD is to evaluate this impact.

98. Countryside tourism

This type of tourism has been rapidly expanding during the last few years in Lithuania, especially in picturesque places. Although this is a very young business in the country, its development is stimulated by the EU financial assistance. At present, there are more than 700 farmsteads offering countryside tourism services in Lithuania and their number is still increasing because the demand is higher than the supply, especially during holidays (Table 75). The National Tourism Development Programme for 2007-2010 provides for promotion of countryside tourism farmsteads in rural areas which cherish traditions of rural architecture and develop traditional craft with the support of the EU agricultural fund for rural development.

Table 75. The number of holidaymakers in farmsteads of countryside tourism in Lithuania

Year	2005	2006	2007
Number of overnight accommodations provided, thou.	440.1	455.4	613.6
Number of holidaymakers offered overnight accommodation, thou.	155.0	246.5	293.7
Number of countryside tourism farmsteads	398	531	538
Average number of overnights stays of one holidaymaker	2.84	1.85	2.09

Countryside tourism, as a separate type of pressures, does not 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 effluents discharged thereby to water bodies conform to the established requirements (BOD_7-29 mg/l, TP-10 mg/l, o TN-40 mg/l).

99. Inland water navigation

The main rivers of the Nemunas River Basin District (the Nemunas and the Neris), the Curonian Lagoon, and other water bodies which have been given the status of national importance, local importance, or the status of prospective inland waterways.

A list of inland waterways of national importance was approved by Resolution No. 1119 of the Government of the Republic of Lithuania of 14 August 1995 on the approval of the list of inland waterways of national importance of the Republic of Lithuania (Žin., 1995, No. 73-1709), and lists of inland waterways of local importance and prospective inland waterways were approved by Order No. 18 of the Minister of Transport of the Republic of Lithuania of 20 January 1998 on the approval of the lists of inland waterways of local importance and prospective inland waterways of the Republic of Lithuania (Žin., 1998, No. 12-284; 2004, No. 18-561).

100. The waterways with the status of national importance are as follows:

100.1. Nemunas River (Viršutinė Privalka to Birštonas, from Kaunas HPP to the mouth of the Atmata; the total length of the sections 401 km),
100.2. Kauno Marios Lagoon (from Kaunas HPP to Birštonas, the length of the section 89.8 km),
100.3. Curonian Lagoon (from the mouth of the Atmata to Klaipėda, the length of the section 74 km),
100.4. Mituva Canal (from the mouth of the canal to Jurbarkas cargo wharf, the length of the section 1 km),
100.5. Minija River (from the mouth to Lankupiai, the length of the section 19 km),
100.6. Neris River (from the mouth to Vilnius, the length of the section 173.5 km),
100.7. Nevėžis River (from the mouth to Kėdainiai, the length of the section 57 km),
100.8. King Wilhelm Canal (from Klaipėda State Seaport to the Minija, the length of the section 22 km).

101. The waterways with the status of local importance are as follows:

101.1. Skirvytė River (from its outflow from the Nemunas to the mouth of the Skirvytė, the length of the section 9 km);

101.2. Akmena-Danė River (in Klaipėda city, the length of the section 1 km),

101.3. Šyša River (from the port of Šilutė to the mouth of the Šyša, the length of the section 5 km),

101.4. Lake Galvė (the length of the section 4 km),

101.5. Curonian Lagoon (from the navigation mark No. 37 to the mouth of the Skirvytė; from the port of Nida to the national border; from Dreverna to Juodkrantė, from Dreverna to Ventė the total length of the sections 68 km).

102. Prospective inland waterways (preliminary, the total length of the waterways is 35 km) are as follows:

102.1. lakes Zarasai and Zarasaitis;
102.2. the Jūra (from the mouth to the bridge over the Jūra in the road Jurbarkas-Mikytai, the length of the section 7 km);
102.3. Elektrėnai Reservoir.

103. The length of inland waterways regularly maintained (operated) during the navigation season maintenance totals to 441 km.

104. The rivers suitable for navigation for the longest period – as many as 230 days per year – are the Nemunas (from Kaunas to the mouth), Danė, Minija, Skirvytė, Šyša, Mituva, and the Curonian Lagoon (the sections assigned to the inland waterways are specified in relevant legislation), hence these water bodies feel the biggest impact of the navigation. The most significant impact comes from the river bottom dredging activities; however, usually minimum measures are sufficient for maintaining the guarantee depths of the waterways, namely, the clearing of the bed for navigation purposes pursuant to the procedure set by the Minister of the Environment. Under normal conditions, the navigation season in the Nemunas River – in the stretch from Druskininkai to Liškiava and from Birštonas (Žemaitkiemis) to Kaunas HPP – lasts for 183 days, and in Lake Galvė and in the Nevėžis River to Sitkūnai – for 138 days per year. Other waterways specified in the legislation are not operated. Navigation is conducted observing the legislation which regulates protection of the environment and inland water transport.

Status and prospects of inland water transport

105. The Republic of Lithuania has signed (and ratified) the European Agreement on Main Inland Waterways of International Importance (AGN), which covers inland waterway E 41 in the Nemunas River and Curonian Lagoon from Kaunas to Klaipėda, inland waterway E 70 which connects Klaipėda with the inland waterway network of Western Europe via Kaliningrad, and route E 60 from Gibraltar to Archangelsk via Kiel Canal, inland waterways of the Baltic countries, St. Petersburg and the inland waterway network of Russia to the White Sea. The dimensions set by the United Nations (TRANS/SC.3/144) must be maintained in the said waterways. The following dimensions have been set for the section Klaipėda–Jurbarkas of waterway E 41: vessel length – 100 m, vessel width – 10 m, waterway depth – 1.50 m, waterway width – 40 m (the width of the waterway in the Curonian Lagoon is 50 m); for the section Jurbarkas – Kaunas: vessel length – 100 m, vessel width – 10 m, waterway depth – 1.20 m, waterway width – 30 m. These dimensions must be maintained throughout the navigation season (navigation in waterway E-41 usually lasts at least 230 days a year).

The said and other inland waterways may also be used by other vessels (entertainment boats, small ships, etc.) the size of which is regulated in the Inland Waterway Code of the Republic of Lithuania (Žin., 1996, No. 105-2393).

A major persisting problem is the maintenance of the guarantee depths and making these depths uniform in inland waterway E 41 in the Nemunas and Curonian Lagoon from Klaipėda to Kaunas (the guarantee depth in the section from Klaipėda to Jurbarkas is currently 1.50 meters, from Jurbarkas to Kaunas – 1.20 meters). The feasibility study *Complex preparation of the inland waterway Klaipėda-Kaunas in the river Nemunas and Curonian Lagoon adjusting it for passenger and cargo navigation* concluded that the inland waterway in E 41 can be shallow (the guarantee depth up to 1.5 m), of average depth (about 2 m) and deep (about 3 m). The river bed must be dredged in the shallow section Kaunas-Jurbarkas increasing the depth from 1.2 to 1.5 meters.

For entertainment purposes, passengers are mainly transported in the Curonian Lagoon and the Nemunas delta, minimum transportation for entertainment purposes is conducted in the Nemunas and in Lake Galvė. Also, there are plans to revive transportation of passengers in the Nemunas between Kaunas and Nida. Leisure and tourism navigation in the Nemunas delta and in the Curonian Lagoon is becoming a more and more attractive area for investments.

Cargo can be carried in waterway E 41 in the section Klaipėda – Kaunas; however, the majority of cargo is currently carried along the route Klaipėda – Jurbarkas – Klaipėda. When Marvelė cargo wharf is constructed in Kaunas (planned by 2013), cargo transportation by inland waterways should increase (0.5-1.0 million tonnes and more per year).

The amount of cargo transported by inland water vessels during 2008 totals to 988.5 thousand tonnes and the number of passengers – to 2 371.6 thousand. Cargo and passengers ferried to Nida account for the largest part of cargos and passengers by inland water transport.

According to the data of the State Inland Waterways Navigation Inspectorate, 60 thousand inland waterway vessels were registered in 2008 (70 % whereof were non-self-propelling vessels) and their number is still increasing (cf. only 30 thousand vessels registered in 2003).

Planned river morphological changes in waterways

106. Environmentally, clearing and dredging activities in the waterways are regulated pursuant to the Environmental Conditions for Clearing and Dredging of the Bottom of Water Bodies for Navigation Purposes approved by Order No. D1-23 of the Minister of the Environment of the Republic of Lithuania of 10 January 2007 (Žin., 2007, No. 7-295). This legal act regulates maintenance (clearing or dredging) of inland waterways as well as has laid down environmental requirements for the development of inland waterways. Preliminary qualitative estimations show that there are no other types of transport which would be more environmentally-friendly than inland waterways.

At present, the main waterway maintenance (bed clearing) works are performed in the Nemunas waterway (in E 41 waterway stretch) in order to ensure the depth and width dimensions required for navigation (and also ensuring the depths of the water areas of ports and wharfs). The average annual amount of alluvial soil removed from the fairway amounts to 1.0-1.5 million m^3 (most of the soil is left in the river bed). A minor part of the soil is taken away (from places with unfavourable conditions for the disposal of the soil in the river bed).

At the moment there are 2 ports (which belong to the state enterprise Inland Waterways Authority), 17 stationary quays and 19 mobile jetties in the Nemunas (Kauno Marios Lagoon included) and in the Curonian Lagoon.

Speaking about new large objects planned for the nearest future (by 2013), Marvelė cargo wharf should be constructed in Kaunas as well as groins reconstructed (using durable materials) in a section of 20 km in the Nemunas waterway E 41 below Jurbarkas (106-126 km from the mouth).

There about 2000 groins of various types built in the Nemunas, which are repaired on demand using the soil excavated during waterway clearance.

There is little data on impacts of navigation on the ecological status of water bodies. As a rule, literature discusses impacts of navigation in the context of construction (increase of the water level, straightening of the bed) and maintenance (dredging) of navigation ways. Other aspects analysed include impacts of fluctuation of the water level (due to the operation of the sluice system) as well as turbulence and waves on the sides of the river bed aroused by ships passing by. Since there is no reliable data on a negative impact of navigation on surface water bodies currently available, this impact is not included among the significant ones.

Planned investments into navigation development and investment sources

107. State funds are allocated for the maintenance of waterways, and EU assistance funds – for the development of the waterways infrastructure.

Summary of impacts on water bodies within the Nemunas RBD

108. The Nemunas RBD consists of 10 river sub-basins and 2 basins, which differ in their size, economic development and impacts exerted thereon. Information on the main economic sectors in the Nemunas RBD – households, industry, agriculture, energy, and tourism – is summarised in Table 76. The household sector includes data on the number of population and water consumption per capita, and the industry sector contains the number of IPPC installations. Also, the number of agricultural farms subject to the requirements of the Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources is provided, as well as the data on agglomerations where loads exceed 2000 p.e. and the number of hydropower plants is given. The latter data indicates a significant impact of the energy sector on the ecological status of rivers. Finally, water bodies where water tourism is widely spread are listed by individual sub-basins.

Table 76. Summary of impacts and pressures on sub-basins and basins of the Nemunas RBD (based on the data of 2008)

Sub-basin/basin	**Factors affecting the status of water bodies**									
	Households		WWTP	Industry	Agriculture				Energy	Water tourism
	Population number	Water consumption l/per capita/day	Cities and towns with pollution loads ≥2000 p.e.	Number of IPPC installations	Declared area of utilised agricultural land, km^2	LSU density (in basin area), 1/ha	Number of farms with 10-300 LSU	Number of farms with ≥300 LSU	Number of HPP exertinga significant impact	Rivers and lakes where water tourism is widely practiced
Neris Small Tributaries	786 033	123.8	13	43	785.05	0.08	309	8	1	rivers Nemunas, Neris, Verknė; lakes Galvė, Skaistis, Totoriškių, Vilkokšnis
Nevėžis	356 241	91.4	6	22	3 073.85	0.15	304	39	5	not available yet
Nemunas Small Tributaries	598 701	109.7	15	12	3 088.8	0.13	1 950	19	9	rivers Nemunas, Verknė, Šalčia
Minija	106 633	90	3	16	1 150.7	0.15	717	5	1	Minija River
Lithuanian Coastal Rivers	214 534	169	1		325.9	0.1		5	none	-
Jūra	116 391	55.7	7	2	1 868.0	0.18	1 250	1	1	rivers Šešuvis, Jūra
Šventoji	168 141	135.8	5	10	2 352.8	0.1	682	7	7	lakes Baltieji Lakajai, Juodieji Lakajai, Virintai, Asveja, Tauragnas, Pakasas, Ūkojas, Alksnis, Linkmenas, Almajas, Baluošas, Dringis, Lūšiai; rivers Virinta, Siesartis, Šventoji
Šešupė	186 622	85.4	9	8	2 419.6	0.19	1 552	14	5	rivers Baltoji Ančia, Niedus, Nemunas, Šešupė, lake Ančia
Žeimena	57 512	220.4	4	4	479.6	0.06	89	1	none	lakes Lūšiai, Asveja, Žeimenys, Asalnai, Linkmenas; rivers Srovė, Žeimena, Lakaja rivers
Merkys	67 591	42.7	4	1	821.3	0.07	148	5	2	rivers Merkys and Ūla
Dubysa	55 806	48.4	3	0	894.8	0.15	1 048	1	2	not available yet
Prieglius	2 959	57.5	-	-	33.4	0.13	-	none	none	none

SECTION IV. SURFACE WATER BODIES AT RISK

Water bodies at risk in the category of rivers and canals

109. In the category of rivers, water bodies at risk are those which are likely to continue failing the requirements of good ecological or good chemical status or good ecological potential even after the implementation of all basic measures.

110. Water bodies at risk include all water bodies which will be failing good ecological or good chemical status or good ecological potential after the implementation of the basic measures covering the requirements of the Urban Waste Water Treatment Directive 91/271/EEC and the Nitrates Directive 91/676/EEC due to at least one of the following factors having a significant impact of the status of rivers:

110.1. straightening of the river bed;

110.2. hydropower plants;

110.3. anthropogenic activities (that is, diffuse and/or point pollution).

111. Water bodies in the category of rivers identified as water bodies at risk due to the straightening of their beds are those which flow over non-urbanised territories and undergo a significant impact of the straightening, meanwhile rivers flowing over urbanised territories with straightened river beds and the river slope lower than 1.5 m/km are assigned to heavily modified water bodies.

Water bodies at risk also include those which suffer from a significant impact of hydropower plants downstream of HPP to the place where the catchment area becomes 10 % larger in comparison to the catchment area at the head.

No river affected by the straightening or HPP is regarded to be a water body at risk if monitoring data indicates that parameters indicative of biological quality elements meet the good ecological status criteria.

112. Speaking about pollution, the risk group contains water bodies where the water status is likely to be failing the established requirements for good ecological or chemical status or good ecological potential even after the implementation of the basics measures, that is, the impact of anthropogenic pressures will remain significant despite the implementation of the basic measures provided for in the Urban Waste Water Directive and Nitrates Directive, and thus concentrations of physico-chemical indicators in rivers will be exceeding the threshold values of good ecological or chemical status or good ecological potential.

113. Parameters indicative of physico-chemical quality elements at good ecological status and their threshold values are as follows:

113.1. average annual concentration of BOD7 – 3.3 mgO2/l;

113.2. average annual concentration of ammonium nitrogen – 0.2 mg/l;

113.3. average annual concentration of nitrate nitrogen – 2.3 mg/l;

113.4. average annual concentration of total nitrogen – 3 mg/l;

113.5. average annual concentration of total phosphorus – 0.14 mg/l.

114. Water bodies at risk also include rivers where parameters indicative of biological quality elements fail to conform to the criteria for good ecological status or good ecological potential. However, no risk factors which determine the failure of parameters for biological quality elements in rivers to meet the good ecological status or good ecological potential requirements can be identified at the moment.

The assessment of risk was carried out on the basis of the available information on pollution sources, their loads, and the impact on water bodies identified during the mathematical modelling, as well as taking into account forecasted changes in pollution loads after the implementation of the basic measures provided for in the Urban Waste Water Treatment Directive and Nitrates Directive. The identification of water bodies at risk due to problems related to their water quality was carried out upon summarising the mathematical modelling results and the latest water quality monitoring data (2005 – 2008).

There are 584 water bodies in the category of rivers (including heavily modified and artificial water bodies) within the Nemunas RBD with the total length of 10 195 km, of which 320 below-listed water bodies with the total length of 5267 km are assigned to a risk group:

115. The following water bodies were designated as water bodies at risk (Table 77):
115.1. 99 water bodies with the total length of 2427 km – due to pollution-related water quality problems; of these, 32 water bodies are HMWB with the total length of 820 km;
115.2. 146 water bodies with the total length of 1601 km – due to the straightening of their river beds;
115.3. 48 water bodies with the total length of 828 km – due to the straightening of their river beds and pollution-related water quality problems;
115.4. 21 water bodies with the total length of 298 km – due to an impact of HPP; 1 of these water bodies is assigned to HMWB (12.5 km in length);
115.5. 5 water bodies with the total length of 88 km - due to an impact of HPP and pollution-related water quality problems;
115.6. 1 water body with the total length of 25.2 km - due to an impact of HPP, straightening of the river bed, and pollution-related water quality problems.

Table 77. Water bodies at risk in the category of rivers in the Nemunas RBD; “1” indicates risk factors

Basin /sub-basin	HMWB	Risk factors			Number of WB	Length, km
		HPP	Straightening	Water quality		
Dubysa	0	0	0	1	3	43.9
	1	0	0	1	1	11.3
	0	0	1	0	6	73.9
	0	0	1	1	3	65.1
	0	1	0	0	1	6.0
	0	1	0	1	1	20.8
Jūra	0	0	0	1	4	86.6
	0	0	1	0	13	128.9
	0	0	1	1	3	88.4
	0	1	0	0	1	7.5
Lithuanian Coastal Rivers	0	0	0	1	2	28.4
	1	0	0	1	2	6.6

Basin /sub-basin	HMWB	Risk factors			Number of WB	Length, km
		HPP	Straightening	Water quality		
	0	0	1	0	2	27.9
	0	0	1	1	1	1.7
Merkys	0	0	0	1	3	44.8
	0	0	1	0	17	197.4
	0	1	0	0	1	17.3
Minija	0	0	1	0	9	88.7
	0	1	0	0	1	15.3
	0	0	1	1	1	48.4
Nemunas Small Tributaries	0	0	0	1	8	268.6
	1	0	0	1	1	224.9
	0	0	1	0	38	417.9
	0	0	1	1	2	24.6
	0	1	0	0	7	52.3
	1	1	0	0	1	12.5
	0	1	1	1	1	25.2
Neris Small Tributaries	0	0	0	1	7	291.5
	0	0	1	0	14	196.4
	0	0	1	1	3	50.1
	0	1	0	0	1	38.1
Nevėžis	0	0	0	1	21	452.8
	1	0	0	1	19	404.3
	0	0	1	0	1	22.6
	0	0	1	1	23	370.0
	0	1	0	1	4	67.2
Šešupė	0	0	0	1	16	352.6
	1	0	0	1	7	137.7
	0	0	1	0	13	157.0
	0	0	1	1	10	160.7
	0	1	0	0	2	76.3
Šventoji	0	0	0	1	2	25.2
	1	0	0	1	1	21.5
	0	0	1	0	25	218.1
	0	0	1	1	2	18.7
	0	1	0	0	6	72.4
Žeimena	0	0	0	1	1	12.5
	1	0	0	1	1	13.8
	0	0	1	0	8	72.5

116. Water bodies at risk in the category of rivers are demonstrated in Figures 20-22: water bodies at risk due to water quality problems are given in Figure 20, water bodies at risk due to hydromorphological alterations (bed straightening and HPP impact) are demonstrated in Figure 21, and those included in the risk category because of all anthropogenic pressures – in Figure 22.

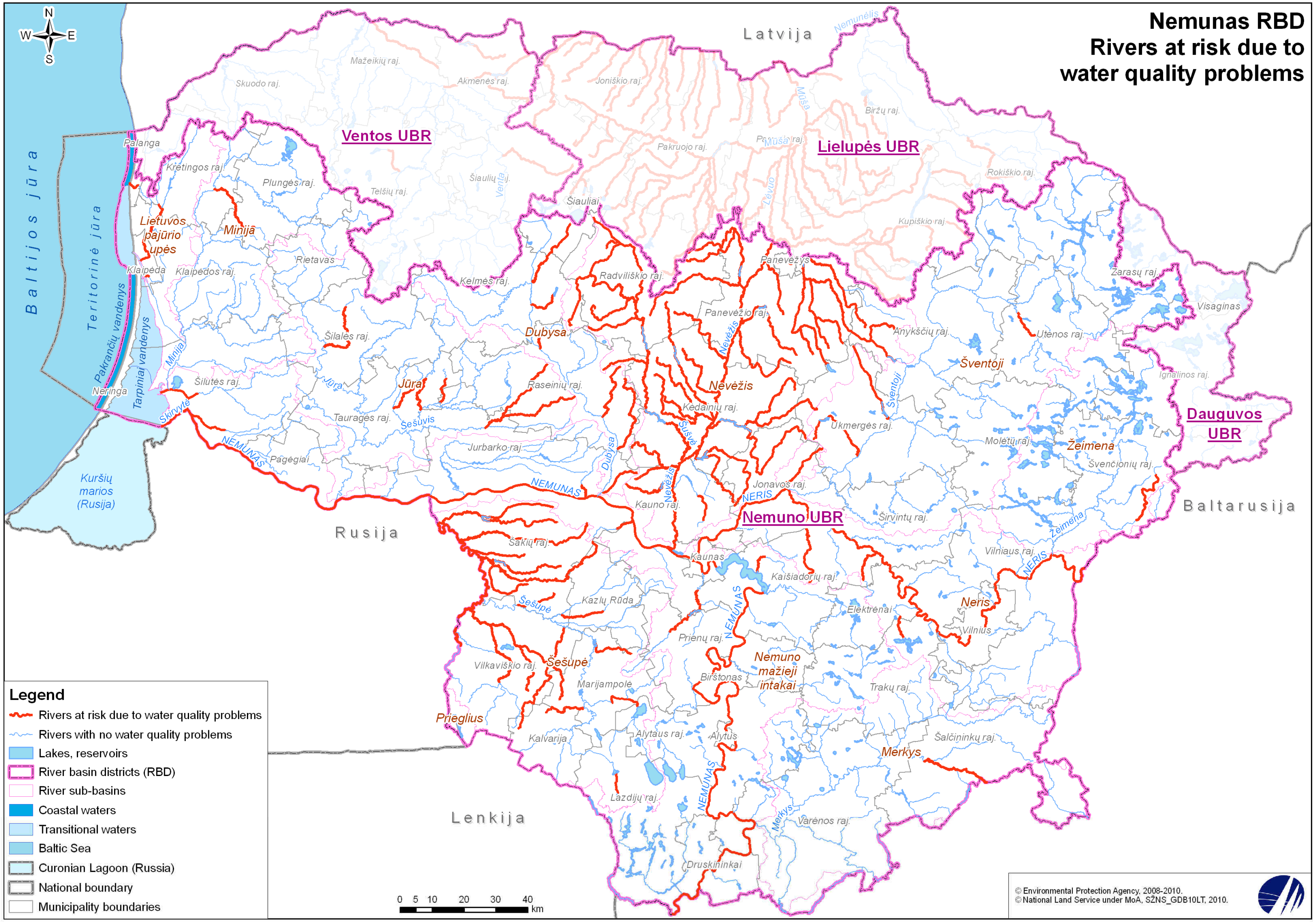


Figure 20. Rivers at risk due to water quality problems in the Nemunas RBD

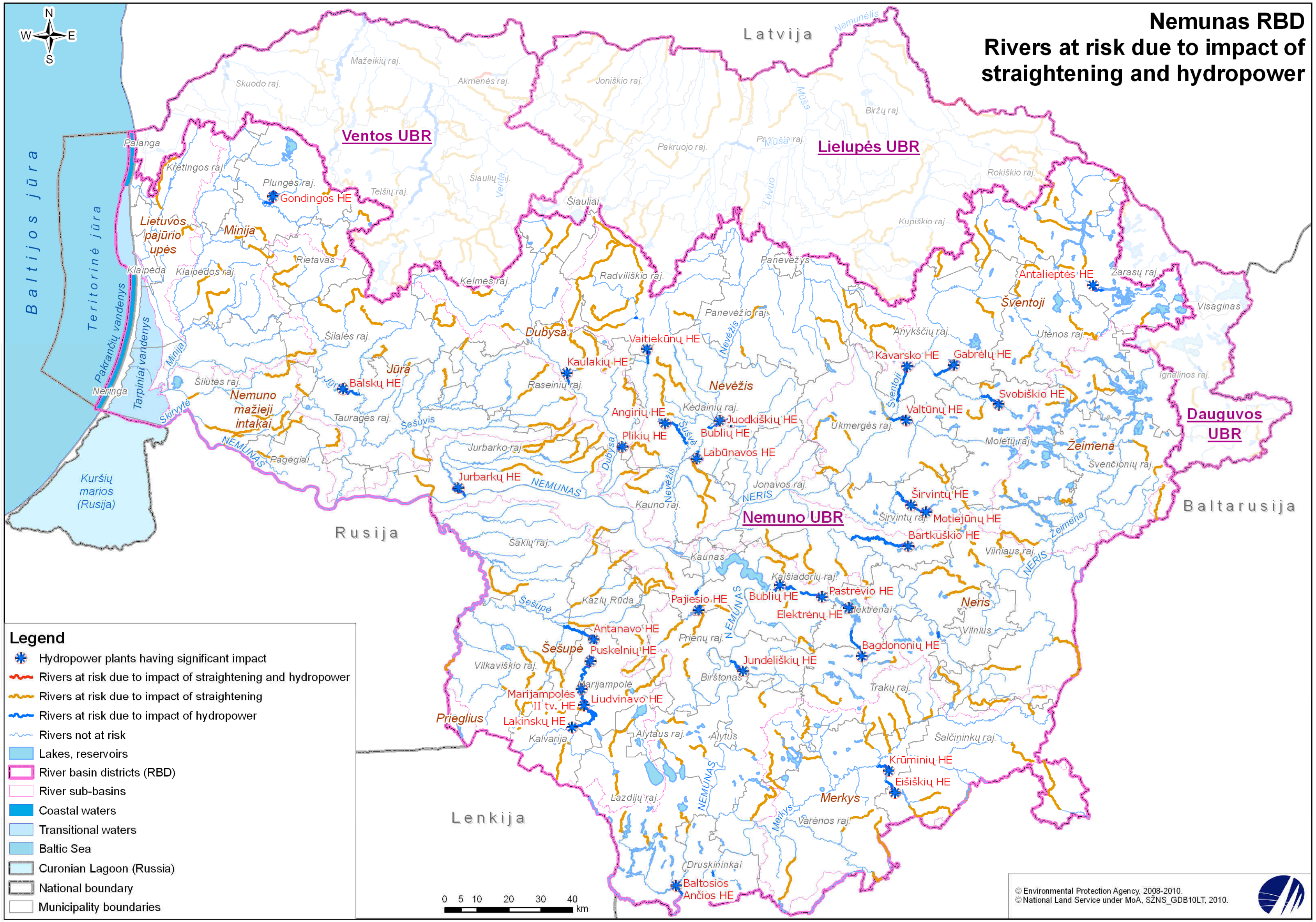


Figure 21. Rivers at risk due to the bed straightening and impacts of hydropower plants in the Nemunas RBD; hydropower plants which exert a significant impact

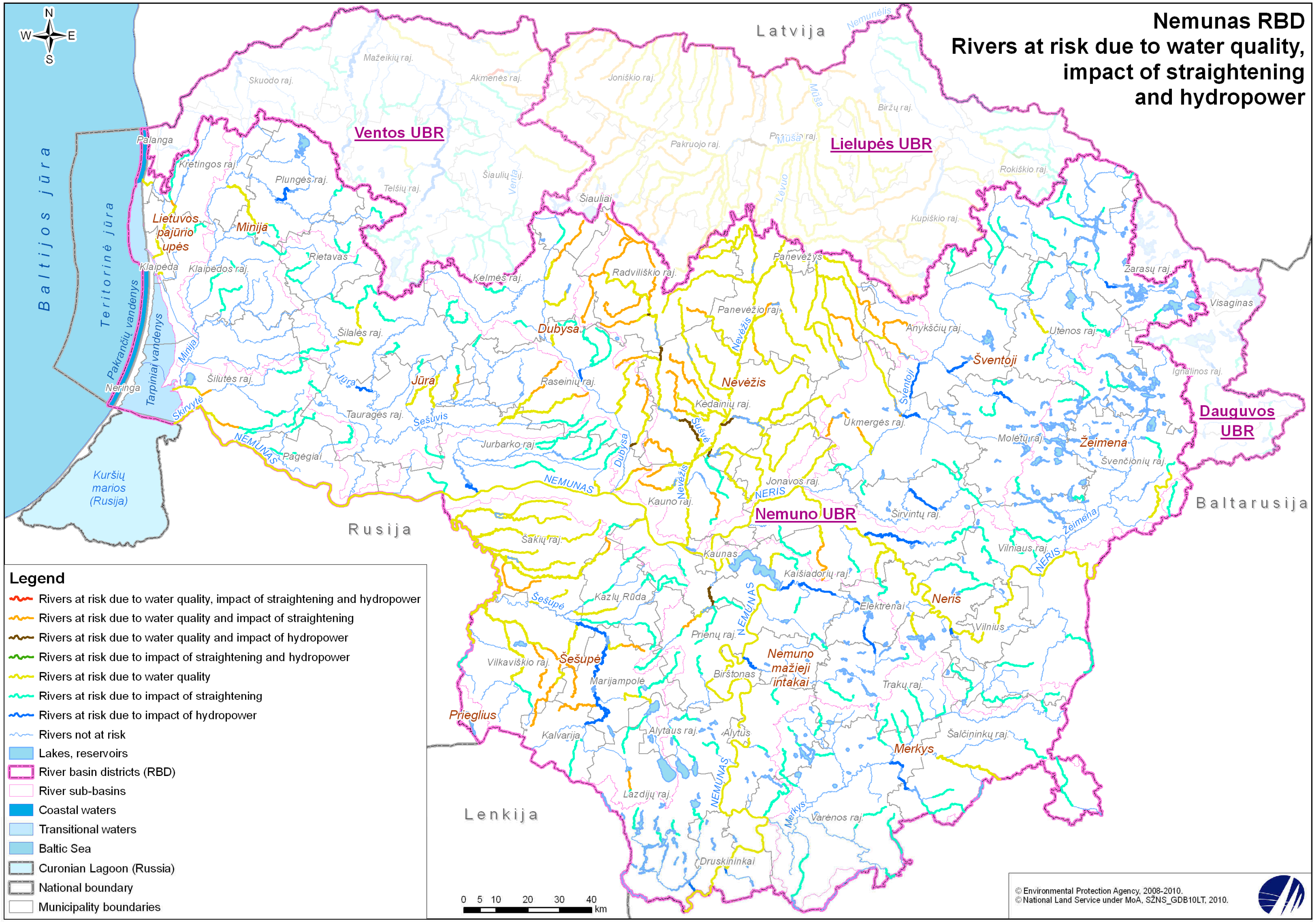


Figure 2.3. Rivers at risk due to water quality problems, bed straightening and impacts of hydropower plants in the Nemunas RBD

Water bodies at risk in the category of lakes

117. Water bodies in the category of lakes (lakes and ponds) are identified as water bodies at risk if the critical values of total nitrogen, total phosphorus and chlorophyll *a* are exceeded:

117.1. Type-1 and Type-2 lakes – Ntotal > 1.80 mg/l, Ptotal > 0.060 mg/l, EQR of chlorophyll a > 0.33;

117.2. in Type-3 lakes – Ntotal > 1.20 mg/l, Ptotal > 0.050 mg/l, EQR of chlorophyll a > 0.33.

118. The ecological status of water bodies in the category of lakes and ponds was assessed on the basis of the state monitoring data (in total 108 lakes and ponds), the data provided in the study *Identification of Lithuanian lakes subject to restoration and preliminary selection of restoration measures for these lakes for improvement of 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 in the category of lakes within the Nemunas RBD in the category of lakes and ponds.

When assigning lakes and ponds to water bodies at risk or those not at risk, priority was given to the national monitoring results, whereas 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 (meanwhile the study data indicates the opposite), the lake or pond was assigned to water bodies at risk.

119. The following order of priorities was observed for assigning lakes and ponds to water bodies at risk/not at risk (water bodies at risk in the category of lakes and their risk factors are given in Table 78 and demonstrated in Figure 23):

119.1. When there was national monitoring data available on the indicators of the ecological status of the 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.

119.2. 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.

119.3. 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.

119.4. 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.

119.5. 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.

119.6. 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 and ponds and their risk factors are listed in Table 2.15 and demonstrated in Figure 2.4.

Table 78. Water bodies at risk in the category of lakes; “1” indicates risk factors

Basin / sub-basin	**Lake / pond**	**Area, km²**	**Risk factors**			
			Diffuse pollution	**Water level fluctuations**	**Potential impact of historic pollution**	**Potential impact of diffuse pollution (uncertainty about ecological status)**
Dubysa	Lake Gauštvinis	1.23			1	
Jūra	Sujainių Pond	0.64	1			
	Balskų Pond	2.82			1	
	Lake Draudenių Ežeras	1			1	
	Paupio Pond	0.67				1
Lithuanian Coastal Rivers	Tūbausių I Pond	0.83	1			
Merkys	Lake Netečius	0.86	1			
	Lake Neveiglas	0.63	1			
	Lake Niedulis	0.61	1			
	Lake Pabezninkų Ežeras	0.65	1			
	Lake Didžiulis	1.86			1	
	Lake Lielukas	0.87				1
	Lake Nedzingis	2.72				1
Nemunas Small Tributaries	Lake Alovės	0.8	1			
	Lake Atesys	1.11	1			
	Lake Aviris	1.43	1			
	Lake Gailintas	0.64	1			
	Girdžių Pond	0.56	1			
	Lake Gudelių Ežeras	1.15	1			
	Lake Ilgės Ežeras	1.45	1	1		
	Lake Jiezno Ežeras	0.77	1			
	Lake Kalvių Ežeras	1.82	1			
	Kauno Marios Lagoon	47.46	1			
	Lake Prapuntas	1.31	1			
	Lake Sagavas	0.77	1			
	Lake Švenčius	0.51	1			
	Volungiškių Pond	0.82	1			
	Lake Antakmenių Ežeras	0.82			1	
	Lake Juodas Kauknoris	0.61			1	
	Lake Latežeris	0.86			1	
	Lake Šlavantas	1.84			1	
	Lake Zapsys	1.87			1	
	Lake Kavalys	1.42			1	

Basin / sub-basin	Lake / pond	Area, km^2	Risk factors			
			Diffuse pollution	Water level fluctuations	Potential impact of historic pollution	Potential impact of diffuse pollution (uncertainty about ecological status)
	Lake Luksnėnų Ežeras	0.66			1	
	Lake Niedus	1.27			1	
	Lake Veisiejis	5.47			1	
	Jurbarkų Pond	2.15				1
	Kriokialaukio Pond	0.75				1
	Lake Liškiavis	0.6				1
	Pajiesio Pond	0.65				1
	Lake Vilkinys	1.46				1
Neris Small Tributaries	Lake Didžiulis	0.83	1			
	Lake Pikeliškių Ežeras	0.65	1			
	Lake Riešės Ežeras	0.84	1			
	Lake Žaslių Ežeras	1.09	1	1		
	Bartkuškio Pond	0.5			1	
	Lake Širvio Ežeras	0.86			1	
	Lake Spėra	0.83			1	
Nevėžis	Labūnavos Pond	1.11	1			
	Pienionių Pond	0.58	1			
	Angirių Pond	2.64			1	
	Bublių Pond	1.5			1	
	Janušonių Pond	0.62			1	
	Krivėnų Pond	0.67			1	
	Stepanionių Pond	0.64			1	
	Vaitiekūnų Pond	1.4			1	
	Juodkiškių Pond	0.95				1
	Liberiškio Pond	0.53				1
	Mantviliškio Pond	0.76				1
Šešupė	Lake Amalvas	1.96	1			
	Lake Giluitis	2.31	1			
	Lake Rimietis	1.39	1			
	Lake Simno	2.44	1			
	Totorviečių Pond	0.53	1			
	Voverių Pond	0.51	1			
	Lake Žaltytis	2.41	1			
	Lake Žuvintas	9.38	1			
	Lake Dusia	23.42			1	
	Lake Orija	0.84			1	
	Lake Paežerių Ežeras	3.97			1	
	Marijampolės Pond	0.79				1
Šventoji	Lake Gėlių Ežeras	0.63	1			
	Lake Ilgajis	0.57	1			
	Lake Luknas	0.53	1			
	Lake Mūšėjus	0.92	1			
	Lake Obelių Ežeras	0.51	1			
	Lake Sartai	13.27	1			
	Lake Siesikų Ežeras	1.21	1			
	Kadrėnų Pond	1.1			1	

Basin / sub-basin	Lake / pond	Area, km^2	Risk factors			
			Diffuse pollution	**Water level fluctuations**	**Potential impact of historic pollution**	**Potential impact of diffuse pollution (uncertainty about ecological status)**
	Lake Dviragis	3.08			1	
	Lake Gelvanės Ežeras	0.57			1	
	Lake Kiementas	1.02			1	
Žeimena	Lake Ilgas	0.6	1			
	Lake Spenglas	0.86	1			
	Lake Šventas	0.6	1			
	Lake Kemėšys	0.56			1	
	Lake Kretuonykštis	0.66			1	
	Lake Urkis	0.65			1	
	Lake Alksnas	0.92				1
	Lake Pravalas	2.57		1		

Artificial water bodies

120. The ecological potential of artificial water bodies was assessed following the mathematical modelling methodology corresponding to the one used for the analysis of the ecological status of rivers. As a result, one artificial water body, Sanžilė Canal, was assigned to the risk group due to diffuse pollution with nitrates. The remaining artificial water bodies consisting of canals, diggings and one quarry are not assigned to the risk group on the basis of the current pollution impact.

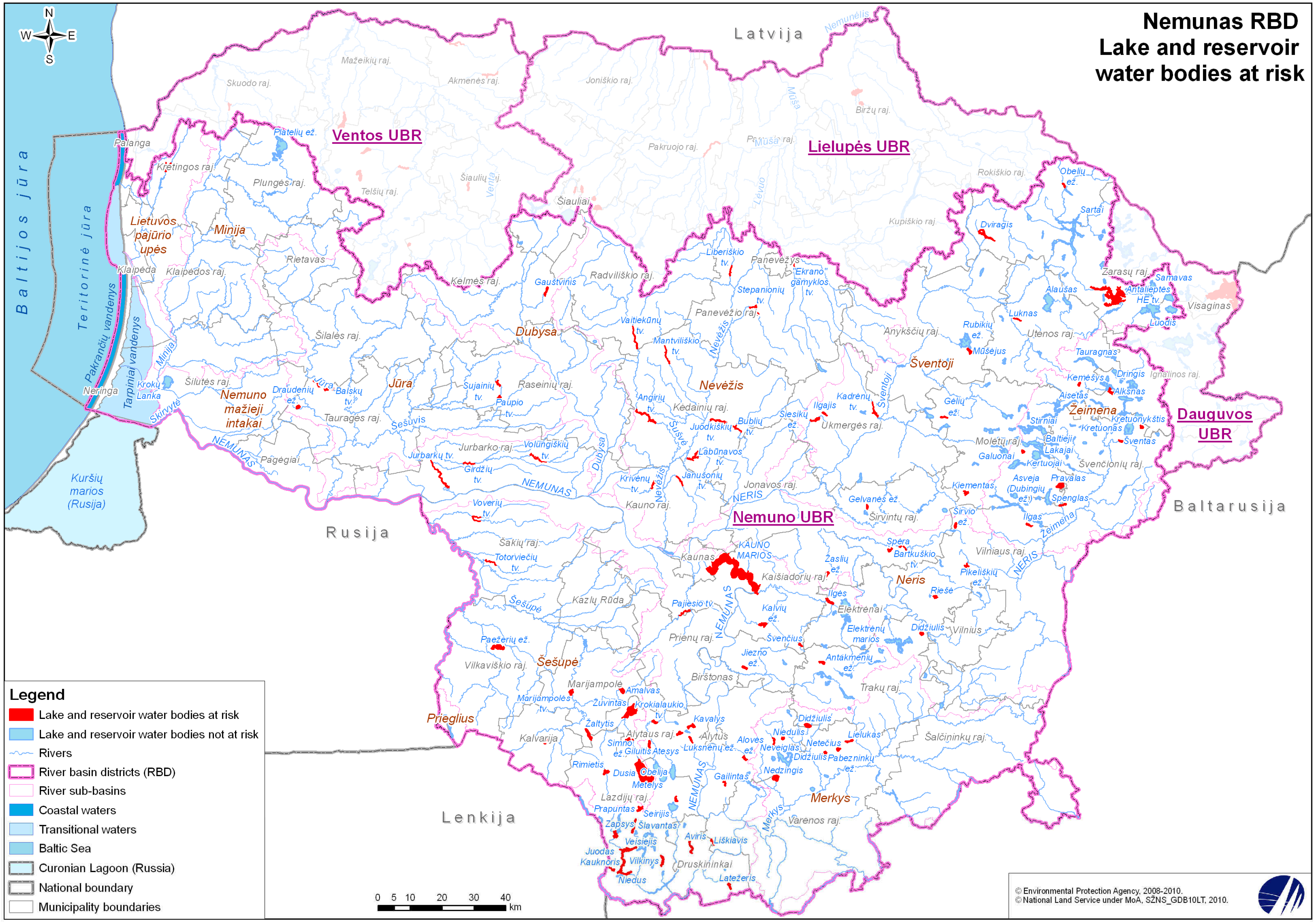


Figure 23. Lakes and ponds at risk in the Nemunas RBD

Transitional and coastal water bodies at risk

121. The assignment of all transitional and coastal waters to the risk group was performed following an assessment of their ecological status on the basis of the available monitoring data and findings of the modelling of the ecological status of the Curonian Lagoon, taking into account reduction of the inflow of nitrogen and phosphorus.

The northern and central parts of the Curonian Lagoon were assigned to the risk group on two grounds. First, the national monitoring results indicate that the ecological status of the Curonian Lagoon has never been classified as good since 1992 and has been varying between bad and average. Though climatic conditions favourable for the status of the environment in the Curonian Lagoon did occur during the last 17 years, the good ecological status criteria have been met only by individual quality elements. The results of monitoring of multi-annual changes do not indicate any ecological status improvement tendencies.

Second, the northern and central parts of the Curonian Lagoon were assigned to the risk group on the basis of the ecological modelling findings which indicate that the planned reduction of inflow of nitrogen and phosphorus upon the implementation of measures in the basin will not be sufficient for the attainment of good ecological status by the indicators of phytoplankton (average biomass and chlorophyll *a*). Concentrations of total phosphorus should also be taken into account, as they have been steadily corresponding to the criteria of moderate status since 1992 and were able to meet the requirements for good ecological status only in 1995. Having in mind that the amounts of phosphorus in the ecosystem can be especially dependant on secondary pollution (bottom sediments) management of which is very limited (due to absence of data and potential concentration of the heaviest pollution in the southern part of the lagoon which belongs to the Russian Federation), the risk of failing the good ecological status requirements is very high.

The environmental status of Klaipėda Strait depends mainly on the environmental status of the Curonian Lagoon the water masses of which are dominant here during most of the year. The impact of pollution is especially strong due to the hydromorphological characteristics of the strait – limited water exchange in close territories (e.g. Malkų or Žiemos bays). Such territories display very limited tendencies of improvement in the environmental status because of particularly favourable conditions for long-term accumulation of polluting substances. During the last few years, the prospects of improving the environmental status of the strait have been reduced by hydromorphological changes in the central part of the water area occurring due to the bottom dredging activities. The increase of the depth of the water area results in a potential increase of the ability of the strait to accumulate pollutants. Klaipėda Strait is also to be classified as a water body at risk due to the currently poor chemical status.

The assignment of the plume of the Curonian Lagoon in the Baltic Sea to water bodies at risk is based on general forecasts of the ecological status of the Curonian Lagoon. The parameters measured in water (concentrations of total nitrogen, total phosphorus, phytoplankton and chlorophyll a) demonstrate that the ecological status of the plume largely depends on hydro-meteorological conditions. In the event of prevailing cyclones and winds from the southwest, west and northwest, the water quality values in this zone are close to the ones measured in coastal water bodies. However, when anticyclones prevail, the status in the zone of circulation of water masses of the Curonian Lagoon rapidly deteriorates. The multi-annual monitoring data of water indicators during 1992 – 2007 show that good status of the plume was last registered only back in 1996.

The most important factor which determines the ecological status of coastal waters is the eutrophication level typical of the central part of the Baltic Sea. Despite the fact that individual indicators of the ecological status did meet the good status criteria in certain years, the general ecological status has been always classified as bad, poor or moderate since 1997 (with the exception of open waters at the sandy coast of the Baltic Sea in 2000). The most important role in the improvement of the ecological status of the open stony coast of the Baltic Sea is played by measures planned for the attainment of good ecological status of transitional waters. The ecological status of coastal waters at the sandy coast depends exceptionally on the regional level of eutrophication. Since there are no sources of point pollution in the waters at the sandy coast and the plume of the Curonian Lagoon is a short-lived phenomenon and seldom registered only in a small part of this zone, the ecological status of these waters cannot be managed with the help of measures implemented in the basin or transitional waters. The neighbouring Baltic countries (Poland, Latvia) also assign their coastal waters to water bodies at risk, hence, taking into account the prevailing transportation of water masses in the S-N direction and the eutrophication level typical of the Baltic Sea, the open waters at the sandy coast of the Baltic Sea were classified as water bodies at risk as well.

Groundwater wellfields at risk

122. Three problematic groundwater bodies were identified in the Nemunas RBD: Suvalkija GWB, Kėdainiai-Dotnuva GWB, and Stipinai groundwater body of Upper Devonian deposits (see Figure 19), where abnormally high concentrations of two problematic indicators, sulfates and chlorides, failing to meet the drinking water quality requirements (not more than 250 mg/l) and, sometimes, the environmental criteria set by the Lithuanian Geological Survey (LGS) (500 mg/l for SO_4 and 350 mg/l for Cl) were detected in certain wellfields. The chemical status of such wellfields is poor and marked in red in maps drawn up by the LGS. Attempts have been made to evaluate changes in the status during the exploitation of the wellfields clarifying the type/tendencies of the trends. Unfortunately, it appeared that the amount of the available monitoring data is clearly insufficient to be able to assess such changes/trends nearly in all wellfields. It was decided to assign these water bodies to the risk category and to conduct extended monitoring during the first planning period which would enable confirming or denying the status of groundwater.

SECTION V. IMPACT OF ECONOMIC ACTIVITIES ON GROUNDWATER WELLFIELDS

Pollution of groundwater

123. By the type of pollution, pollution of groundwater is divided into regional and local pollution. Regional pollution is usually related to polluted atmosphere, chemisation of agriculture and urbanised territories hence its regulation and management is rather complicated. In Lithuania, pollution of this type has mostly affected the upper layer of groundwater, that is, shallow groundwater. The impact of pollution on deeper confined aquifers is less significant.

Sources of point pollution that are related to objects of polluting economic activity, such as industries, large animal husbandry farms, storages of fuel, fertilisers, pesticides and other materials, landfills of household and industrial waste, pollutant spill accidents in railways, etc., are common in all groundwater bodies. According to the data of the Lithuanian Geological Survey (LGS), the number of such polluting places in the country total to several dozens of thousands; however, the impact of these sources on groundwater is usually of local significance.

Local pollution of groundwater is also noticeable in places of other types of economic activities. Pollutants which are most often found in groundwater in the neighbourhood of landfills, farms, fields of slurry application, treatment facilities, fertiliser storages and similar objects include biogenic compounds (the group of nitrogen and phosphorus compounds) and pesticides, and products of their decay as well as unidentified organic pollution. Groundwater on the territory of industries, sludge tanks of treatment facilities contain heavy metals, and the environment of road maintenance companies, boiler houses, fuel stations, power plants is usually polluted with NaCl and KCl. Hydrocarbons and other specific chemical compounds (detergents, phenols, etc.) are detected in groundwater of certain industrial and former military territories; however, as already said before, the impact of such pollution sources on groundwater is of local importance.

For the purpose of collection and systematic arrangement of information on contamination sources, the Lithuanian Geological Survey developed a uniform Form for Contamination Sources of Geological Environment and introduced the information system on contamination sources of the geological environment in 1998. A procedure for inventory of discharges of hazardous substances into groundwater and collection of information was adopted by Order No. 1-06 of the Director of the Lithuanian Geological Survey of 3 February 2003 (Žin., 2003, No. 17-770).

The purpose of the said procedure is to collect information on potential groundwater polluters which directly or indirectly discharge or can discharge pollutants into groundwater, and to control groundwater protection from contamination.

At the end of 2008, the database of the Contamination Sources of the Geological Environment contained data from 7173 forms about 6502 potential contamination sources. This number includes 1307 Forms of Inventory of a Potential Contamination Source (Declarations). By 2008, about 570 declarations were provided by municipal institutions and 735 – by legal and natural persons. The majority of contamination sources were inventoried. More than 5230 contamination sources were inventoried during fieldwork of the LGS specialists. During the period from 1999 to October 2008, contamination sources were inventoried in 24 municipalities. The fieldwork inventories covered 44.15 % of the Lithuanian territory (source: www.lgt.lt).

The available data of many researches shows that the most significant pollutants of the underground geosphere environment in Lithuania are nitrogen compounds, total organic matter and hydrocarbons, and the main contamination sources include agricultural fields and urbanised territories at the regional level, and farms, landfills, old storages of oil products, fuel stations, and territories of certain industries at the local level.

Groundwater exploitation

124. Statistical data indicates that centralised water supply services are currently provided to about 2.2 million, or 68.5 % of the population in the country. According to meter measurements in flats, water consumption amounts to 50–130 l/day per capita.

After the restoration of independence, consumption of fresh groundwater in Lithuania has been going down – from 1.2-1.4 million m^3 to 0.4 million m^3 per day. The reason is significantly reduced water consumption in the sectors of industry and agriculture and increasing water prices (due to objective reasons), which stimulates saving. Taking into account the actual water consumption situation in Lithuania and planned development of drinking water supply systems, preparation of a forecast assumed that household consumption in Lithuania will be gradually increasing and will reach the current maximum average of Western Europe by 2025, which is 150 l/per capita per day.

In Lithuania, all wellfields abstracting more than 10 m^3/day must account the abstracted amount and those abstracting more than 100 m^3/day are subject to monitoring of the quantity and quality of groundwater resources. Groundwater monitoring in water abstraction sites is rather widely spread. According to the LGS data, groundwater monitoring is carried out by 265 wellfields which abstract more than 100 m^3/day. 35 wellfields in this category do not engage in this activity. Water accounting is performed by 745 extracting less than 100 m^3 groundwater per day (source: www.lgt.lt).

Another reason of the decrease in groundwater consumption is reduction of water losses by water supply companies. In addition, amendment of the requirements for IPPC permits in 2007 resulted in decrease of the number of companies subject to the reporting – a permit is required only for companies which abstract more than 100 m^3 of water per day using their own equipment (earlier the limit was 10 m^3) (source: http://aaa.am.lt/). Pursuant to the procedure for approval of explored groundwater (except for industrial) resources approved by Order No. 1-101 of the Director of the Lithuanian Geological Survey under the Ministry of the Environment (Žin., 2005, No. 106-3934), groundwater resources must be approved and sanitary protection zones (hereinafter – SPZ) must be established for all wellfields of public water supply which are currently used and those newly designed. However, by 2008, water resources were approved only for 170 wellfields of 1996 ones actually used, and SPZ were officially established and approved only around four wellfields.

Uncontrolled groundwater abstraction can lead to decrease of the water table, intrusions of salty water, and easier hydraulic relations between aquifers and their interaction with surface water bodies. However, due to reduced consumption and substantial resources of groundwater, a negative impact of groundwater extraction in Lithuania is exerted only at the local level.

Impacts of diffuse and point pollution on groundwater and, as a result, on surface water bodies

125. Discharges of groundwater into surface water bodies in simulated groundwater bodies (hereinafter – GWB) and expert judgements lead to a preliminary conclusion that impacts of groundwater affected by diffuse pollution on the quality of surface water at the regional level are of a minor significance – the yield of groundwater discharged amounts to litres per second meanwhile the flow of any larger river amounts to cubic meters per second.

As already said before, an impact of point pollution on groundwater/shallow groundwater is always of a local nature because: 1) even maximum pollution dispersion rates under the ground seldom exceed more than a few/a dozen or so meters per year; 2) moving away from the contamination source, concentrations of polluting substances under the ground are rapidly decreasing due to the dilution effect and degradation/decay. As a result, even polluted groundwater patches formed by very intensive but local contamination sources (e.g. landfills, fields of slurry application, storages of oil products) are only slightly larger than the contamination source itself and do not have any negative impact on surface water bodies.

Impacts of diffuse and pollution of groundwater is demonstrated in maps of concentrations of individual analytes of its hydro-chemical composition in groundwater, which illustrate the extent of contamination of shallow groundwater with a specific polluting substance in a certain place. Maps of the groundwater table and quality have been prepared for all sub-basins of the Nemunas RBD. Figures 24 and 25 below demonstrate concentrations of nitrates and ammonium in shallow groundwater of the Nemunas RBD. The maps show that the concentrations of the said nitrogen compounds do not exceed the standards of drinking water at the regional level, and the most significant impact of diffuse pollution on groundwater is observed in urbanised territories and areas of intensive agriculture, where the nitrate concentration in shallow groundwater is close to the 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).

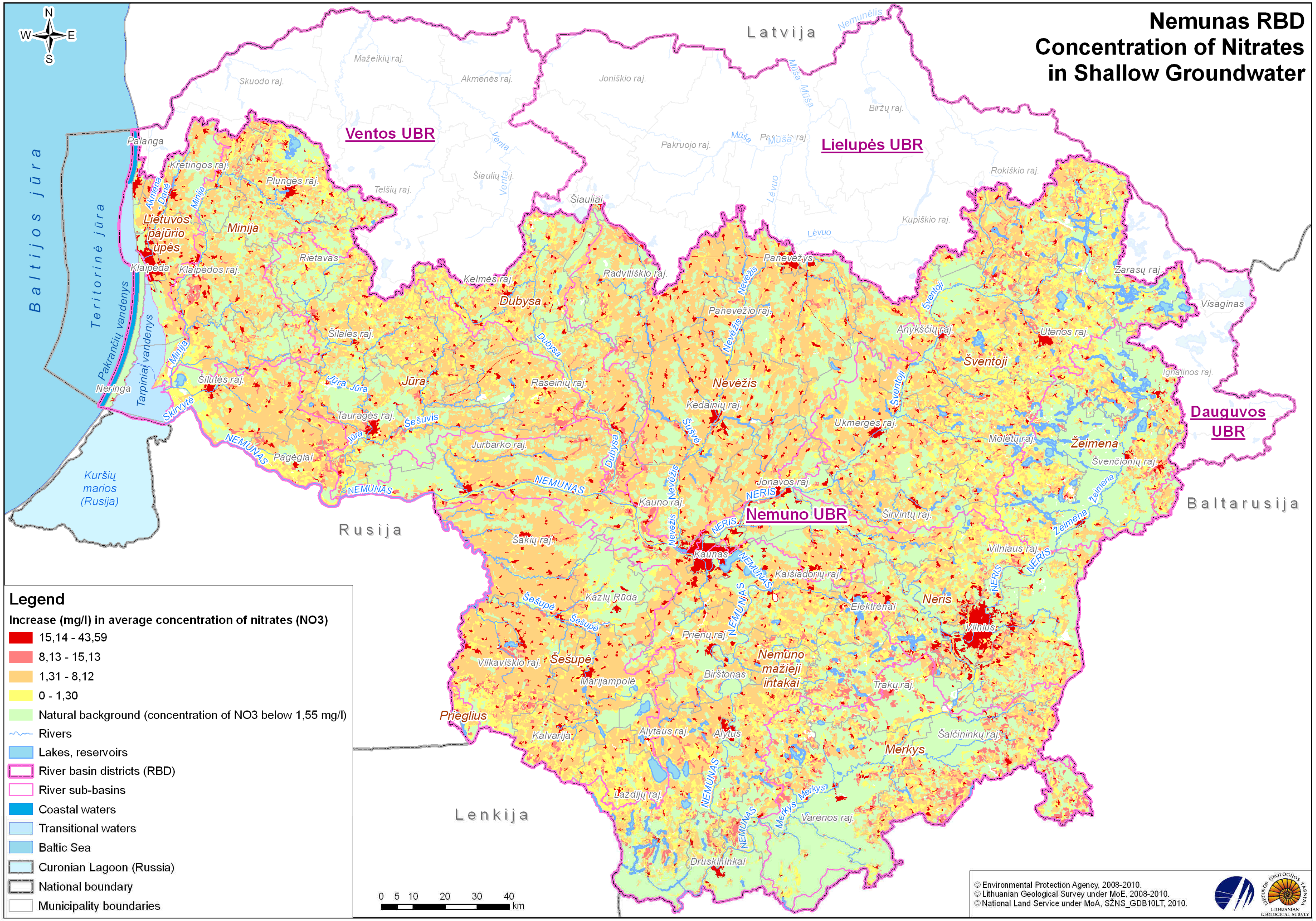


Figure 24. Nitrate concentrations in shallow groundwater in the Nemunas RBD

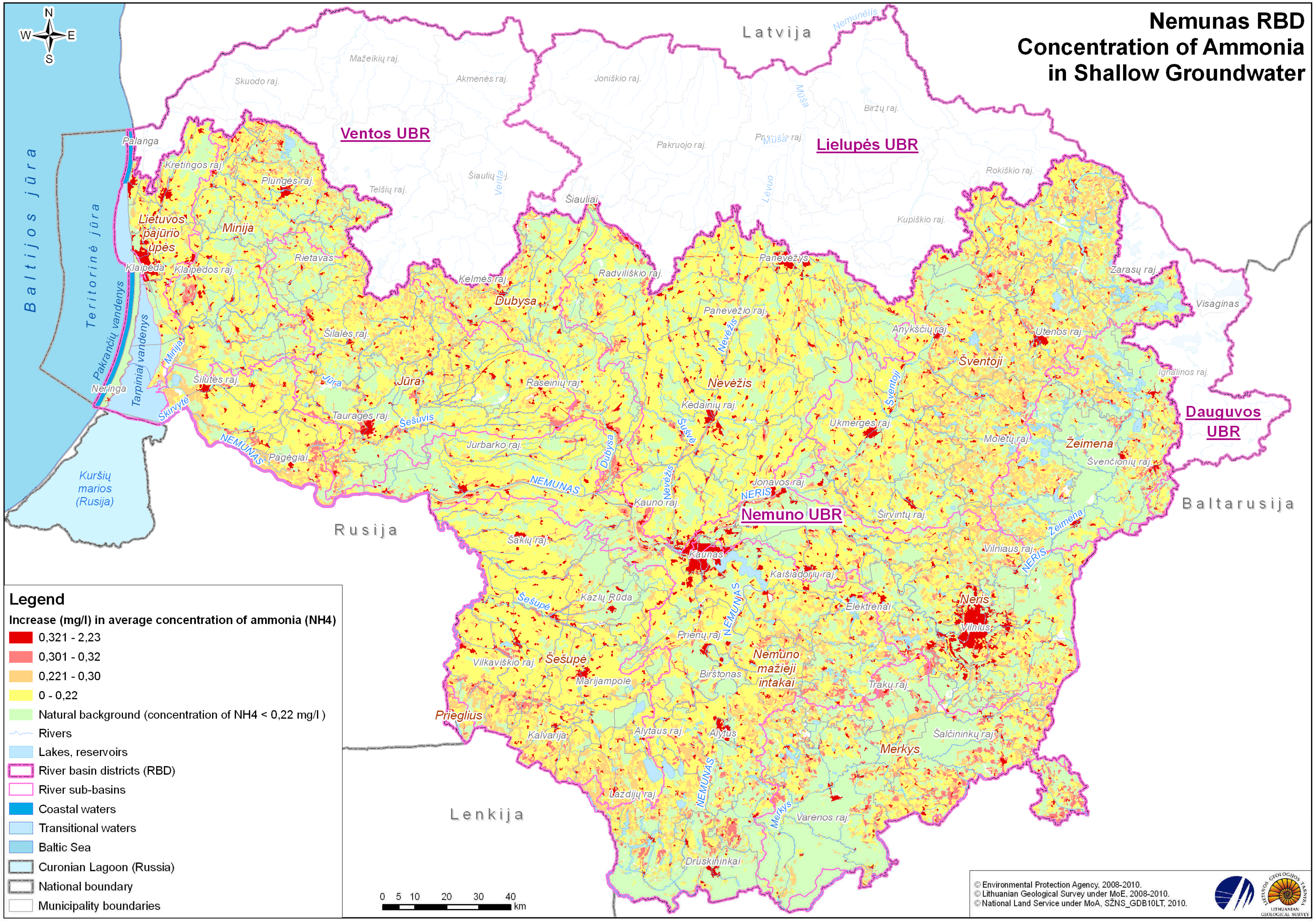


Figure 25. Ammonium concentrations in shallow groundwater in the Nemunas RBD

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

126. For the purpose of assessing impacts of groundwater exploitation on surface water bodies, a comparison of groundwater flow into surface water bodies under conditions of the undisturbed regime (before the exploitation of wellfields) with changes that have occurred during the current exploitation and which are likely to occur under the prospective one in 2015 was simulated (table 79).

Table 79. Simulated groundwater flow into surface water bodies during different periods of exploitation of groundwater in wellfields

Basin/sub-basin	Simulated groundwater flow into rivers, l/s/km^2		
	Under conditions of undisturbed regime	At present	Forecast for 2015
Šventoji	2.273	2.259	2.214
Nevėžis	0.48	0.472	0.468
Neris	2.035	1.955	1.948
Dubysa	1.117	1.114	1.111
Jūra	1.05	1.05	1.05
Lithuanian Coastal Rivers	0.696	0.653	0.642
Minija	1.466	1.461	1.451
Nemunas Small Tributaries	1.491	1.485	1.479
Jūra	1.690	1.688	1.687
Šešupė	0.963	0.955	0.952
Average	**1.326**	**1.309**	**1.300**

Table 80. Current and forecasted yields of wellfields in groundwater bodies

Groundwater body	Aggregate yield of wellfields			
	Present (2007 average)		Forecasted 2015 m.	
	m^3/day	mm/year	m^3/day	mm/year
GWB of Upper-Middle Devonian deposits (Nemunas)	45 100	1.5	66 550	2.2
Stipinai GWB of Upper Devonian deposits (Nemunas)	7250	0.8	13 600	1.45
GWB of Upper-Lower Cretaceous deposits	27 300	1.2	49 000	2.16
GWB of Permian-Upper Devonian deposits (Nemunas)	15 400	5.6	29 650	10.7

Forecasted annual groundwater abstraction in the main Lithuanian wellfields varies between 1.45 and 10.7 mm (Table 79), which is a very small amount in the total groundwater balance of a groundwater body since nourishment (inflow) of shallow groundwater varies from 28.5 to 69.4 mm per year. It is obvious that exploitation of deep groundwater aquifers practically cannot have any impact on shallow groundwater or surface waters.

Impacts of groundwater of neighbouring countries on shallow groundwater and deeper groundwater aquifers in the Nemunas RBD

127. The territories of two Lithuanian groundwater bodies (GWB of Upper-Lower Cretaceous deposits, and GWB of Quaternary deposits of South-Eastern Lithuania) also extend to the neighbouring countries: Russia, Belarus and Poland. It was established that groundwater exploitation in the neighbouring countries does not have any negative impact on shallow groundwater and deeper aquifers in the Nemunas RBD. The modelling results show that both shallow groundwater and groundwater situated in a

deeper confined aquifer of Upper Cretaceous deposits in the area at the border with Kaliningrad Region discharges into the Nemunas and the Šešupė without reaching our country, therefore pollution of both of these layers in the neighbouring country cannot have any impact on Lithuanian shallow and confined groundwater. Groundwater abstraction at the border with the neighbouring country can only slightly affect the level of the Upper Cretaceous aquifer in the Lithuanian wellfields situated in the border zone. There are a few larger wellfields at the border with Kaliningrad Region (Sovetsk, Neman) which used to extract considerable volumes of groundwater, and groundwater table depressions used to extend to Lithuania. The modelling results indicate that abstraction of groundwater in Sovetsk and Neman wellfields totalling to 10 000 m^3/day and 2000 m^3/day respectively would reduce the groundwater table in Pagėgiai by 0.4 m and the one at Pagėgiai monitoring station – by 0.6 m. Such reduction practically does not have any impact on the amount of groundwater resources in Pagėgiai wellfield.

The dominating type of geotopes in the border zone between Lithuania and Belarus in the southeast of the country is recreational geotopes. The territory is mostly covered with forests and in some places – with bogs and marshes, there are no settlements or other economic objects which could endanger the groundwater quality in Lithuania. On the Belarusian side, there are only a few small and medium settlements where groundwater abstraction does not exceed 10-15 thousand m^3/day and such yields do not form any larger water table depressions.

The recreational-type territory extends to the border with Poland. The larger settlements of Suvalkai and Augustavas are located 35 km away from the national border. Groundwater in these settlements is abstraction from intermoraine aquifers where the radius of the depression funnel is limited due to minor exploitation and does not have any significant impact on the status of shallow and confined groundwater in Lithuania.

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

128. There are no groundwater wellfields which would negatively affect surface water bodies or terrestrial ecosystems dependent on groundwater in the Nemunas RBD. Calculations of the groundwater balance show that, as compared to conditions of the undisturbed regime, groundwater flow into surface water bodies has practically remained the same from the beginning of its exploitation and is likely to remain as such until 2015. In addition, the yield of groundwater discharged into rivers is much lower than the river flow.

The most important preservable objects of nature which can be subject to a direct impact of changes in the status of shallow groundwater aquifer are wetlands and bogs, marshes and swamps. The list of NATURA 2000 objects includes 57 preservable bogs in the Nemunas RBD. The mathematical modelling results show that exploitation of confined aquifers does not have any significant impact on the status of groundwater aquifer in the neighbourhood of preservable objects of nature. The forecasted decrease of the groundwater table in the major part of the Nemunas RBD as a result of the forecasted groundwater abstraction is lower than 0.01 m, that is, much lower than seasonal fluctuations of the water table (Figure 26).

Consequently, the forecasted decrease in the groundwater table will not have any significant impact on the status of NATURA 2000 sites directly related to the shallow groundwater aquifer.

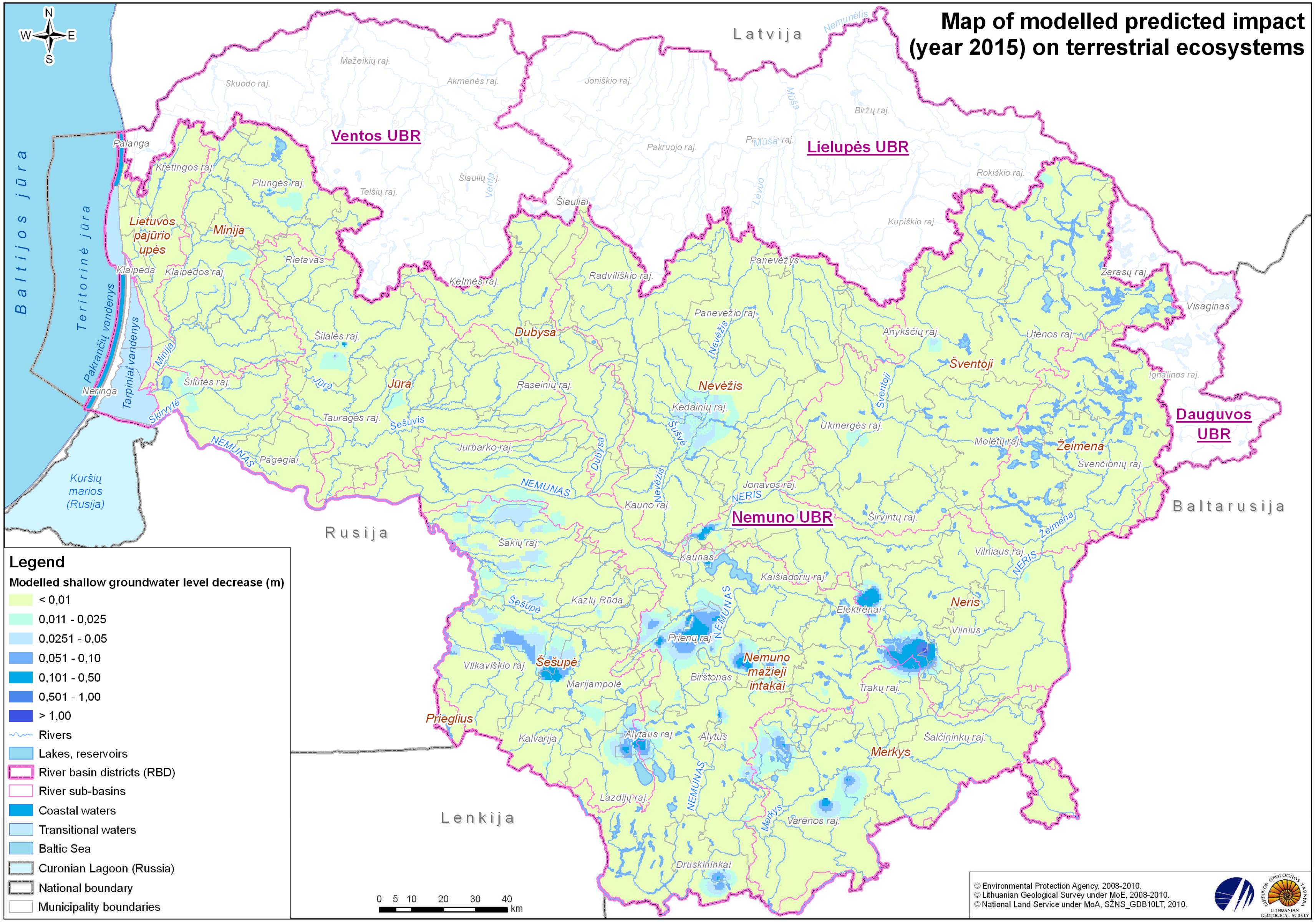


Figure 26. Simulated forecasted impact (2015) of groundwater on terrestrial ecosystems

Summary of significant impacts and anthropogenic pressures on surface waters and groundwater, including the impact of water abstraction

129. Daily consumption of fresh groundwater has been continuously decreasing during the last years – from 1.2–1.4 million m^3 to 0.4 million m^3. The underlying reason is significantly decreased water consumption in the sector of industry and agriculture, water prices which are going up due to objectives reasons and thus making people save. Due to such decreased consumption of groundwater and availability of sufficiently large water resources, only local negative impacts of the abstraction are observed within the Nemunas RBD.

An analysis of the impact of diffuse and point pollution on shallow groundwater shows that concentrations of nitrogen compounds at the regional level do not exceed the requirements for drinking water standards.

It was established that abstraction of groundwater in the neighbouring countries does not have any negative impact on shallow and deeper groundwater aquifers in the Nemunas RBD.

There are no groundwater wellfields in confined aquifers of the Nemunas RBD which would negatively affect surface water bodies or terrestrial ecosystems dependent on groundwater.

Summing up, it can be maintained that the impact of anthropogenic activities on surface waters and groundwater, including the impact of water abstraction, is of a minor importance.

CHAPTER IV. PROTECTED AREAS

130. The whole system of protected areas in Lithuania is composed of the following:
130.1. Protected areas of conservational priority protecting unique or typical complexes and objects of natural and cultural landscape. This category includes strict reserves (natural and cultural), reserves, as well as objects of natural and cultural heritage (monuments).
130.2. Protected areas of ecological protection priority which are singled out in order to avoid adverse effects on protected complexes and objects of natural and cultural heritage or adverse impact of anthropogenic objects on the environment. Zones of ecological protection are attributed to this category.
130.3. Protected areas of recuperational protection which are designed for restoration, augmentation and protection of natural resources. Recuperational and genetic plots are attributed to this category.
130.4. Integrated protected areas which include preservation and protection areas, as well as recreational and economic zones under a general programme for protection, management and use. State (national and regional) parks and biosphere monitoring areas (biosphere reserves and biosphere grounds) are attributed to this category.

131. At present, the system of particularly protected areas occupies over 998 thousand ha, that is, about 15.3 % of the total area of the country (source: www.vstt.lt).

132. Protected areas in Lithuania are established for the purposes of:

132.1. protecting natural and cultural heritage, landscape and biological diversity;

132.2. sustaining the ecological balance of the landscape;
132.3. preserving the genetic fund;
132.4. restoring natural resources;
132.5. creating conditions for recreation, scientific observations, environmental monitoring;
132.6. promoting the protection of natural and cultural heritage.

133. With a view to implement the requirements of Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds and Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, Lithuania has been developing the network of NATURA 2000 sites. NATURA 2000 sites have been incorporated into the existing national system of protected areas.

The objectives for NATURA 2000 sites are defined in two EU directives, namely, Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds and Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. In principle, both of these directives require establishment of special protected areas designated for certain species of birds or for important habitats. Having selected sites eligible for protection pursuant to Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds and Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, specific objectives were formulated for each protected area and the possibilities of achieving these objectives were explored.

Currently, there are 77 sites of importance for the conservation of birds and 296 sites of importance for the conservation of habitats throughout the country.

The objectives set for protected areas do not contradict the purpose of the Water Framework Directive.

Particularly protected areas lying within Nemunas RBD take up about 16.8 % of the total area of the basin (Table 81 and Figure 27) and are slightly above the national average. Nemunas RBD contains relatively more protected areas of all types, except for biosphere grounds. The major protected areas in Lithuania since long ago have been concentrated in laky uplands, sandy plains, and on the seaside. The national landscapes of this type mostly belong to the Nemunas RBD and indirectly condition an abundance of protected areas. On the other hand, the Nemunas RBD occupies two thirds of the total area of the country; therefore, most indicators of protected areas are rather close to national averages.

Table 81. Categories and areas of protected areas in the Nemunas RBD

Categories and types of protected areas	Number	Area (ha)	% of protected areas in the RBD	Ratio with the country’s average
Strict reserves and small strict reserves	5	14 834	0.31	>
Natural and complex reserves	284	137 031	2.83	>
Recuperational plots	4	875	0.02	>
National parks	5	148 925	3.08	>
Regional parks	27	366 668	7.58	>
Biosphere reserves	1	18 490	0.38	>
Biosphere grounds	17	127 464	2.64	<
Total:	**343**	**814 286**	**16.83**	**>**

Pursuant to the requirements of Article 6 of and Annex IV to WFD, the register of protected areas should include the following lists: protective zones for bodies of water intended for human consumption; bodies of water designated as recreational waters (bathing waters); areas designated for the conservation of habitats or species, including relevant NATURA 2000 sites. All maps and registers of protected areas required under WFD have been compiled.

134. The above-listed protected areas were established observing the following legislation of the Republic of Lithuania:

134.1. Regulations on Areas Important for the Conservation of Birds approved by Resolution No. 276 of the Government of the Republic of Lithuania of 15 March 2004 (Žin., 2004, No. 41-1335, 2006, No. 44-1606). 77 areas important for the conservation of birds were approved under the said piece of legislation. The full list of protected areas or parts thereof containing areas important for the conservation of birds in the Republic of Lithuania (including maps with specific territorial boundaries) is provided in Resolution No. 399 of the Government of the Republic of Lithuania of 8 Aril 2004 (Žin., 2004, No. 55-1899, 2006, No. 92-3635).

134.2. A list of sites in conformity with screening criteria for areas important for the conservation of natural habitats approved by Order No. D1-210 of the Minister of the Environment of 22 April 2009 (Žin., 2009, No. 51-2039; 2009, No. 135-5903).

134.3. The requirements of Directive 2006/7/EC of the European Parliament and of the Council concerning the management of bathing water quality and repealing Directive 76/160/EEC were transposed into the national legislation by the Lithuanian Hygiene Norm HN 92:1999 “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), and monitoring of the bathing water quality is regulated pursuant to Resolution No. 668 of the Government of the Republic of Lithuania of 25 June 2009 on the approval of the Bathing Water Quality Monitoring Programme for 2009-2011 (Žin., 2009, No. 80-3344).

134.4. Sanitary protection zones of wellfields (SPZ) are established and validated pursuant to 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)

Sanitary protection zones of wellfields

135. Sanitary protection zones (SPZ) and belts around wellfields and individual bore-wells are designed to protect groundwater sources against pollution, as well as to ensure the safety and quality of groundwater supplied to customers. SPZ must be defined and established for all wellfields supplying more than 10 m^3 a day as an average or serving more than 50 persons.

136. There are three belts of sanitary protection zones around wellfields and individual bore-wells:

136.1. the belt of strict regime (first belt) is designed for the protection of the wellfield and groundwater capture system therein against intentional or accidental pollution where any economic or other activity not related with groundwater abstraction, improvement and supply is forbidden;

136.2. the belt preventing microbial pollution (second belt) is a protective belt where microbial and chemical pollution is restricted;

136.3. the belt preventing chemical pollution (third belt) is a protective belt where chemical pollution is restricted.

137. By the year 2008, 480 sanitary protection zones around public water supply wellfields were entered in the Register of the Earth Entrails of the Lithuanian Geological Survey (Figure 28), which accounts for about one third of public water supply wellfields exploited in the country. Out of the given number, only four wellfields have sanitary protection zones (SPZ) installed as required by the Lithuanian Hygiene Norm HN 44:2006 "Delineation and maintenance of sanitary protection zones of wellfields". As regards the remaining wellfields exploiting more than 100 m^3 a day as an average, SPZ have been defined, but not yet legalised. The legalisation of SPZ in territorial planning documents and decisions is an appropriate measure for the protection of groundwater resources. Control over the SPZ of wellfields is exercised by officials of REPD within their competence in accordance with the procedure established by legal acts in respect of the safety of groundwater, pollution prevention and accounting of the amounts of groundwater resources extracted, as well as by officials of the State Food and Veterinary Service in accordance with the procedure established by the Law of the Republic of Lithuania on Drinking Water.

138. In 2008, the condition of 151 bathing sites in Lithuania was observed, 70 of which lie within the Nemunas RBD. The map of the bathing sites is given in Figure 29.

139. In addition, the entire territory of Lithuania has been declared to be a nutrient-sensitive area. This means that all farmers in Lithuania must observe the agri-environmental measures provided for in the Rural Development Programme. The entire territory of Lithuania has also been declared a vulnerable zone in respect of pollution regulated under Urban Waste Water Treatment Directive 91/271/EEC. Sensitive areas include all natural rivers, lakes, ponds and reservoirs, transitional waters, and coastal waters.

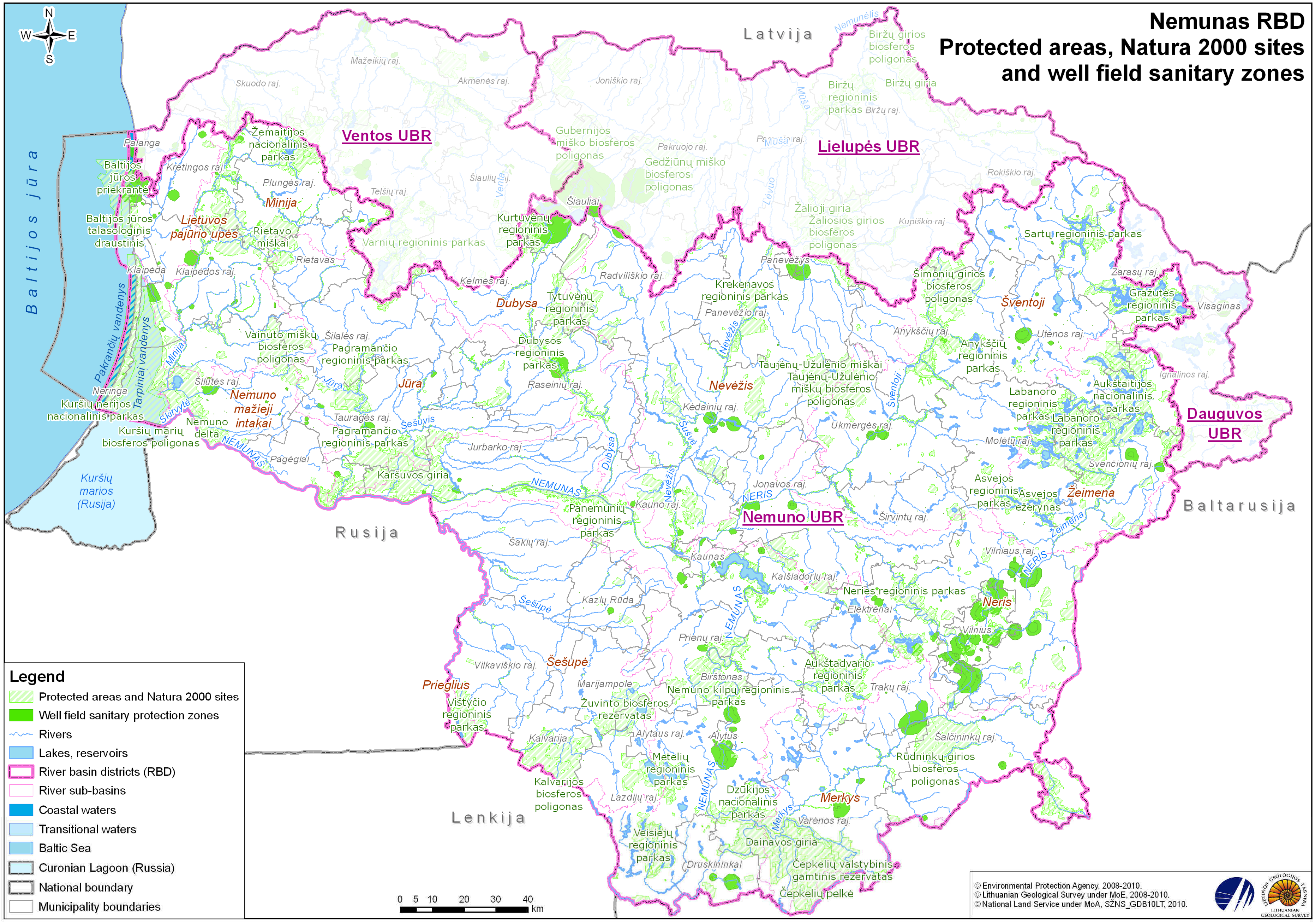


Figure 27. Sanitary protection zones of protected areas and wellfields in the Nemunas RBD

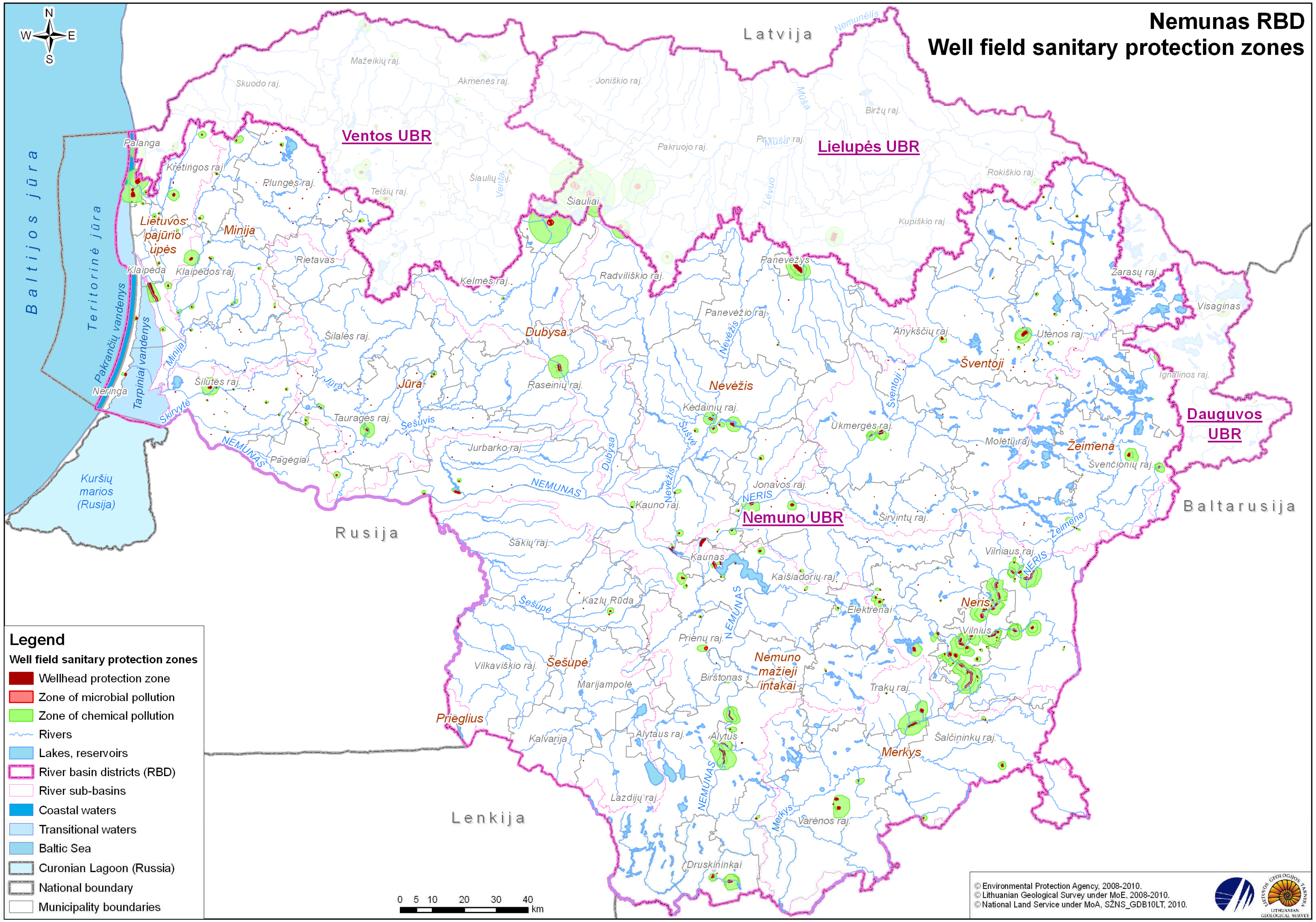


Figure 28. Sanitary protection zones of wellfields

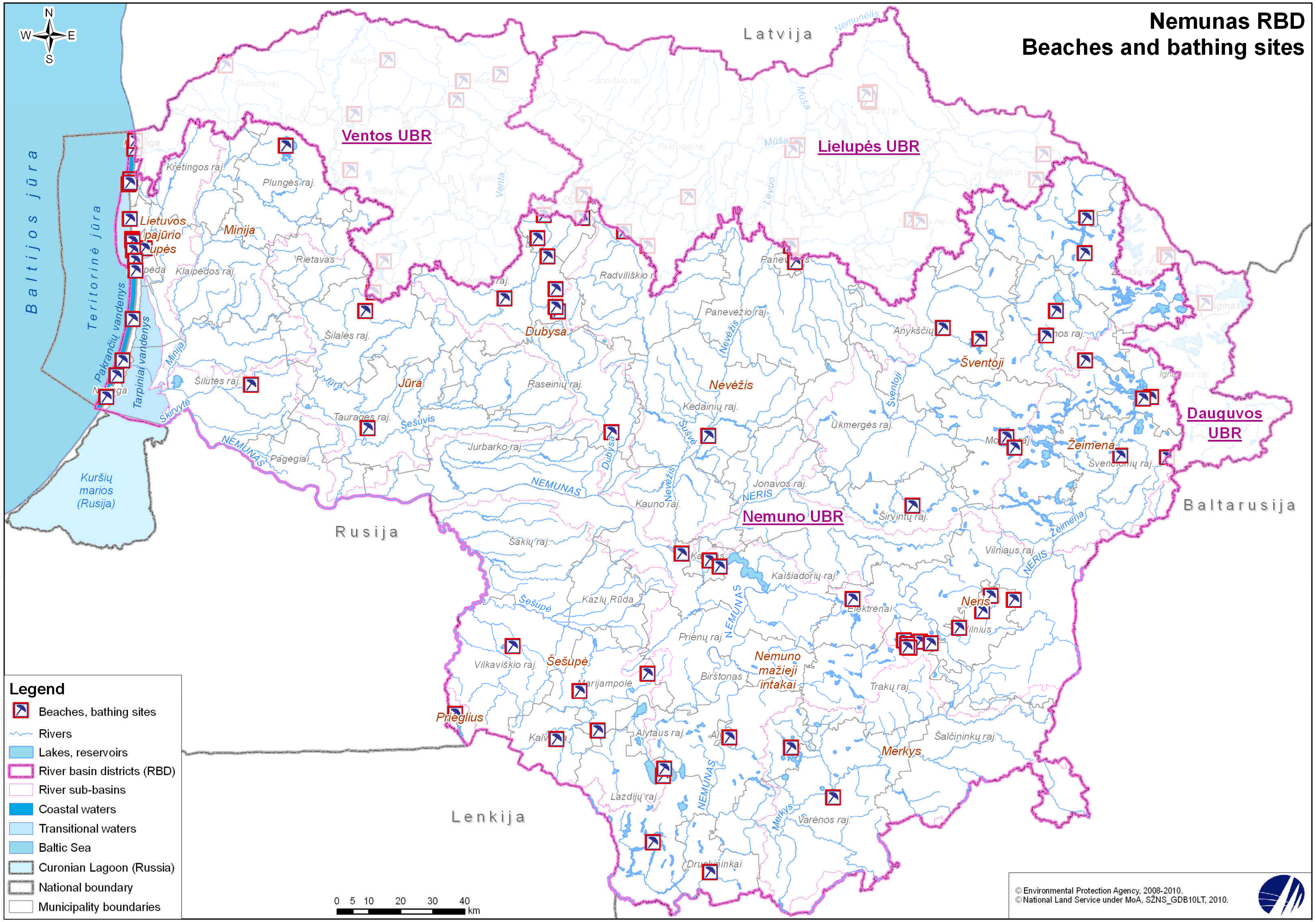


Figure 29. Beaches and bathing sites in the Nemunas RBD

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

SECTION I. SURFACE WATER BODIES

Monitoring programme for surface water bodies

140. 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 providing conditions for the attainment of good ecological and chemical status of rivers, lakes, ponds, transitional and coastal water bodies and related ecosystems.

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

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.

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

141. Surveillance intensive monitoring sites have been selected:

141.1. in the major rivers of sub-basins;
141.2. at the mouth of the rivers flowing into the Baltic Sea;
141.3. in transboundary water bodies situated at the border;
141.4. in water bodies suffering from a significant agricultural impact;
141.5. in reference water bodies (unaffected by anthropogenic pressures);
141.6. in other water bodies of national significance (Kauno Marios Lagoon).

142. Surveillance extensive monitoring is carried out for water bodies which are indicative of the overall status of water bodies, that is, 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.

143. 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.

144. Investigative monitoring is undertaken in cases when the reason of failure of an indicator 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.

145. 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, 584 water bodies in the category of rivers, 276 water bodies in the category of lakes, 4 water bodies in the category of transitional waters and 2 water bodies in the category of coastal waters (including heavily modified and artificial water bodies) have been identified within the Nemunas RBD. Hence, the task of the monitoring programme is to reflect the status of all 866 water bodies in the Nemunas RBD.

Network of monitoring sites for water bodies in the category of rivers

146. 584 water bodies have been identified as falling into the category of rivers (including heavily modified and artificial water bodies) within the Nemunas RBD. If monitoring sites were planned in each water body, the monitoring network would be too wide. For this reason, the monitoring network was developed taking into account that each sub-basin contains water bodies characterised by similar typological descriptors, status and factors determining the status. In order to reduce the total number of monitoring sites, at least one monitoring site was selected for a group of water bodies differentiated by the same type, status and factors determining status, that is, one monitoring site represents the status of water bodies within the same sub-basin. Such grouping of water bodies for monitoring purposes was applied in respect of water bodies at high and good ecological status, at maximum and good ecological potential, as well as to water bodies where ecological status lower than good is determined by the bed straightening. For instance, if the monitoring site is located in a water body of high ecological status belonging to the first type, it is assumed that the monitoring data from this monitoring site represents the quality of all water bodies at high ecological status belonging to the first type within the respective sub-basin. Individual operational monitoring sites were provided for in each of the water bodies where ecological status lower than good is determined by an impact of hydropower plants, 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 network of surveillance intensive monitoring 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 in the Nemunas RBD covers 300 sites. Surveillance intensive monitoring should be carried out at 36 sites, surveillance extensive monitoring – at 74 sites, and operational monitoring – at 190 sites. The surveillance intensive monitoring network includes 6 sites for the monitoring of reference conditions and six sites for the monitoring of impacts of agricultural activities. Reference monitoring should also be undertaken at five sites of surveillance extensive monitoring. The surveillance intensive monitoring programme also includes observations at rivers flowing into the Baltic Sea (5 sites), transboundary rivers (5 sites) and major tributaries of the Nemunas river (14 sites).

The number of monitoring sites in the basins and sub-basins of the Nemunas RBD is provided in Table 82 below.

Table 82. Type and number of monitoring sites in basins and sub-basins of the Nemunas RBD

Basin/ sub-basin	Surveillance intensive monitoring sites			Surveillance extensive monitoring sites	Operational monitoring sites
	Total number	of which reference monitoring	of which agricultural monitoring		
Žeimena	5	4	0	4	4
Šventoji	4	1	1	6	15
Neris Small Tributaries	2	0	0	6	13
Nevėžis	4	0	2	3	64
Merkys	3	1	0	12	6
Nemunas Small Tributaries	7	0	1	12	20
Šešupė	3	0	1	5	35
Dubysa	2	0	0	4	11
Jūra	3	0	1	11	10
Minija	2	0	0	7	7
Lithuanian Coastal Rivers	1	0	0	4	5
Prieglius	0	0	0	0	0
Total:	**36**	**6**	**6**	**74**	**190**

Network of monitoring sites for lakes, ponds and a quarry

147. The status of lakes, ponds and a quarry can be affected and determined by different factors; thus, due to the unique conditions in each lake or pond and in the quarry, monitoring should be carried out in respect of all water bodies falling under the category of lakes. The programme of monitoring of lakes, ponds and the quarry covers the total of 276 sites. Surveillance extensive monitoring should be carried out in 155 lakes, 64 lakes should be subject to operational monitoring and 7 lakes – to intensive reference monitoring, while extensive reference monitoring should also be undertaken in 7 lakes. 17 ponds should be subject to surveillance monitoring (including intensive surveillance monitoring in 1 reservoir, Kauno Marios Lagoon), 25 ponds – to operational monitoring. The quarry requires surveillance extensive monitoring.

The number of monitoring sites for lakes and ponds in the basins and sub-basins of the Nemunas RBD is provided in Table 83.

Table 83. Type and number of monitoring sites for lakes, ponds and the quarry in basins and sub-basins of the Nemunas RBD

Basin/sub-basin	Monitoring of lakes			Monitoring of ponds		Monitoring of the quarry
	Surveillance extensive	Operational	Reference	Surveillance	Operational	Surveillance
Žeimena	49	8	5	0	0	0
Šventoji	44	10	5	6	1	0
Neris Small Tributaries	13	6	0	0	1	0
Nevėžis	1	0	0	1	11	1
Merkys	9	7	0	3	0	0
Nemunas Small Tributaries	34	22	1	4	5	0
Šešupė	1	9	0	1	3	0
Dubysa	1	1	1	0	0	0
Jūra	0	1	0	0	3	0
Minija	2	0	2	1	0	0
Lithuanian Coastal Rivers	0	0	0	1	1	0
Prieglius	1	0	0	0	0	0
Total:	**155**	**64**	**14**	**17**	**25**	**1**

Since networks of monitoring of different types differ in their purposes, the elements analysed also differ, and so does regularity and frequency of monitoring.

Network of monitoring sites for transitional and coastal water bodies

148. The monitoring network for transitional (including one heavily modified water body, Klaipėda Strait) and coastal water bodies cover 22 sites. As it can happen that none of the water bodies achieves water protection objectives, operational monitoring shall be performed. The frequency of monitoring was selected so as to obtain enough of data for assessment of the status of quality elements and its variation. The planning of the monitoring programme for 2011–2016 also took into account the data collected during the National Environmental Monitoring Programme for 2005–2010 (and much earlier) and distribution of historic monitoring sites, which enables assessing multi-annual tendencies of variation of parameter values. Extensive monitoring will be performed in two sites in coastal waters and in one site in transitional waters – that is, once in three years.

The WFD points out that in respect of chemical status surface waters shall also include territorial waters. However, observing long-established monitoring traditions in the territorial sea, monitoring also involves analysis of biological quality elements in addition to hazardous substances and physico-chemical parameters. Monitoring in these waters is conducted in nine points. Following scientists' recommendations, the data obtained from two monitoring sites situated past the boundaries of one nautical mile shall be used to assess the status of open rocky coast of the Baltic Sea. With a view to evaluate a potential impact of clean soil dumped in the sea on the marine environment, one monitoring site in the territorial sea was assigned for investigative monitoring. Here analysis will be performed occasionally, taking into account the frequency of soil dumping.

The number of monitoring sites for transitional and coastal water bodies and the territorial sea is provided in Table 84.

Table 84. The type and number of monitoring sites in transitional (including one heavily modified water body) and coastal water bodies and territorial sea

Transitional water bodies	Coastal water bodies	Territorial sea	
Operational monitoring	Operational monitoring	Operational monitoring	Investigative monitoring
16	6	9	1

Monitoring programme for rivers, heavily modified and artificial water bodies

Surveillance intensive monitoring

149. Frequencies of monitoring of parameters indicative of all quality elements were established so as to ensure a high level of data confidence and precision. Hydrological parameters and parameters for general 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 rivers entering the sea, transboundary rivers and their main tributaries.

Concentrations of hazardous substances (HS) and metals shall be measured 12 times a year in transboundary rivers, rivers entering the sea, their main tributaries and in rivers in basins situated in agricultural areas. If concentrations of hazardous substances and metals in the water of the main tributaries and rivers in basins situated in agricultural areas do not exceed the established standards (the maximum allowed concentrations of these substances) during the first year of the monitoring, repeat samples for assessment of concentrations may be taken in three years. Once a year concentrations of metals and hazardous substances in the main tributaries, transboundary rivers and rivers entering the sea shall also be measured in their sediments. Not all hazardous substances may be monitored in the water of rivers in basins situated in agricultural areas but only those which are most likely to be detected.

The frequency of parameters for 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. Parameters for macrophytes in reference sites should be measured every three years (one measurement per year). More frequent monitoring of macrophytes in reference condition sites (once in three years) are required for a more precise characterisation of macrophyte communities under reference conditions, meanwhile in the remaining sites parameters for macrophytes may be measured once in six years. Though this frequency is lower than the one given in the WFD (once in three years), it is deemed to be sufficient for the monitoring of the status of macrophytes because macrophyte communities are one of the most inert ones (changing the most slowly) among biological elements. Measurements of parameters for fish, which are more quickly reacting to environmental changes, in the sites of intensive monitoring should be performed once in three years and benthic invertebrates should be monitored every year. Parameters for phytobenthos should be measured on an annual basis four time a year. Of all biological elements, these parameters are the first to react to changes in the water quality hence four measurements per year are expected to provide information on momentary (short-term) impacts of changes in the water quality. Parameters indicative of biological elements for rivers entering the sea are proposed to be measured only in the Nemunas upstream of the Curonian Lagoon. Aquatic communities in other places of the river may have changed due to specific conditions (untypical river points). Monitoring of phytoplankton (chlorophyll *a*) is proposed only for the Nemunas upstream of the Curonian Lagoon (very large lower reaches of the river where the concentration of chlorophyll *a* may reflect pollution with biogenic elements) as well as in the Nemunas at Druskininkai and in the Neris at Buivydžiai. In the latter two sites monitoring is required in order to explain high concentrations of BOD_7 registered in these rivers in summer time. Parameters indicative of morphological conditions, which change the most slowly, and river continuity are sufficient to be monitored once during a six-year monitoring cycle (Table 85, Figure 30).

Table 85. Surveillance intensive monitoring programme for rivers. Analyses to be performed in each analytical package (AP) are provided in Table 88

Elements for monitoring		**Surveillance intensive monitoring sites in rivers**														
		Reference condition sites			**Rivers entering the sea**			**Transboundary rivers**			**Main tributaries**			**Basins in agricultural areas**		
	1	2	3	4	2	3	4	2	3	4	2	3	4	2	3	4
General physico-chemical parameters	AP 1	6	12	6	5	12	6	5	12	6	14	12	6	6	12	6
Main ions	AP 2	6	4	2	5	12	6	5	12	6	14	12	6	6	4	2
Metals	AP 3	0	0	0	5	12	6	5	12	6	14	12	6	6	12	6
Metals in sediments	AP 3	0	0	0	5	1	6	5	1	6	14	1	6	0	0	0
Hazardous substances	AP 4	0	0	0	5	12	6	5	12	6	14	12	6	6	12	6
Hazardous substances in sediments	AP 4	0	0	0	5	1	6	5	1	6	14	1	6	0	0	0
Phytoplankton	AP 5	0	0	0	1(1)	4	6	2(2)	4	6	0	0	0	0	0	0
Macrophytes	AP 6	4	1	2	1(1)	1	1	5	1	1	14	1	1	5	1	1
Benthic invertebrates	AP 7	6	1	6	1(1)	1	6	5	1	6	14	1	6	6	1	6
Fish	AP 8	6	1	2	1(1)	1	2	5	1	2	14	1	2	6	1	2
Phytobenthos	AP 9	6	4	6	1(1)	4	6	5	4	6	14	4	6	6	4	6
Hydrological regime	AP 10	6	12	6	5	12	6	5	12	6	14	12	6	6	12	6
Morphological conditions	AP 11	6	1	1	5	1	1	5	1	1	14	1	1	6	1	1
River continuity	AP 12	6	1	1	5	1	1	5	1	1	14	1	1	6	1	1

(1) - Nemunas above Rusnė upstream of the Leitė
(2) - Nemunas at Druskininkai, Neris at Buivydžiai

Explanation of the numeration of the columns:

1 – analytical package, lists of parameters for each analytical package are provided in Table 4.7
2 – number of monitoring sites
3 – annual number of samples in sites
4 – frequency during a six-year monitoring cycle

Note:
If concentrations of hazardous substances and metals in the water of the main tributaries and rivers in basins situated in agricultural areas do not exceed the established standards (the maximum allowed concentrations of these substances) during the first year of monitoring, repeat samples for assessment of concentrations may be taken in three years.

Surveillance extensive monitoring

150. Surveillance extensive monitoring aims to observe 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. Hence it is sufficient to monitor only the main elements: general physico-chemical parameters, hydrological regime, morphological conditions, river continuity, the main ions and biological indicators. Accordingly, the monitoring frequency is also lower: measurements of parameters in the same monitoring site should be performed every three years, except for parameters for phytoplankton, 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 shall be measured four times (every three months) and the remaining parameters – once a year.

The frequency and regularity of the monitoring of all parameters to be observed conform to the requirements specified in the WFD and are sufficient for monitoring general ecological status of water bodies and ensuring medium confidence and precision of the data. 74 sites for surveillance extensive monitoring have been provided for in the Nemunas RBD (including 5 sites for the monitoring of reference conditions, Table 86, Figure 30).

Table 86. Surveillance extensive monitoring programme for rivers (natural and heavily modified and artificial canals). Analyses to be performed in each analytical package (AP) are provided in Table 88

	Surveillance extensive monitoring sites in rivers						
Elements for monitoring		**Reference condition sites**			**Other sites**		
	1	2	3	4	2	3	4
General physico-chemical parameters	AP 1	5	4	2	69	4	2
Main ions	AP 2	5	1	2	69	1	2
Macrophytes	AP 6	1	1	1	36	1	1
Benthic invertebrates	AP 7	5	1	2	69	1	2
Fish	AP 8	5	1	2	69	1	2
Phytobenthos	AP 9	5	1	2	69	1	2
Hydrological regime	AP 10	5	4	2	69	4	2
Morphological conditions	AP 11	5	1	1	69	1	1
River continuity	AP 12	5	1	1	69	1	1

Explanation of the column numeration:
1 – analytical package, lists of parameters for each analytical package are provided in Table 88
2 – number of monitoring sites
3 – annual number of samples in sites
4 – frequency during a six-year monitoring cycle

Operational monitoring

151. 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 achievement of water protection objectives. The operational monitoring network in the Nemunas RBD covers 190 river sites (Table 87, Figure 30).

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 and not 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 elements which might prevent 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, that is, river morphology, continuity and macrophytes (the latter shall be monitored only in river stretches which are not Type-1 rivers). Though the monitoring frequency for macrophytes is lower than indicated in the WFD (once in three years), it is deemed to be sufficient because macrophyte communities are one of the most inert ones (changing the most slowly) among biological elements. General physico-chemical parameters shall be measured in all river sites subject to operational monitoring 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, except for the river sites affected by HPP where the hydrological regime should be measured on an annual basis 12 times a year (that is, every month). These measurements will allow making a more accurate assessment of the impact of HPP on the hydrological regime of rivers. Monitoring of metals and other hazardous substances is recommended only in the river stretches where good chemical status is not likely to be achieved because of these elements (there are eight such places in the Nemunas RBD), making the measurements in water during the monitoring year every month (12 times a year) and in bottom sediments – once a year (twice during a six-year monitoring cycle).

Parameters indicative of biological elements, that is, those for benthic invertebrates and fish, shall be measured once a year (every three years) and parameters for phytobenthos (as parameters indicative of physico-chemical quality elements) are recommended to be measured four times a year because parameters for phytobenthos are the ones which change the most quickly as a result of changes in water quality.

Investigative monitoring

152. Measured values of certain parameters indicative of physico-chemical quality elements in a number of operational monitoring sites (water bodies where water protection objects are not likely to be achieved) differ from the ones indicated by the information on pollution loads (simulated values). More intensive – investigative monitoring is recommended for such places (22 sites; Table 87, Figure 30) in order to find out precise actual values of the parameters and, at the same time, potential sources of pollution. Values of general physico-chemical parameters and the quantity of flow in such places should be measured 12 and not 4 times a year (every year).

Table 87. Investigative monitoring programme for rivers. Analyses to be performed in each analytical package (AP) are provided in Table 88

Elements for monitoring	**Operational and investigative monitoring sites**			
	1	2	3	4
General physico-chemical parameters	AP 1	22(1)/168	12(1)/4	2
Metals(2)	AP 3	8(2)/182	12(2)/0	2(2)/0
Metals in sediments(2)	AP 3	8 (2)/182	1(2)/0	2(2)/0
Hazardous substances (2)	AP 4	8 (2)/182	12(2)/0	2(2)/0
Hazardous substances in sediments(2)	AP 4	8 (2)/182	1(2)/0	2(2)/0
Macrophytes	AP 6	75	1	1
Benthic invertebrates	AP 7	190	1	2
Fish	AP 8	190	1	2
Phytobenthos	AP 9	190	4	2
Hydrological regime (3)	AP 10	27(3)/163	12(3)/4	6(3)/2
Morphological conditions	AP 11	190	1	1
River continuity	AP 12	190	1	1

(1) – investigative monitoring sites/remaining sites
(2) – sites at risk due to hazardous substances (8 sites)/remaining sites
(3) – sites at risk due to HPP impact (33 sites)/remaining sites

Explanation of the column numeration:
1 – analytical package, lists of parameters for each analytical package are provided in Table 88
2 – number of monitoring sites
3 – annual number of samples in sites
4 – frequency during a six-year monitoring cycle

Table 88. Parameters in each analytical package (for rivers)

Analytical package	**Lists of parameters**
AP 1	General physico-chemical parameters: temperature, colour (Pt mg/l), pH, oxygen concentration, BOD_7, suspended particles, P total, PO_4-P, N mineral, N total, NO_3-N, NH_4-N, NO_2-N, VOA, COD, Mn, Ca, electric conductivity, alkalinity
AP 2	Main ions Cl, SO_4, Na, K, Mg, Si
AP 3	Heavy metals: lead and its compounds, nickel and its compounds, total chromium, chromium VI, copper, cadmium, tin, vanadium, arsenic, aluminium, zinc, mercury
AP 4	Hazardous substances listed in the Wastewater Management Regulation approved by Order No. D1-515 of the Minister of the Environment of 8 October 2007 (Žin., 2007, No. 110-4522)
AP 5	Phytoplankton: species composition, abundance, biomass, parameters for indicative groups, chlorophyll *a*
AP 6	Macrophytes: species composition, abundance and bottom coverage with each species (SI or other adequate indices)
AP 7	Benthic invertebrate fauna: species composition, abundance of individuals of each species (DSFI or other adequate indices)
AP 8	Fish: species composition, abundance of individuals of each species (DSFI or other adequate indices)
AP 9	Phytobenthos: species composition, abundance
AP 10	Hydrological regime: quantity of water flow
AP 11	Morphological conditions: type of river bed, length and width of natural riparian vegetation zone
AP 12	River continuity: artificial barriers for fish migration and transportation of outwash material

Monitoring programme for lakes, ponds and quarries

Surveillance intensive monitoring

153. Surveillance intensive monitoring is intended for monitoring the ecological status of the most important lakes and ponds, including the ones with a significant quantity of water in respect of the entire river catchment (ponds included). Surveillance intensive monitoring is recommended for lakes representing different lake types (7 lakes) as well as for Kauno Marios Lagoon (where the water quantity is significant in respect of the entire river catchment) (Table 89, Figure 31).

Frequencies of monitoring of parameters indicative of all quality elements were chosen so as to ensure a high level of confidence and precision. It is suggested that parameters indicative of general physico-chemical quality elements are measured on an annual basis nine times a year (during a period when water is free from ice cover) in surveillance intensive monitoring sites. Parameters for phytoplankton which are the most sensitive to changes in physico-chemical parameters shall be measured in surveillance intensive monitoring sites on an annual basis six times a year (in April, May, July, August, September and October). In Kauno Marios Lagoon, concentrations of hazardous substances and metals shall be measured every year: in water – nine time a year, in bottom sediments – once a year. The sufficient frequency for the monitoring of parameters indicative of biological elements which are reacting to environmental changes slower, such as macrophytes, fish and benthic invertebrate fauna, is once every three years (twice during a six-year monitoring cycle). Monitoring of parameters for macrophytes is recommended only in six lakes of seven reference condition lakes (macrophyte communities in one of them, Lake Šventas, are atypical due to natural characteristics of the lake). Morphological conditions shall be assessed and the water exchange rate shall be measured once during a six-year monitoring cycle.

Table 89. Surveillance intensive monitoring programme for lakes and ponds. Analyses to be performed in each analytical package (AP) are provided in Table 92

Elements for monitoring	**Surveillance intensive monitoring sites in lakes and ponds**						
		Reference condition lakes			**KaunoMarios Lagoon**		
	1	2	3	4	2	3	4
General physico-chemical parameters	AP 13	7	9	6	1	9	6
Metals	AP 14	0	0	0	1	9	6
Metals in sediments	AP 14	0	0	0	1	1	6
Hazardous substances	AP 15	0	0	0	1	9	6
Hazardous substances in sediments	AP 15	0	0	0	1	1	6
Phytoplankton	AP 16	7	6	6	1	6	6
Macrophytes	AP 17	6	1	2	1	1	2
Fish	AP 18	7	1	2	1	1	2
Benthic invertebrate fauna	AP 19	7	1	2	1	1	2
Water exchange rate	AP 20	7	1	1	1	1	1
Morphological conditions	AP 21	7	1	1	1	1	1

Explanation of the column numeration:

1 – analytical package, lists of parameters for each analytical package are provided in Table 92
2 – number of monitoring sites
3 – annual number of samples in sites
4 – frequency during a six-year monitoring cycle

Surveillance extensive monitoring

154. This type of monitoring is intended to monitor general status of water bodies which are not at risk. The monitoring network in the Nemunas RBD covers 162 lakes

(including 7 reference condition lakes), 1 artificial lake (Lampėdžių Quarry) and 16 ponds. The ecosystems of lakes change rather slowly hence it is sufficient to measure parameters for the monitoring elements once during a six-year cycle. Such frequency and regularity of monitoring meet the minimum requirements established in the WFD and are sufficient for ensuring a medium level of data confidence and precision.

Parameters indicative of general physico-chemical elements and phytoplankton shall be measured at least four times a year during the monitoring 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). Parameters for the remaining monitoring elements shall be measured once in a monitoring cycle. Monitoring is not recommended for macrophytes and benthic invertebrates in naturally aging lakes (where communities may have undergone changes due to natural reasons).

Table 90. Surveillance extensive monitoring programme for lakes and ponds. Analyses to be performed in each analytical package (AP) are provided in Table 92

Elements for monitoring	**Surveillance extensive monitoring sites in lakes and ponds**												
		Reference condition lakes			Other lakes			Ponds			Artificial lakes (quarries)		
	1	2	3	4	2	3	4	2	3	4	2	3	4
General physico-chemical parameters	AP 13	7	4	1	155	4	1	16	4	1	1	4	1
Phytoplankton	AP 16	7	4	1	155	4	1	16	4	1	1	4	1
Macrophytes	AP 17	7	1	1	145	1	1	16	1	1	1	1	1
Fish	AP 18	7	1	1	151	1	1	16	1	1	1	1	1
Benthic invertebrates	AP 19	7	1	1	145	1	1	16	1	1	1	1	1
Water exchange rate	AP 20	7	1	1	155	1	1	16	1	1	1	1	1
Morphological conditions	AP 21	7	1	1	155	1	1	16	1	1	1	1	1

Explanation of the column numeration:

1 – analytical package, lists of parameters for each analytical package are provided in Table 92

2 – number of monitoring sites

3 – annual number of samples in sites

4 – frequency during a six-year monitoring cycle

Operational monitoring

155. Operational monitoring is carried out in lakes and ponds where the established water protection objectives are not likely to be achieved.

The operational monitoring network in the Nemunas RBD covers 64 lakes and 25 ponds (Table 91, Figure 31).

With a view to monitor changes in the ecological status, measurements of parameters indicative of general physico-chemical elements and phytoplankton as well as chlorophyll *a* in monitoring sites 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 after a certain time and not immediately. Reaction of biological elements to improved living environment in lakes is especially slow hence it is believed that such monitoring frequency ensures sufficient data confidence and precision.

In some monitoring sites (lakes and ponds where water protection objectives are unlikely to be achieved), causes which determine poorer than good ecological status are not clear (potential effects of historic pollution) and hence more intensive – investigative monitoring is recommended for such places (23 lakes and 9 ponds; Table 90) during one year in a six-year monitoring cycle in order to get more precise data on seasonal changes in general physico-chemical parameters and, at the same time, 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 in investigative monitoring sites should be measured 12 and not 4 times a year (that is, every month, including during the period of ice cover), if possible, and those of parameters for phytoplankton – 6 times a year (during the period of intensive vegetation).

Table 91. Operational monitoring programme for lakes and ponds. Analyses to be performed in each analytical package (AP) are provided in Table 92

Elements for monitoring	**Operational and investigative monitoring sites in lakes and ponds**						
		Lakes			Ponds		
	1	2	3	4	2	3	4
General physico-chemical parameters [(1)]	AP 13	23/41	12/4	1/2	9/16	12/4	1/2
Phytoplankton [(1)]	AP 16	23/41	6/4	1/2	6/16	6/4	1/2
Macrophytes	AP 17	64	1	1	25	1	1
Fish	AP 18	64	1	1	25	1	1
Benthic invertebrates	AP 19	64	1	1	25	0	0
Water exchange rate	AP 20	64	1	1	25	1	1
Morphological conditions	AP 21	64	1	1	25	1	1

[(1)] – investigative monitoring sites/remaining sites

Explanation of the column numeration:

1 – analytical package, lists of parameters for each analytical package are provided in Table 92
2 – number of monitoring sites
3 – annual number of samples in sites
4 – frequency during a six-year monitoring cycle

Table 92. Parameters in each analytical package (for lakes and ponds)

Analytical package	Lists of parameters
AP 13	General physico-chemical parameters: transparency, oxygen concentration, temperature, pH, suspended particles, 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 14	Heavy metals: lead and its compounds, nickel and its compounds, chromium total, chromium VI, copper, cadmium, tin, vanadium, arsenic, aluminium, zinc, mercury
AP 15	Hazardous substances listed in the Wastewater Management Regulation approved by Order No. D1-515 of the Minister of the Environment of 8 October 2007 (Žin., 2007, No. 110-4522)
AP 16	Phytoplankton: species composition, abundance, biomass, parameters for indicative groups, chlorophyll a
AP 17	Macrophytes: species composition, abundance and bottom coverage with each species (SI index)
AP 18	Fish: species composition, abundance of individuals of each species and biomass
AP 19	Benthic invertebrates: species composition, abundance of individuals of each species
AP 20	Water exchange rate
AP 21	Morphological conditions: changes in the shore line, length of natural riparian vegetation zone

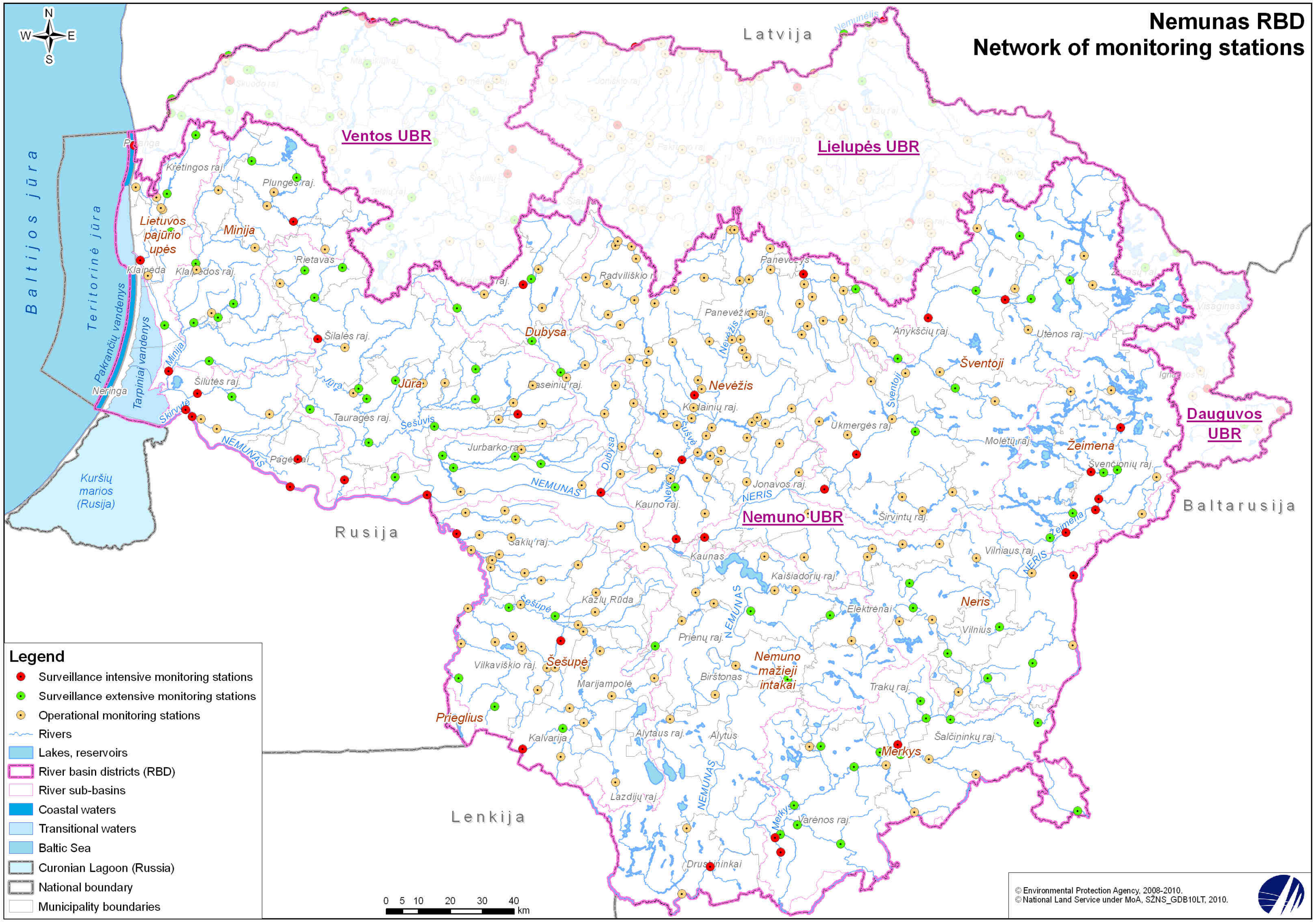


Figure 30. Monitoring sites for rivers

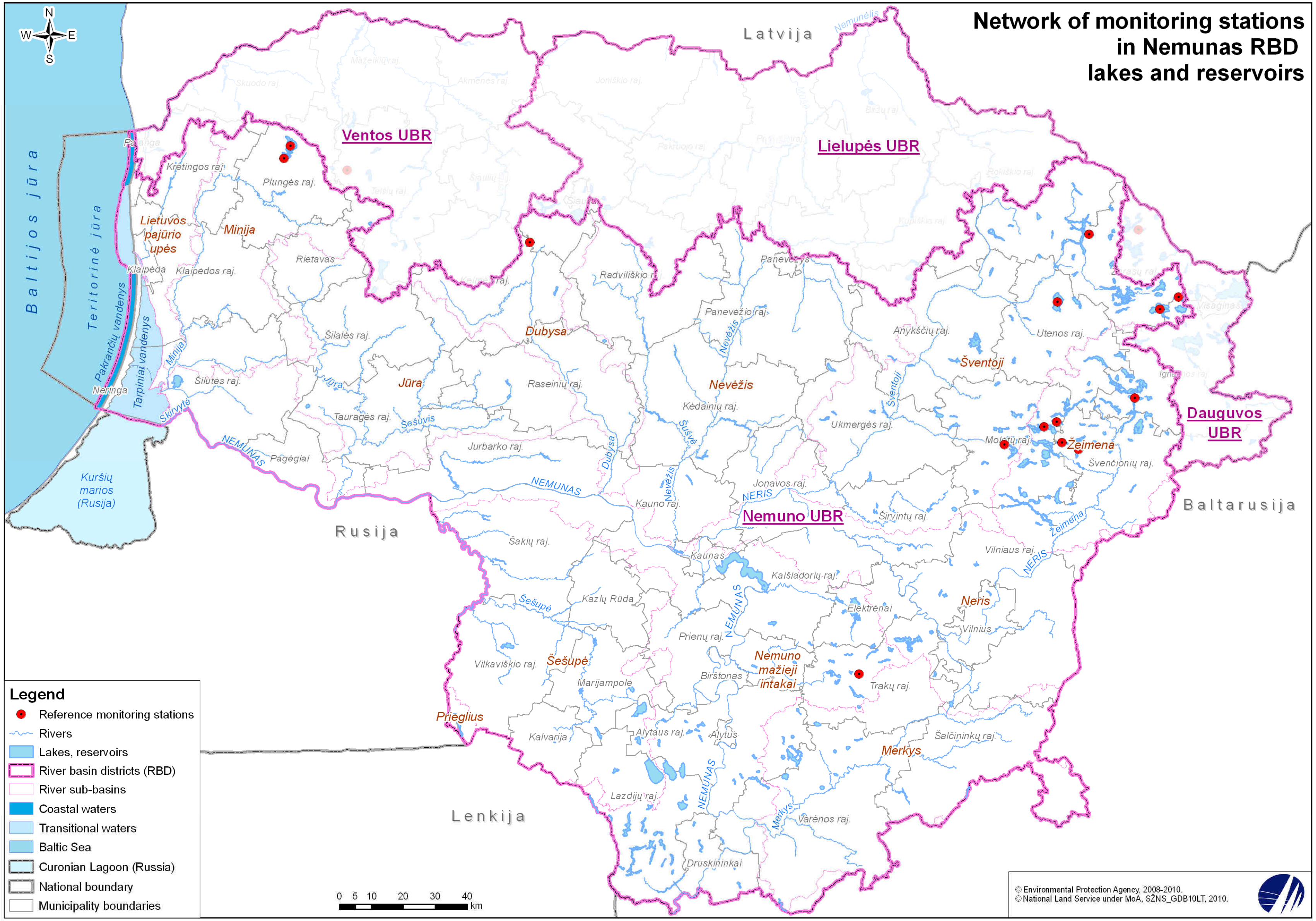


Figure 31. Monitoring sites for lakes and ponds

Monitoring programme for transitional water bodies

Operational monitoring

156. Operational monitoring is carried out in transitional water bodies where the established water protection objectives are not likely to be achieved. The operational monitoring network covers 16 sites in water bodies in the category of transitional water bodies.

Monitoring in the Curonian Lagoon shall be carried out ten times a year (during February–November). Such decision has been taken having in mind that measurements performed in winter when the lagoon is often covered with ice, may distort the actual situation. On the other hand, however, monitoring in winter is necessary because of intensive mineralisation processes occurring at that time and thus it enables assessing amounts of biogenic forms in water. In addition, winter concentrations of biogens are used in reports for implementing other directives and strategies. In most places monitoring of parameters indicative of physico-chemical quality elements and phytoplankton will be carried out ten times a year, in some points – only during the period of intensive vegetation (five times, May–September). Monitoring in the plume of the Curonian Lagoon in the Baltic Sea will be conducted four–seven times a year (once in a season; additional monitoring of parameters for physico-chemical quality elements and phytoplankton are planned in June, July, September under favourable hydrometeorological conditions).

Occasional examination indicates that large amounts of biogenic compounds may be accumulating in the bottom sediments in the Curonian Lagoon. Under favourable conditions, these compounds return to the water layer thus causing secondary pollution. Following scientists' recommendations, the monitoring programme will include monitoring of biogens in bottom sediments (in two sites twice a year) and the results obtained after a six-year monitoring cycle will be used for revising programmes of measures.

Samples of benthic invertebrate fauna will be taken in all monitoring sites once a year (in May). Macrophytes and fish will be monitored every three years (twice during a six-year monitoring cycle). Concentrations of hazardous substances (HS) relevant for transitional waters (or substances information on which is rather scarce) shall be measured ten times a year (in the Curonian Lagoon) and four times a year (in the plume) in selected sites located in the impact zone. If concentrations of hazardous substances in water do not exceed the established standards (the maximum allowed concentrations of these substances) during the first year of monitoring, repeat samples for assessing concentrations may be taken in three years. Pesticides (Table 94) in water and bottom sediments shall be monitored once a year (in August). Though such frequency is different from the one required in the WFD, long-term monitoring results indicate that concentrations of certain substances, such as mercury, DDT, etc., measured in water are usually below the establishment limit of the method used. Concentrations of oil products, detergents and some heavy metals in water in many sites will be measured four times a year (once in a season), in bottom sediments – three times a year (once in a season, except for winter). Hazardous substances in bottom sediments and biota will be monitored once a year (in August) (or at least once in three years if decided so by experts on the basis of available data). Physico-chemical parameters and hazardous substances in one site, Klaipėda Strait, will be carried out extensively, that is, once in three years.

Monitoring of morphological conditions (depth variation, composition of substratum) in the Curonian Lagoon will be carried out every three years (twice in a six-year year cycle), in the plume – every six years. Such hydrological parameters as freshwater flow, water exchange (usually assessed according to the distribution and retention of saline water) and meteorological indicators affecting these parameters shall be assessed in the same way (Table 93).

Information on variation in the values of hydrometeorological parameters will also be obtained from coastal points where measurements are taken/monitoring performed every day. Such daily measurements are especially helpful for assessing exchange of fresh and saline water, its retention and the magnitude of the plume on a daily basis.

Table 93. Operational monitoring programme for transitional water bodies. Analyses to be performed in each analytical package (AP) are provided in Table 94

Elements for monitoring	**Operational monitoring sites in transitional water bodies**						
		Intensive			Extensive		
	1	2	3	4	2	3	4
General physico-chemical parameters	AP 1	14/15	4/10	6	1	10	2
General physico-chemical parameters in sediments	AP 2	2	2	6	-	-	-
Heavy metals (excl. Cd), oil products, detergents	AP 3	10/14	4	6	1	4	2
Heavy metals, oil products in sediments	AP 4	12/14	3	6	1	3	2
Pesticides	AP 5	9	1	6	1	1	2
Pesticides in sediments	AP 6	9	1	6	1	1	2
Hazardous substances	AP 7	6	4/10	6	1	10	2
Hazardous substances in sediments	AP 7	6	1	6	1	1	2
Hazardous substances in biota	AP 7	2	1	6/2	-	-	-
Other parameters	AP 8	7/11	4/10	6	1	10	2
Phytoplankton	AP 9	9/14	3/10	6	-	-	-
Macrophytes	AP 10	6	1	2	-	-	-
Fish	AP 11	6	1	2	-	-	-
Benthic invertebrates	AP 12	15	1	6	-	-	-
Other biological parameters	AP 13	1/10	2/7	6	-	-	-
Hydrological parameters*	AP 14	1/15	1/10	6	-	-	
Morphological conditions	AP 15	15	1	2	1	1	2

Explanation of the column numeration:

1 – analytical package, lists of parameters for each analytical package are provided in Table 94

2 – number of monitoring sites (the lowest/highest number of sites where individual parameters listed in Table 94 are monitored)

3 – annual number of samples/measurements/monitoring exercises in sites (minimum/maximum number of individual parameters listed in Table 94). Note: the number does not reflect the quantity of samples taken in individual water horizons.

4 – frequency during a six-year monitoring cycle

* – some hydrological parameters are also measured in coastal hydrometeorological points on a daily basis.

Table 94. Parameters in each analytical package (for transitional water bodies)

Analytical package	Lists of parameters
AP 1	General physico-chemical parameters: water temperature, salinity, transparency, oxygen concentration, pH, P total, N total, NO_3-N, NO_2-N, PO_4-P, NH_4-N, SiO_2-Si
AP 2	General physico-chemical parameters in sediments: biogenic compounds
AP 3	Heavy metals: mercury, copper, total chromium, zinc, lead, nickel; oil products, detergents
AP 4	Heavy metals in sediments: mercury, cadmium, copper, total chromium, nickel, zinc, lead, arsenic; oil products in sediments
AP 5	Pesticides: DDT and its metabolites, hexachlorocyclohexane (alfa, beta, gama HCH), endosulphane, endosulphane (alfa), aldrin, dieldrin, endrin, hexachlorobenzene (HCB)
AP 6	Pesticides in sediments: DDT and its metabolites, hexachlorocyclohexane (alfa, beta, gama HCH), endosulphane, endosulphane (alfa), aldrin, dieldrin, endrin, hexachlorobenzene (HCB), simazin, antrazine
AP 7	Hazardous substances listed in the Wastewater Management Regulation approved by Order No. D1-515 of the Minister of the Environment of 8 October 2007 (Žin., 2007, No. 110-4522)
AP 8	Other parameters: BOD7, suspended particles
AP 9	Phytoplankton: species composition, abundance, biomass, chlorophyll *a*
AP 10	Macrophytes: species composition, abundance, bottom coverage, growing depths
AP 11	Fish: species composition, abundance, biomass, age structure
AP 12	Benthic invertebrates: species composition, abundance, biomass
AP 13	Other biological parameters: bacterioplankton (total number, biomass, number of saphrophite and oil hydrocarbon-oxidizing bacteria), zooplankton (species composition, abundance, gender)
AP 14	Hydrological parameters: inflow of fresh water, water exchange, waves, meteorological parameters
AP 15	Morphological conditions: depth variation, composition of substrate

Monitoring programme for coastal water bodies

Operational monitoring

157. The operational monitoring network in coastal water bodies covers six sites. Monitoring will be carried out four–seven times a year (once in a season; additional monitoring of parameters for physico-chemical quality elements and phytoplankton are planned in June, July, September under favourable hydrometeorological conditions).

Samples of benthic invertebrates will be taken in all monitoring sites once a year (in May). Macrophytes will be monitored every three years (twice during a six-year monitoring cycle). Concentrations of hazardous and other relevant substances in water will be measured up to four times a year (once in a season), monitoring of bottom sediments will be conducted once a year (or at least once in three years if decided so by experts on the basis of available data). Pesticides in water and bottom sediments shall be monitored once a year (in August). Although such frequency is different from the one required in the WFD, long-term monitoring results indicate that concentrations of certain priority substances, such as mercury, DDT, etc., measured in water are usually below the establishment limit of the method used. Besides, monthly monitoring exercises in the sea would be irrational. In addition, extensive monitoring (once every three years) will be conducted in two of four sites in the open sandy coastal zone of the Baltic Sea. Such frequency is sufficient because the status of this water body is mainly affected by the general pollution level in the Baltic Sea (Figure 32).

Monitoring of hydromorphological parameters (depth variation, composition of substratum) will be conducted once in six years, including monitoring of such parameters as waves and dominating currents (Table 95).

Information on variation in the values of hydrometeorological parameters will also be obtained from coastal points where measurements are taken/monitoring performed every day.

The WFD points out that in respect of chemical status surface waters shall also include territorial waters. However, observing long-established monitoring traditions in the territorial sea, monitoring shall also involve analysis of biological quality elements in addition to hazardous substances and physico-chemical parameters. Monitoring in these waters is conducted in nine points four times a year (once in a season). In one site only hydrometeorological parameters is monitored for the purpose of assessing variation in water salinity due to the discharges of waters of the Curonian Lagoon into the sea. With a view to evaluate a potential impact of clean soil dumped in the sea on the marine environment, one monitoring site in the territorial sea has been assigned for investigative monitoring. Here analysis of physico-chemical elements, hazardous and other controlled substances as well as certain biological quality elements will be performed occasionally, taking into account the frequency of soil dumping.

Table 95. Operational monitoring programme for coastal water bodies. Analyses to be performed in each analytical package (AP) are provided in Table 97

Elements for monitoring	**Operational monitoring sites in coastal water bodies**						
		Intensive			Extensive		
	1	2	3	4	2	3	4
General physico-chemical parameters	AP 1	3	4/7	6	2	4	2
Heavy metals, oil products, detergents	AP 2	3	4	6	1/2	4	2
Heavy metals, oil products in sediments	AP 3	3	3	6	1/2	3	2
Pesticides in water and sediments	AP 4	2	1	6	1	1	2
Hazardous substances in water and sediments	AP 5	1	1/4	6	-	-	-
Other parameters	AP 6	1	4	6	1	4	2
Phytoplankton	AP 7	3	3/7	6	1/2	3/4	2
Macrophytes	AP 8	2	1	2	-	-	-
Benthic invertebrates	AP 9	4	1	6	2	1	2
Other biological parameters	AP 10	2/3	2/4	6	1	2	2
Hydrological parameters *	AP 11	3	4	6	2	4	2
Morphological conditions	AP 12	4	1	1	2	1	1

Explanation of the column numeration:

1 – analytical package, lists of parameters for each analytical package are provided in Table 97

2 – number of monitoring sites (the lowest/highest number of sites where individual parameters listed in Table 97 are monitored)

3 – annual number of samples/measurements/monitoring exercises in sites (minimum/maximum number of individual parameters listed in Table 97). Note: the number does not reflect the quantity of samples taken in individual water horizons.

4 – frequency during a six-year monitoring cycle

* – some hydrological parameters are also measured in coastal hydrometeorological points on a daily basis.

Table 96. Monitoring programme for the territorial sea. Analyses to be performed in each of the analytical packages (AP) are provided in Table 97

Elements for monitoring	**Operational monitoring sites in the territorial sea**			
	1	2	3	4
General physico-chemical parameters	AP 1	8/9	4	6
Heavy metals, oil products, detergents	AP 2	4/8	4	6
Heavy metals, oil products in sediments	AP 3	4/6	3	6
Pesticides in water and sediments	AP 4	3/5	1	6
Hazardous substances in biota	AP 5	3	1	6
Hazardous substances in water and sediments	AP 5	2	1/4	6
Other parameters	AP 6	3	4	6
Phytoplankton	AP 7	8	3/4	6
Benthic invertebrates	AP 9	8	1	6
Other biological parameters	AP 10	1/8	2/4	6
Hydrological parameters *	AP 11	9	4	6
Morphological conditions	AP 12	9	1	1

Explanation of the column numeration:

1 – analytical package, lists of parameters for each analytical package are provided in Table 97

2 – number of monitoring sites (the lowest/highest number of sites where individual parameters listed in Table 97 are monitored)

3 – annual number of samples/measurements/monitoring exercises in sites (minimum/maximum number of individual parameters listed in Table 97). Note: the number does not reflect the quantity of samples taken in individual water horizons.

4 – frequency during a six-year monitoring cycle

Table 97. Parameters in each analytical package (for coastal water bodies)

Analytical package	**Lists of parameters**
AP 1	General physico-chemical parameters: water temperature, salinity, transparency, oxygen concentration, pH, P total, N total, NO_3-N, NO_2-N, PO_4-P, NH_4-N, SiO_2-Si
AP 2	Heavy metals: mercury, cadmium, copper, total chromium, zinc, lead, nickel; oil products, detergents
AP 3	Heavy metals in sediments: mercury, cadmium, copper, total chromium, nickel, zinc, lead, arsenic; oil products
AP 4	Pesticides in water and bottom sediments: DDT and its metabolites, hexachlorocyclohexane (alfa, beta, gama HCH), endosulphane, endosulphane (alfa), aldrin, dieldrin, endrin, hexachlorobenzene (HCB)
AP 5	Hazardous substances listed in the Wastewater Management Regulation approved by Order No. D1-515 of the Minister of the Environment of 8 October 2007 (Žin., 2007, No. 110-4522)
AP 6	Other parameters: suspended particles
AP 7	Phytoplankton: species composition, abundance, biomass, chlorophyll *a*
AP 8	Macrophytes: species composition, abundance, bottom coverage, growing depths
AP 9	Benthic invertebrates: species composition, abundance, biomass

Analytical package	Lists of parameters
AP 10	Other biological parameters: zooplankton (species composition, abundance, gender)
AP 11	Hydrological parameters: waves, currents
AP 12	Morphological conditions: depth variation, composition of substrate

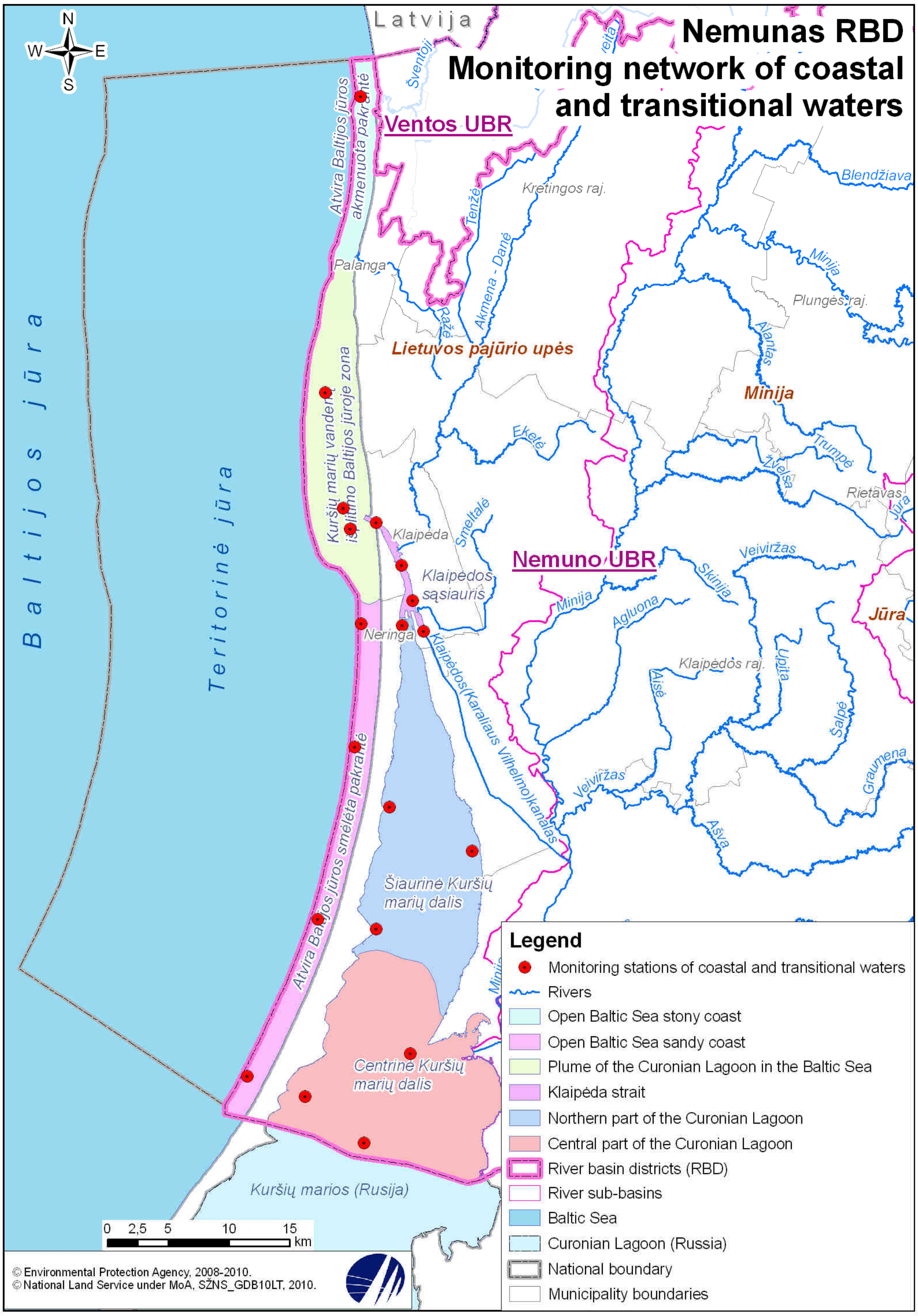


Figure 32. Monitoring sites for transitional and coastal waters (including the territorial sea)

Results of the status assessment of surface water bodies

Status of water bodies in the category of rivers in the Nemunas RBD

158. New principles for the delineation of water bodies were proposed during the development of the Nemunas RBD Management Plan. Accordingly, 584 water bodies in the category of rivers were identified. The most important source of the assessment of the ecological status of water bodies is water quality monitoring data. However, the data collected during the implementation of the Monitoring Programme for 2005–2008 fails to reflect the ecological status of all newly delineated water bodies to the required extent, because the monitoring programme for the said period was developed in respect of water bodies which had been delineated earlier. Thus, not only the water quality monitoring data was employed for the assessment of the ecological status of water bodies in the category of rivers, but also mathematical modelling results and data on the hydromorphological parameters for river beds.

The ecological status/ecological potential of the water bodies the water quality of which was monitored from 2005 through 2008 was established on the basis of the monitoring data. The assessment was made pursuant to the requirements of the Methodology for the Assessment of the Status of Surface Water Bodies.

The assessment of the ecological status of all water bodies in the category of rivers was also carried out employing simulated values of parameters indicative of physico-chemical quality elements and hydromorphological parameters for river beds. 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 assessment of the ecological status and ecological potential of water bodies on the basis of the monitoring data was followed by the modelling of values of parameters for physico-chemical quality elements and hydromorphological parameters, and comparison of the results obtained.

159. Analyses of the results were conducted in cases of discrepancies between the ecological status/ecological potential evaluated on the basis of the monitoring data and the one assessed in accordance with the simulated values of parameters for physico-chemical quality elements and hydromorphological parameters. The final assessment of the ecological status of a water body was performed as follows:

159.1. 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 and hydromorphological parameters, the final assessment of the ecological status or ecological potential of the water body was performed using the monitoring data;

159.2. 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.

160. 584 water bodies falling into the category of rivers were delineated within the Nemunas RBD, the total length of which reaches nearly 10 195 km. Of these, 54 water

bodies with the total length of 1 173 km were identified as HMWB, and 4 water bodies with the total length of 40.2 km are artificial water bodies.

161. The assessment of the ecological status of water bodies (Figure 33) revealed that the requirements of high ecological status are met by 102 water bodies within the Nemunas RBD, the total length of which is 1 935 km. This accounts for about 17 % of all water bodies in the category of rivers. 135 water bodies accounting for almost 23 % of all bodies are at good ecological status. The total length of water bodies classified as being at good ecological status equals to 2 589 km. The largest group of water bodies within the Nemunas RBD is the one where the ecological status is classified as being moderate. Such water bodies total to 258, or 44 %, and their total length is 3 955 km. Water bodies rated as having poor or bad ecological status constitute a minor part in the Nemunas RBD. Poor ecological status was identified in 26 water bodies with the total length of 466 km, and bad ecological status – in 5 water bodies with the total length of about 38 km. Accordingly, water bodies identified as having poor ecological status account for mere 4 % and those having bad ecological status – about 1 % of the total number of water bodies.

Maximum ecological potential was identified in 8 water bodies in the Nemunas RBD which are attributed to the group of HMWB. These water bodies account for about 1 % of the total number of water bodies, and their total length is 151 km. 13 water bodies in the Nemunas RBD, or 2 %, with the total length of 189 km are identified as having good ecological potential. 22 water bodies identified as HMWB are classified as having moderate ecological potential. These bodies account for 4 % of the total number of water bodies, and their total length is 623 km. Poor ecological potential was found in 10 water bodies, which accounts for 2 % of the total number of water bodies within the Nemunas RBD, and their total length is 207 km. There is only 1 water body rated as having bad ecological potential, and its length is 1.8 km.

The ecological potential of three artificial water bodies with the total length of 32 km is deemed to be maximum, one artificial water body with the length of 8 km was classified as being at moderate ecological potential.

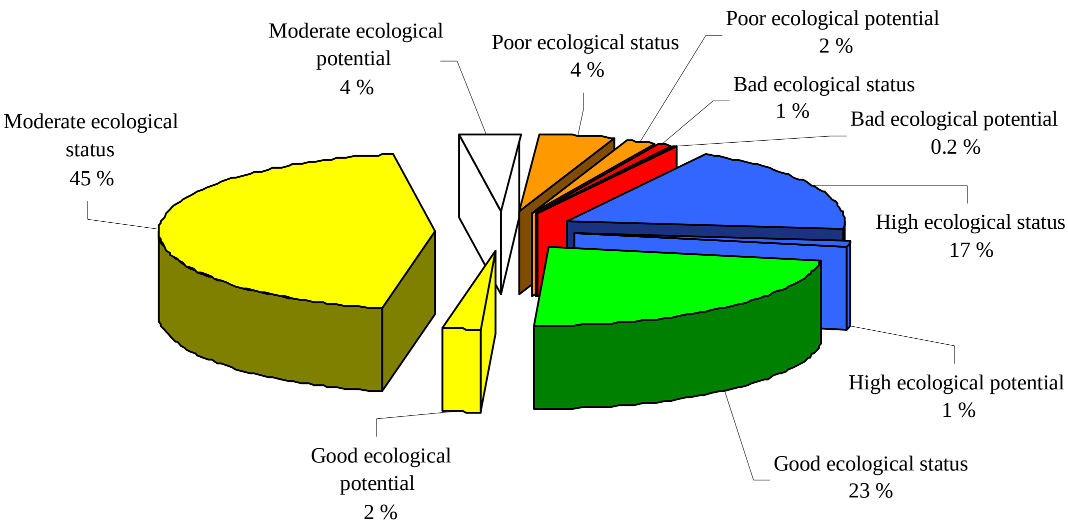


Figure 33. Ecological status and ecological potential assessment results for water bodies in the category of rivers in the Nemunas RBD

The analysis of factors determining the ecological status showed that the status of 146 water bodies (50 %) out of 289 ones the ecological status of which is currently assessed as being poorer than good fail to meet the requirements of good ecological status because of the straightening of river beds. The status of 69 water bodies (24 %) falls short of the requirements of good ecological status due to water quality problems, 48 (17 %) – due to problems relating to the bed straightening and water quality, 20 (7 %) – due to the impact of hydropower plants, 5 (1.7 %) – due to water quality problems and the impact of hydropower plants, and 1 water body (0.3 %) – due to both the impact of HPP, bed straightening and water quality problems.

The ecological potential of 32 heavily modified water bodies is lower than good because of water quality problems, and the ecological potential of 1 water body is poorer than good due to the impact of a hydropower plant.

Moderate ecological potential of 1 artificial water body is determined by water quality problems.

The distribution of water bodies identified as having different ecological status and ecological potential within the basins and sub-basins of the Nemunas RBD is given in Table 98 and demonstrated in Figure 34. The information presented in the table indicates that the best ecological situation is in the Minija, Jūra and Žeimena sub-basins. 60-68 % of all water bodies in these sub-basins fulfil the requirements of high and good ecological status or maximum and good ecological potential. The number of such water bodies in the Šventoji and Merkys sub-basins stands at about 56-57 %. The worst situation is observed in the Nevėžis Sub-basin where the majority of water bodies, that is as much as 96 %, fail to meet the requirements for good ecological status or good ecological potential. The criteria for good ecological status or good ecological potential are not met by over 60 % of the water bodies in the Šešupė and Dubysa sub-basins, meanwhile the share of such water bodies in the Neris and Nemunas Small Tributaries sub-basins and in the Lithuanian Coastal Rivers Basin accounts for over 50 %.

Table 98. Number of water bodies at different ecological status and ecological potential in basin and sub-basins of the Nemunas RBD

Basin/sub-basin	Ecological status									
	High		Good		Moderate		Poor		Bad	
	No. of WB	Length, km	No. of WB	Length, km	No. of WB	Length, km	No. of WB	Length, km	No. of WB	Length, km
Žeimena	14	274.7	2	9.5	9	85.0	0	0	0	0
Šventoji	37	627.2	9	131.1	34	314.9	1	19.5	0	0
Neris Small Tributaries	7	136.8	12	144.8	22	538.5	1	18.1	2	19.4
Nevėžis	0	0	1	14.7	33	650.3	15	254.1	0	0
Merkys	7	191.1	15	270.3	20	229.7	2	38.4	0	0
Nemunas Small Tributaries	12	177.6	37	571.6	52	729.9	2	42.2	2	16.6
Šešupė	2	21.4	16	237.2	40	707.0	1	39.6	0	0
Dubysa	0	0	8	229.4	13	197.2	1	12.6	0	0
Jūra	4	74.7	25	643.1	20	292.4	1	19.1	0	0
Minija	18	415.2	9	317.8	12	164.8	1	11.0	0	0
Lithuanian Coastal Rivers	1	36.5	1	19.7	3	44.8	1	11.6	1	1.7
Prieglius	0	0	0	0	0	0	0	0	0	0
Total:	**102**	**1 955.2**	**135**	**2 589.3**	**258**	**3 954.6**	**26**	**466.1**	**5**	**37.7**

Basin/ sub-basin	Ecological potential									
	Maximum		Good		Moderate		Poor		Bad	
	No. of WB	Length, km	No. of WB	Length, km	No. of WB	Length, km	No. of WB	Length, km	No. of WB	Length, km
Žeimena	0	0	0	0	1	13.8	0	0	0	0
Šventoji	0	0	1	8.7	1	21.5	0	0	0	0
Neris Small Tributaries	1	3.9	0	0	0	0	0	0	0	0
Nevėžis	1	5.2	1	25.8	10	204.9	10	207.4	0	0
Merkys	2	50.7	4	54.5	0	0	0	0	0	0
Nemunas Small Tributaries	2	29.4	1	4.9	2	237.4	0	0	0	0
Šešupė	0	0	4	61.8	7	137.7	0	0	0	0
Dubysa	0	0	1	24.7	1	11.3	0	0	0	0
Jūra	1	27.2	1	8.4	0	0	0	0.0	0	0.0
Minija	0	0	0	0	0	0	0	0	0	0
Lithuanian Coastal Rivers	4	46.5	0	0	1	4.7	0	0	1	1.8
Prieglius	0	0	0	0	0	0	0	0	0	0
Total:	**11**	**162.9**	**13**	**188.8**	**23**	**631.3**	**10**	**207.4**	**1**	**1.8**

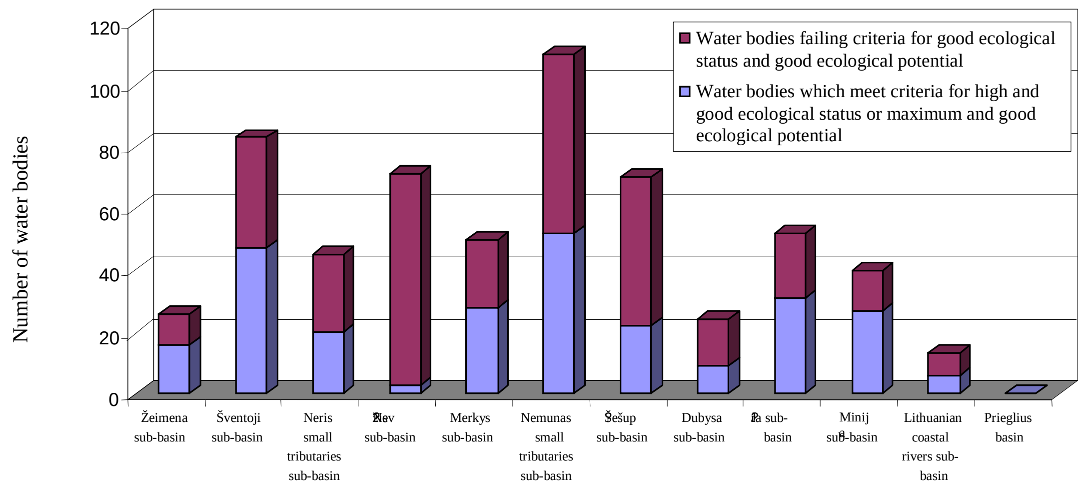


Figure 34. Ecological status and ecological potential of water bodies in the category of rivers in the Nemunas RBD

Having assessed the level of confidence in the ecological status and ecological potential of water bodies falling within the category of rivers, high confidence was granted in respect of the identification of the ecological status or ecological potential of 37 water bodies, which accounts for 6 % of all water bodies in the Nemunas RBD. Medium confidence in the status assessment has been granted in respect of 185 water bodies (32 %), and low confidence – in respect of 362 water bodies (62 %).

The assessment of the chemical status of rivers was carried out on the basis of the river water quality monitoring data and with reference to the findings of the study *Screening of hazardous substances in the aquatic environment of Lithuania* conducted in 2006.

An analysis of all available information on concentrations of priority hazardous, hazardous and other regulated substances detected in rivers led to the conclusion that the rivers Neris, Nevėžis, Nemunas and Akmena-Danė may be failing to achieve good chemical status. At present, good chemical status has been attained in the remaining 574 water bodies.

An assessment of the ecological and chemical status of water bodies under the category of rivers in the Nemunas RBD has demonstrated that good status or good potential has been achieved in 261 water bodies in the category of rivers, meanwhile 323 ones fail to achieve such status.

Status of lakes and ponds in the Nemunas RBD

162. The ecological status of lakes in the Nemunas RBD was assessed on the basis of the following three information sources:

162.1. national monitoring data;
162.2. data presented in the study *Identification of Lithuanian lakes subject to restoration and preliminary selection of restoration measures for these lakes for improvement of their status*;
162.4. mathematical modelling results.

163. When classifying the ecological status of lakes, priority was given to the national monitoring data, that is, in case of availability of 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.

In the absence of the national monitoring data, lakes were classified into the ecological status classes in accordance with the following principles:

Table 99. Principles for classification of the ecological status of lakes

<table>
<tr><th colspan="2">Status acc. to modelling results</th><th>Status according to the study data</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>

In accordance with the above-mentioned principles for the classification of the ecological status of lakes, 64 lakes out of 234 lakes with the surface area over 0.5 km^2 lying within the Nemunas RBD should be identified as being at risk. No data is available on the ecological status of two lakes (Gilūšis and Ūdrija) (there is no monitoring data, ecological status was not simulated, lakes are not mentioned in the lake study), hence their status was established on the basis of expert judgement. At present, the ecological status of Gilūšis and Ūdrija is assessed to be good; they have been included in the extensive surveillance monitoring network and their status will be revised after monitoring.

The ecological status of 17 lakes is classified as high both according to the monitoring data and modelling results and the findings of the study on lakes. 14 of them are proposed to be included in the network of intensive and extensive monitoring of reference conditions (7 lakes for each type of monitoring). As regards the remaining 3 lakes (Dringis, Margis, Metelys), their water quality indicators comply with the requirements for high ecological status, but these lakes have been affected by different anthropogenic impacts (lowering of the water level, intensive fish breeding and commercial fishing, urbanisation of shores) and thus fail to meet the criteria for reference status.

The ecological potential of ponds within the Nemunas RBD was assessed on the basis of the national monitoring data and modelling results. When classifying ponds into ecological potential classes, priority was given to the national monitoring data, that is, in case of availability of the national monitoring data on indicators of the ecological status of a pond, that pond was attributed to the ecological potential class indicated by the monitoring data. The modelling results were used in determining the ecological potential of a pond only if no monitoring data was available.

In accordance with the above-mentioned principles for the classification of the ecological potential of ponds, 26 ponds out of 42 ones with the surface area over 0.5 km^2 situated in the Nemunas RBD should be identified as being at risk; no data is available on the status of 1 pond (Jurgonių pond). The ecological potential with no data available has been established on the basis of expert judgement. The pond has been included in the surveillance extensive monitoring network. Its ecological potential will be revised after monitoring and is currently assessed as good.

An assessment of the ecological status and ecological potential of lakes and ponds showed that at present 112 water bodies in the Nemunas RBD are meeting the requirements for high ecological status, 57 water bodies are at good ecological status, 56 – at moderate, and 8 – at poor ecological status. Maximum ecological potential was determined in 6 water bodies, good ecological potential was observed in 11, moderate – in 17, and bad ecological potential – in 9 bodies of water.

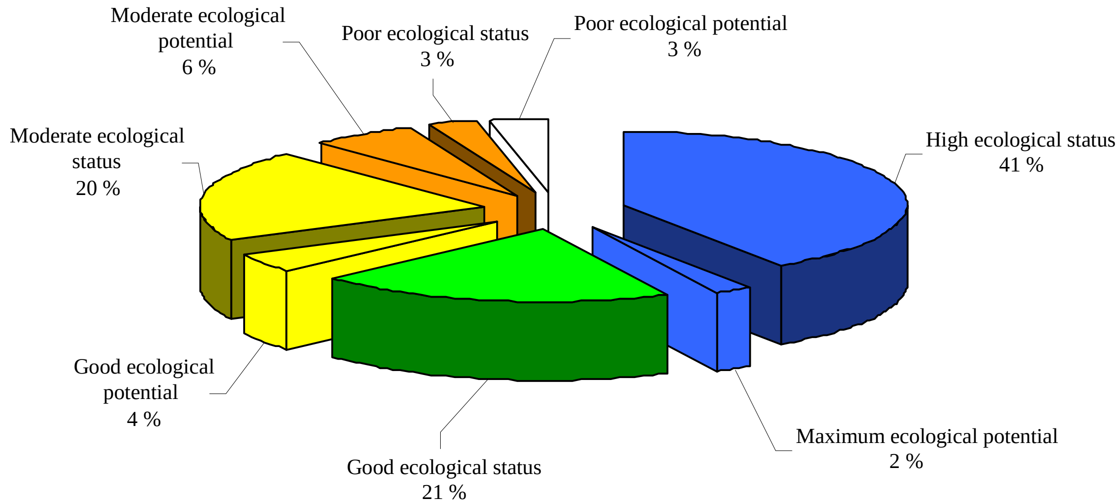


Figure 35. Ecological status and ecological potential of lakes and ponds in the Nemunas RBD

High confidence was granted to the identification of the ecological status and ecological potential in respect of 51 water bodies, which account for 18 % of all water bodies in the Nemunas RBD. Medium confidence in the status assessment was granted in respect of 49 water bodies (18 %), and low confidence – in respect of 176 water bodies (64 %).

Monitoring of hazardous substances was conducted only in lakes and ponds of the Nemunas RBD where exceedance of the MAC of these substances had been expected. Measurements show that concentrations of hazardous substances in monitored lakes and ponds do not exceed the established environmental quality standards, that is, all of them are at good chemical status. Consequently, it is assumed that good chemical status has been achieved in all water bodies in the category of lakes in the Nemunas RBD.

An assessment of the ecological and chemical status of water bodies in the category of lakes and ponds in the Nemunas RBD demonstrated that good status or good potential has been achieved in 186 water bodies in the said category, meanwhile 90 ones are failing such status. The results of the assessment of the status of surface water bodies within the Nemunas RBD are demonstrated in Figures 36-39.

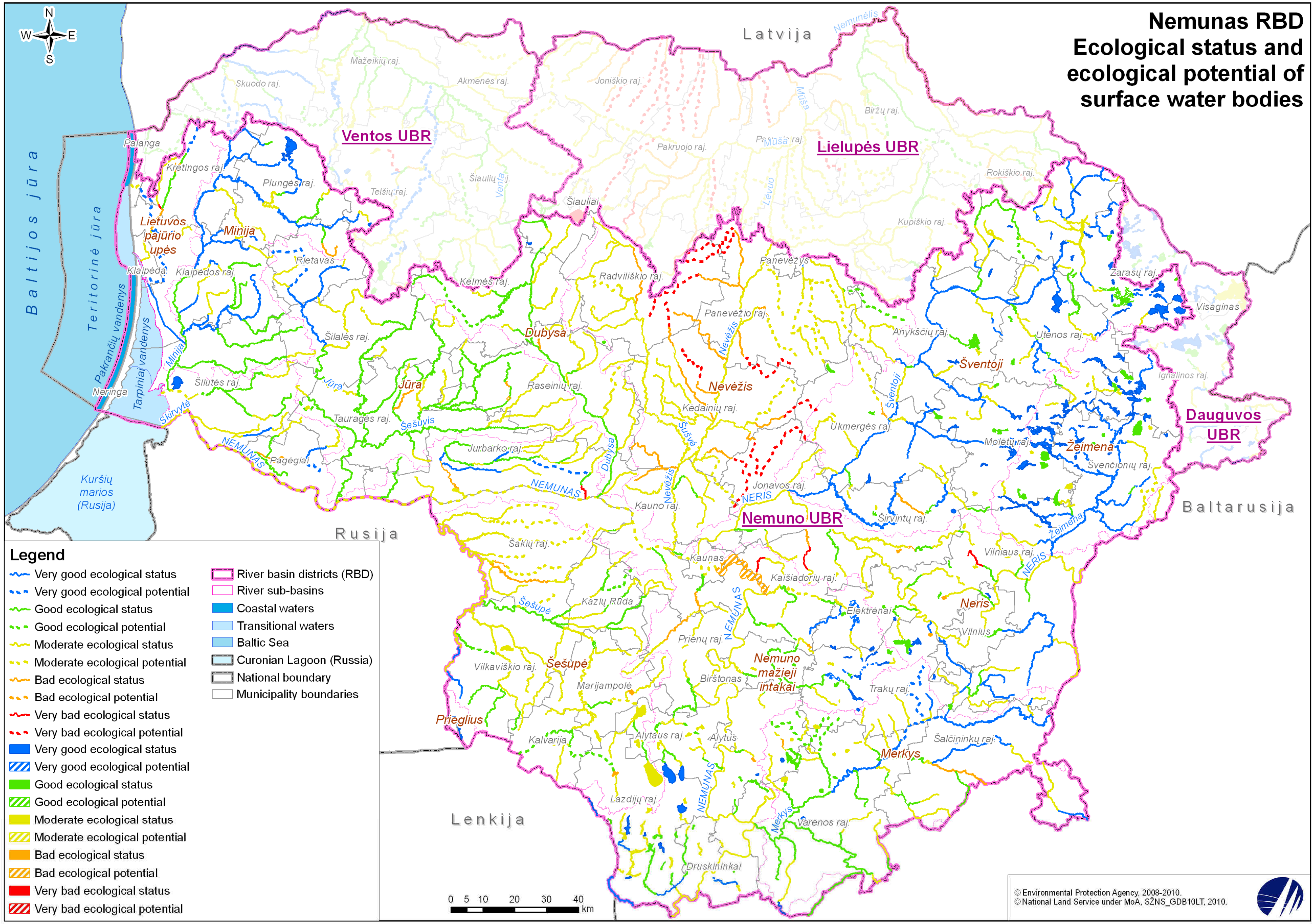


Figure 36. Ecological status and ecological potential of surface water bodies in the Nemunas RBD

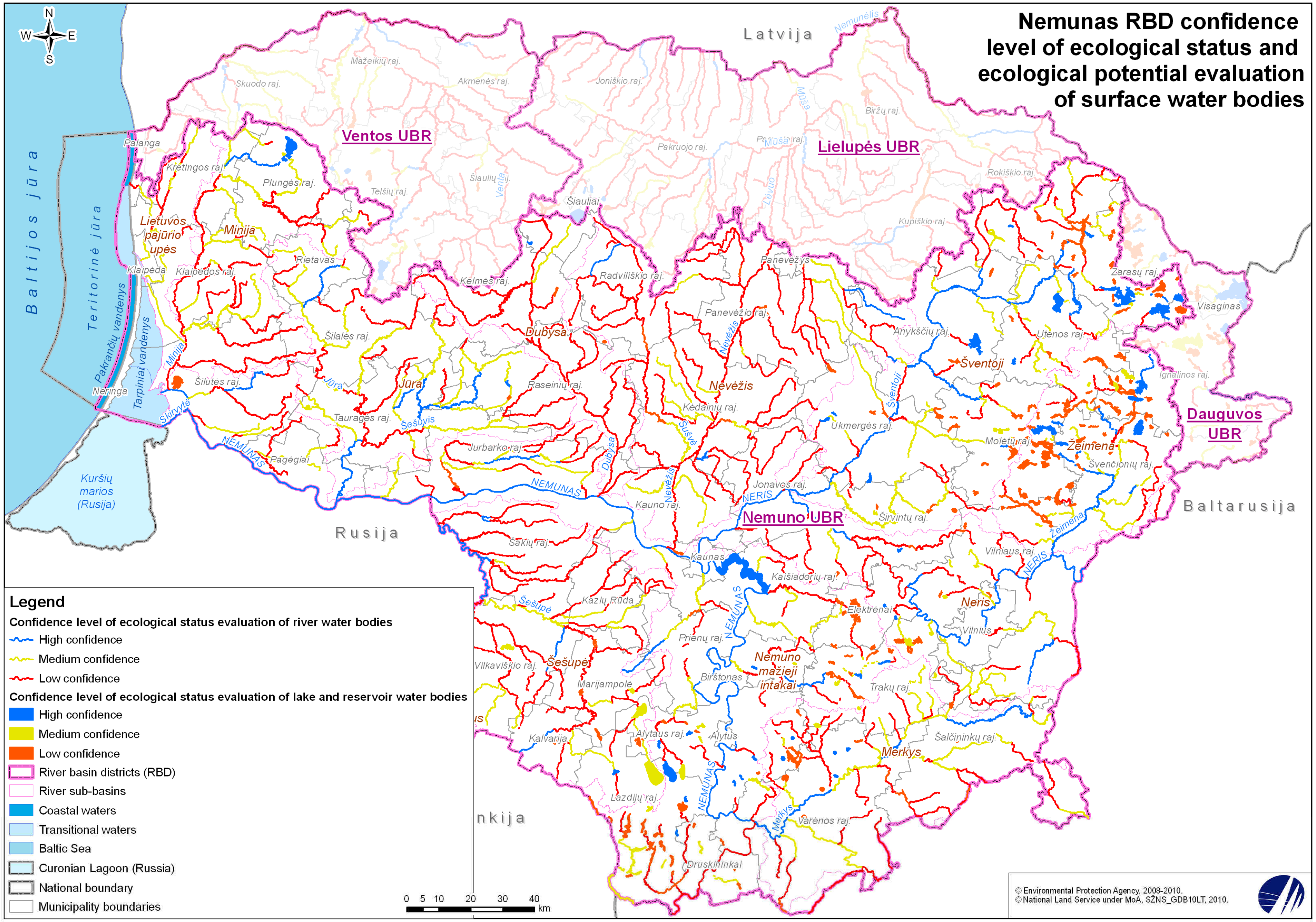


Figure 37. Level of confidence in assessment of the ecological status and ecological potential of surface water bodies in the Nemunas RBD

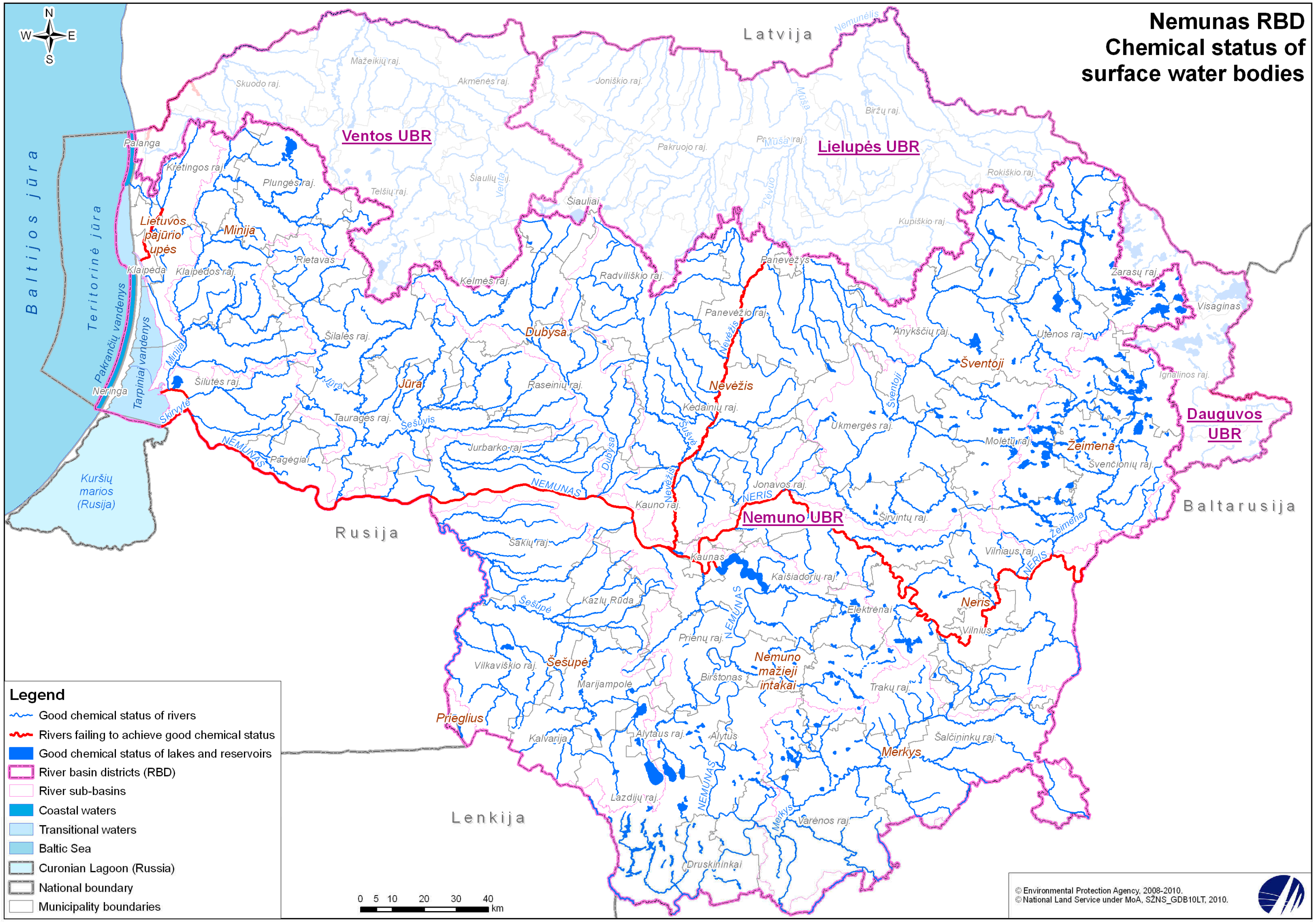


Figure 38. Chemical status of surface water bodies in the Nemunas RBD

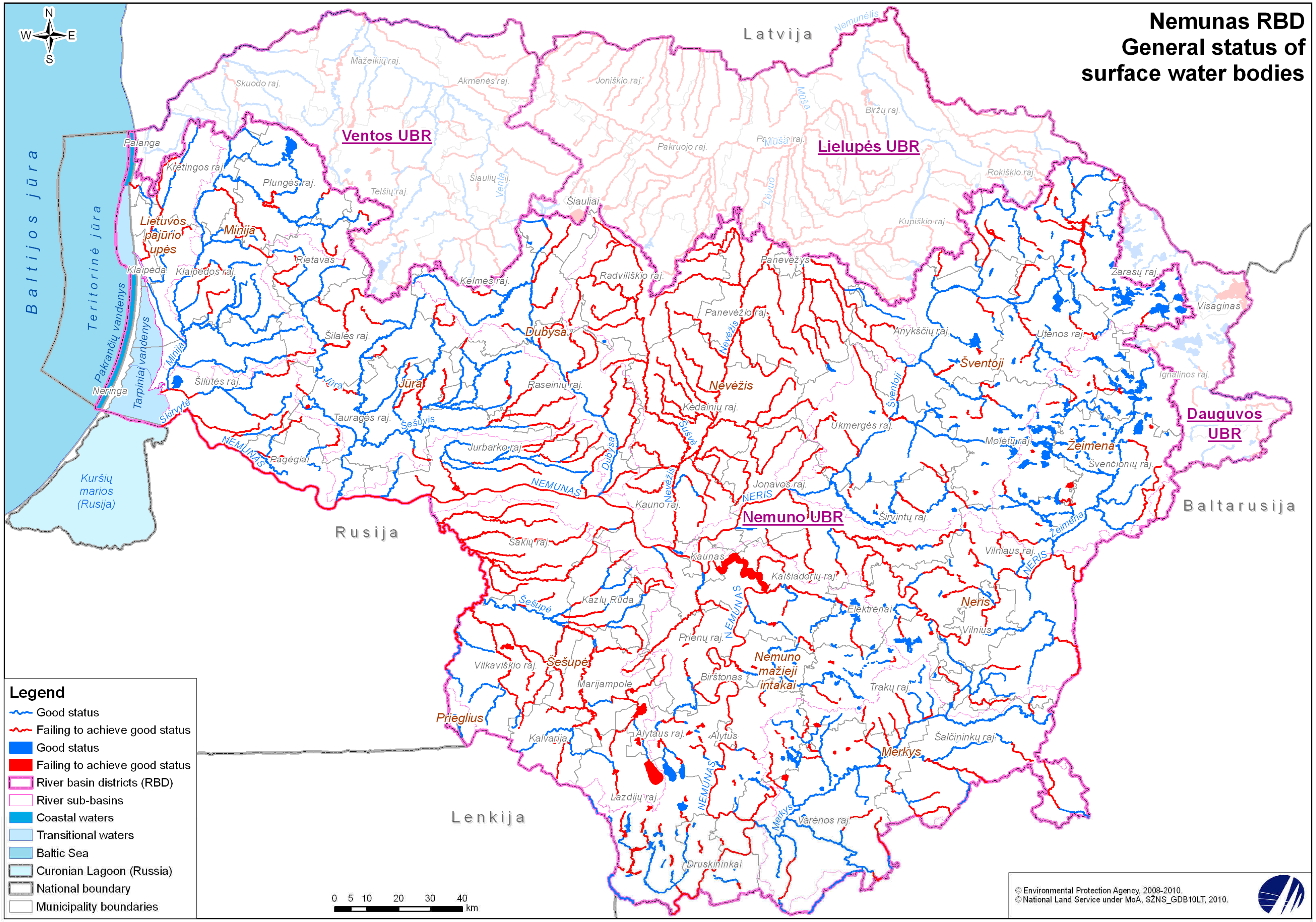


Figure 39. Overall ecological status and ecological potential of water bodies in the Nemunas RBD

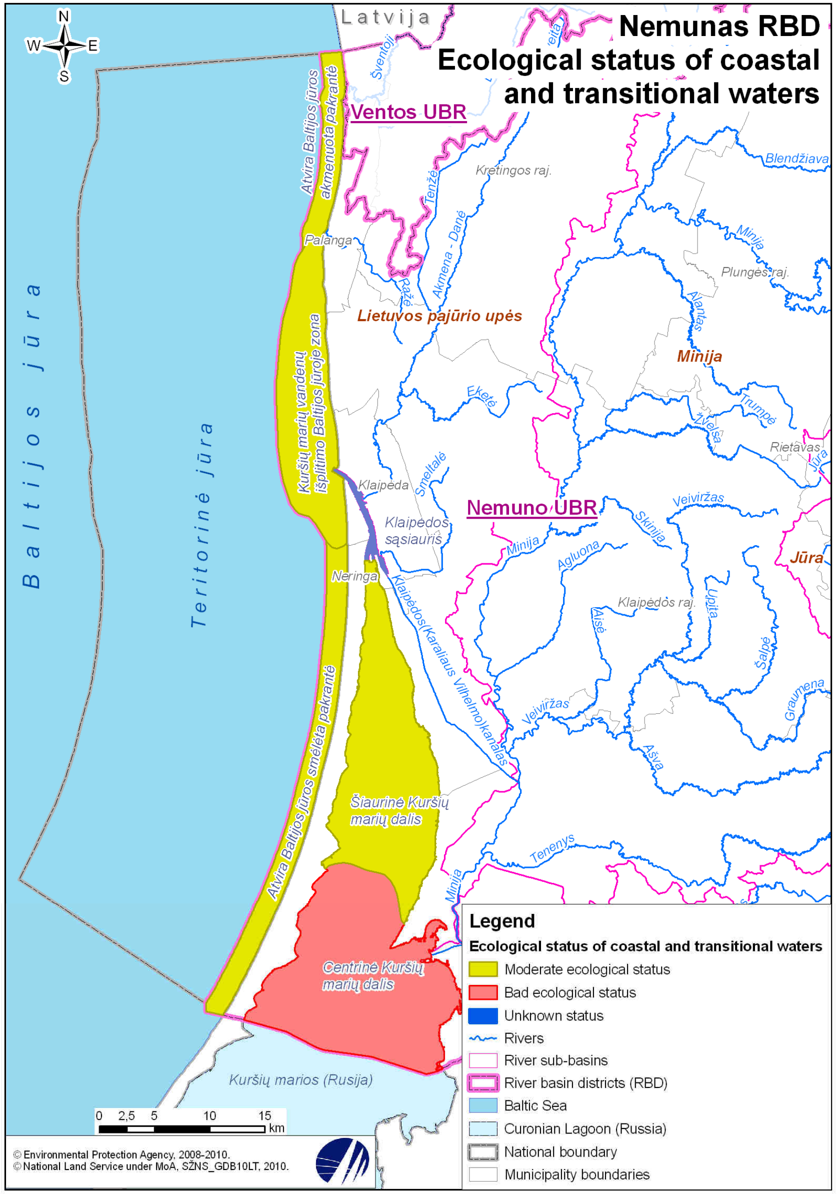
Status of transitional and coastal water bodies in the Nemunas RBD

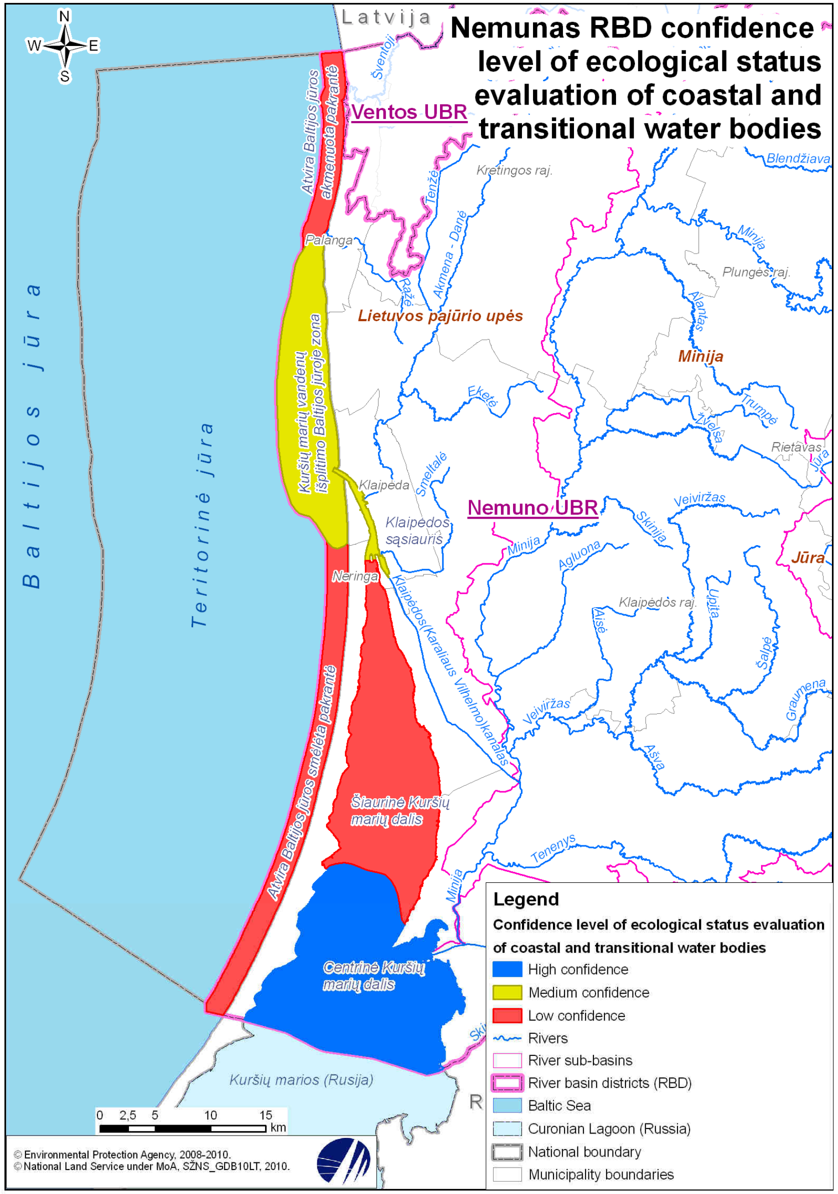
Ecological status

164. The ecological status of transitional and coastal waters in 2008 was assessed on the basis of the national monitoring data obtained from 17 monitoring sites and following analyses of physico-chemical and biological water quality elements. The following parameters indicative of physico-chemical elements – nutrients – were used: total phosphorus, total nitrogen and water transparency (the latter was applied only to coastal water bodies); parameters indicative of biological quality elements: taxonomic composition, abundance, biomass (chlorophyll *a*) of phytoplankton, taxonomic composition and abundance of zoobenthos (average number of species in a sample), taxonomic composition and abundance of fish fauna (average abundance of the gudgeon). Ecological potential was assessed only on the basis of water quality parameters. Monitoring of macro algae and angiosperms under the National Environmental Monitoring Programme was carried out in 2007, the assessment of the ecological status considered the values of such parameters as the maximum depth of the occurrence of *Furcellaria lumbricalis* and *Potamogenotaceae* (*Potamogeton*). The level of confidence in the assessment of ecological status/ecological potential was established in accordance with the Rules of Classification of the Ecological Status.

Good ecological status was not observed in individual monitoring sites. Moderate status was registered in 13 sites (76.5 %) and poor – in 3 sites (17.6 %). In one site ecological status was not subject to classification.

The data from individual monitoring sites reflects the overall status of a water body in question. The data of the National Environmental Monitoring of 2008 indicates that coastal water bodies and transitional waters (the northern part of the Curonian Lagoon, the plume of the Curonian Lagoon in the Baltic Sea, and Klaipėda Strait, which is a HMWB) were of moderate ecological status/moderate ecological potential (the level of confidence in the assessment of the ecological status/ecological potential – medium or low), meanwhile the central part of the Curonian Lagoon, which belongs to transitional waters, was at poor ecological status (the level of confidence in the assessment of the ecological status – high). In all cases ecological status (ecological potential) lower than good was indicated by the values of both biological indicators (one of them) and general data (nutrients, water transparency) (Figures 40-41).





Figures 40-41. Ecological status, ecological potential of transitional and coastal waters and level of confidence in the assessment

Chemical status

165. The chemical status of transitional and coastal waters (including the territorial sea) was assessed on the basis of the national monitoring data of 2005–2008 and the findings of the study *Screening of hazardous substances in the aquatic environment of Lithuania* conducted in 2006. The monitoring data of 2008 shows that the annual average concentration of zinc exceeded the MAC (100 µg/l) only in one place of transitional waters – in the central part of the Curonian Lagoon (in the vicinity of Nida). However, such high average annual concentration of zinc was registered as a result of a single measurement (in autumn).

Average annual concentrations of copper during individual monitoring years in Klaipėda Strait and Curonian Lagoon exceeded the MAC (in all monitoring sites in these water bodies). In 2008 (in the Curonian Lagoon – also in 2007), however, none of the water bodies exceeded the established MAC for copper (MAC 10 µg/l) (Figure 42).

Concentrations of oil hydrocarbons were randomly exceeding the MAC in all water bodies during the monitoring period. However, the results do not indicate any substantial pollution of an individual body of water (the exceedances in the water bodies were random both from the point of view of place and time).

The findings of the project *Screening of hazardous substances in the aquatic environment of Lithuania* show that the port water area faces water pollution with di(2)ethylhexyl phthalate (its concentrations exceeded the currently applicable MAC of 0.1 µg/l in all sites and varied within the limits of 0.13 and 1.27 µg/l in individual monitoring sites), organotin compounds (the concentrations measured in surface water in the neighbourhood of Klaipėda cardboard company Klaipėdos kartonas were 0.011-0.012 µg/l, (MAC 0.001 µg/l); large concentration of these compounds were also detected in bottom sediments), and nickel (in bottom sediments). Monitoring of tributyltin was also carried out in August 2008. The results showed that the largest concentrations of TBT in bottom sediments were detected in the inlet canal of Klaipėda Strait (8.8 µg/kg DW), at Malkų Bay (57 µg/kg DW.) and in the dumping area (2.3 µg/kg DW), meanwhile those in the stations situated in the open sea, in the plume of the Curonian Lagoon in the Baltic Sea and in the southern part of the Baltic coast where within the limits under the methodology used (1.0 µg/kg DW).

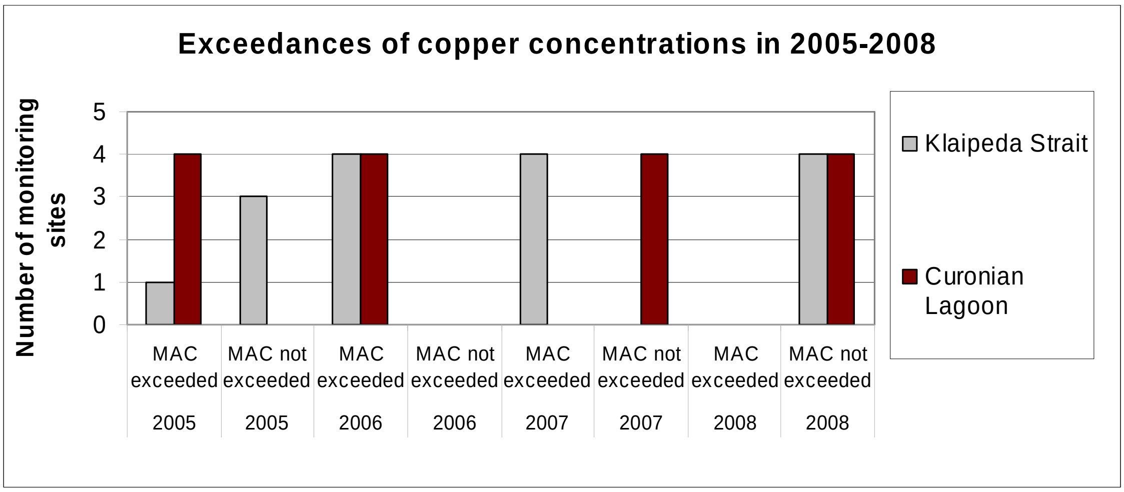


Figure 42. Exceedances of copper concentrations in 2005-2008

Article 3(2) of Directive 2008/105/EC on environmental quality standards in the field of water policy says that Member States may opt to apply environmental quality standards (EQS) for bottom sediments and/or biota instead of the EQS for water. In future, it would be wise to establish EQS for bottom sediments and/or biota because of the pollutant tendency to accumulate in these environmental components and slower change in their concentrations (as compared to water), which would enable a more comprehensive analysis of the chemical status of the environment and tendencies in pollutant changes.

The chemical status of a water body fails to meet the criteria of good status if the concentration of at least one hazardous substance exceeds the maximum allowable concentration. The summarised monitoring data shows that Klaipėda Strait fails to achieve good chemical status (Figure 43). Unfortunately, sources of pollution with hazardous substances cannot be identified due to shortage of information; besides, exceedances of concentrations were registered in the entire water body and not in one locality. The water area of Klaipėda Straits accumulates not only pollutants which have entered the water as a result of port activities and navigation but also those transported hereto with river waters from land (municipal waste, pesticides, etc.). For the purpose of further collection of data on pollutant concentrations and tendencies of their change, the current monitoring activities should be continued and the monitoring programme should be supplemented with new substances the available information on which is scarce but nevertheless indicates the occurrence of those substances. Supplementary measures for the achievement of good chemical status also include revision of the Rules of IPPC permits for municipal wastewater in relation to navigation activities.

Status of a water body is determined by the poorer of its ecological status/ecological potential or chemical status. As a result, the water body is then classified as of good status or failing good status. Analyses show that the ecological status and ecological potential of Lithuanian transitional and coastal waters fail the good status and good potential requirements.

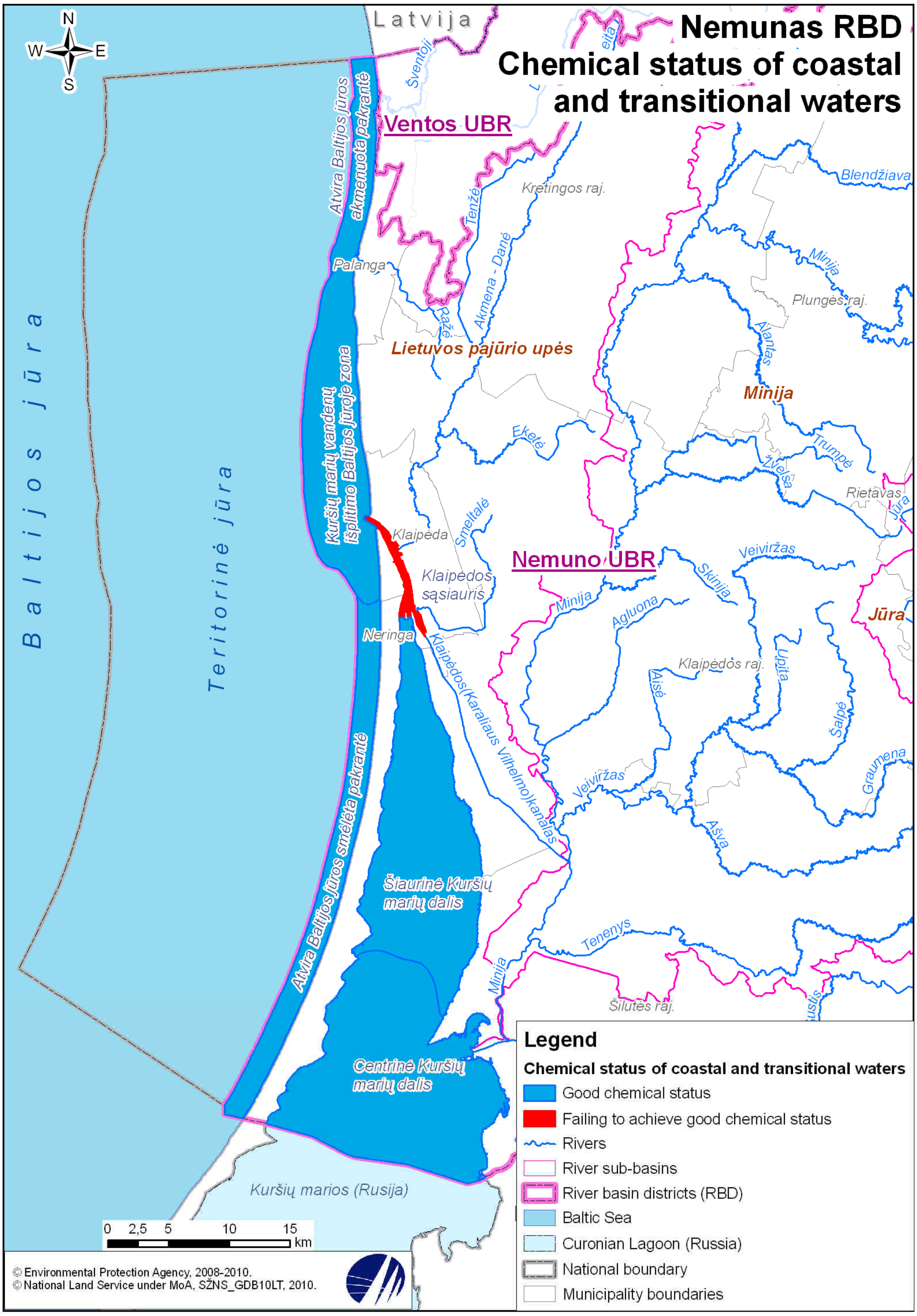


Figure 43. Chemical status of transitional and coastal waters and territorial sea

The results of the complete assessment of the chemical and ecological status of surface water within the Nemunas RBD are demonstrated in Figures 36-39.

SECTION II. GROUNDWATER

Groundwater monitoring programme

166. The monitoring system of groundwater in Lithuania consists of three levels: national level, municipal level and the level of economic entities. The Lithuanian Geological Survey conducts national groundwater monitoring and approves monitoring programmes developed by economic entities, evaluates monitoring findings, and provides proposals on environmental measures.

167. National monitoring of groundwater is intended for continuous monitoring of groundwater status throughout Lithuania. The main objectives of the national monitoring are modified depending on the priorities laid down in the environmental policy. At present, monitoring is carried out on the basis of the National Environmental Monitoring Programme for 2005-2010 (Žin., 2005, No. 19-608). Its key objective is to collect data which would enable assessment of the status of groundwater resources and change thereof according to the requirements of the Water Framework Directive (2000/60/EC), Groundwater Directive (2006/118/EC) and Nitrates Directive (91/676/EC).

The majority of the stations consist of one bore-well. Such wells have been drilled specially for groundwater monitoring, meanwhile monitoring of confined aquifers is usually carried out in development wells of small wellfields.

With a view to assess impacts of land use on shallow groundwater resources, groups of wells located in a small area, under the same hydro-geological conditions but in sites of different land use, are used. A group usually consists of two to four wells.

Well clusters, which are wells specially drilled into aquifers situated at different depths, are intended for the monitoring of all main aquifers comprising fresh water column and their interaction. A well cluster usually consists of two to four wells.

The monitoring network is denser at the Lithuanian-Polish border where cross-border groundwater monitoring is being conducted.

National monitoring is conducted according to a works plan approved every year, which consists of activities of monitoring of the groundwater table and quality. As from 2005, the groundwater table has been measured once a day with the help of electronic sensors located in 75 bore-wells. The majority of wells for groundwater table monitoring – 61 wells – are intended for shallow groundwater, 6 wells – for Quaternary intermoraine, and 8 wells – for Pre-Quaternary confined aquifers. In other wells, the groundwater table is measured during samplings. 280 wells have been included in the National Monitoring Programme for 2005-2010: 179 monitoring wells from the previous monitoring network and 101 development wells of small wellfields.

Monitoring of groundwater quality and of groups of the individual indicators thereof is conducted observing the principle of rotation: water sampling is more frequent in a shallow aquifer the composition of which is changing more rapidly, and less frequent – in confined aquifers. Such specific chemical components as organic compounds, pesticides, metals the concentrations whereof in groundwater are very low are monitored once in a five years (Table 100) in wells where these components are likely to be detected.

Table 100. Monitoring of groundwater quality in 2005-2008

Parameters monitored	**Units**	**Aquifer type**	**Years**			
			2005	**2006**	**2007**	**2008**
General chemical parameters + biogenic components	wells	shallow	88	39	83	66
		Q confined	12		21	
		pQ confined	5		9	
		Total	**105**/280	**39**/280	**112**/280	**66**/280
	stations		88	35	86	54
Microelements	wells	shallow		24/280		
	stations			24		
Pesticides	wells	shallow			10/140	
	stations				10	

168. Municipal groundwater monitoring is conducted in accordance with approved General Regulations for Municipal Environmental Monitoring (Žin., 2004, No. 130-46801) in the territories assigned to respective municipalities and is intended for the monitoring of the status of the natural environment and its components (including groundwater) and their interaction, as well as assessment and forecasting of anthropogenic pressures. Groundwater monitoring according to approved programmes is currently conducted only in 7 municipalities: Šiauliai city – from 2000, Alytus town and Druskininkai – from 2001, Panevėžys city and Kaunas city – from 2005, Varėna town – from 2006, and Vilnius city – from 2007.

169. Monitoring by economic entities is conducted in order to establish the amount of pollutants discharged and emitted from sources of economic entities and impacts of economic activity on the natural environment, and to ensure reduction of such pollution or other negative impacts. Groundwater monitoring is mandatory for groundwater users (wellfields) and entities engaged in economic activities which are on the list of potential polluters. Groundwater monitoring is conducted on the basis of individual monitoring programmes developed for each economic entity for a period of 3-5 years. Monitoring programmes are coordinated with regional environmental protection departments and approved by the Lithuanian Geological Service. Monitoring results are also submitted to the said institutions and stored in the databases of the Lithuanian Geological Survey.

170. Economic entities can be classified into two groups according to the character of their activity and impact on groundwater and, consequently, on the basis of respective monitoring requirements: potential polluters and groundwater users (wellfields). In the group of potential polluters, the most active monitoring is conducted in the environment of petrol stations and storages of oil products. During the last couple of years, more intensive monitoring activities have been observed in the animal husbandry sector. The highest total number of new economic entities joining the groundwater monitoring networks was registered in 2003-2004, meanwhile currently this number has been going down. 880 economic entities were conducting groundwater monitoring under approved programmes, the programmes of another 95 economic entities have expired and should be extended.

Results of monitoring by economic entities are very important for assessments of the ecological status of territories and decisions on its improvement. Information about pollution identified is provided to regional environmental protection departments.

Monitoring data of economic entities enables both to evaluate impacts by each of them and contributes to assessments of regional changes.

In Lithuania, all wellfields abstracting more than 10 m^3 a day must account the abstracted amount, and those abstracting more than 100 m^3 a day are subject to monitoring of the quantity and quality of groundwater resources. In 2008, 1052 abstraction sites performed accounting of the abstraction, and groundwater monitoring was carried out by 254 water abstraction sites.

Monitoring of groundwater in the Nemunas RBD

Groundwater monitoring network in basins and sub-basin of the Nemunas RBD

171. Status of shallow groundwater in the Nemunas RBD is monitored in national monitoring wells and wells of economic entities. The national monitoring wells are distributed rather evenly but their density is low and varies between 0.1 and 0.3/100 km^2 in individual river catchments. The monitoring network of economic entities is much denser but scattered, with most of the sites located in towns and cities. A general overview of the groundwater monitoring network in the Nemunas RBD is provided in Table 101 and Figure 44.

Since groundwater monitoring conducted for river basin district management purposes should reflect impacts of pollution at the regional level, the monitoring wells of economic entities situated in urbanised territories were eliminated from the table below.

Although the density of the national monitoring network in the Nemunas RBD is low, it becomes much higher upon inclusion of the systems of economic entities therein thus totalling to 1.5–4.0 monitoring wells/100 km^2. The density of the network in the Lithuanian Coastal Rivers Basin is as high as 13.8/100 km^2 (Tables 101-102).

Table 101. Shallow groundwater monitoring network in basins and sub-basin of the Nemunas RBD

Basin/sub-basin	Sub-basin area	100 km^2	Number of monitoring wells			Number of wells/100 km^2	
			national	economic entities	total	national	total
Lithuanian Coastal Rivers	1 004.64	10.0	2	323	325	0.20	32.3
Klaipėda city	97	1.0		200	200		206.2
Sub-basin (without towns)	907.64	9.1	2	123	125		**13.8**
Dubysa	1 965.38	19.7	3	17	20	0.2	**1.0**
Jūra	4 004.93	40.0	4	105	109	0.1	2.7
Tauragė town				49	49		
Sub-basin (without towns)	4 004.93	40.0	4	56	60		**1.5**
Merkys	3 724.73	37.2	8	71	79	0.2	**2.1**
Minija	2 939.99	29.4	9	110	119	0.3	**4.0**
Nemunas Small Tributaries	8 960.22	89.6	9	359	368	0.1	4.1
Kaunas city	110	1.1		87	87		79.1
Alytus town	40	0.4		46	46		115.0

Basin/sub-basin	Sub-basin area	100 km^2	Number of monitoring wells			Number of wells/100 km^2	
			national	economic entities	total	national	total
Sub-basin (without towns)	8 810.22	88.1	9	226	235		**2.7**
Neris Small Tributaries	4 187.21	41.9	10	344	354	0.2	8.5
Vilnius city	400	4.0		170	170		42.5
Kaunas city	30	0.3		31	31		103.3
Sub-basin (without towns)	3 757.21	37.6	10	143	153		**4.1**
Nevėžis	6 119.23	61.2	6	236	242	0.1	4.0
Panevėžys city	50	0.5		64	64		128.0
Šiauliai city	20	0.2		31	31		155.0
Sub-basin (without towns)	6 049.23	60.5	6	141	147		**2.4**
Šešupė and Prieglius	4 678	46.8	12	186	198	0.3	4.2
Marijampolė town				30	30		
Sub-basin (without towns)	6 049.23	46.8	12	156	168		**3.6**
Šventoji	6 789.11	67.9	10	100	110	0.1	1.6
Utena town				15	15		
Sub-basin (without towns)	6 789.11	67.9	10	85	95		**1.4**
Žeimena	2 789.56	27.9	3	22	25	**0.1**	**0.9**
Total:			76	1 873	1 949		
average						0.2	6
average in towns and cities							118
average in areas without towns							3.4

Table 102.Density of shallow groundwater monitoring wells in basins and sub-basins of the Nemunas RBD (excl. monitoring wells in towns)

Basin/sub-basin	Number of wells per 100 km^2	
	national monitoring	total
Lithuanian Coastal Rivers	0.20	13.8
Dubysa	0.2	1.0
Jūra	0.1	1.5
Merkys	0.2	2.1
Minija	0.3	4.0
Nemunas Small Tributaries	0.1	2.7
Neris Small Tributaries	0.2	4.1
Nevėžys	0.1	2.4
Šešupė and Prieglius	0.3	3.6
Šventoji	0.1	1.4
Žeimena	0.1	0.9

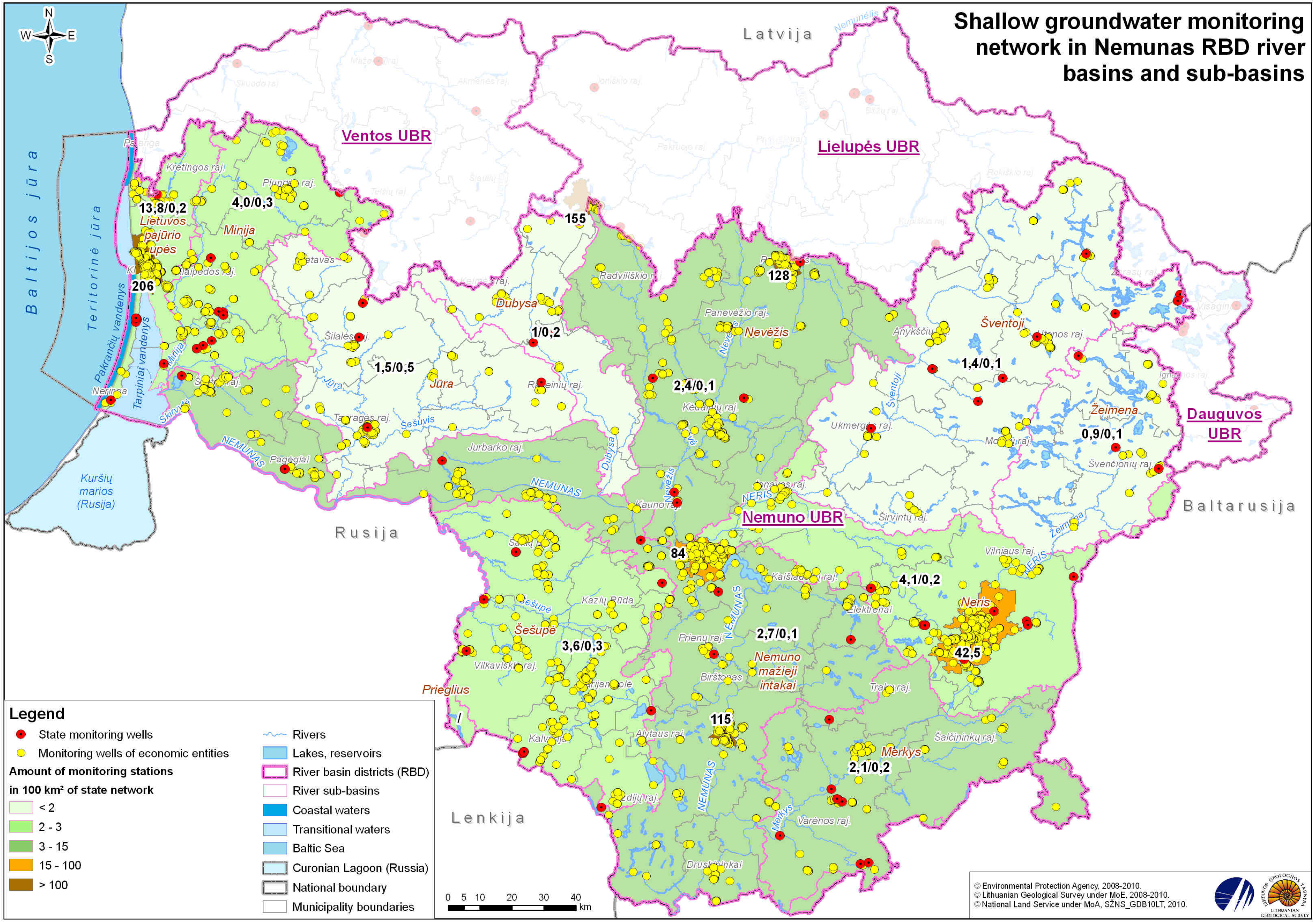


Figure 44. Distribution of the groundwater monitoring network in basins and sub-basins of the Nemunas RBD

Network of monitoring of confined aquifers in groundwater bodies of the Nemunas RBD

172. The network of monitoring of confined aquifers in groundwater bodies identified in the Nemunas RBD is presented in Table 103 and Figure 45.

Table 103. Monitoring network for confined aquifers in the Nemunas RBD

Groundwater body	Area km^2	100 km^2	Number of monitoring sites			Number of sites/ 100 km^2	
			National monitoring	Wellfields	Total	National monitoring	Total
GWB of Upper-Middle Devonian deposits	11 180	111.8	32	25	57	0.2	0.5
Stipinai GWB of Upper Devonian deposits	3 411	34.11	8	5	13	0.1	0.4
GWB of Permian-Upper Devonian deposits	1 005	10.05	3	8	11	0.8	1.1
GWB of Upper-Lower Cretaceous deposits	8 351	83.51	22	45	67	0.5	0.8
GWB of Quaternary deposits of South-Eastern Lithuania	19 600	196	51	48	99	0.2	0.5
GWB of Western Samogitian Quaternary deposits	4 388	43.88	7	18	25	0.4	0.6

Confined aquifers are monitored in wells of national monitoring and in wells of economic entities (wellfields). It should be noted that the national monitoring network also covers the wells of small wellfields, and only a few wells have been drilled specially for the monitoring purpose. If required, the monitoring network can be easily expanded by including wells of the wellfields in relevant areas. However, special monitoring wells are required in groundwater bodies potentially at risk in order to observe whether a wellfield in question has been affected by water abstraction activities.

The main objective of monitoring would be to assess and control the optimal volume of groundwater which can be abstracted in a specific wellfield without incurring any significant impact on the water quality and status of the aquifer.

An optimal network for groundwater monitoring should consist of at least three monitoring wells, two of which would be intended for the monitoring of potential changes in the chemical composition of groundwater outside the boundaries of the wellfield, and the third one, located in the wellfield itself, would control the quality of the abstracted water.

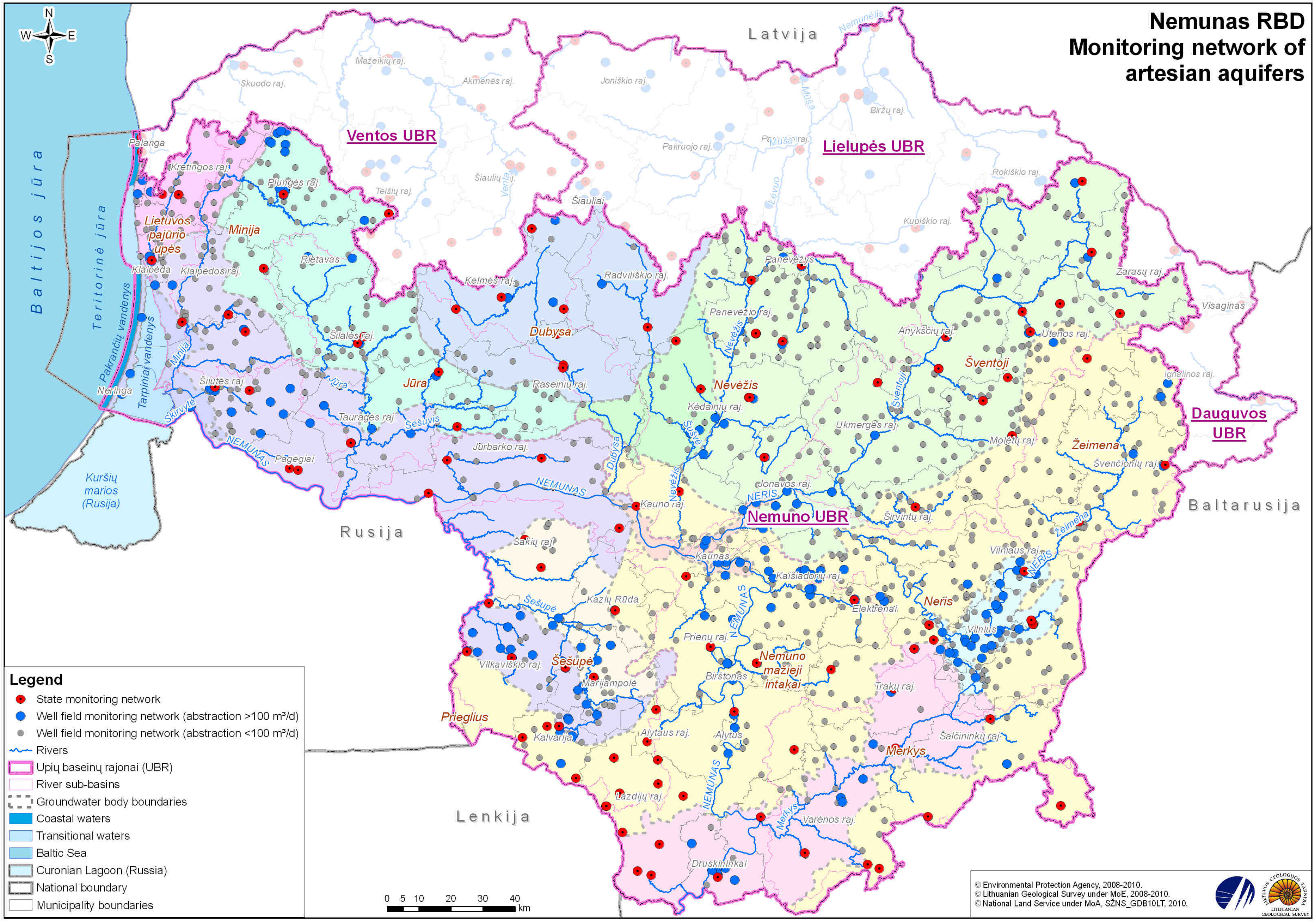


Figure 45. Monitoring network for confined aquifers in the Nemunas RBD

Status of groundwater

173. In 2008, the national groundwater monitoring was conducted under the National Environmental Monitoring Programme 2005-2010.

Groundwater samples were taken only in the shallow aquifer, once a year, in April-May. 120 samples were taken for a brief chemical analysis and identification of biogenic elements and COD. The elements analysed in the water samples were as follows: general chemical indicators (total hardness, number of permanganate and bichromate), the main anions (Cl, SO_4, HCO_3, CO_2), cations (Ca, Mg, Na, K), and biogenic components (NO_2, NO_3, NH_4, PO_4). The data obtained characterises the chemical status and quality of shallow groundwater which is formed under different natural and anthropogenic loads. Also, 11 samples we taken for the analysis of chloro-and phospho-organic- and triazine-pesticides. The pesticide analysis results showed that there are almost no pesticides in shallow groundwater under conditions of diffuse pollution. The concentrations of all pesticides in ten samples were lower than their detection limit.

Following the monitoring and other research data, the dominating quantitative and chemical status of groundwater bodies in the Nemunas RBD is good (Figures 46-47).

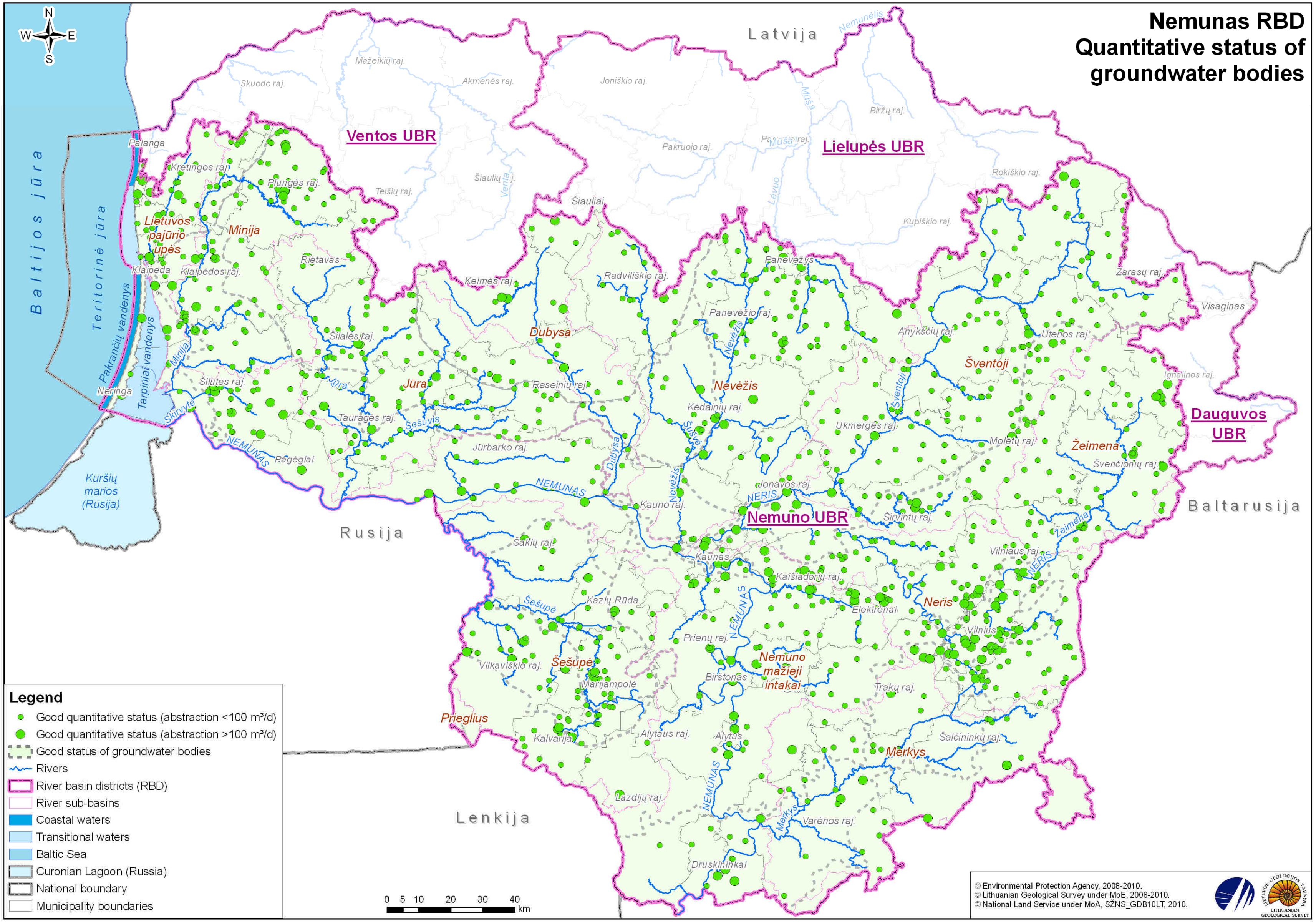


Figure 46. Quantitative status of groundwater bodies and wellfields in the Nemunas RBD

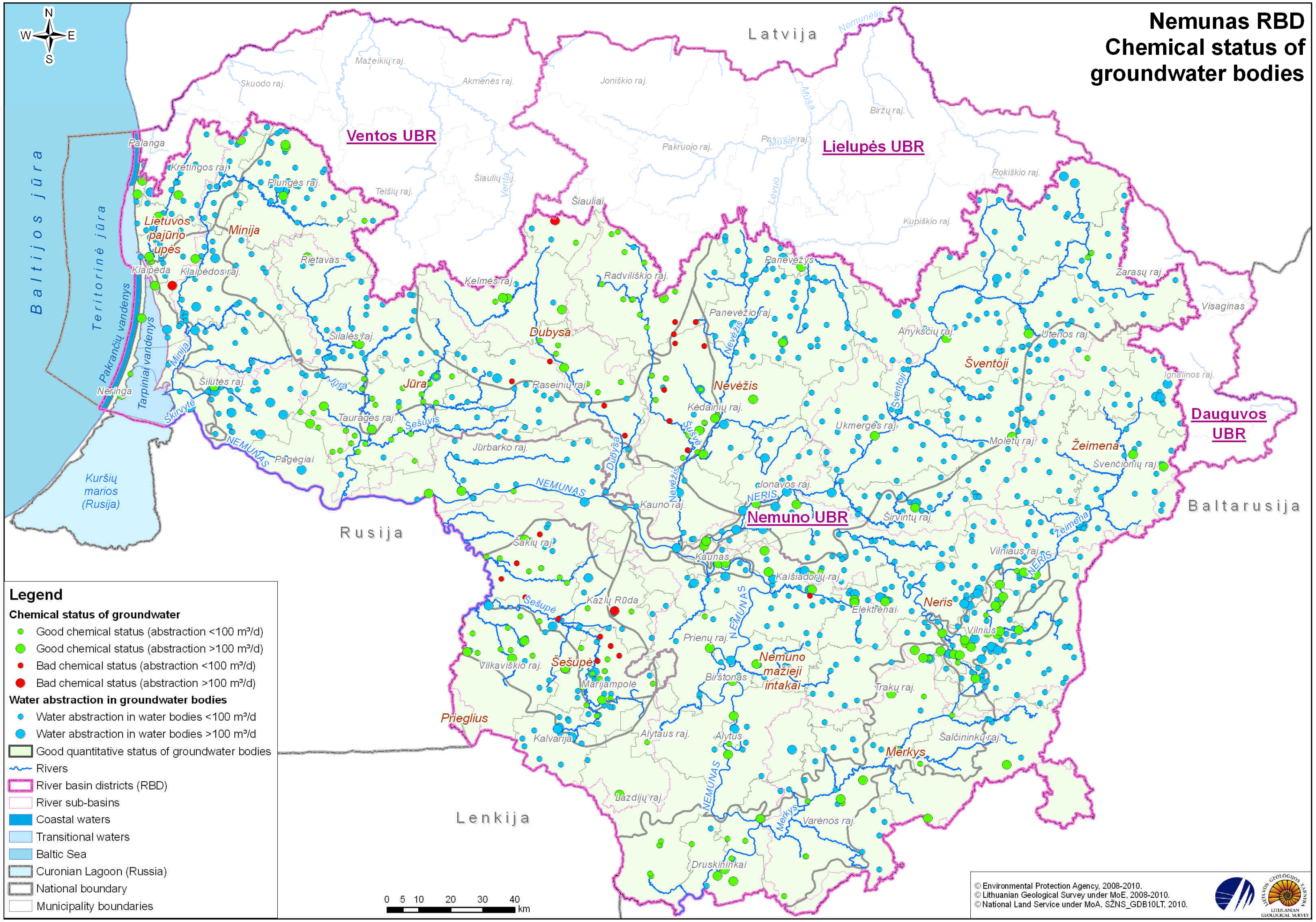


Figure 47. Chemical status of groundwater bodies and wellfields in the Nemunas RBD

SECTION III. MONITORING PROGRAMME FOR AREAS IMPORTANT FOR THE CONSERVATION OF HABITATS AND BIRDS

174. Pursuant to Order No. 695 of the Minister of the 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 and Birds (Žin., 2003, No. 4-161), monitoring in all areas important for the conservation of habitats and birds established in the Republic of Lithuania must be carried out while implementing Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora and Directive79/409/EEC on the conservation of wild birds.

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 the 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 Nemunas River Basin District that are subject to monitoring pursuant to the requirements of the Water Framework Directive includes the following: (1) marine habitats, (2) river estuaries and lagoons, (3) lake habitats, and (4) river habitats. The frequency of the habitat monitoring must be at least every 3 years. The indicators subject to monitoring include the following: physical and chemical characteristics of water, variety and abundance of typical organisms, bottom morphology (only in marine habitats), structure and distribution of plant communities (except for marine habitats). The scope and topics of the monitoring programmes differ depending on a protected area in question, varying from vary 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).

Pursuant to paragraph 10 of Order No. 695 of the Minister of the Environment of the Republic of Lithuania of 31 December 2002, certain individual parameters of the 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 these 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 (which is carried out by the Environmental Protection Agency and the Marine Research Centre in accordance with the requirements of the Water Framework Directive) partially overlap both in respect of the parameters subject to monitoring and the frequency of monitoring, that is, their objectives are the same. The network of monitoring of the protected areas in the Nemunas RBD is demonstrated in Figure 48.

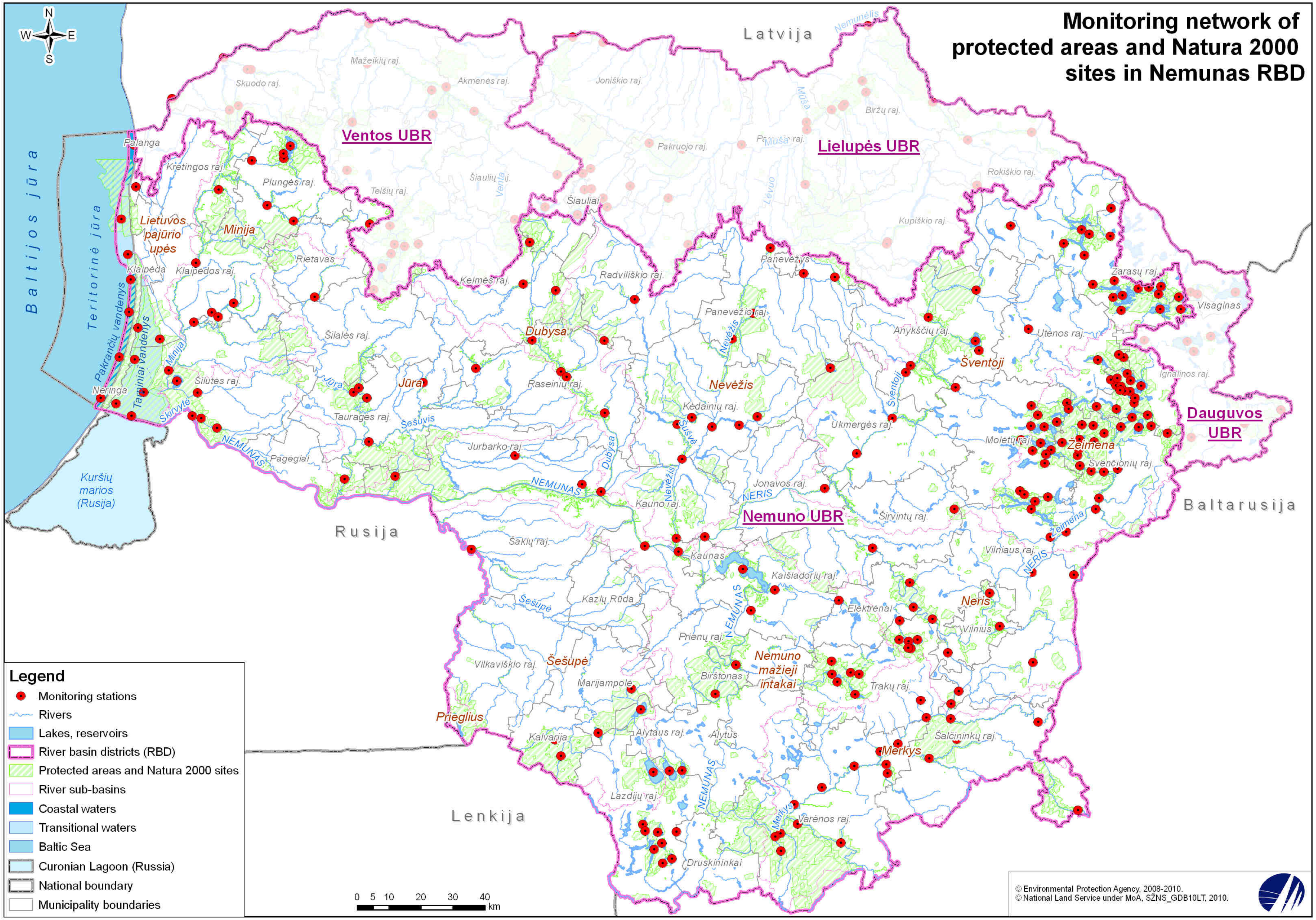


Figure 48. Monitoring network for protected areas and for NATURA 2000 areas in the Nemunas RBD

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

SECTION I. GENERAL WATER PROTECTION OBJECTIVES FOR SURFACE WATER BODIES

175. Pursuant to Article 4 of the WFD and the Law of the Republic of Lithuania on Water, the Member States shall achieve compliance with the established standards and water protection objectives not later than by 2015. The key WFD 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 for heavily modified water bodies. The normative requirements to achieve good status in water bodies are stated in WFD, Annex 5. *"The values of the biological quality elements for the surface water body type show low levels of distortion resulting from human activity, but deviate only slightly from those normally associated with the surface water body type under undisturbed conditions"*. It is up to the Member States to define and specify these acceptable deviations from the reference conditions. An intercalibration between the Member States facilitated by the Commission shall establish a common boundary between good and moderate status (WFD, Annex 5, 1.4.1.).

As already mentioned in the introduction to this plan, 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 WFD, including postponement of the 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

176. Classification systems applicable to the ecological status assessment in Lithuanian rivers have been developed (adapted) only for benthic invertebrates (Danish Stream Fauna Index; DSFI) and fish (Lithuanian Fish Index; 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 DSFI ≤ 5 and LFI ≤ 0.71 have been identified deviation from which would mean lower than good ecological status.

Physico-chemical elements

177. The general physico-chemical elements which have the most considerable impact on the status of the biological elements in rivers include BOD_7, total phosphorus, P-PO_4, total nitrogen, N-NH_4, N-NO_3, and O_2. The following average annual values of the parameters for the water quality elements have been identified to represent good ecological status of rivers which should be achieved in rivers by 2015:

Table 104. Parameter values of water quality elements for rivers

BOD_7, mgO_2/L	≤3.3
P_{total}, mg/l	≤0.14
$P\text{-}PO_4$, mg/l	≤0.09
N_{total}, mg/l	≤3.0
$N\text{-}NH_4$, mg/l	≤0.2
$N\text{-}NO_3$, mg/l	≤2.3
O_2, mg/l (1)	≥6.5 (Type-2 rivers) ≥7.5 (rivers of other types)

Hydromorphological elements

178. Pursuant to the WFD implementation guidelines, the hydromorphological elements are taken into account only for the purpose of identifying water bodies at high status or maximum ecological potential. If the ecological status of a water body is lower than high according to the parameters indicative of the biological elements, meanwhile the parameters indicative of the 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 meet the requirements set for the relevant status/potential of the biological elements, that is, 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 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.

179. Current data on aquatic organisms indicates that decrease in the water flow by more than 30 % leads to less 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 the 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 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 %.

180. Straightened rivers with a slope less than 1.5 m/km which flow over urbanised territories of the Nemunas RBD have been identified as HMWB. Other straightened rivers have been 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 the biological elements because this also depends on individual characteristics of a river in question.

181. The common goal would be to ensure at least partially natural conditions when:

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

181.2. 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);

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

182. 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 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 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

183. Concentrations of hazardous substances in water may not exceed the maximum allowable concentrations (MAC) set in the Wastewater Management Regulation approved by Order No. D1-236 of the Minister of the Environment of the Republic of Lithuania of 17 May 2006. So far, no MAC have been established for hazardous and priority hazardous as well as other regulated substances in bottom sediments.

Lakes

Biological elements

184. A classification system for the identification of the status of lakes in the Nemunas RBD has been completely developed only in respect of the parameters for chlorophyll *a* (which characterises the status of phytoplankton). The values for good status in lakes to be aimed at are as follows:

Table 105. Pursued parameter values for phytoplankton for good status in lakes

Parameter	Parameter values
Chlorophyll *a* (mean of the EQR of the average annual value and the EQR of the maximum value)	≤ 0.33

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

Physico-chemical elements

185. 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 average annual values for the physico-chemical quality elements

characterising good ecological status of lakes which should be attained in lakes by 2015 are as follows:

Table 106. Pursued parameter values for physico-chemical quality elements for good status in lakes

Parameters	Type-1 and Type-2 lakes:	Types-3 lakes:
Total P:	≤0.06 mg/l	≤0.05 mg/l
Total N:	≤1.8 mg/l	≤1.2 mg/l

Hydromorphological elements

186. 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 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 Nemunas 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, that is, 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 the Nemunas RBD when decrease in the water level of a lake resulted in destruction of a variety of fish species (e.g. lake smelts disappeared in Lake Dringis (the Žeimena Sub-basin), or change in the structure of a fish community (Lake Šalnaitis; the Žeimena Sub-basin). 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 according to the values of the parameters for biological quality elements. Since changes in the parameters for hydromorphological quality elements in the majority of lakes within the Nemunas RBD are relatively low, the pursued values should be the same as the values which meet the requirements for high ecological status.

Chemical status

187. Concentrations of hazardous substances in water may not exceed the maximum allowable concentrations (MAC) set in the Wastewater Management Regulation approved by Order No. D1-236 of the Minister of the Environment of the Republic of Lithuania of 17 May 2006. So far, no MAC have been established for hazardous and priority hazardous as well as other regulated substances in bottom sediments.

Transitional and coastal waters

188. Only preliminary values to be aimed at were established for parameters indicative of certain biological elements (e.g. total biomass of phytoplankton) in respect of transitional and coastal water bodies, with the parameters currently being tested. General physico-chemical quality elements which have the most significant impact on the ecological status in transitional and coastal water bodies are total nitrogen and total phosphorus. The values of parameters for biological and physico-chemical water quality elements characterising the ecological status of transitional and coastal water bodies which should be attained by 2015 are provided in Tables 107-108.

Table 107. Pursued parameter values for good ecological status in transitional water bodies by biological and physico-chemical quality elements

ECOLOGICAL STATUS			
Parameters	Plume of the Curonian Lagoon in the Baltic Sea	Northern part of the Curonian Lagoon	Central part of the Curonian Lagoon
BIOLOGICAL			
EQR of the values of chlorophyll *a* (average of June-September)	≥0.57*; ≥0.55**; ≥0.42***	≥0.57	≥0.68
EQR of the values of the maximum depth of occurrence of *Potamogetonaceae* (*Potamogeton*)	-	≥0.28	≥0.28
EQR of the values of the maximum depth of occurrence of the red seaweed	≥0.78	-	-
EQR of the values of the average number of macrozoobenthos species (unit/sample)	≥0.58	≥0.71	≥0.68
EQR of the values of the average abundance of the gudgeon (unit/100 m^2)	-	-	≥0.4
PHYSICO-CHEMICAL			
Total nitrogen (average value of June-September), mg/l	≤1.08*; ≤0.67**; ≤0.25***	≤1.08	≤1.07
Total phosphorus (average value of June-September), mg/l	≤0.080*; ≤0.053**; ≤0.026***	≤0.080	≤0.079

* when water salinity of the water body is <2 psu;

** when water salinity of the water body is 2-4 psu;

*** when water salinity of the water body is >4 psu.

Table 108. Pursued parameter values for good ecological status in coastal water bodies according to biological and physico-chemical quality elements

ECOLOGICAL STATUS		
Parameters	Open sandy coast of the Baltic Sea	Open stony coast of the Baltic Sea
BIOLOGICAL		
EQR of the values of chlorophyll *a* (average of June-September)	≥0.42	≥0.42
EQR of the values of the maximum depth of occurrence of the red seaweed	-	≥0.75
EQR of the values of the average number of macrozoobenthos species (unit/sample)	≥0.71	≥0.68
PHYSICO-CHEMICAL		
Total nitrogen (average value of June-September), mg/l	≤0.25	≤0.25
Total phosphorus (average value of June-September), mg/l	≤0.026	≤0.026
Average water transparency in summer, m	≥5.0	≥5.0

Hydromorphological elements for coastal and transitional waters

189. Changes in hydromorphological parameters in coastal and transitional waters are relatively small and affected exceptionally by natural factors. The most distinctive changes in coastal waters are those of the coastline and bottom geomorphology; however, they play a minor role in respect of both biological and chemical indicators of water quality. One of important hydrological parameters in transitional waters, especially in the Curonian Lagoon, is the level of water, but changes therein are mainly determined by climatic factors. Batimetrics of the Curonian Lagoon and hydraulic transportation of drift, which are important for occurrence of macrophyte belts and macrozoobenthos communities, are also formed by natural factors to a large extent. Due to the said reasons, establishment of hydromorphological criteria is not grounded.

Chemical status

190. Concentrations of hazardous substances in water may not exceed the maximum allowable concentrations (MAC) set in Annexes 1 and 2 to the Wastewater Management Regulation approved by Order No. D1-236 of the Minister of the Environment of the Republic of Lithuania of 17 May 2006 (Žin., 2006, No. 59-2103; 2009, No. 83-3473). So far, no MAC have been established for hazardous and priority hazardous as well as other regulated substances in bottom sediments.

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

191. 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 an 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 and 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

192. By their ecological properties, quarries are comparable to natural lakes. The maximum ecological potential of biological quality elements should meet the high ecological status criteria established for lakes. In turn, good ecological potential of the biological quality elements should meet the same requirements, that is, those established for good ecological status.

Table 109. The parameter value for good ecological potential of AWB by biological elements

Parameter	Value
Chlorophyll *a* (mean of the EQR of the average annual value and the EQR of the maximum value)	≤0.33

193. By their ecological features, artificial canals are most similar to rivers. The maximum ecological potential of biological quality elements should meet the good status criteria established for natural rivers of a respective type. Hence, good ecological potential of quality elements should meet the moderate ecological status requirements established for natural rivers: DSFI EQR ≥0.50, LFI ≥0.40.

The requirements for physico-chemical quality elements and chemical ecological potential?? of artificial water bodies are the same as those established for natural water bodies of corresponding types.
Reikalavimai fizikiniams-cheminiams dirbtinių vandens telkinių kokybės elementams bei **cheminei šių telkinių ekologiniam potencialui** yra tokie patys, kaip ir natūraliems atitinkamų tipų vandens telkiniams

Heavily modified water bodies

194. 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 110. The parameter value for good ecological potential of HMWB by biological elements

Parameter	Value
Chlorophyll *a* (mean of the EQR of the average annual value and the EQR of the maximum value)	≤0.33

195. The ecological potential of the heavily modified stretch of the Merkys (Type 2 according to the catchment size and gradient slope criteria) should be assessed based on the system developed for rivers of a corresponding type. The good ecological status criteria established for rivers should also be applied to describe the maximum ecological potential of this heavily modified river stretch. Respectively, good ecological potential of biological quality elements should meet the moderate ecological status criteria established for natural rivers: DSFI EQR ≥0.5, LFI ≥0.40.

196. The ecological potential of the heavily modified stretch of the Nemunas River should be assessed based on the system developed for assessing the ecological status of very large slow-flowing rivers. Good ecological potential of biological quality elements should meet the moderate ecological status criteria established for natural rivers: DSFI EQR≥0.50, LFI ≥0.40.

197. The ecological potential of heavily modified straightened rivers should be assessed based on the system developed for natural rivers of corresponding catchment size and low slope. Good ecological potential of biological quality elements should meet the moderate status criteria established for natural Type-2 rivers: DSFI EQR ≥0.50, LFI ≥0.40.

198. Assessment of the ecological potential of Klaipėda Strait should be based only on general water conditions, meanwhile “long memory” benthic parameters (macrophytes and benthic invertebrates) are not suitable for this purpose. Due to peculiar features of water exchange in the strait, the values of the ecological status criteria established for the closest water bodies – the northern part of the Curonian Lagoon, the plume of the

Curonian Lagoon in the Baltic Sea, or coastal wasters – should be used depending of the prevailing water masses in the strait (which can be easily identified on the basis of measured water salinity).

Table 111. Values for good ecological potential in Klaipėda Strait

Parameters	< 2 psu	2-4 psu	> 4psu
EQR of the values of chlorophyll *a* (average of June-September)	≥0.57	≥0.55	≥0.42
Total nitrogen (average of June-September), mg/l	≤1.08	≤0.67	≤0.25
Total phosphorus (average of June-September), mg/l	≤0.080	≤0.053	≤0.026

199. The requirements for physico-chemical quality elements and chemical status of heavily modified water bodies are the same as those established for natural water bodies of corresponding types.

SECTION III. WATER PROTECTION OBJECTIVES FOR GROUNDWATER WELLFIELDS

200. The most important water protection objective for groundwater wellfields is good quantitative and qualitative (chemical) status of the wellfields:

200.1. when the status is good, it must be maintained;
200.2. when the status is lower than good, measures should be introduced to improve the status;
200.3. when the status is critically going down, such process should be stopped.

201. Taking into account the actual status of groundwater in Lithuania and assessments thereof carried out, two criteria groups are recommended for evaluating the quality status of polluted shallow and relatively clean confined groundwater: 1 – environmental criteria, and 2 – drinking water criteria, which corresponds to the latest recommendations developed by a special EU working group.

202. A pollution limit value for nitrates established in the WFD and GWD is recommended for the assessment of groundwater status, which is 50 mg/l and coincides with a corresponding criteria set for the quality of drinking water (Lithuanian Hygiene Norm HN 24:2003). In addition, concentrations of other forms of nitrogen (nitrites, ammonium) in groundwater should be taken into account. Since there are no facts about pollution of groundwater with pesticides in Lithuania, so far it is not suggested applying the limit value established for pesticides in the WFD and GWD.

203. Assessments of the chemical status of confined groundwater in Lithuania should be based on the quality criteria for drinking water (Lithuanian Hygiene Norm HN 24:2003) as it is done now. The limit values suggested for two problematic hydrochemical parameters – chlorides and sulphates in the zones of natural hydrochemical anomalies with intrusions of water of increased mineralisation – are respectively 350 mg/l for chlorides and 500 mg/l for sulphates. No limit values are required for other water quality components because they do not exceed the concentrations established in the Lithuanian Hygiene Norm HN 24:2003.

SECTION IV. ENVIRONMENTAL OBJECTIVES FOR PROTECTED AREAS

Environmental objectives for protected areas designed for the conservation of birds

204. Council Directive 79/409/EEC on the conservation of wild birds requires creating special protected areas for the conservation of birds and their habitats of Community importance. The implementation of the directive results in expansion of NATURA 2000 sites.

The objectives set in the Birds Directive basically do not contradict the objectives of the Water Framework Directive. 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, e.g. when constructing ponds, cleaning water bodies and adjusting these for recreation. Since the protected areas occupy a very small part of the Lithuanian territory (10-15 %), many constructions/activities can usually be placed outside the protected areas. It should be remembered though that 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 performed.

Environmental objectives for protected areas designed for the conservation of habitats

205. Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (hereinafter – the Habitats Directive) requires creating special protected areas for the conservation of habitats and species which are very important for the biological variety in the Community. The implementation of the directive results in expansion of NATURA 2000 sites.

As in the case of the Council Directive 79/409/EEC on the conservation of wild birds, the objectives set in the Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora basically do not contradict the objectives of the Water Framework Directive. Both directives aim at sustainable development and ensuring quality of a living environment for both humans and all living objects. 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. If a planned economic activity is likely to have a significant impact on NATURA 2000 sites, an environmental impact assessment must be performed in the established procedure. Significance of an impact of planned economic activities on NATURA 2000 sites is established observing the Procedure for Establishment of an Impact of Plans or Programmes and Planned Economic Activities on Potential NATURA 2000 Sites or those Already Created approved by Order No. D1-255 of the Minister of the 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

206. The provisions on environmental objectives laid down in Article 4 of the WFD 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.

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

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

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

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

208. An additional analysis has been carried out upon the identification of the water bodies at risk within the Nemunas RBD (320 rivers, 64 lakes and 26 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 56 water bodies in the category of rivers and in one body of water in the category of lakes. Point pollution reduction measures will enable achieving good status/potential in 15 water bodies in the category of rivers. Good status/potential in other 41 rivers will be attained upon the implementation of diffuse pollution reduction measures. Critical status in one lake (Lake Pravalas) is conditioned by fluctuation of the water level due to activities of Arnionys fish farm. Good ecological status of this lake should be ensured by regulating uptake of water for the purposes of the fish farm and thus reducing fluctuation of the water level. For the remaining water bodies at risk (264 rivers, 63 lakes, 26 ponds, 4 transitional and 2 coastal water bodies), extension of the deadline for achieving environmental objectives is proposed for reasons of technical feasibility, disproportionate costs or natural conditions.

Technical feasibility

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

209.1. there is no technical solution to deal with the problem;
209.2. more time is needed to solve the problem than it has been provided;
209.3. there is no information on the cause of the problem and hence no solution can be proposed.

210. It has been established that concentrations of nitrate nitrogen generated in a number of water bodies in the category of rivers within the Nemunas RBD due to pressures from diffuse pollution are much higher than the criteria set for good ecological status/potential. Application of the supplementary measures to reduce agricultural pollution proposed for the entire country would not be sufficient in certain areas and even more additional measures will be required. With a view to reduce nitrogen concentrations in such water bodies to the required level, artificial wetlands/sedimentation ponds or similar measures would be needed as such measures enable capturing nitrogen in drainage water and have been recognised as very efficient ones in various literary sources. However, these measures which demand large investments have never been applied in Lithuania before, hence pilot projects are

proposed to make sure whether the measures are sufficiently efficient, as well as to get to know practical aspects of their implementation and to postpone investments for a later period.

Accordingly, the achievement of water protection objectives in the said water bodies – 14 in total – is proposed to be postponed until application of the most efficient measures has been properly studied.

211. Establishment of objectives for ecological status inevitably involves uncertainties and therefore most of the measures during the first cycle of the implementation of the WFD in a number of countries are mainly designed to reduce these. Such measures are related to research, monitoring and assessment.

212. An analysis in the Nemunas RBD established the following uncertainties:

212.1. uncertainty about the status of water bodies in the category of rivers;

212.2. uncertainty about impacts of certain risk factors on water bodies in the category of rivers;

212.3. uncertainty about the ecological status in lakes and good ecological potential in ponds and about the reasons of poor status.

213. Uncertainty about the status of water bodies in the category of rivers

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 is obtained. Uncertainty about the status of water bodies under the category of rivers has been established in respect of 32 bodies of water out of 320.

214. Uncertainty about impacts of certain risk factors

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 has been established in respect of 27 water bodies in the category of rivers.

Mathematical modelling showed that certain point pollutions sources may be exerting a negative significant impact on the status/potential of receiving water bodies; however, there is either no monitoring data verifying such impact or the available data does not indicate any significant impact. Uncertainty about a potential significant impact of point pollution has been identified in respect of 13 water bodies in the category of rivers.

A separate issue is straightened rivers. It is clear and commonly agreed that river straightening deteriorates the ecological status of rivers and hence such rivers are designated either as water bodies at risk or heavily modified water bodies. There are 195 water bodies at risk with straightened beds in the Nemunas RBD. Impacts of the straightening on the ecological status of water bodies have not been analysed yet, therefore it is recommended to postpone the achievement of objectives due to uncertainty about such impacts. However, the main reason of the extension of the deadline for achieving good ecological status is inability to afford renaturalisation of rivers.

A very important potential factor determining ecological status in shallow water bodies, such as transitional waters of the Curonian Lagoon, is secondary pollution. Available isolated data indicates that more than 75 % of the total annual amount of ammonium and nitrate nitrogen transported by rivers has been accumulated in the bottom sediments of the Curonian Lagoon in the Lithuanian territory. The amount of total phosphorus accumulated in sediments is three times higher than total P transported by rivers. Under favourable climatic conditions, additionally up to 80 % of the total annual amount of dissolved nitrogen may be transported into the lagoon by the Nemunas and other rivers by way of atmospheric nitrogen fixation. Still, uncertainty about interaction between these risk factors and pollution dynamics is very high.

Operational or investigative monitoring has been envisaged for the monitoring of risk factors impacts of which are currently not known or doubtful. It is recommended to extend the deadline for achieving water protection objectives in these water bodies until more data verifying a significant impact of the risk factors on the status/potential of water bodies is collected.

215. Uncertainty about impacts of diffuse pollution is not relevant because the impacts are usually verified both by modelling and monitoring results. In addition, the uncertainty factor is not very important for assessing diffuse pollution pressures since many measures against diffuse pollution will be implemented at the national and not at the local level, which will lead to decrease of pollution in all bodies of water.

216. Uncertainty about the ecological status in lakes and good ecological potential in ponds and about the reasons of poor ecological status/potential

The reasons of lower than good ecological status/potential in 32 lakes and ponds (23 lakes and 9 ponds) of the total number of 90 lakes and ponds (64 lakes and 26 ponds) designated as water bodies at risk within the Nemunas RBD are not sufficiently clear because such lower status/potential could have also been determined by historical pollution and therefore investigative monitoring has been envisaged for these water bodies. Also, the validity of the designation of 13 lakes and ponds (5 lakes and 8 ponds) as water bodies at risk will be further verified through additional research (potential impacts of diffuse pollution have to be verified by data of research of parameters for quality elements). Accordingly, attainment of water protection objectives in the said 45 lakes and ponds (28 lakes and 17 ponds) has to be postponed. Speaking about the remaining 45 lakes and ponds, the ecological status/potential lower than good in 44 lakes and ponds (28 lakes and 17 ponds) is determined by diffuse pollution. The measures envisaged for improvement of the ecological status/potential of these water bodies are the same as the ones intended for reduction of diffuse agricultural pollution and upgrading of WWTP in settlements. However, even if entry of polluting substances into water bodies is stopped, it will still be not possible to attain good ecological status in lakes and good ecological potential in ponds during the first Programme implementation cycle because of both potential re-suspension of pollutants accumulated in bottom sediments and delayed restoration of more inert biological elements, such as communities of macrophytes and fish. Self-cleaning processes in standing waters and low-drainage water bodies are much slower than in the ecosystems of flowing water bodies. Hence the achievement of objectives in such water bodies should be postponed in accordance with the provisions of Article 4(4) of the WFD on natural restoration of water bodies. During the first Programme implementation cycle (2010-2015), good ecological status can be achieved only in one lake – Lake Pravalas (Vidugiris), where the only reason determining lower than good ecological status is water level fluctuation of unnatural origin.

217. Transboundary pollution

Derogations from water protection objectives in cross-border river basin districts must be agreed by the respective states. However, no agreement is required under certain circumstances – when the other party is a non-EU Member State.

Impacts of transboundary pollution within the Nemunas RBD are significant in respect of the ecological status of both rivers (Neris, Nemunas and Šešupė) and the Curonian Lagoon. The ecological status of rivers is determined by pollution from pollution sources, meanwhile the Curonian Lagoon suffers from both pressures from pollution sources and pollutants transported by rivers. Transboundary pollution loads consist of pollutants entering rivers of the Nemunas RBD in Belarus and in Kaliningrad Region of the Russian Federation.

Impact on rivers

Water quality monitoring results show that concentrations of BOD_7 in the rivers Neris and Nemunas and concentrations of total phosphorus in the lower reaches of the Šešupė may be failing the good ecological status requirements due to transboundary pollution. However, more data is required to be able to conduct a qualitative assessment of the impact of transboundary pollution. In any case it is clear that the attainment of water protection objectives in these rivers depend not only on Lithuanian actions but also on those of Russia and Belarus. Accordingly, it is suggested to postpone the achievement of the objectives in the Neris, Nemunas and in the lower reaches of the Šešupė. The key measure in pursuing common water protection objectives is to strengthen cooperation with the neighbouring countries and therefore negotiations have been going on with Russia and Belarus for a number of years regarding the signing of a cooperation agreement. Another measure is to continue monitoring of cross-border water bodies provided for in the National Monitoring Programme and thus increase reliability of the assessment of the scale of transboundary pollution.

Impact on the Curonian Lagoon

Calculations show that the key source of pollution of the Curonian Lagoon is pollution transported by the Nemunas and other rivers. According to the modelling results (MIKE BASIN), transboundary pollution may account for about 60 % of the BOD_7 load, 42 % of the ammonium nitrogen load, 28 % of the nitrate nitrogen load, and around 50 % of the total phosphorus load transported by rivers to the Curonian Lagoon. A large input of transboundary pollution coming from Belarus is mainly determined by the fact that about half of the Nemunas flow is formed in the territory of the neighbouring country. It has been estimated that the attainment of good ecological potential in the Curonian Lagoon requires reduction of the inflow of total phosphorus by 25 %. If transboundary pollution generated in Belarus, which accounts for 50 % of the total pollution load, is not reduced, pollution generated in Lithuania would have to be reduced by half. Unfortunately, this is hardly feasible because, according to calculations, nearly half of the load of total phosphorus in Lithuania occurs as natural background and so anthropogenic pollution would have to be subject to radical reduction. It should also be noted that secondary pollution of the Curonian Lagoon, although depending on the climatic situation of a year in question, can be an important factor determining the status of the lagoon. The main sources of secondary pollution are situated in the southern part of the lagoon in the territory of the Russian Federation. Though the exact amounts of mobile phosphorus located therein are not known, comparative assessments of the bottom sediments of a similar composition indicate potential presence of substantial amounts. Consequently, it is clear that it will not be possible to attain the established environmental objectives in the Curonian Lagoon without having reduced transboundary pollution.

Impact on coastal waters

The ecological and chemical status of the Lithuanian coastal area of the Baltic Sea depends on a number of factors, such as the quality of waters entering the sea with the waters of the Curonian Lagoon; the amount of pollutants transported by rivers; the overall situation in the Baltic Sea where there are no boundaries between waters which belong to the jurisdiction of individual states due to currents; nutrients input from the atmosphere, as well as acitivities at the coast and in the sea. Assessments of the status of the coastal waters should also take into account the natural characteristics of the Curonian Lagoon and the Baltic Sea, such as their enclosed nature, slow exchange of water between the Baltic Sea and the North Sea. The parties to the Helsinki Convention agreed on recognition of the Baltic Sea as a sensitive sea due to its specific features and on according of a special sea area status thereto. Consequently, more stringent restrictions on disposal of oil, harmful liquid substances and litter from ships in the Baltic Sea were established.

It is still difficult to say what percentage of the current status of the coastal waters is determined by natural successive processes and what percentage is affected by transboundary anthropogenic ones. The only thing clear is that the status of the Lithuanian coastal waters and of the territorial sea is influenced by the aggregate impact of the loads generated in all states situated at the Baltic Sea.

Disproportionate costs of the status improvement within the established timescale

218. 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, that is, cost-benefit comparison was not required in any case of extension of the deadline for the attainment of environmental objectives in the Nemunas 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

Out of the total number of 320 water bodies at risk in the category of rivers within the Nemunas RBD, as many as 195 water bodies have been designated as such either due to straightening or because of both straightening and other risk factors. The length of straightened water bodies at risk is 2 179 km, meanwhile the total length of all straightened rivers and streams (including water bodies at risk and heavily modified water bodies) within the Nemunas RBD is 3 119 km. According to expert judgement, stretches situated in the upper reaches of 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 (in 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, that is, attainment of good ecological status in water bodies at risk, would require LTL 72 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, and only then further actions should be taken on the basis of the project results.

Natural conditions which prevent attaining water protection objectives

219. 44 lakes and ponds (35 lakes and 9 ponds) out of 90 ones identified as water bodies at risk are failing good ecological status/potential clearly because of diffuse pollution. These water bodies will not be able to achieve good ecological status and good ecological potential during the first cycle of the implementation of the Programme of Measures even upon having stopped pollutants in water bodies due to natural reasons. It is well known that self-cleaning processes in standing waters and low-drainage water bodies are much slower than in the ecosystems of flowing water bodies. When pollution is cut, pollutants accumulated in lakes and ponds, differently from rivers, cannot automatically disperse during a short period. Pollutants which enter rivers are carried away by the stream and hence the water quality of rivers is able to improve relatively quickly after pollution is stopped, whereas in lakes and ponds biogenic elements cannot be effectively taken away with the stream and thus remain circulating in the matter cycle of the ecosystem for a lengthy time. Consequently, the process of self-removal of pollutants lasts very long. Similarly, self-restoration of more inert biological quality elements, such as macrophytes and fish is also a slow process. Due to these reasons it is proposed to postpone the achievement of environmental objectives under Article 4(4) of the WFD, which provides for a possibility to extend the deadline for achieving the objectives when the achievement is prevented by natural conditions.

The overall status of transitional and coastal waters is determined by diffuse pollution from the basin, the inflow of excessive nitrogen and phosphorus with river waters, mainly the Nemunas. The mathematical modelling results show that the planned reduction of the inflow of nitrogen and phosphorus upon the introduction of relevant measures in the Nemunas RBD will be insufficient to achieve good ecological status in the Curonian Lagoon. In addition, phosphorus amounts in the ecosystem may be largely depending on secondary pollution (from bottom sediments) which can be managed only in a limited way. The most important factor determining the ecological status of coastal waters is the level of eutrophication typical of the Baltic Sea. Due to these natural causes it will not be possible to achieve the established water protection objectives in transitional and coastal waters during the first planning period and thus it is recommended to postpone the attainment of good ecological in transitional and coastal waters for subsequent periods.

Summing up, the scheme for assessment of the degree of achievement of good ecological status in all 416 water bodies at risk would be as follows:

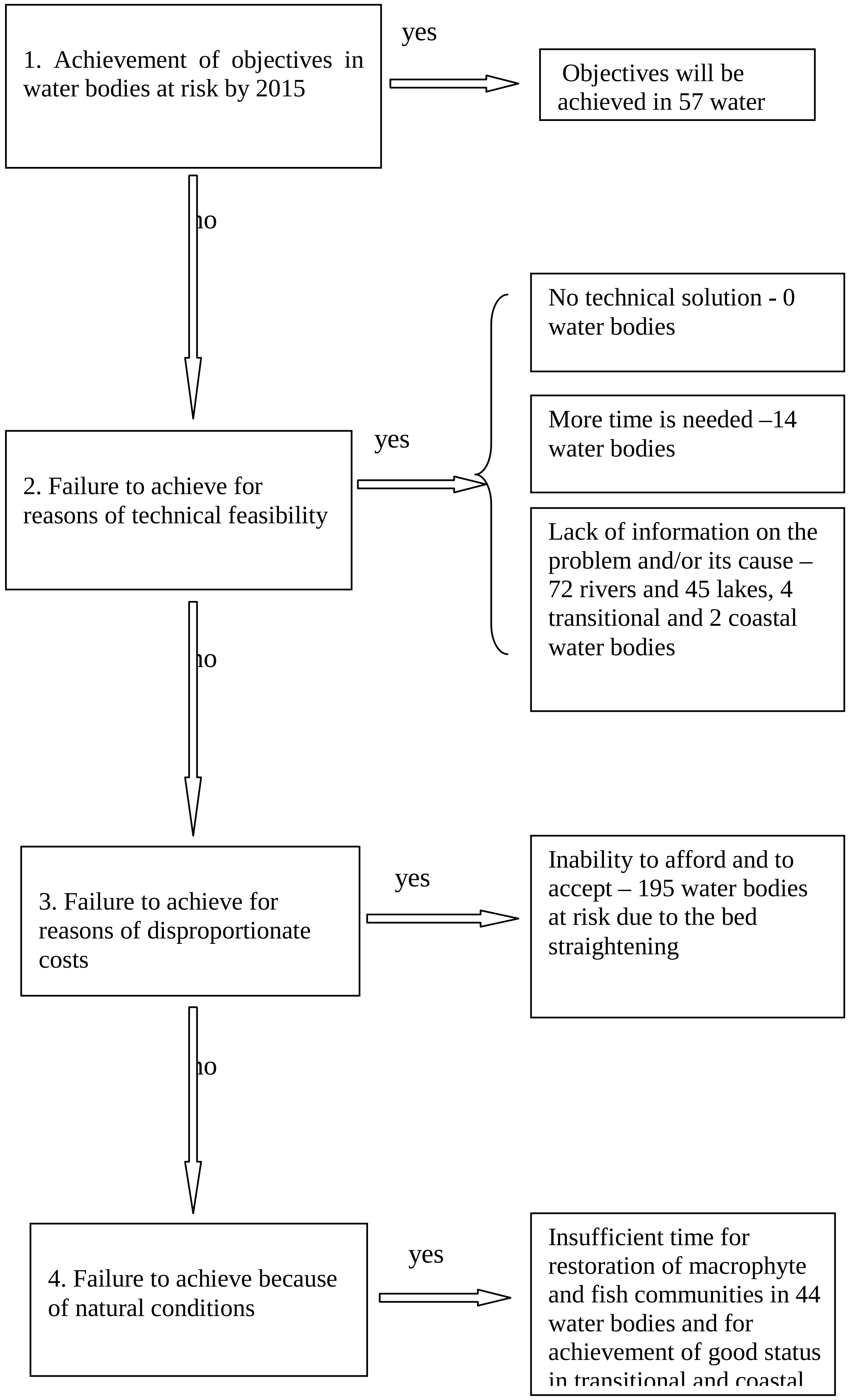


Figure 49. Steps of the deadline extension for the achievement of good ecological status in water bodies at risk

220. The second and the third stages will provide for new measures and continue implementing the ones started in the first stage:

220.1. measures to achieve good status in water bodies in the category of rivers and lakes (2016-2027) taking into account the results of the first stage and findings of scientific research and studies;

220.2. measures to improve the status of transitional and coastal water bodies (2016-2017) taking into account the data collected and priorities set in the first stage;

220.3. measures to strengthen control over the use of hazardous substances (2016-2017) taking into account the results of the first stage and findings of scientific research and studies;

220.4. measures to improve management of surface runoff (2015-20121) if the measures provided for in the first stage were not sufficient for the attainment of the objectives (due to technical feasibility, or shortage of funding sources or data for prioritising measures);

220.5. measures related to reduction of phosphorus and nitrogen entering water bodies from point pollution sources, especially in Šventoji and Nevėžis sub-basins (2015-2021) taking into account monitoring results of the first stage;

220.6. measures related to reduction of diffuse pollution in the Nevėžis Sub-basin, which is an area of intensive agricultural activities and low runoff (such as artificial wetlands, sedimentation ponds, controlled drainage, etc.) (2015-2021) if the measures provided for in the first stage were not sufficient for the attainment of the objectives due to a demand of large investment, shortage of data and/or other reasons;

220.7. measures related to the upgrading of HPP turbines in the merkys, Nevėžis, Dubysa, Minija, Nemunas Small Tributaries and Šešupė sub-basins (2015-2021) if the measures provided for in the first stage were not sufficient for the attainment of the objectives due to a demand of large investment, shortage of data and/or other reasons;

220.8. measures related to analyses of impacts of remeandering and restoration of discharge (2015-2021) taking into account that fish bypass channels should be constructed following the results of special feasibility studies conducted to select the most suitable technological solution for a bypass channel in question; the construction of a facility should take into account the data of monitoring performed both before and after the construction of such facilities to be able to assess an impact thereof on the ecological status of the river and thus select the best option;

220.9. measures related to the assessment of impacts of groundwater abstraction on potential changes of water quality in groundwater bodies;

220.10. other measures effects of which will be visible in 2015 after the implementation of the first stage measures.

CHAPTER VII. SUMMARY ECONOMIC ANALYSIS OF WATER USE

221. The present chapter reviews economic analyses of water use for each basin and sub-basin of the Nemunas RBD, which were carried out on the basis of revised socio-economic indicators.

The term “economic analysis” is used within the meaning given in the Water Framework Directive and fully reflects the requirements of the directive.

The assessment of the impact of human economic activities revealed that the main drivers of the major pressures on surface water bodies include agricultural activities which result in diffuse pollution; point pollution consisting of loads from dischargers of domestic and industrial wastewater and stormwater (surface) runoff; transboundary pollution, and physical alteration of natural watercourses. One of the drivers of the latter pressure is the energy sector, that is, Lithuanian hydropower plants built on watercourses, therefore the energy sector was also included in the economic analysis. In addition, other activities which also exert a certain impact (though less significant), such as fishery and recreation, were analysed as well.

Further section provide a summary of the economic analyses of water use consisting of the general overview of the situation, an analysis of economic sectors, and an assessment of the economic significance of these sectors.

SECTION I. GENERAL OVERVIEW OF THE SITUATION

222. With the area of 47 814 km^2 (excluding transitional and coastal waters), the Nemunas River Basin District (RBD) occupies almost 74 % of the territory of Lithuania. The percentage of the land use for different purposes in the Nemunas RBD is presented in Table 112.

Table 112. Land use in the Nemunas RBD

Land use*	Area in the Nemunas RBD, %
Urban areas	3.2
Agricultural areas	60
Natural habitats	36.4
Cities >10 000 inhabitants	28

Data source: CORINE land cover map

The number of population living in the Nemunas RBD comprises 80 % of the total Lithuanian population, the proportion of urban and rural inhabitants remains stable since 2004: a larger part of the population – about 70 % – lives in urban areas.

The unemployment rate in the Nemunas RBD was decreasing from 2003, when it was 10.6 %, to 2008, when the share of unemployed population in the area was about 4 %. This number is different for 2009, however, no data was available at the time when the present report was being prepared.

A comparison of the socio-economic situation in the Nemunas RBD with the Lithuanian average showed that some economic indicators in the Nemunas RBD are higher. For example, average household income per month in the Nemunas RBD (calculated as an average for seven counties located in this district) was LTL 1 018 meanwhile the Lithuanian average amounted to LTL 986.8 in 2008. High socio-economic indicators are characteristic of the Nemunas RBD mainly because of the fact that the largest and economically strongest cities are situated in this RBD.

Rural population in the Nemunas RBD in 2008 accounted for 25.6 % of the total population in this area (the respective share at the national level is 33 %).

Water abstraction and use in the Nemunas RBD has varied a lot during the last five years, mainly due to the operation of Kruonis Pump Storage Plant. Groundwater consumption trends, however, have quite a different character – very low fluctuations of water use have been observed. Hence it may be concluded that in general water consumption for purposes other than energy generation in recent years has been stable.

When comparing water consumption in the Nemunas RBD with tendencies in other river basin districts, it is important to exclude the water used for energy production, since large volumes of water used in Ignalina NPP or Kaišiadorys HPP distort the actual situation. Otherwise the estimation figures show that about 83 % of water is consumed in the Nemunas RBD, and only 17 % – in the remaining river basin districts.

A major share of wastewater (about 94 %) does not require any treatment. 93 % of the water consumed is used for energy production, so the wastewater which does not require any treatment is mainly the water used in the energy sector for cooling purposes.

The volume of untreated wastewater in Lithuania comprises 0.3 % of all discharged effluents, and the volume of wastewater which is treated below the established standards totals to 27 % (excluding wastewater which does not require any treatment at all). These figures are provided below for comparison with discharges in sub-basins.

In 2008, industry accounted for about 21 % of the total water consumption in the Nemunas RBD (excluding water used for energy generation purposes), and this volume has been increasing since the year 2001. Keeping in mind that Lithuanian industries have to implement the IPPC Directive 96/61/EC and introduce the best available techniques, it can be assumed that water consumption has been increasing due to the overall growth and development of the industrial sector. Industrial wastewater roughly makes only half of effluents discharged by households; however, here a special attention should be paid to discharges of hazardous substances by industries.

The sections below describe water uses in various sectors and their relationship with the key socio-economic indicators by individual sub-basins of the Nemunas RBD. Details of the data on water pollution and its impact on water bodies are provided in the second chapter of this Plan on the assessment of the impact of economic activities.

It should be pointed out that in statistics socio-economic indicators are usually calculated only by counties and not by sub-basins or municipalities. Hence, where appropriate, these indicators were recalculated on the basis of the share of the municipal population in a respective county. Also, the statistics of 2008 does not reflect consequences of the financial crisis and hence unemployment or disposable income trends will be different in the statistical information of 2009.

Information common for all sub-basins

Households

223. 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 l per day[1]. The precise figure on the consumption of water per capita in the sub-basins of the Nemunas RBD cannot be provided because there is no common strategy for drinking water supply and wastewater management at the municipal level, which results in a number of small water supply and wastewater management companies operating in the area of one

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

municipality. So far, none of the municipalities has defined any territory for public supply of water. The estimations are further complicated by the fact that the territories of the sub-basins do not coincide with the territories of the municipalities. Nevertheless, following certain assumptions, the analysis provided below has employed the said figure (even though imprecise) of average daily consumption of water per capita in accordance with the data received from water supply companies dominating in respective municipalities.

Agriculture

224. Agriculture is considered to be an economic driver for pressures related to both point and diffuse source pollution. In addition, this sector also involves straightening and canalisation of river stretches for reclamation purposes. The impact of agricultural loads is very important yet little analysed in Lithuania.

One of the main drivers of hydromorphological changes is land reclamation. Since the purpose of reclamation is to regulate the moisture regime of the soil thus providing favourable conditions for plants, the consequences of reclamation may be called an agricultural load. The impact of land reclamation on the hydrological regime is twofold: first, evaporation is reduced, which is especially noticeable in spring and at the beginning of summer; second, the maximum flow rates of rivers are increased. The impact of drainage on the hydrological regime of rivers and streams is generally more pronounced in small basins. The larger the basin, the lower the impact of drainage.

Straightened rivers

225. Using a GIS-based methodology, it was established that the length of straightened rivers and streams in the Nemunas RBD is around 3 119 km, about 1 053 km of which have been assigned to heavily modified water bodies (HMWB). The majority of the straightened rivers are small streams.

Energy

226. Approximately 93 % of all water abstracted in the Nemunas RBD is used for energy generation. This sector is the main driver of alterations of the hydrological regime due to dams and similar embankments, often preventing achievement of good ecological status of water bodies.

There are 50 hydropower plants currently operating in the Nemunas RBD. River stretches downstream of 32 HPP are recommended to be identified as water bodies at risk due to unnatural fluctuations of the water level and flow and the Nemunas stretch downstream of Kaunas HPP is proposed to be designated as HMWB. One of the ways to mitigate the risk is to replace old-type turbines with new ones, which are better suited for the natural regime of the river flow. This would reduce the impact of significant fluctuations of the water level on the ecological status of water downstream of the hydropower plants, and provide conditions for the achievement of good ecological status.

Fisheries

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

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 100 km^2. The number of live marketable fish grown in these ponds in 2007 totalled to about 3.5 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 has been 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, hence this sector is not included among significant pressures.

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 the 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.

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. Decrease of resources, seasonal fishery, fishery insurance 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 2007, certificates of ecological fishery were issued to 13 farms with 50.4 km^2 (the area of the stocked ponds – 49.4 km^2).

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 directions as well. The Programme includes such objectives as development of the aquaculture sector, upgrading of aquaculture companies and of inland water vessels.

According to the data of the EPA, the quality parameters (BOD_7, N_{total} and P_{total}) of water released from the fishery ponds seldom exceed the permitted norms.

Recreation

228. Descriptions of recreation in the sub-basins of the Nemunas RBD will often contain references to the Scheme of the National Water Tourism Routes provided below (Figure 50).

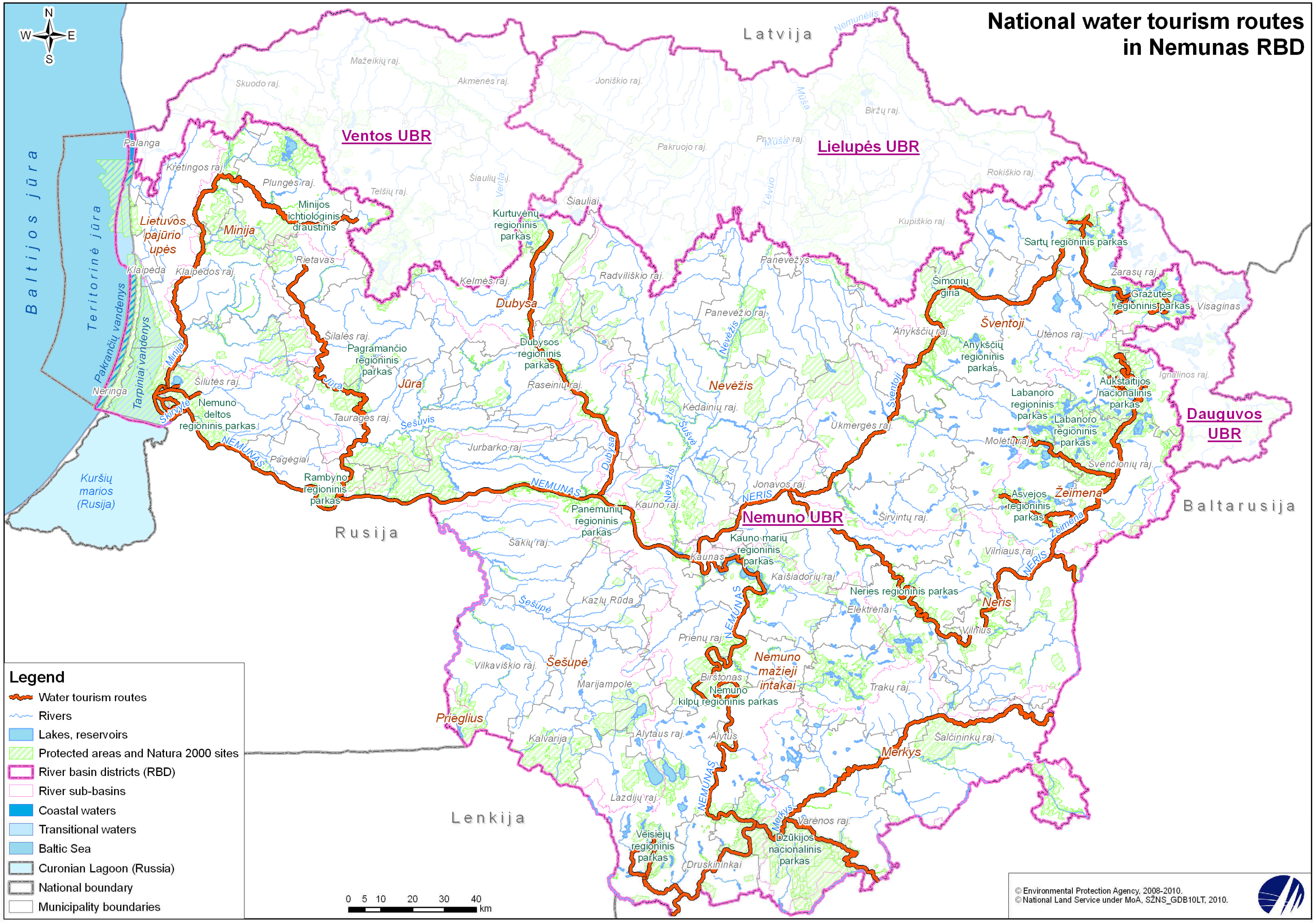


Figure 50. National water tourism routes. Source: Special Plan of National Water Tourism Routes

Pursuant to the National Tourism Development Programme 2007-2013, a Special Plan of National Water Tourism Routes was approved by the Minister of Economy in February 2009. The objective of the Plan is to encourage active water tourism in Lithuania developing an integral network of water tourism routes. This network will connect individual tourism routes formed in national and regional parks for the purpose of targeted use of the available water resources for promotion of local and inbound tourism. The total length of the planned national water tourism routes is 1858 km. The Special Plan of National Water Tourism Routes distinguishes eight routes of national importance: 1. the Merkys and the Ūla, 2. Aukštaitija National Park and the Žeimena, 3. the Neris, 4. the Minija, 5. the Jūra, 6. the Šventoji, 7. the Nemunas, and 8. the Dubysa.

Characterisation of the sub-basins

Minija Sub-basin

229. The Minija Sub-basin occupies the area of 2 942.1 km^2, which totals to 6.16 % of the total area of the Nemunas RBD.

The Minija Sub-basin situates two municipalities the shares of the areas of which in this sub-basin comprise more than 50 % of their respective areas: the municipalities of Plungė district and Klaipėda district. In addition, the Minija Sub-basin also comprises parts of the following municipalities: Skuodas (only 3.4 % of the area), Kretinga (31.5 %), Telšiai (8.2 %), Rietavas (27.0 %), Šilalė (9.7 %), and Šilutė (29.9 %) municipalities (10.6 %). Further description of the Minija Sub-basin is based on the socio-economic data of the main districts – those of Plungė and Klaipėda. Agricultural indicators are adjusted according to the areas of the said municipalities.

The number of population in Plungė and Klaipėda districts is 43.5 and 49 thousand people respectively, of which the respective percentage of rural population is 47 % and 64 %.

The unemployment rate in the Nemunas RBD has been decreasing since 2003 when it was 10.6 %. In 2008, unemployed people accounted for 4 % of the total population in this territory. As from 2004, the unemployment rate has gone down by 27 % in Plungė district and by 60 % in Klaipėda district.

Since there is no data available on disposable income of households in individual municipalities, only a relative average of the two counties where Plungė and Klaipėda districts are situated can be applied. In 2008, this average was LTL 900, which is less than the average of the whole Lithuania, which totalled to LTL 987 in 2008.

Water consumption in the Minija Sub-basin totals to approximately 3 000 thousand m^3 per year.

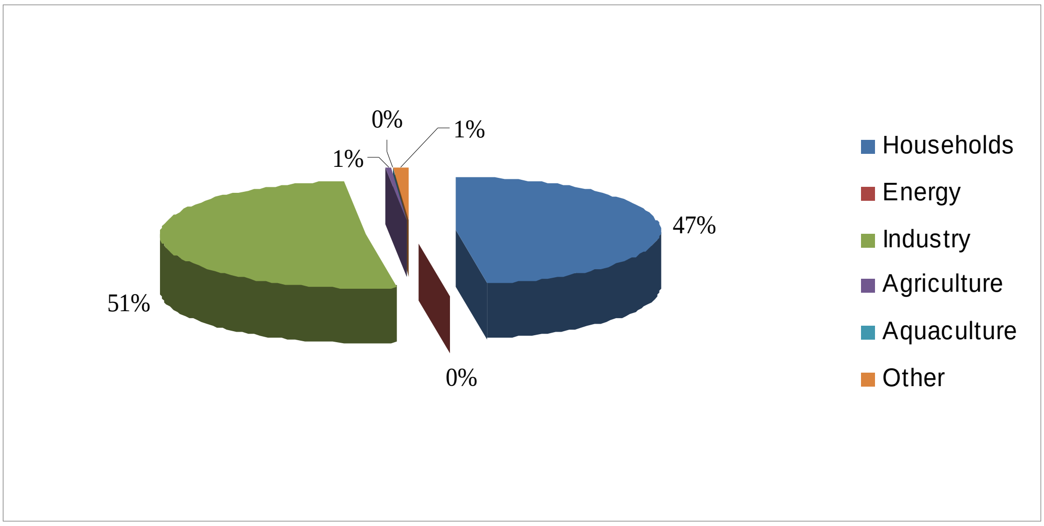


Figure 51. Water consumption in the municipalities of Plungė and Klaipėda districts in 2008. Source: Statistics Lithuania. The chart was drawn by the Consultant.

Figure 51 demonstrates that the largest share of water users is comprised of inhabitants, institutions and industry. Agriculture consumes only 0.6 % and energy – 0.1 % of the total amount of water consumed in these municipalities. There are no fishery companies in the Minija Sub-basin.

Though there is no untreated wastewater discharged in these municipalities (the volume of untreated wastewater in Lithuania totals to 0.3 %), the treatment quality is insufficient: 42 % of wastewater is treated below the established standards, meanwhile in Lithuania this figure is 27 % (excluding wastewater which is generally not subject to treatment).

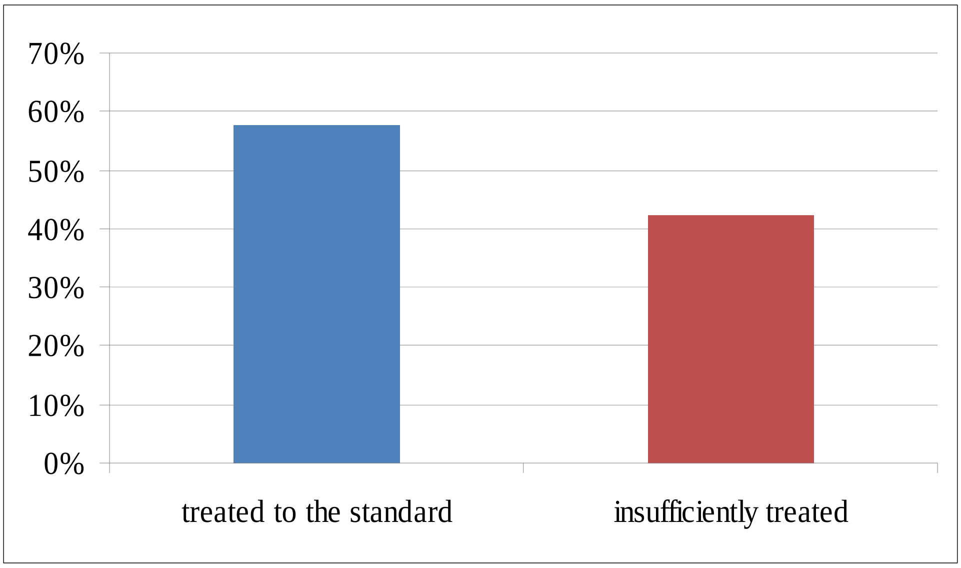


Figure 52. Level of treatment in both Plungė and Klaipėda district municipalities in 2008. Source: Statistics Lithuania. The chart was drawn by the Consultant.

Merkys Sub-basin

230. The Merkys Sub-basin occupies the area of 3 781 km^2, which totals to 8 % of the total area of the Nemunas RBD.

The Merkys Sub-basin situates two municipalities the shares of the areas of which in this sub-basin comprise more than 50 % of their respective areas: the municipalities of Varėna district and Šalčininkai district. In addition, the Merkys Sub-basin comprises parts of the following municipalities: Alytus (18.1 %), Trakai (40.5 %), and Vilnius district (2.7 %) municipalities. Further description of the Merkys Sub-basin is based on the socio-economic data of the main districts – those of Varėna and Šalčininkai. Agricultural indicators are adjusted according to the areas of the utilised agricultural land in the said municipalities.

The number of population in Varėna and Šalčininkai districts is 28.5 and 37.5 thousand people respectively, of which the respective percentages of rural population are 64 % and 70 % (higher than the average figure for rural areas).

The unemployment rate in the Nemunas River Basin District has been decreasing since 2003 when it was 10.6 %. In 2008, unemployed people in this territory accounted for less than 4 % of the total population. During the period from 2004 to 2008, the unemployment rate went down by 50 % in Varėna district and by 59 % in Šalčininkai district.

Since there is no data available on disposable income of households in individual municipalities, only the figures of the two counties where Varėna and Šalčininkai districts are situated can be applied. In this case, differently from other sub-basins, the average is not applied because the disposable income in Vilnius county is very high due to the income level in Vilnius city. Consequently, the average disposable income per one household member in the Lithuanian rural areas shall be applied in respect of Šalčininkai district, which is LTL 811.2. In Varėna district, which belongs to Alytus county, this indicator was LTL 806.2 in 2008, and this figure is lower than the Lithuanian average which was LTL 986.8 in 2008.

Annual water consumption in the Merkys Sub-basin totals to approximately 5 600 thousand m^3, of which more than 4 000 thousand m^3 per year is consumed for fishery purposes.

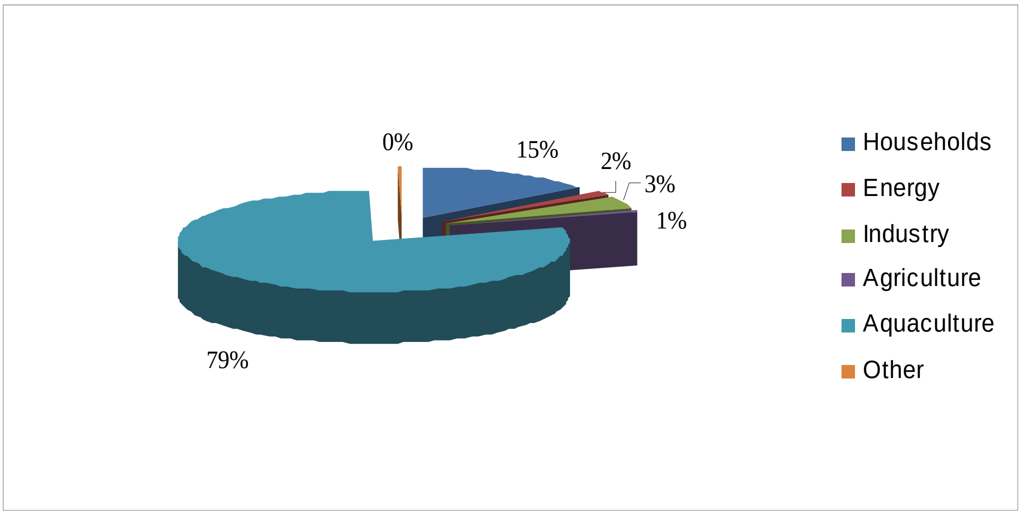


Figure 53. Water consumption in the municipalities of Varėna and Šalčininkai districts in 2008. Source: Statistics Lithuania. The chart was drawn by the Consultant.

As demonstrated in Figure 53, apart from fisheries, the largest share of water is used in the household sector. Industry consumes 4 %, agriculture and energy – only 1 % of the total amount of water consumed in these municipalities.

Though there is no untreated wastewater discharged in these municipalities, the treatment quality is insufficient: 47 % of wastewater is treated below the established standards.

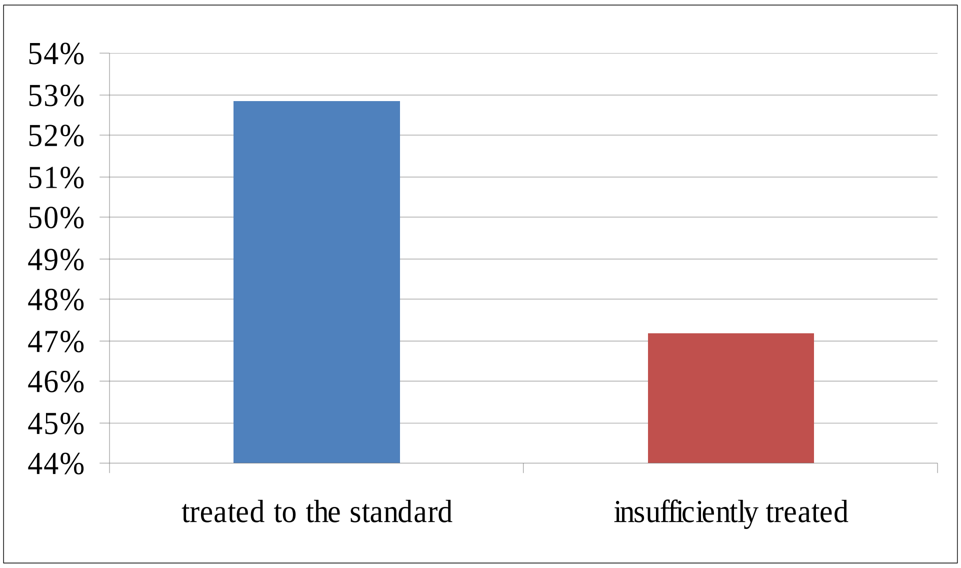


Figure 54. The level of treatment in both Varėna and Šalčininkai district municipalities in 2008. Source: Statistics Lithuania. The chart was drawn by the Consultant.

Žeimena Sub-basin

231. The Žeimena Sub-basin occupies the area of 2 775 km^2, which comprises 5.8 % of the total area of the Nemunas RBD.

There is one municipality the area of which in this sub-basin comprises more than 50 % of its area – Švenčionys district municipality. In addition, the Žeimena Sub-basin comprises parts of the following municipalities: Ignalina (29.3 %), Molėtai (37.1 %), Vilnius district (9.1 %), Utena (24.5 %) and Zarasai (0.9 %) municipalities. Further description of the Žeimena Sub-basin is based on the socio-economic data of Švenčionys district municipality. Agricultural indicators are adjusted according to the areas of the utilised agricultural land in the said municipality.

The number of population in Švenčionys district is 30 thousand people, 40 % of which live in the rural area. This figure is higher than the Lithuanian average.

The unemployment rate in the Nemunas River Basin District has been decreasing since 2003 when it was 10.6 %. In 2008, less than 4 % of the people of this territory were unemployed. During the period from 2004 to 2008, the level of unemployment rate in Švenčionys district went down by 55 %.

Since there is no data available on disposable income of households in individual municipalities, only the figures of the county where Švenčionys district is situated can be applied. However, differently from other sub-basins, this average shall not be applied here because disposable income in Vilnius county is very high due to the income level in Vilnius city. Accordingly, the so-called indicator of disposable income in “other towns” of Lithuania is applied to Švenčionys district – LTL 885.8 per one household member per month. This figure is lower than the Lithuanian average which was LTL 986.8 in 2008.

Annual water consumption in the Žeimena Sub-basin totals to approximately 10 850 thousand m^3, of which more than 10 000 thousand m^3 per year is consumed for fishery purposes.

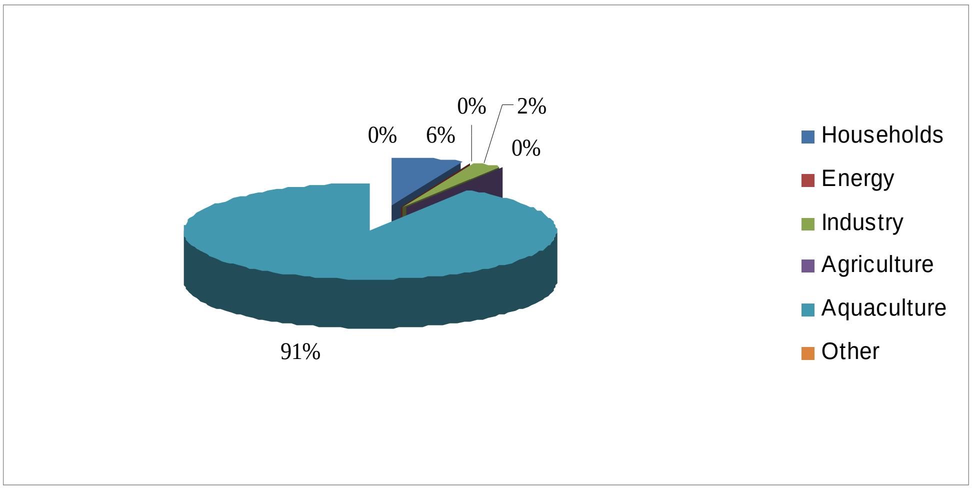


Figure 55. Water consumption in Švenčionys district municipality in 2008. Source: Statistics Lithuania. The chart was drawn by the Consultant.

As demonstrated in Figure 55, apart from fisheries, the largest share of water is used in the household sector. Industry consumes 2 % and agriculture – merely 0.01 % of the total amount of water consumed in this municipality.

The amount of wastewater subject to treatment in this district is only 12 % of the total volume of wastewater. Though there are no untreated discharges in this municipality, the treatment quality is insufficient: 31 % of the wastewater is treated below the established standards.

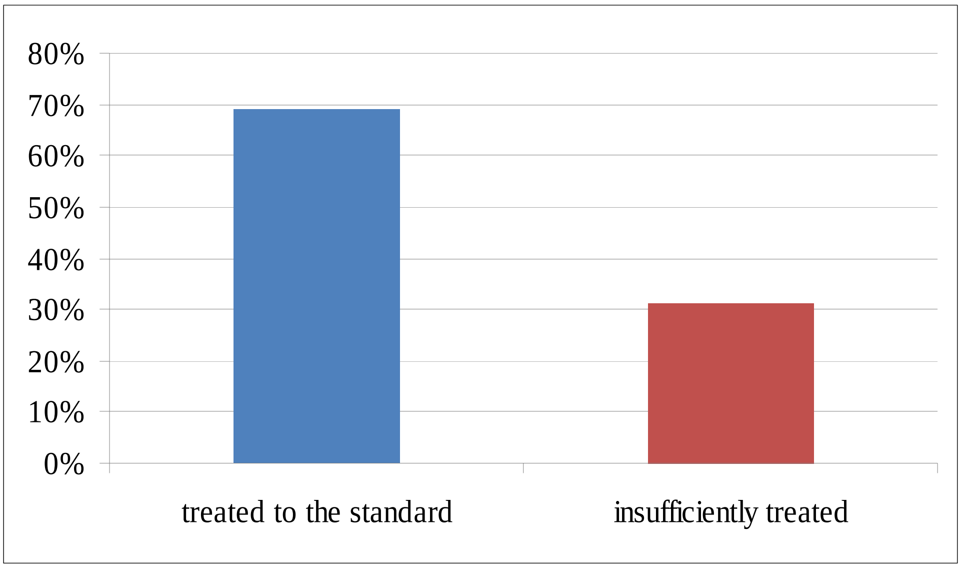


Figure 56. The level of treatment in Švenčionys district municipality in 2008.
Source: Statistics Lithuania. The chart was drawn by the Consultant.

Šventoji Sub-basin

232. The Šventoji Sub-basin occupies the area of 6 789 km^2, which makes up 14.2 % of the total area of the Nemunas RBD.

There are even six municipalities the shares of the areas of which in this sub-basin constitute more than 50 % of their respective areas: the municipalities of Anykščiai district (72 %), Molėtai district (61 %), Širvintos district (63 %), Ukmergė district (86 %), Utena district (73 %), and Zarasai district (55 %). In addition, the Šventoji Sub-basin comprises parts of the following municipalities: Ignalina (3 %), Jonava (13 %), Kupiškis (18 %), Rokiškis (48 %), and Vilnius district (3 %) municipalities. Further description of the Šventoji Sub-basin is based on the socio-economic data of the six main districts. Agricultural indicators have been adjusted according to the areas of the utilised agricultural land in the said municipalities.

The number of population in Anykščiai, Molėtai, Širvintos, Ukmergė, Utena and Zarasai districts is given in Table 113 below.

Table 113. The number of population in the municipalities of the Šventoji Sub-basin

Municipality	Total number of population	of which urban population	Percentage of rural population
Zarasai distr.	20 593	8 597	58.3 %
Anykščiai distr.	32 137	13 025	59.5 %
Utena distr.	47 934	32 572	32.0 %
Molėtai	23 187	6 949	70.0 %
Širvintos	19 142	7 070	63.1 %
Ukmergė distr.	45 868	27 603	39.8 %
Total	188 861	95 816	49.3 %

Source: Statistics Lithuania

The unemployment rate in the Nemunas River Basin District has been decreasing since 2003 when it was 10.6 %. In 2008, less than 4 % of the people in this territory were unemployed. The level of unemployment decreased by 20 % in Anykščiai district and by 60 % in Utena district, meanwhile in Zarasai district the figure remained the same.

Since there is no data available on disposable income of households in individual municipalities, the figures of two counties where the municipalities in question are situated can be applied. These are Utena and Vilnius counties where average disposable income per one household member per month was LTL 851 and LTL 1 186, respectively. The monthly average disposable income of one inhabitant was LTL 967.

Annual water consumption in the Šventoji Sub-basin totals to approximately 13 500 thousand m^3, of which almost 58 % are consumed for fishery purposes.

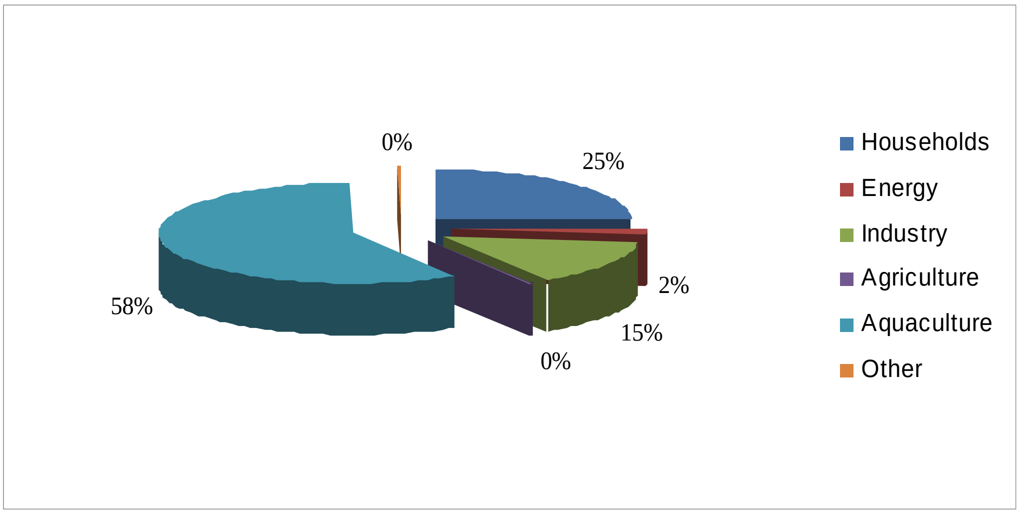


Figure 57. Water consumption in the main municipalities of the Šventoji Sub-basin in 2008. Source: Statistics Lithuania. The chart was drawn by the Consultant.

As demonstrated in Figure 57, apart from fisheries, the largest share of water is used in the household sector. Industry consumes 15 %, energy –1.7 % and agriculture – merely 0.16 % of the total amount of water consumed in these municipalities.

There is no untreated wastewater discharged in these municipalities, and the treatment quality is excellent – the percentage of wastewater treated to the established standards is as high as 99.7 %.

Neris Small Tributaries Sub-basin

233. The Neris Small Tributaries Sub-basin occupies the total area of 24 942 km^2. Its share in Lithuania is 4 267 km^2, which makes up 8.9 % of the total area of the Nemunas RBD in Lithuania.

There are two municipalities the shares of the areas of which in this sub-basin constitute more than 50 % of their respective areas: Vilnius city municipality (100 %) and Vilnius district municipality (85.2 %). In addition, the Neris Small Tributaries Sub-basin comprises parts of the following municipalities: Jonava (48.2 %), Kaišiadorys (42.7 %), Elektrėnai (38 %), Kaunas city (20.8 %), Kaunas district (6 %), Šalčininkai (4.2 %), Širvintos (37.3 %), Švenčionys (9.7 %), Trakai (19.9 %), and Ukmergė district (0.8 %) municipalities. Further description of this sub-basin is based on the socio-economic data of four main municipalities – those of Vilnius city and Vilnius district, Jonava and Kaišiadorys. The latter two municipalities are included as well because no other sub-basin situates such large shares of their areas as the Neris Small Tributaries Sub-basin, that is, 48.2 % and 42.7 % of their respective areas. Agricultural indicators have been adjusted according to the areas of the utilised agricultural land in the said municipalities.

The number of population in the four municipalities is given in Table 114 below.

The unemployment rate in the Nemunas River Basin District has been decreasing since 2003 when it was 10.6 %. In 2008, less than 4 % of the people in this territory were unemployed. The level of unemployment in the Neris Small Tributaries Sub-basin decreased by 18 % in Vilnius city and by 52 % in Jonava district.

Table 114. The number of population in the municipalities of the Neris Small Tributaries Sub-basin

Municipality	Total number of population	of which urban population	Percentage of rural population
Vilnius city	555 733	555 672	0.0 %
Vilnius district	95 078	5 876	93.8 %
Jonava district	51 745	34 446	33.4 %
Kaišiadorys district	35 905	13 488	62.4 %
Total	738 461	609 482	17.5 %

Source: Statistics Lithuania

Since there is no data available on disposable income of households in individual municipalities, only the figures of two counties where the municipalities in question are situated can be applied. These are Kaunas and Vilnius counties where disposable income per one household member per month is LTL 1 015.9 and LTL 1 186, respectively. The monthly average disposable income of one inhabitant in the sub-basin is LTL 1 166.

Annual water consumption in the Neris Small Tributaries Sub-basin totals to approximately 23 460 000 thousand m^3, of which 97.2 % were consumed for energy purposes because of the operation of Kruonis Pumped Storage Plant. The plant belongs to the Nemunas Small Tributaries Sub-basin therefore the issue of water consumption for energy purposes is not discussed in this section. The chart below illustrates the water consumption excluding the energy sector.

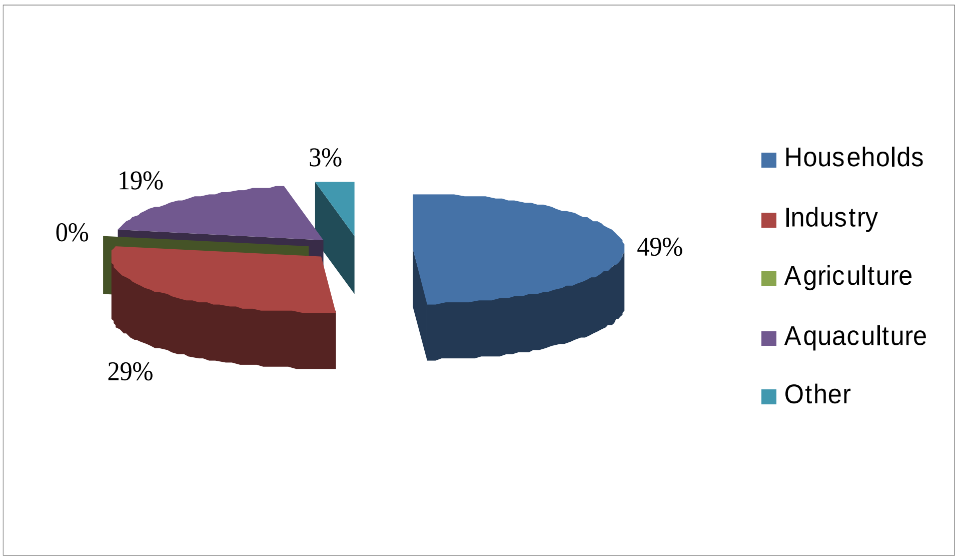


Figure 58. Water consumption in the main municipalities of the Neris Small Tributaries Sub-basin in 2008, excluding the energy sector which accounts for 97 % of the total water consumption in these municipalities. Source: Statistics Lithuania. The chart was drawn by the Consultant.

As demonstrated in Figure 58, apart from energy, the largest share of water is used in the household sector. Industry comes next, and fisheries (aquaculture) – differently from other sub-basins – is only on the third place. Agriculture accounts for mere 0.4 % of the total water consumption in these municipalities.

There is no untreated wastewater discharged in these municipalities, and the treatment quality is excellent – the percentage of wastewater treated to the established standards is as high as 98 %.

Nevėžis Sub-basin

234. The Nevėžis Sub-basin occupies the area of 6 140.5 km^2, which makes up 12.8 % of the total area of the Nemunas RBD.

There are four municipalities the shares of the areas of which in this sub-basin constitute more than 50 % of their respective areas: the municipalities of Kėdainiai (98.3 %), Panevėžys city (90.9 %), Panevėžys district (73.9 %) and Radviliškis district (71.0 %). Further description of this sub-basin is based on the socio-economic data of these main districts. In addition, the Nevėžis Sub-basin comprises parts of the following municipalities: municipalities of Anykščiai district (18.6 %), Jonava (38.7 %), Kaunas city (9.3 %), Kaunas district (40.3 %), Kelmė district (4.7 %), Raseiniai district (4.9 %), Šiauliai city (15.8 %), Šiauliai district (only 0.5 %), and Ukmergė district (13.2 %). Agricultural indicators have been adjusted according to the areas of the utilised agricultural land in the said municipalities.

The number of population in the municipalities of Panevėžys city and district, Kėdainiai and Radviliškis districts is given in Table 115 below.

Table 115. The number of population in the municipalities of the Nevėžis Sub-basin

Municipality	Total number of population	of which urban population	Percentage of rural population
Kėdainiai distr.	63 033	31 055	50.7 %
Panevėžys city	42 986	1 695	96.1 %
Panevėžys distr.	113 653	113 653	0.0 %
Radviliškis distr.	49 250	22 825	53.7 %
Total	268 922	169 228	37.1 %

Source: Statistics Lithuania

The unemployment rate in the Nemunas River Basin District has been decreasing since 2003 when it was 10.6 %. In 2008, less than 4 % of the population in this territory was unemployed. The level of unemployment in the Nevėžis Sub-basin decreased by 45 % (in Panevėžys city) – 61 % (in Panevėžys district).

Since there is no data available on disposable income of households in individual municipalities, only the figures of three counties where the municipalities in question are situated can be applied. These are Kaunas, Panevėžys and Šiauliai counties where monthly disposable income per one household member is LTL 1 016, 877 and 915, respectively. The monthly average disposable income of one inhabitant in the sub-basin in 2008 was LTL 918.

Annual water consumption in the Nevėžis Sub-basin totals to approximately 16 700 thousand m^3.

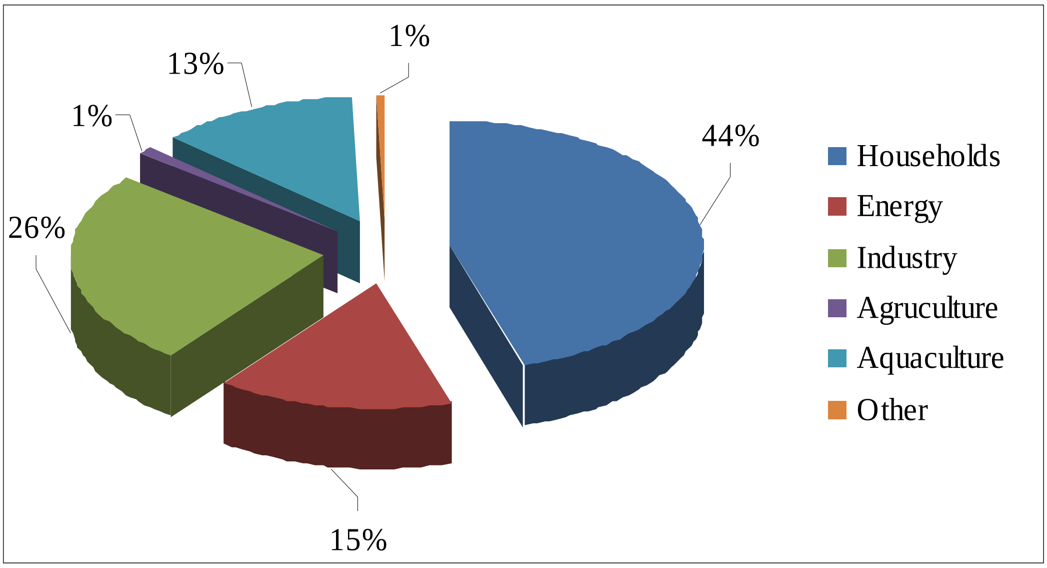


Figure 59. Water consumption in the main municipalities of the Nevėžis Sub-basin in 2008. Source: Statistics Lithuania. The chart was drawn by the Consultant.

As demonstrated in Figure 59, the household sector accounts for the highest consumption of water. Industry consumes 26 %, energy – 15 %, fisheries - 13 %, and agriculture merely 0.7 % of the total amount of water consumed in these municipalities.

There is no untreated wastewater discharged in these municipalities, and the treatment quality has been rapidly improving during the last years: in 2007 as much as 80 % of wastewater was treated below the established standards whereas in 2008 such wastewater accounted only for 34 %. However, it should be pointed out that the insufficient treatment occurred in Panevėžys city before 2009. As from this year, the situation should be much better, which should be reflected in the latest statistics.

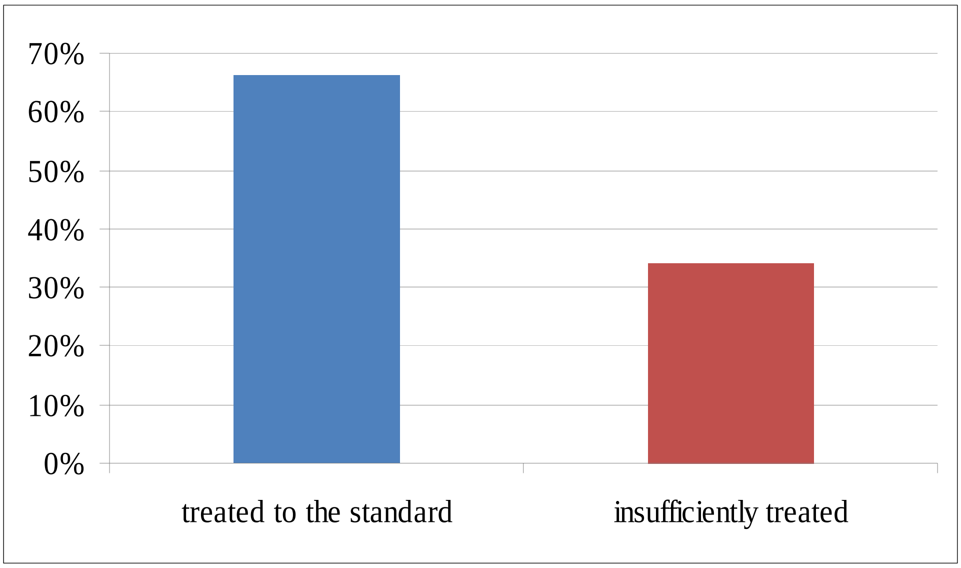


Figure 60. Level of wastewater treatment in the municipalities of Kėdainiai, Panevėžys city, Panevėžys district and Radviliškis district together in 2008. Source: Statistics Lithuania. The chart drawn by the Consultant.

Šešupė Sub-basin

235. The Šešupė Sub-basin occupies the area of 6 104.8 km^2. 4769.75 km^2 of this sub-basin are situated in Lithuania thus comprising 9.98 % of the total area of the Nemunas RBD.

The Šešupė Sub-basin situates five municipalities the shares of the areas of which in this sub-basin comprise more than 50 % of their areas: the municipalities of Kalvarija (99.3 %), Kazlų Rūda (99.1 %), Marijampolė (100 %), Šakiai district (76.2 %), and Vilkaviškis district (100 %). Further description of the Šešupė Sub-basin is based on the socio-economic data of these main districts. In addition, the Šešupė Sub-basin also comprises parts of the following municipalities: Alytus (10 % of the area), Kaunas district (7.5 %), Lazdijai (33.1 %), and Prienai (10.6 %) municipalities. Agricultural indicators are adjusted according to the area of the utilised agricultural land situated in these municipalities.

The number of people living in the municipalities of the main districts in the Šešupė Sub-basin is given in Table 116.

Table 116. The number of population in the municipalities of the Šešupė Sub-basin

Municipality	Total number of the population	of which urban population	Percentage of rural population
Marijampolė munic.	68 973	47 010	31.8
Kalvarija munic.	13 407	5 013	62.6
Kazlų Rūda munic.	14 497	7 162	50.6
Vilkaviškis distr. munic.	47 978	20 390	57.5
Šakiai distr. munic	36 364	10 363	71.5
Total / on average	181 219	89 938	50.4

Source: Statistics Lithuania

The unemployment rate in the Nemunas RBD has been decreasing since 2003 when it totalled to 10.6 %, meanwhile in 2008 it was less than 4 %. As compared to 2003, the number of the unemployed in the municipalities of the Šešupė Sub-basin went down by more than 60 % and in Šakiai municipality – even by 70 %.

There is no statistical data on disposable income of households by individual municipalities, therefore only the information of the county to which all the said municipalities belong can be applied. The average monthly disposable income in Marijampolė region was LTL 868.2 per household.

The annual water consumption in the Šešupė Sub-basin is about 10 400 thousand m^3.

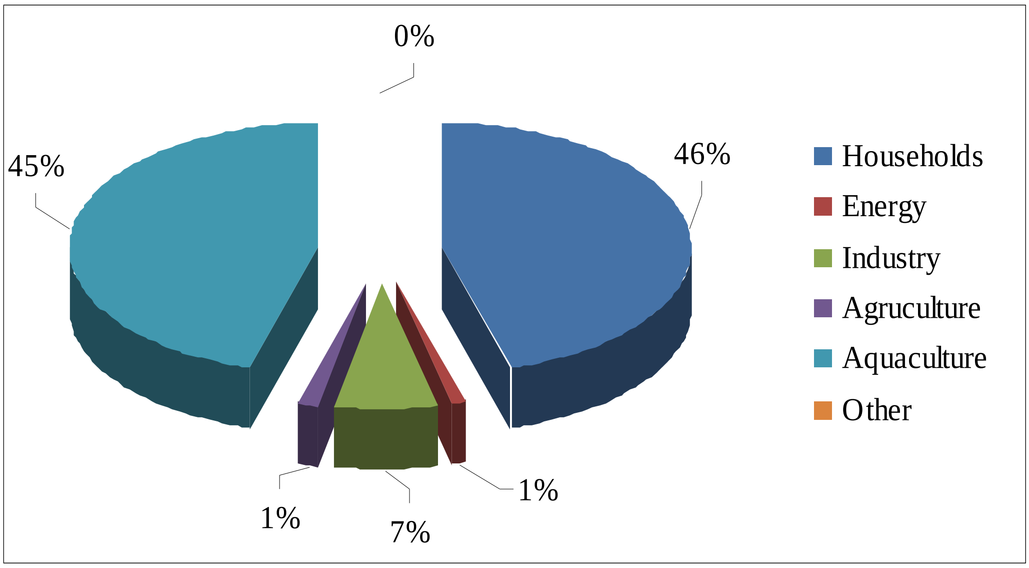


Figure 61. Water consumption in the Šešupė Sub-basin in 2008. Source: Statistics Lithuania. The chart was drawn by the Consultant.

As demonstrated in Figure 61, the largest amount of water is consumed for household purposes. The consumption in the fishery sector in 2008 was only slightly lower (by 1 %). Industry consumes 7 %, agriculture – 1.5 %, and the energy sector – 0.6 %.

The year 2008 saw some positive changes in this sub-basin. In 2007, all wastewater in Kalvarija municipality was discharged untreated, whereas in 2008, after the construction of a wastewater treatment plant, all wastewater is treated to the standard. The treatment quality in the sub-basin is very good – the level of clean-up to the standards is as high as 99.7 %.

Dubysa Sub-basin

236. The Dubysa Sub-basin occupies the area of 1 965.9 km^2, which makes up 4.1 % of the total area of the Nemunas RBD. This is one of the smallest sub-basins in the Nemunas RBD from the point of view of the size.

There are no municipalities the shares of the areas of which in this sub-basin constitute more than 50 % of their respective areas. For calculation purposes, two main municipalities – those of Kelmė district and Raseiniai district which occupy the major part of the sub-basin area (46.5 % and 45.2 % respectively) – have been taken. The shares of the remaining seven municipalities in this sub-basin are very small: Jurbarkas (2.6 %), Kaunas district (4.9 %), Kėdainiai (1.7 %), Radviliškis (4.5 %), Šiauliai city

(3.0 %), Šiauliai district (13.0 %), and Telšiai (only 0.7 %) municipalities. Agricultural indicators have been adjusted according to the areas of the utilised agricultural land in the said municipalities.

The number of population in the main municipalities of the Dubysa Sub-basin is given in Table 117 below.

Table 117. The number of population in the municipalities of the Dubysa Sub-basin

Municipality	Total number of population	of which urban population	Percentage of rural population
Kelmė distr.	38 057	13 803	63.7 %
Raseiniai distr.	41 895	15 703	62.5 %
Total / on average	79 952	29 506	63.1 %

Source: Statistics Lithuania

The unemployment rate in the Nemunas River Basin District has been decreasing since 2003 when it was 10.6 %. In 2008, less than 4 % of the population of this territory were unemployed. The level of unemployment in the municipalities of the Dubysa Sub-basin decreased by 38-67 %.

Since there is no data available on disposable income of households by individual municipalities, only the figures of the counties where the municipalities in question are situated can be applied. In 2008, the average monthly disposable household income in Kaunas county where Raseiniai is situated was LTL 1 016, and that in Šiauliai county where Kelmė is located – LTL 915.

Annual water consumption in the Dubysa Sub-basin totals to approximately 8 900 thousand m^3.

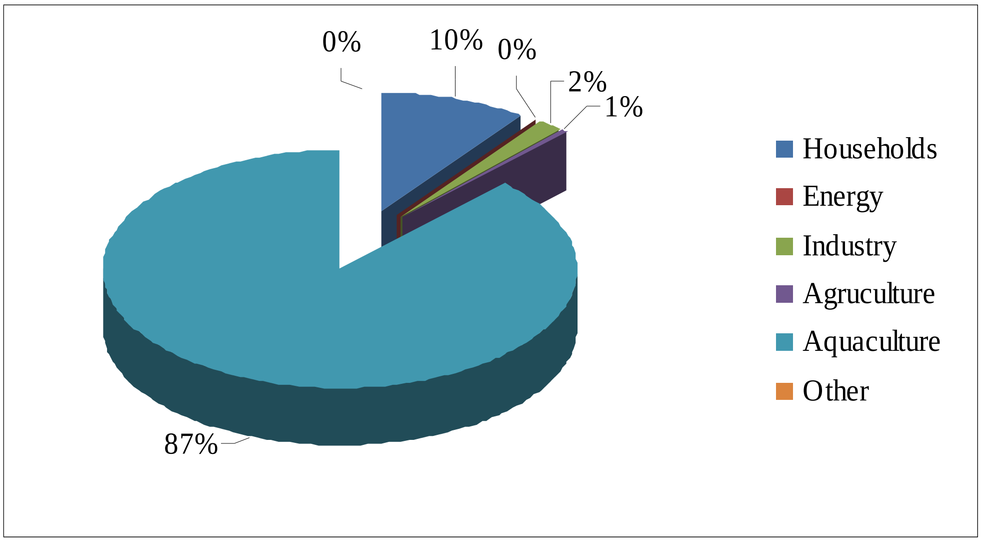


Figure 62. Water consumption in Kelmė and Raseiniai municipalities which are situated in the Dubysa Sub-basin in 2008. Source: Statistics Lithuania. The chart drawn by the Consultant.

As demonstrated in Figure 62, the largest share of water is used in the fisheries sector. Water consumed for fisheries purposes both in Kelmė and Raseiniai municipalities accounts for almost 90 % of the total consumption. The household sector consumes 10 %, industry – even five times less water. For agricultural purposes water is used only in Kelmė district, which accounts for only 0.5 % of the total water consumption in the sub-basin. The energy sector does not consume any water at all.

As in many other sub-basins, there are no untreated discharges in this sub-basin. The treatment quality is excellent – the percentage of wastewater treated to the established standards is as high as 99 %.

Jūra Sub-basin

237. The Jūra Sub-basin occupies the area of 4 005 km^2, which makes up 8.38 % of the total area of the Nemunas RBD.

There are three municipalities the shares of the areas of which in this sub-basin constitute more than 50 % of their respective areas: the municipalities of Rietavas (69.7 %), Šilalė (85.2 %) and Tauragė (87.7 %). Further description of the Jūra Sub-basin is based on the socio-economic data of these districts. In addition, the Jūra Sub-basin comprises parts of the following municipalities: Jurbarkas (26.7 %), Kelmė (13.9 %), Klaipėda (3.0 %), Pagėgiai (20.3 %), Plungė (only 0.4 %), Raseiniai (44.1 %), Šilutė (3.3 %), and Telšiai (only 0.6 %) municipalities. Agricultural indicators have been adjusted according to the areas of the utilised agricultural land in the said municipalities.

The number of population in the main municipalities of the Jūra Sub-basin is given in Table 118 below.

Table 118. The number of population in the municipalities of the Jūra Sub-basin

Municipality	Total number of population	of which urban population	Percentage of rural population
Rietavas distr.	10 085	3 843	61.9 %
Šilalė distr.	30 131	6 037	80.0 %
Tauragė distr.	50 690	29 838	41.1 %
Total / on average	90 906	39 718	56.3 %

Source: Statistics Lithuania

The unemployment rate in the Nemunas River Basin District has been decreasing since 2003 when it was 10.6 %. In 2008, less than 4 % of the population of this territory was unemployed. The level of unemployment in the municipalities of the Jūra Sub-basin during the said period decreased by 56 % on average, and in Šilalė district – by 80 %.

Since there is no data available on disposable income of households in individual municipalities, only the figures of the county where all the municipalities in question are situated can be applied. The average disposable income per one household member per month was LTL 851.5 in Telšiai county and LTL 861 in Tauragė. The monthly average disposable income of one inhabitant in the Jūra Sub-basin was LTL 860.

Annual water consumption in the Jūra Sub-basin totals to approximately 1 593 thousand m^3.

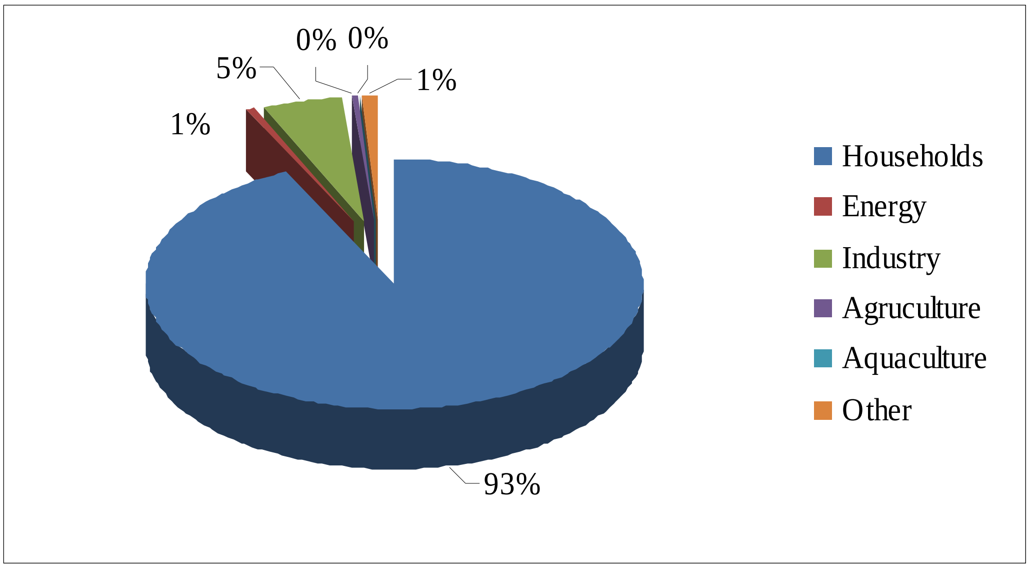


Figure 63. Water consumption in the Jūra Sub-basin in 2008. Source: Statistics Lithuania. The chart drawn by the Consultant.

As illustrated in Figure 63, the largest share of water is used in the household. Industry accounts for 5 %, agriculture – 0.5 % and energy – 0.6 % of the total water consumption in the Jūra Sub-basin.

There is no untreated wastewater discharged in these municipalities, and the treatment quality is excellent – the percentage of wastewater treated to the established standards is as high as 97 %.

Lithuanian Coastal Rivers Basin

238. The Lithuanian Coastal Rivers Basin occupies the area of 1 077 km^2, which makes up 2.3 % of the total area of the Nemunas RBD.

There are two municipalities the shares of the areas of which in this basin constitute more than 50 % of their respective areas: the municipalities of Klaipėda city (89.9 %) and Neringa (100 %). Further description of the Lithuanian Coastal Rivers Basin is based on the socio-economic data of these main municipalities. In addition, the basin comprises parts of the following municipalities: the municipalities of Klaipėda district (31.4 %), Kretinga (41.7 %), Palanga (49.0 %) and Šilutė (only 2.9 %). Agricultural indicators have been adjusted according to the areas of the utilised agricultural land in the said municipalities.

The number of population in the main municipalities of the basin is given in Table 119 below.

Table 119. The number of population in the municipalities of the Lithuanian Coastal Rivers Basin

Municipality	Total number of population	of which urban population	Percentage of rural population
Klaipėda city	184 657	184 657	0.0 %
Neringa	3 371	3 371	0.0 %
Total / on average	188 028	188 028	0.0 %

Source: Statistics Lithuania

The unemployment rate in the Nemunas River Basin District has been decreasing since 2003 when it was 10.6 %. In 2008, less than 4 % of the population of this territory was unemployed. During the said period, the level of unemployment in the Lithuanian Coastal Rivers Basin decreased by 50 % in Klaipėda and even by 100 % in Neringa.

Since there is no data available on disposable income of households by individual municipalities, only the figures of the counties where both municipalities in question are situated can be applied. In 2008, the average disposable household income per month in Klaipėda county was LTL 943.

Annual water consumption in the Lithuanian Coastal Rivers Basin totals to approximately 15 700 thousand m^3.

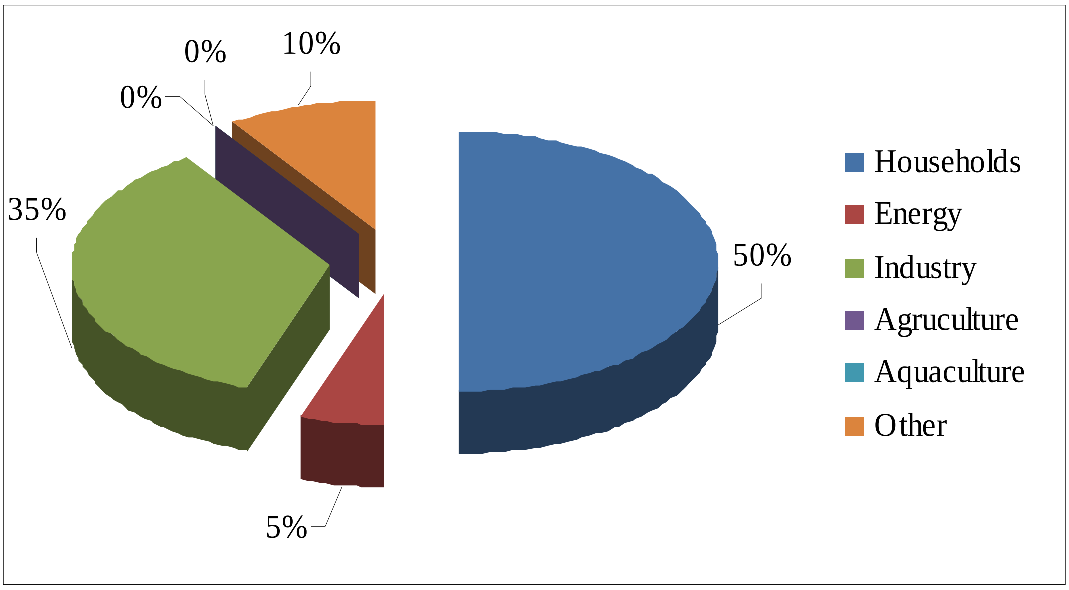


Figure 64. Water consumption in the Lithuanian Coastal Rivers Basin in 2008.
Source: Statistics Lithuania. The chart drawn by the Consultant.

As illustrated in Figure 64, the largest share of water is used in the household sector. Differently from other sub-basins, industry consumes almost the same amount, which is mainly determined by Klaipėda city, a large industrial centre. Energy accounts for 5 % of the total water consumption in the Lithuanian Coastal Rivers Basin.

The amount of untreated wastewater in this basin totals to 2.5 %. All such effluents are discharged in Neringa municipality. The wastewater treatment quality in the basin is very good – the percentage of wastewater treated to the established standards is as high as 97 %. The situation will improve even more after the startup of Neringa WWTP.

The Nemunas Small Tributaries Sub-basin

239. The Nemunas Small Tributaries Sub-basin occupies the total area of 8 813 km^2, which makes up 18.4 % of the total area of the Nemunas RBD in Lithuania.

This is a large sub-basin. There are even 11 municipalities the shares of the areas of which in the sub-basin constitute more than 50 % of their respective areas: the municipalities of Alytus town (100 %), Alytus district (71.9 %), Birštonas (100 %), Druskininkai (99.7 %), Elektrėnai (62 %), Jurbarkas (70.8 %), Pagėgiai (79.5 %),

Kaišiadorys (57.3 %), Kaunas city (70 %), Lazdijai (66.8 %), and Prienai district (89.4 %).
In addition, the Nemunas Small Tributaries Sub-basin comprises parts of the following municipalities: the municipalities of Kaunas (41.3 %), Kazlų Rūda (only 0.9 %), Marijampolė (10.3 %), Raseiniai (5.8 %), Šakiai (23.8 %), Šalčininkai (16.9 %), Šilutė (47.5 %), Tauragė (12.3 %), Trakai (39.5 %), and Varėna (17.7 %) districts.

Further description of the Nemunas Small Tributaries Sub-basin is based on the socio-economic data of twelve largest municipalities. Šilutė district municipality, 47.5 % of the area of which is situated in this sub-basin, has been included as well because no other sub-basin situates such a large share of its area.

Agricultural indicators have been adjusted according to the areas of the utilised agricultural land in the said municipalities.

The number of population in the said municipalities is given in Table 120 below.

Table 120. The number of population in the municipalities of the Nemunas Small Tributaries Sub-basin

Municipality	Total number of population	of which urban population	Percentage of rural population
Alytus distr.	31 073	3 276	89.5 %
Alytus town	68 304	68 304	0.0 %
Lazdijai distr.	24 823	6 403	74.2 %
Druskininkai town	24 341	16 263	33.2 %
Kaunas city	355 586	355 586	0.0 %
Birštonas town	5 261	3 172	39.7 %
Prienai distr.	33 580	12 295	63.4 %
Kaišiadorys distr.	35 905	13 488	62.4 %
Šilutė distr.	52 960	20 945	60.5 %
Jurbarkas distr.	35 158	13 907	60.4 %
Pagėgiai distr.	11 399	2 554	77.6 %
Elektrėnai	27 911	18 867	32.4 %
Total	706 301	535 060	24.2 %

Source: Statistics Lithuania

The unemployment rate in the Nemunas River Basin District has been decreasing since 2003 when it was 10.6 %. In 2008, less than 4 % of the population of this territory was unemployed. The level of unemployment in the Nemunas Small Tributaries Sub-basin decreased by 50 % on average (from 0 % in Birštonas and Prienai municipalities to more than 75 % in Elektrėnai).

Since there is no data available on disposable income of households in individual municipalities, only the figures of five counties where the municipalities in question are situated can be applied. These are Alytus, Kaunas, Klaipėda, Tauragė, and Vilnius counties where average monthly disposable income per one household member in 2008 was LTL 806, 1016, 943, 861, and 1 186, respectively. The average disposable income of one inhabitant in the sub-basin is LTL 963 per month.

Annual water consumption in the Nemunas Small Tributaries Sub-basin totals to approximately 2 520 000 thousand m^3, of which 99 % is consumed for energy purposes because of the operation of Kruonis Pumped Storage Plant. The issue of water consumption for energy purposes is not discussed in this section. The chart below illustrates the water consumption excluding the energy sector.

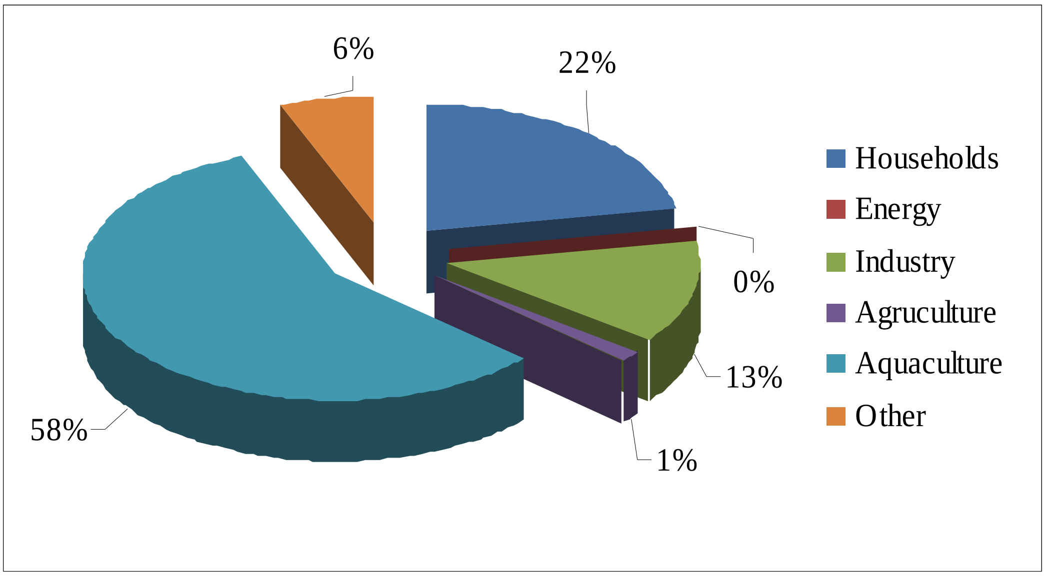


Figure 65. Water consumption in the main municipalities of the Nemunas Small Tributaries Sub-basin in 2008, excluding the energy sector which accounts for 99 % of the total water consumption in these municipalities. Source: Statistics Lithuania. The chart drawn by the Consultant.

As illustrated in Figure 65, apart from energy, the largest share of water is used in the fisheries (aquaculture) sector. The household sector comes next and industry is on the third place. Agriculture accounts for 1.4 % of the total water consumption in these municipalities (excluding energy).

The amount of untreated wastewater is small, such effluents are discharged in Pagėgiai, Šilutė district and Kaunas, which accounts for 0.3 of all wastewater subject to treatment. The treatment quality is good – the percentage of wastewater treated to the established standards is as high as 89 % (Figure 66).

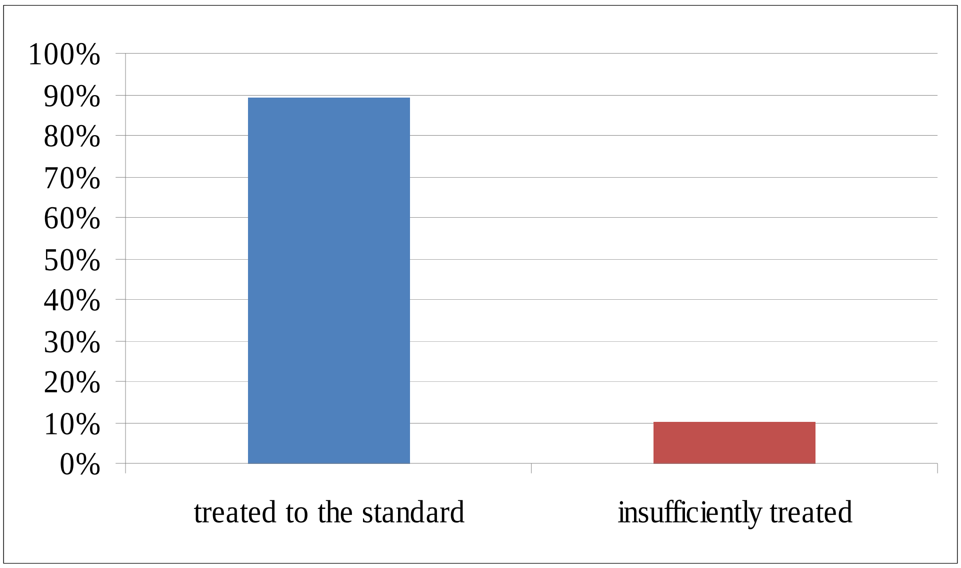


Figure 66. Wastewater treatment in the main municipalities of the Nemunas Small Tributaries Sub-basin in 2007. Source: Statistics Lithuania. The chart drawn by the Consultant.

Prieglius Basin

240. The Prieglius Basin occupies the area of 88.4 km^2, which constitutes only 0.18 % of the total area of the Nemunas RBD.

This basin comprises 6 % of the territory of Vilkaviškis district municipality.

No dischargers of point pollution have been identified in the Prieglius Basin. There are no sources of significant pollution and no hydropower plants and ponds or straightened rivers which would be assigned to heavily modified water bodies.

Consequently, no economic analysis and selection of supplementary measures has been carried out for the Lithuanian part of this basin.

SECTION II. IMPACTS OF ECONOMIC SECTORS ON THE STATUS OF WATER BODIES

241. An analysis of impacts on water resources has identified the following sectors related to and affecting the use of water resources in Lithuania: households, industry, energy, agriculture, and fisheries. As demonstrated in the sections above, the most important ones are households, industry and fisheries.

Summary of the major impacts by individual sub-basins

Minija Sub-basin

242. The major sources of impacts in the Minija Sub-basin are municipal and industrial discharges. Neither agricultural activities nor hydropower facilities pose any major problems to the status of water.

Following the mathematical modelling data, the concentration of ammonium nitrogen in a small stretch of the Minija below Plungė (that is, downstream of the inflow of the Sruoja) may be balancing between good and moderate ecological status, but it has not been designated as a water body at risk and will be subject to operational monitoring.

No other point pollution sources with a significant impact on the Minija Sub-basin and no water bodies at risk due to dangerous substances have been identified in the Minija Sub-basin.

One water body at risk (the Babrungas River) has been subject to pressures from hydrological fluctuations because of a hydropower plant, and 95.7 km of rivers have undergone hydromorphological modifications as a result of river straightening.

Merkys Sub-basin

243. The main identified sources of impacts in the Merkys Sub-basin are effluents from the fisheries sector as well as municipal and industrial wastewater.

It has been established that BOD_7 concentrations in the Varėnė River may be exceeding the threshold values of good ecological status due to pollution by the aquaculture company Daugų žuvis; however, following 2008 data, the said concentrations in discharges from the fishery farm have significantly gone down and therefore the Varėnė has not been designated as a water body at risk. The river will be subject to operational monitoring.

Following monitoring and modelling data, supplementary measures due to excessive amounts of BOD_7, nitrogen or phosphorus are required in Šalčininkai wastewater treatment plant. No water bodies at risk because of dangerous substances have been identified in the Merkys Sub-basin.

Agricultural activities do not pose any major problems to the status of water.

One water body at risk (the Verseka River) has been subject to pressures from hydrological fluctuations because of two hydropower plants, and 295 km of rivers have undergone hydromorphological modifications as a result of river straightening.

Žeimena Sub-basin

244. The main identified sources of impacts in the Žeimena Sub-basin are municipal and industrial wastewater. No negative impact of wastewater from the fisheries sector has been detected. Neither agricultural activities nor hydropower facilities pose any major problems to the status of water.

Following monitoring and modelling data, supplementary measures due to excessive amounts of phosphorus are required in Švenčionys wastewater treatment plant. No water bodies at risk because of dangerous substances have been identified in the Žeimena Sub-basin. However, a one-off analysis conducted three years ago detected presence of certain hazardous substances in the effluents discharged from WWTPs.

There are no hydropower plants exerting significant impacts on water bodies in the Žeimena Sub-basin. The length of straightened river stretches which have undergone hydromorphological changes totals to 86 km.

Šventoji Sub-basin

245. The main identified sources of impacts in the Šventoji Sub-basin are effluents from the fisheries sector, municipal and industrial wastewater, and agricultural pollution. However, no negative impact of fisheries effluents has been detected. Hydropower facilities do not pose any major problems to the status of water.

Following monitoring and modelling data, supplementary measures due to excessive amounts of phosphorus are required in Utena town. Analysis shows that stormwater runoff loads may be significantly contributing to pollution loads discharged from Utena wastewater treatment plant, although the actual amount of pollution emitted from surface runoff dischargers is not known at the moment and needs supplementary analysis.

Agricultural pollution does not have any significant impact on the ecological status of many rivers in the sub-basin. Nevertheless, a couple of rivers flowing over the areas of intensive agricultural activities are polluted with nitrate nitrogen. The achievement of good ecological status in these rivers will require supplementary measures against agricultural pollution.

No water bodies at risk because of dangerous substances have been identified in the Šventoji Sub-basin. However, a one-off analysis conducted three years ago detected presence of certain dangerous substances in the effluents discharged from WWTP and in the Šventoji.

Six water bodies at risk due to hydrological fluctuations because of seven hydropower plants have been identified in the sub-basin. 267 km of rivers have undergone hydromorphological modifications as a result of river straightening.

Neris Small Tributaries Sub-basin

246. The main identified sources of impacts in the Neris Small Tributaries Sub-basin are municipal and industrial wastewater, and agricultural pollution, as well as transboundary pollution.

Following monitoring and modelling data, supplementary measures due to excessive amounts of nitrogen and phosphorus are required only in Kaišiadorys wastewater treatment plant.

It is suggested that the Neris River is designated as a water body at risk because of hazardous substances in its water. A one-off analysis conducted three years ago detected presence of certain dangerous substances in the Neris at Buivydžiai and in wastewater discharged from Jonava WWTP.

Following water quality monitoring data, the values of BOD_7 in the Neris fail to conform to the good ecological status requirements due to transboundary pollution. However, the assessment of transboundary pollution will be revised upon collection of more monitoring data.

Agricultural pollution does not have any significant impact on many rivers in the sub-basin. Still, a couple of stretches flowing over the areas of intensive agricultural activities suffer from significant pollution. Improvement of their ecological status will require supplementary measures against agricultural pollution.

One water body (the Musė River) has been subject to pressures from water level fluctuations because of the operation of a hydropower plant and thus has been identified as a water body at risk. 225 km of rivers have undergone hydromorphological modifications as a result of river straightening.

Nevėžis Sub-basin

247. The main identified sources of impacts in the Nevėžis Sub-basin are municipal and industrial wastewater, and agricultural pollution. This sub-basin requires more supplementary measures for reduction of household, industrial and agricultural pollution than in any other sub-basin.

Following analyses data, supplementary measures due to excessive amounts of nitrogen and phosphorus compounds are required in three wastewater treatment plants (Baisogala, Pakiršinis and Bukonys). Supplementary pollution reduction measures may also be needed in a few more WWTP (nine such plants have been identified at the moment); however, there is lack of data to prove significance of their impact.

A very important driver of pressures in the Nevėžis Sub-basin is agricultural diffuse pollution, which exerts a significant impact on as many as 69 water bodies at risk in the category of rivers. Supplementary agricultural pollution reduction measures will be required in order to achieve good ecological status in these water bodies.

The Nevėžis River downstream of Panevėžys WWTP is designated as a water body at risk due to pollution with hazardous substances. A one-off analysis conducted three years ago detected presence of certain hazardous substances in the Nevėžis water downstream of Panevėžys and in the effluents of the water company Aukštaitijos vandenys.

Four water bodies have been subject to pressures from hydrological fluctuations because of five hydropower plants and hence have been identified as water bodies at risk. 747 km of rivers have undergone hydromorphological modifications as a result of river straightening.

Šešupė Sub-basin

248. To date, the major identified sources of impacts in the Šešupė Sub-basin have been municipal and industrial wastewater, and agricultural pollution. As in the case of the Nevėžis Sub-basin, a number of supplementary measures to reduce pollution from households and agriculture are required in the Šešupė Sub-basin.

Following monitoring and modelling data, supplementary measures may be required in five wastewater treatment plants (Šakiai, Vilkaviškis, Lazdijai, Kybartai, and Kazlų Rūda) due to excessive amounts of nitrogen and phosphorus. Yet, more data verifying significance of pollution discharged from Lazdijai and Kazlų Rūda WWTP is required as well loads emitted from dischargers of surface runoff and their input into the total pollution of Vilkaviškis town need to be analysed before introducing such measures. Accordingly, at the moment supplementary pollution reduction measures are proposed only for Kybartai WWTP. As to Šakiai WWTP, no supplementary measures might be required if requirements restricting the use of phosphorus in detergents used in households and industry are introduced.

Significant pollution from agricultural sources has to be reduced in as many as 29 water bodies in the Šešupė Sub-basin.

No water bodies at risk because of hazardous substances have been identified in the Šešupė Sub-basin. However, a one-off analysis conducted three years ago detected presence of certain dangerous substances in the water of the Siesartis downstream of Šakiai.

Two water bodies have been subject to pressures from hydrological fluctuations because of five hydropower plants and hence identified as water bodies at risk. 490 km of rivers have undergone hydromorphological modifications as a result of river straightening.

Dubysa Sub-basin

249. The major identified sources of impacts in the Dubysa Sub-basin are municipal wastewater and agricultural pollution.

Supplementary pollution reduction measures in the Dubysa Sub-basin are required only in Tytuvėnai WWTP where ammonium nitrogen loads have to be reduced. Other point pollution loads in the Dubysa Sub-basin do not have any significant impacts on the ecological status of the rivers therein.

Supplementary measures are required to reduce agricultural pollution in eight water bodies in the category of rivers.

No water bodies at risk because of hazardous substances have been identified in the Dubysa Sub-basin.

Two water bodies at risk have been identified as such due to water level fluctuations because of two hydropower plants. 150 km of rivers have undergone hydromorphological modifications as a result of river straightening.

Jūra Sub-basin

250. The main identified sources of impacts in the Jūra Sub-basin are municipal and industrial wastewater, and agricultural pollution.

Following monitoring and modelling data, supplementary measures due to excessive amounts of nitrogen and phosphorus are required in one wastewater treatment plant (Raseiniai WWTP). Besides, three more settlements and villages may be sources of significant pollution but the impact requires additional analysis.

Also, agricultural pollution entering two water bodies has to be reduced. No water bodies at risk because of dangerous substances have been identified in the Jūra Sub-basin.

One water body at risk has been identified as such due to hydrological fluctuations because of a hydropower plant. 196 km of rivers have undergone hydromorphological modifications as a result of river straightening.

Lithuanian Coastal Rivers Basin

251. The main identified sources of impacts in the Lithuanian Coastal Rivers Basin are municipal and industrial wastewater, and surface runoff.

Following monitoring and modelling data, supplementary measures due to excessive amounts of nitrogen and phosphorus are required in one wastewater treatment plant (Kretinga WWTP). Supplementary measures may also be required to reduce discharges of surface runoff. However, the actual loads are not known yet and hence supplementary measures to address these loads have not been included in the present Plan.

The Akmena-Danė has been identified as a water body at risk due to potential pollution with hazardous substances.

There are no hydropower plants exerting significant impacts in this sub-basin. The length of regulated rivers totals to 80 km.

Nemunas Small Tributaries Sub-basin

252. The main identified sources of impacts in the Nemunas Small Tributaries Sub-basin are municipal, industrial, and fishery wastewater. Another driver of significant pressures in this sub-basin is transboundary pollution.

Following monitoring and modelling data, supplementary measures due to excessive amounts of BOD_7, nitrogen and phosphorus are required in Pravieniškės, Šilutė, Klausučiai, and Lekėčiai wastewater treatment plants.

It is proposed to assign the Nemunas to water bodies at risk because of potential pollution thereof with hazardous substances. A one-off analysis conducted three years ago detected presence of certain dangerous substances in the Nemunas at the border, at Rusnė, downstream of Sovetsk and of Kaunas, as well as in wastewater of the water companies Dzūkijos vandenys, Birštono vandentiekis and Kauno vandenys.

Nine water bodies have been subject to pressures from water level fluctuations because of the operation of eight hydropower plants and hence designated as water bodies at risk. The Nemunas stretch downstream of Kaunas HPP has been identified as a heavily modified water body due impacts of the hydropower plant. 486 km of rivers have undergone hydromorphological modifications as a result of river straightening.

Agricultural pollution does not have any significant impact on the rivers in the Nemunas Small Tributaries Sub-basin; however, concentrations of BOD_7 in the Jiesia River may be failing the good ecological status requirements due to pollution from fishery ponds.

Water quality monitoring data indicates that values of BOD_7 in the Nemunas River might be failing the good ecological status requirements due to transboundary pollution. The impact of transboundary pollution will be revised upon collection of more data.

Households

253. Statistical data on water consumption in Lithuania is accumulated according to administrative units – municipalities. The exact data on the number of population connected to the centralised water supply and wastewater network in the sub-basin cannot be provided because such data is collected at the level of water supply companies. The territories serviced by water supply companies do not coincide with the municipal borders; besides, the percentage of people serviced is different in individual settlements. To be able to obtain accurate information at the level of the sub-basin, collection of statistics at the level of sub-basins should be initiated.

254. The revision of the data for the sub-basins of the Nemunas RBD was based on the following sources of information:

254.1. Data of the Department of Statistics of the Republic of Lithuania (Statistics Lithuania) on water consumption in 2007 by sectors (amounts of water consumed for domestic and municipal needs and industry in individual municipalities);

254.2. Data of the wastewater discharger database of the Environmental Protection Agency of 2007. The amounts of wastewater discharged into individual sub-basins were calculated on the basis of the location of dischargers. The calculations did not include effluents from energy objects and fishery companies.

255. The water consumption in individual sub-basins was revised taking into account the following assumptions:

255.1. All water consumed for domestic and municipal needs is attributed to households (the category “Consumed for domestic and municipal needs” of Statistics Lithuania);

255.2. Water consumption for domestic and municipal needs in a sub-basin is proportionate to the amount of wastewater discharged into the sub-basin (that is, if 20 % of domestic and municipal wastewater is discharged from municipality A into sub-basin B, it means that 20 % of water consumed for domestic and municipal needs in the territory of the municipality is consumed in this sub-basin).

256. The majority of dischargers emit mixed domestic and industrial wastewater. The estimations of the share of domestic wastewater therein was based on the proportion calculated according to the water amounts consumed in the domestic and municipal sector and in the sector of industry, as provided by the Statistics Lithuania.

For the purpose of implementing the strategic goal to achieve that 95 % of the population become able to use water supply and wastewater management services, it has been planned to allocate funds for the municipalities situated in the Nemunas RBD for 2007-2013.

Also, plans have been made to develop a sludge management infrastructure building sludge processing installations in 23 towns[5]. The characteristics of water consumption by households in the Nemunas RBD are provided further below.

Minija Sub-basin

257. Of all municipalities the territories of which are situated in the Minija Sub-basin, the largest amount of water is consumed in the municipality of Plungė district (almost 70 % of the total water consumption in the sub-basin for household purposes). In Plungė municipality, the daily consumption of water by one inhabitant connected to the central network totals to 50 l on average. Consequently, average water consumption in the Minija Sub-basin is lower than the Lithuanian average.

Information on the water consumption in the household sector and domestic/municipal wastewater discharges in the Minija Sub-basin is provided in Table 121.

The most significant pressure in the household sector in the Minija Sub-basin is made in Plungė municipality. The Minija Sub-basin situates 83 % of the area of Plungė district municipality, however, all wastewater produced in this district is discharged into the rivers of the Minija Sub-basin. Plungė district accounts for 70 % of water consumption by households and 85 % of wastewater discharges in the sub-basin.

The difference between the consumption of water and discharge of wastewater (the amount of water supplied exceeds the amount of discharges by 20 %) could have emerged due to the assumptions made for the revision purposes. The share of domestic

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[5] A list of national projects under Measure No VP3-3.1-AM-01-V *Renovation and development of water supply and wastewater treatment systems*, activity *Development of a sludge management infrastructure*, was approved by Order No. D1-667 of the Minister of the Environment of the Republic of Lithuania of 9 December 2008 (Žin., 2009, No. 6-188, 48-1913).

wastewater in municipal wastewater (in individual dischargers) emitted into the Minija Sub-basin in Šilutė and Klaipėda districts may be larger than the district average.

In comparison to other sub-basins of the Nemunas RBD, the level of water consumption in the Minija Sub-basin is low (about 1.5 % of the household consumption in the Nemunas RBD).

Table 122 below provides information on planned investment projects in towns and settlements in the Minija Sub-basin, including the required costs.

No investments have been planned for sludge treatment facilities in the Minija Sub-basin.

Table121. Water consumption and wastewater discharges in the household sector in the Minija Sub-basin, 2007

Municipality	Share of the municipality in the sub-basin, %	Share of domestic wastewater in municipal wastewater, %	Water consumption and wastewater discharge on the territory of the municipality			Water consumption and wastewater discharge on the territory of the sub-basin				
			Total amount of water consumed for domestic and municipal needs, thou. m^3/year	Total amount of domestic and municipal (excl. industrial) wastewater discharged, thou. m^3/year	Total amount of surface runoff, thou. m^3/year	Amount of water consumed for domestic needs, thou. m^3/year	Amount of municipal (domestic and industrial) wastewater discharged, thou. m^3/year	Amount of domestic wastewater discharged, thou. m^3/year	Amount of surface runoff, thou. m^3/year	Share of wastewater in the total amount of wastewater (domestic-municipal) discharged on the territory of the municipality, %
Klaipėda distr.	58.0	47.0	732.0	335.0	621.0	288.4	132.0	62.0	42.0	39.4
Kretinga distr.	31.5	85.1	682.0	594.0	441.0	40.2	35.0	29.8	13.0	5.9
Plungė distr.	83.0	71.5	1 005.0	1 424.0	913.0	1 005.0	1 424.0	1 018.6	913.0	100.0
Rietavas	27.0	94.7	90.0	264.0	9.0	0.7	2.0	1.9	0.0	0.8
Skuodas distr.	3.4	100.0	722.0	383.0	214.1	0.0	0.0	0.0	0.0	0.0
Šilalė distr.	9.7	84.7	412.3	411.0	219.0	0.0	0.0	0.0	0.0	0.0
Šilutė distr.	29.9	32.8	1 154.0	2 711.0	397.0	95.8	225.0	73.7	23.0	8.3
Telšiai distr.	8.2	57.0	1 398.0	3 362.0	190.0	5.8	14.0	8.0	0.0	0.4
TOTAL			**6 195.3**	**9 484.0**	**3 004.1**	**1 435.9**	**1 832.0**	**1 194.0**	**991.0**	

Notes:

1. The table lists all municipalities in the Minija Sub-basin.

2. The share of domestic wastewater in the total municipal wastewater was calculated dividing the amount of water consumed for domestic and municipal needs by the aggregate amount of water consumed for industrial and domestic-municipal purposes.

Table 122. National projects in the Minija Sub-basin in 2007-2013

Municipality	Settlement	Planned works							Project value, mil LTL
		New WWTP unit	Renovated WWTP, unit	New WW netw., km	Renovated WW netw., km	New water supply netw., km	Renovated water supply netw., km	New/renovated water improvement facilities	
Klaipėda distr.	Gargždai			3.4		3.4			4.76
	Vėžaičiai		1	6.1		4.9			10.92
Kretinga distr.	Salantai		1	3.9		3.2		1	9.455
Plungė distr.	Plungė			5.6		3.3			8.9
Plungė distr.	Plungė			24.0		17.3			28.91
Šilutė distr.	Švėkšna			4.7					6.533
TOTAL			**2**	**51.1**		**32.1**		**1**	**69.478**

Source: Order No. D1-462 of the Minister of the Environment of the Republic of Lithuania of 9 September 2008 on the approval of List No. 01 under Measure No VP3-3.1-AM-01-V Renovation and development of water supply and wastewater treatment systems (Žin., 2008, No. 109-4162, 2009, No. 47-1882)

Notes:

1. Development of Vėžaičiai water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Klaipėda district.* The project also includes development of the infrastructure in Kretingalė settlement (Lithuanian Coastal Rivers Basin). The total value of the project is LTL 21.84 million. It is assumed that half of the project amount will be invested in the Minija Sub-basin.
2. Development of Salantai water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Kretinga district.* The project also includes development of the infrastructure in Kretinga town and in Vydmantai settlement (Lithuanian Coastal Rivers Basin). The total value of the project is LTL 28.366 million. It is assumed that one third of the project amount will be invested in the Minija Sub-basin.
3. Two investment projects are planned to be implemented in Plungė town: *Development of the water supply and wastewater management infrastructure in Plungė. Stage I* and *Development of the water supply and wastewater management infrastructure in Plungė. Stage II.* In the table, the information on these two projects is given in separate lines.
4. Development of Švėkšna water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Šilutė district.* The project also includes development of the infrastructure in Šilutė town and in Rusnė settlement (the Nemunas Small Tributaries Sub-basin). The total value of the project is LTL 19.6 million. It is assumed that one third of the project amount will be invested in the Minija Sub-basin.

Merkys Sub-basin

258. Of all municipalities the territories of which are situated in the Merkys Sub-basin, the largest amount of water is consumed in Šalčininkai and Varėna districts (51 % and 41 % of the total water consumption in the sub-basin for domestic-municipal purposes, respectively). Water supply services in these municipalities are provided by UAB Vilniaus vandenys and UAB Varėnos vandenys. In the territories serviced by these companies, the daily consumption of water by one inhabitant connected to the central heating network on average totals to 59 l and 51 l respectively. The average consumption in the Merkys Sub-basin is 58 l/day, and this figure is lower than the Lithuanian average.

Information on the water consumption in the household sector and domestic/municipal wastewater discharges in the Merkys Sub-basin is provided in Table 123.

The most significant pressure in the household sector in the Merkys Sub-basin is made in Šalčininkai and Varėna municipalities. Šalčininkai and Varėna districts together account for 92 % of the total water consumption by households and for 95 % of the total wastewater discharges in the sub-basin. The difference between the consumption of water and discharge of wastewater (the amount of water supplied is less than the amount of discharges by 20 %) at the sub-basin level is close to the average indicators provided by the water supply companies.

In comparison to other sub-basins of the Nemunas RBD, the level of water consumption in the Merkys Sub-basin is low (about 1 % of the household consumption in the Nemunas RBD).

Table 124 below provides information on planned investment projects in towns and settlements in the Merkys Sub-basin, including the required costs.

No investments are planned for sludge treatment facilities in the Merkys Sub-basin.

Table 123. Water consumption and wastewater discharges in the household sector in the Merkys Sub-basin, 2007

Municipality	Share of the municipality in the sub-basin, %	Share of domestic wastewater in municipal wastewater, %	Water consumption and wastewater discharge on the territory of the municipality			Water consumption and wastewater discharge on the territory of the sub-basin				
			Total amount of water consumed for domestic and municipal needs, thou. m^3/year	Total amount of domestic and municipal (excl. industrial) wastewater discharged, thou. m^3/year	Total amount of surface runoff, thou. m^3/year	Amount of water consumed for domestic needs, thou. m^3/year	Amount of municipal (domestic and industrial) wastewater discharged, thou. m^3/year	Amount of domestic wastewater discharged, thou. m^3/year	Amount of surface runoff, thou. m^3/year	Share of wastewater in the total amount of wastewater (domestic-municipal) discharged on the territory of the municipality, %
Alytus distr.	18.1	75.7	357.8	3 939.2	55.4	5.9	65.2	49.3	0.0	1.7
Šalčininkai distr.	78.6	98.0	491.0	734.5	0.0	466.9	698.5	684.6	0.0	95.1
Trakai distr.	40.5	57.7	695.1	243.0	23.0	62.9	22.0	12.7	0.0	9.1
Varėna distr.	82.1	64.4	402.3	668.1	193.0	379.5	630.3	405.6	193.0	94.3
Vilnius distr.	2.7	60.2	1 544.0	1 714.0	301.0	0.0	0.0	0.0	0.0	0.0
TOTAL			**3 490.2**	**7 298.8**	**572.4**	**915.3**	**1 416.0**	**1 152.2**	**193.0**	

Notes:

1. The table lists all municipalities in the Merkys Sub-basin.

2. The share of domestic wastewater in the total municipal wastewater was calculated dividing the amount of water consumed for domestic and municipal needs by the aggregate amount of water consumed for industrial and domestic-municipal purposes.

Table 124. National projects in the Merkys Sub-basin in 2007-2013

Municipality	Settlement	Planned works							Project value, mil LTL
		New WWTP, unit	Renovated WWTP, unit	New WW netw., km	Renovated WW netw., km	New water supply netw., km	Renovated water supply netw., km	New/renovated water improvement facilities	
Šalčininkai distr.	Eišiškės		1						8.0
	Šalčininkai			1.7		1.7			
Trakai distr.	Rūdiškės	1		1.1		0.9			29.9
Varėna distr.	Varėna			22.4		3.7			23.005
TOTAL		**1**	**1**	**25.2**	**0**	**6.3**	**0**	**0**	**60.905**

Source: Order No. D1-462 of the Minister of the Environment of the Republic of Lithuania of 9 September 2008 on the approval of List No. 01 under Measure No VP3-3.1-AM-01-V *Renovation and development of water supply and wastewater treatment systems* (Žin., 2008, No. 109-4162, 2009, No. 47-1882)

Notes: Development of Rūdiškės water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Trakai district.* The project also includes development of the infrastructure in Trakai and Lentvaris towns (the Neris Small Tributaries Sub-basin). The total value of the project is LTL 59.8 million. It is assumed that half of the project amount will be invested in the Merkys Sub-basin.

Žeimena Sub-basin

259. Of all municipalities the territories of which are situated in the Žeimena Sub-basin, the largest amount of water is consumed in the municipality of Švenčionys district (85 % of the total water consumption in the sub-basin for domestic-municipal purposes). Water supply services in Švenčionys municipality are provided by UAB Vilniaus vandenys. In the territory serviced by this company, the daily consumption of water by one inhabitant connected to the central network on average totals to 88 l.

Information on the water consumption in the household sector and domestic/municipal wastewater discharges in the Žeimena Sub-basin is provided in Table 125.

The most significant pressure in the household sector in the Žeimena Sub-basin is made in Švenčionys district municipality. The Žeimena Sub-basin situates 73 % of the area of Švenčionys district municipality; however, 97 % of wastewater produced in this district is discharged into the rivers of the Žeimena Sub-basin. Švenčionys district accounts for 84 % of water consumption by households and 90 % of domestic wastewater discharges.

The difference between water consumption and wastewater discharge (the amount of water supplied exceeds the amount of discharges by 53 %) is difficult to explain – it could have emerged because of statistical data accounting problems.

In comparison to other sub-basins of the Nemunas RBD, the level of water consumption in the Žeimena Sub-basin is very low (about 0.7 % of the water consumption by households in the Nemunas RBD).

Water supply services are provided to 94 % and those of wastewater management - to 92 % of the inhabitants living in the territory serviced by the water company UAB Vilniaus vandenys.

Table 126 provides information on planned investment projects in towns and settlements in the Žeimena Sub-basin, including the required costs.

Table125. Water consumption and wastewater discharges in the household sector in the Žeimena Sub-basin, 2007

Municipality	Share of the municipality in the sub-basin, %	Share of domestic wastewater in municipal wastewater, %	Water consumption and wastewater discharge in the territory of the municipality			Water consumption and wastewater discharge in the territory of the sub-basin				
			Total amount of water consumed for domestic and municipal needs, thou. m^3/year	Total amount of domestic and municipal (excl. industrial) wastewater discharged, thou. m^3/year	Total amount of surface runoff, thou. m^3/year	Amount of water consumed for domestic needs, thou. m^3/year	Amount of municipal (domestic and industrial) wastewater discharged, thou. m^3/year	Amount of domestic wastewater discharged, thou. m^3/year	Amount of surface runoff, thou. m^3/year	Share of wastewater in the total amount of wastewater (domestic-municipal) discharged on the territory of the municipality, %
Ignalina distr.	29.3	99.9	359.0	107.4	21.4	68.9	20.6	20.6	21.4	19.2
Molėtai distr.	37.1	98.7	330.3	263.9	5.4	15.0	12.0	11.8	0.0	4.5
Švenčionys distr.	73.1	67.2	545.0	512.0	70.0	529.0	546.0	366.9	70.0	97.1
Utena distr.	24.5	47.8	1 244.6	3 524.0	1 393.4	1.1	3.0	1.4	0.0	0.1
Vilnius distr.	9.1	60.2	1 544.0	1 714.0	301.0	9.0	10.0	6.0	0.0	0.6
Zarasai distr.	0.9	99.8	257.3	303.7	19.2	0.0	0.0	0.0	0.0	0.0
TOTAL			**4 280.2**	**6 425.0**	**1 810.4**	**623.0**	**591.6**	**406.8**	**91.4**	

Notes:

1. The table lists all municipalities in the Žeimena Sub-basin.

2. The share of domestic wastewater in total municipal wastewater was calculated dividing the amount of water consumed for domestic and municipal needs by the aggregate amount of water consumed for industrial and domestic-municipal needs.

Table 126. National projects under the Measure Renovation and development of water supply and wastewater treatment systems in the Žeimena Sub-basin in 2007-2013

Municipality	Settlement	Planned works							Project value, million LTL
		New WW TP, unit	Renovated WW TP, unit	New WW netw., km	Renovated WW netw., km	New water supply netw., km	Renovated water supply netw., km	New/renovated water improvement facilities	
Ignalina distr.	Ignalina			2.3		1.0			2.31
Švenčionys distr.	Pabradė		1	3.2		3.2			16.354
	Švenčionys			11.0		7.7			
TOTAL			**1**	**16.5**		**11.9**			**18.664**

Source: Order No. D1-462 of the Minister of the Environment of the Republic of Lithuania of 9 September 2008 on the approval of List No. 01 under Measure No VP3-3.1-AM-01-V *Renovation and development of water supply and wastewater treatment systems* (Žin., 2008, No. 109-4162, 2009, No. 47-1882)

No investments are planned for sludge treatment facilities in the Žeimena Sub-basin.

Šventoji Sub-basin

260. Of all municipalities the territories of which are situated in the Šventoji Sub-basin, the largest amount of water is consumed in the municipality of Utena district (38 % of the total water consumption in the sub-basin for domestic-municipal purposes). Water supply services in this municipality are provided by UAB Utenos vandenys. In the territories serviced by this company, the daily consumption of water by one inhabitant connected to the central network on average totals to 42 l, and the average customer of all six water supply companies which provide services to the municipalities in this sub-basin (Molėtų vanduo, Anykščių vandenys, Širvintų vandenys, Ukmergės vandenys, and Zarasų vandenys) consumes 49 l of water per day, so the average water consumption in the Šventoji Sub-basin is lower than the Lithuanian average.

Information on water consumption in the household sector and domestic/municipal wastewater discharges in the Šventoji Sub-basin is provided in Table 127.

The most significant pressure in the household sector in the Šventoji Sub-basin is made in Utena municipality. The Šventoji Sub-basin situates 48 % of the area of Utena district municipality, however, all wastewater produced in this district is discharged into the rivers of the Šventoji Sub-basin. Utena district accounts for 38 % of water consumption by households and 86 % of domestic/municipal wastewater discharges.

The difference between water consumption and wastewater discharge (the amount of water supplied is lower than the amount of discharges by 26 %) is close to the average indicators provided by water supply companies.

In comparison to other sub-basins of the Nemunas RBD, the level of water consumption in the Šventoji Sub-basin is low (about 4 % of the water consumption by households in the Nemunas RBD).

Water supply services of six water companies are provided to 72 % and those of wastewater treatment – to 55 % of all inhabitants living in the territory serviced by these companies.

Table 128 provides information on planned investment projects in towns and settlements in the Šventoji Sub-basin, including the required costs.

Table 127. Water consumption and wastewater discharges in the household sector in the Šventoji Sub-basin, 2007

Municipality	Share of the municipality in the sub-basin. %	Share of domestic wastewater in municipal wastewater. %	Water consumption and wastewater discharge in the territory of the municipality			Water consumption and wastewater discharge in the territory of the sub-basin				
			Total amount of water consumed for domestic and municipal needs, thou. m³/year	Total amount of domestic and municipal (excl. industrial) wastewater discharged, thou. m³/year	Total amount of surface runoff, thou. m³/year	Amount of water consumed for domestic needs, thou. m³/year	Amount of municipal (domestic and industrial) wastewater discharged, thou. m³/year	Amount of domestic wastewater discharged, thou. m³/year	Amount of surface runoff, thou. m³/year	Share of wastewater in the total amount of wastewater (domestic-municipal) discharged on the territory of the municipality, %
Anykščiai distr.	72.0	51.9	437.5	720.0	32.0	432.5	1 017.8	528.4	32.0	98.9
Ignalina distr.	3.0	99.9	359.0	107.4	21.4	0.0	0,0	0.0	0.0	0.0
Jonava distr.	13.0	11.3	1 919.0	3 310.0	294.0	18.0	34.0	3,9	0.0	0.9
Kupiškis distr.	18.0	72.8	396.8	509.8	220.2	0.0	0.0	0.0	0.0	0.0
Molėtai distr.	61.0	98.7	330.3	263.9	5.4	315.3	251.9	248.7	5.4	95.5
Rokiškis distr.	48.0	38.2	702,4	1 734.7	1 185.9	38,1	670,0	36,0	0,0	5,4
Širvintos distr.	63.0	99.3	417.0	336.0	3.0	371.1	299.0	296.9	3.0	89.0
Ukmergė distr.	86.0	84.4	799.0	1 807.0	185.0	799,0	1 807.0	1 524.6	185.0	100.0
Utena distr.	73.0	47.8	1 244.6	3 524.0	1 393.4	1 243.5	3 521.0	1 681.5	1 393.4	99.9
Vilnius distr.	3.0	60.2	1 544.0	1 714.0	301.0	4.5	5.0	3.0	0.0	0.3
Zarasai distr.	55.0	99.8	257.3	303.7	19.2	25.9	30.6	30.5	0.0	10.1
TOTAL			**8 406.9**	**14 330.5**	**3 660.5**	**3 247.9**	**7 636.3**	**3 821.2**	**1 618.8**	

Notes:

1. The table lists all municipalities in the Šventoji Sub-basin.

2. The share of domestic wastewater in the total municipal wastewater was calculated dividing the amount of water consumed for domestic and municipal needs by the aggregate amount of water consumed for industrial and domestic-municipal needs.

Table 128. National projects under the Measure Renovation and development of water supply and wastewater treatment systems in the Šventoji Sub-basin in 2007-2013

Municipality	Settlement	Planned works							Project value, million LTL
		New WWTP unit	Renovated WWTP, unit	New WW netw., km	Renovated WW netw., km	New water supply netw., km	Renovated water supply netw., km	New/renovated water improvement facilities	
Anykščiai	Anykščiai		1	3.1		3.1			22.24
Ukmergė	Ukmergė		1	5.7		4.7			9.4
Utena	Utena			6.2		6.2			8.68
Zarasai	Dusetos-Padusetėlis Užtiltė		1	8.0		1.6			9.0
TOTAL:			**3**	**23.0**		**15.6**			**49.32**

Source: Order No. D1-462 of the Minister of the Environment of the Republic of Lithuania of 9 September 2008 on the approval of List No. 01 under Measure No VP3-3.1-AM-01-V Renovation and development of water supply and wastewater treatment systems (Žin., 2008, No. 109-4162, 2009, No. 47-1882)

Table 129 provides planned investment projects on sludge management infrastructures in towns located in the Šventoji Sub-basin.

Table 129. Projects on development of sludge management infrastructures in 2007-2013 in the Šventoji Sub-basin

Municipality	Expected project outputs	Preliminary project value, million LTL
Ukmergė distr.	1 composting site	8.200
Utena distr.	1 rotting and air drying equipment	20.380
TOTAL:		**28.580**

Source: Order No. D1-659 of the Minister of the Environment of the Republic of Lithuania of 8 December 2008 on the approval of financing conditions for projects under Measure Renovation and development of water supply and wastewater treatment systems, activity Development of a sludge management infrastructure (Žin., 2009, No. 6-186)

Neris Small Tributaries Sub-basin

261. Of all municipalities the territories of which are situated in the Neris Small Tributaries Sub-basin, the largest amount of water is consumed in the municipality of Vilnius city (almost 74 % of the total water consumption in the sub-basin for domestic-municipal purposes). Water supply services in a large number of municipalities of Vilnius district are provided by UAB Vilniaus vandenys. In the territory serviced by this company, the daily consumption of water by one inhabitant connected to the central network on average totals to 59 l. This figure corresponds to the average consumption by one inhabitant according to the data of three main water companies operating in the sub-basin, that is, Vilniaus vandenys, Jonavos vandenys and Kaišiadorių vandenys. Consequently, it can be maintained that average water consumption in the Neris Small Tributaries Sub-basin is close to the Lithuanian average.

Information on water consumption in the household sector and domestic/municipal wastewater discharges in the Neris Small Tributaries Sub-basin is provided in Table 130.

The most significant pressure in the household sector in the Neris Small Tributaries Sub-basin is made in Vilnius city municipality. This municipality accounts for 74 % of water consumption by households and 96 % of domestic wastewater discharges in the territory of the Neris Small Tributaries Sub-basin. The difference between water consumption and wastewater discharge (the amount of water supplied is less than the amount of discharges by 10 %) is lower than the average indicators provided by the water supply companies. This ratio is distorted by Kaunas city municipality (20.8 % of the territory of this municipality is situated in the Neris Small Tributaries Sub-basin, therefore 20.8 % of water consumed in the territory of the municipalities was attributed to this sub-basin).

In comparison to other sub-basins of the Nemunas RBD, the level of water consumption by households in the Neris Small Tributaries Sub-basin is very high (about 41 % of the total water consumption by households in the Nemunas RBD).

Water supply services are provided to about 90 % and those of wastewater treatment - to 87 % of the inhabitants living in the territory serviced by the above-said three water companies.

Table 131 provides information on planned investment projects in towns and settlements in the Neris Small Tributaries Sub-basin, including the required costs.

Table 130. Water consumption and wastewater discharges in the household sector in the Neris Small Tributaries Sub-basin, 2007

Municipality	Share of the municipality in the sub-basin, %	Share of domestic wastewater in municipal wastewater, %	Water consumption and wastewater discharge in the territory of the municipality			Water consumption and wastewater discharge in the territory of the sub-basin				
			Total amount of water consumed for domestic and municipal needs, thou. m^3/year	Total amount of domestic and municipal (excl. industrial) wastewater discharged, thou. m^3/year	Total amount of surface runoff, thou. m^3/year	Amount of water consumed for domestic needs, thou. m^3/year	Amount of municipal (domestic and industrial) wastewater discharged, thou. m^3/year	Amount of domestic wastewater discharged, thou. m^3/year	Amount of surface runoff, thou. m^3/year	Share of wastewater in the total amount of wastewater (domestic-municipal) discharged on the territory of the municipality, %
Elektrėnai	38.0	73.7	1 253.0	1 356.0	227.0	1 175.4	1 552.0	938.1	109.0	93.8
Jonava distr.	48.2	11.3	1 919.0	3 310.0	294.0	1 801.9	11 390.0	1 290.8	294.0	93.9
Kaišiadorys distr.	42.7	65.5	1 288.0	1 560.0	338.0	608.5	737.0	483.1	271.0	47.2
Kaunas city	20.8	76.7	14 184.0	95.0	5 323.0	2 950.3	0.0	0.0	1 310.0	0.0
Kaunas distr.	6.0	99.4	1 178.0	26 786.0	561.0	7.7	175.0	174.0	245.0	0.7
Šalčininkai distr.	4.2	98.0	491.0	734.5	0.0	14.0	21.0	20.6	0.0	2.9
Širvintos distr.	37.3	99.3	417.0	336.0	3.0	45.9	37.0	36.7	0.0	11.0
Švenčionys distr.	9.7	67.2	545.0	512.0	70.0	10.6	10.0	6.7	0.0	2.0
Trakai distr.	19.9	57.7	695.1	243.0	23.0	577.8	202.0	116.5	23.0	83.1
Ukmergė distr.	0.8	84.4	799.0	1 807.0	185.0	0.0	0.0	0.0	0.0	0.0
Vilnius city	100.0	85.3	25 062.7	42 232.0	944.0	25 062.7	4 232.0	36 007.8	944.0	100.0
Vilnius distr.	85.2	60.2	1 544.0	1 714.0	301.0	1 530.5	1 699.0	1 023.1	301.0	99.1
TOTAL			**49 375.8**	**80 685.5**	**8 269.0**	**33 785.3**	**58 055.0**	**37 385.4**	**3 497.0**	

Notes:

1. The table lists all municipalities in the Neris Small Tributaries Sub-basin.

2. The share of domestic wastewater in the total municipal wastewater was calculated dividing the amount of water consumed for domestic and municipal needs by the aggregate amount of water consumed for industrial and domestic-municipal needs.

3. The municipality of Kaunas city is situated in three sub-basins (the Nemunas Small Tributaries Sub-basin, the Neris Small Tributaries Sub-basin, and the Nevėžis Sub-basin). Accordingly, water consumption in Kaunas city municipality was distributed in proportion to the respective shares of the municipal areas in each of these sub-basins.

4. Wastewater produced in Kaunas city is discharged in the Nemunas Small Tributaries Sub-basin.

Table 131. National projects under the Measure *Renovation and development of water supply and wastewater treatment systems* in the Neris Small Tributaries Sub-basin in 2007-2013

Municipality	Settlement	Planned works							Project value, million LTL
		New WWTP, unit	Renovated WWTP, unit	New WW netw., km	Renovated WW netw., km	New water supply netw., km	Renovated water supply netw., km	New/renovated water improvement facilities	
Elektrėnai	Elektrėnai - Vievis			2.1		2.0			8.47
	Elektrėnai – Vievis agglomeration	1		3.9		3.8			
Jonava distr.	Jonava			7.3		2.0			10.1
	Rukla		1						
Kaišiadorys distr.	Kaišiadorys			8.1		7.6			5.933
Kaunas distr.	Karmėlava and Ramučiai			20.1		8.8			8.152
Trakai distr.	Trakai-Lentvaris			26.7	0.4	18.3		1	29.9
Vilnius city	Vilnius			47.8	4.2	32.9	4.6		62.65
Vilnius distr.	Avižieniai			6.4		2.1			54.481
	Juodšiliai			6.1		1.5			
	Kalveliai		1	3.5		2.2			
	Nemenčinė			2.6		2.0			
	Nemėžis			3.0					
	Pagiriai			6.9		5.2			
	Rudamina			9.9		7.2			
	Skaidiškės			5.5		5.5			
	Valčiūnai			1.1					
TOTAL		**1**	**2**	**161**	**4.6**	**101.1**	**4.6**	**1**	**179.686**

Source: Order No. D1-462 of the Minister of the Environment of the Republic of Lithuania of 9 September 2008 on the approval of List No. 01 under Measure No VP3-3.1-AM-01-V Renovation and development of water supply and wastewater treatment systems (Žin., 2008, No. 109-4162, 2009, No. 47-1882)

Notes:

1. Development of Kaišiadorys water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Kaišiadorys district.* The project also includes development of the infrastructure in Rumšiškės and Žiežmariai settlements (the Nemunas Small Tributaries Sub-basin). The total value of the project is LTL 17.8 million. It is assumed that one third of the project amount will be invested in the Neris Small Tributaries Sub-basin.
2. Development of Karmėlava and Ramučiai water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Kaunas district (Karmėlava and Ramučiai, Neveronys, Raudondvaris, Vilkija, and Šlienava.* The project also includes development of the infrastructure in Raudondvaris (the Nevėžis Sub-basin), Neveronys, Vilkija and Šlienava (the Nemunas Small Tributaries Sub-basin) settlements. The total value of the project is LTL 40.76 million. It is assumed that one fifth of the project amount will be invested in the Neris Small Tributaries Sub-basin.
3. Development of Trakai-Lentvaris water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Trakai district.* The project also includes development of the infrastructure in Rūdiškės settlement (the Merkys Sub-basin). The total value of the project is LTL 59.8 million. It is assumed that half of the project amount will be invested in the Neris Small Tributaries Sub-basin.

Table 132 provides planned investment projects on development of sludge management infrastructures in towns located in the Neris Small Tributaries Sub-basin.

Table 132. Projects on development of sludge management infrastructures in 2007-2013 in the Neris Small Tributaries Sub-basin

Municipality	Expected project outputs	Preliminary project value, million LTL
Vilnius city	1 rotting and air drying equipment	175.735
Jonava distr.	1 composting site	5.700
Kaišiadorys distr.	1 composting site	3.400
TOTAL		**184.835**

Source: Order No. D1-659 of the Minister of the Environment of the Republic of Lithuania of 8 December 2008 on the approval of financing conditions for projects under the Measure Renovation and development of water supply and wastewater treatment systems, activity Development of a sludge management infrastructure (Žin., 2009, No. 6-186)

Nevėžis Sub-basin

262. Information on water consumption in the household sector and domestic/municipal wastewater discharges in the Nevėžis Sub-basin is provided in Table 133.

The most significant pressure in the household sector in the Nevėžis Sub-basin is made in Panevėžys city and Panevėžys district municipalities (wastewater produced in Panevėžys city is discharged in the territory of Panevėžys district municipality). Panevėžys city accounts for 47 % of the total water consumption by households in the territory of the sub-basin and Panevėžys district municipality – for 78 % of domestic/municipal wastewater discharges.

The difference between water consumption and wastewater discharge (the amount of water supplied is less than the amount of discharges by 20 %) is close to the average indicators provided by water supply companies.

In comparison to other sub-basins of the Nemunas RBD, the level of water consumption by households in the Nevėžis Sub-basin is relatively high (about 10 % of the total water consumption by households in the Nemunas RBD).

Table 134 below provides information on planned investment projects in towns and settlements in the Nevėžis Sub-basin, including the required costs.

Table133. Water consumption and wastewater discharges in the household sector in the Nevėžis Sub-basin, 2007

Municipality	Share of the municipality in the sub-basin, %	Share of domestic wastewater in municipal wastewater, %	Water consumption and wastewater discharge in the territory of the municipality			Water consumption and wastewater discharge in the territory of the sub-basin				
			Total amount of water consumed for domestic and municipal needs, thou. m³/year	Total amount of domestic and municipal (excl. industrial) wastewater discharged, thou. m³/year	Total amount of surface runoff, thou. m³/year	Amount of water consumed for domestic needs, thou. m³/year	Amount of municipal (domestic and industrial) wastewater discharged, thou. m³/year	Amount of domestic wastewater discharged, thou. m³/year	Amount of surface runoff, thou. m³/year	Share of wastewater in the total amount of wastewater (domestic-municipal) discharged on the territory of the municipality, %
Anykščiai distr.	18.6	51.9	437.5	720.0	32.0	5.0	8.2	4.3	0.0	1.1
Jonava distr.	38.7	11.3	1 919.0	3 310.0	294.0	99.1	171.0	19.4	0.0	5.2
Kaunas city	9.3	76.7	14 184.0	95.0	5 323.0	1 319.1	40.0		1.0	42.1
Kaunas distr.	40.3	99.4	1 178.0	26 786.0	561.0	10.5	238.0	236.6	46.0	0.9
Kėdainiai distr.	98.3	37.5	1 479.0	2 164.0	1 295.0	1 479.0	2 164.0	1 639.2	1 295.0	100.0
Kelmė distr.	4.7	82.1	262.0	447.0	14.0	0.0	0.0	0.0	0.0	0.0
Panevėžys city	90.9	69.4	4 366.1	0.0	5 146.3	3 968.8	0.0	0.0	5146.3	0.0
Panevėžys distr.	73.9	98.2	874.3	10 502.0	88.7	874.3	10 502.0	10 313.3	87.7	100.0
Radviliškis distr.	71.0	94.8	969.0	1 471.0	124.0	150.9	229.0	217.1	12.0	15.6
Raseiniai distr.	4.9	83.5	687.5	635.0	62.0	0.0	0.0	0.0	0.0	0.0
Šiauliai city	15.8	95.4	3 619.0	9 599.0	515.0	571.8	0.0	0.0	79.0	0.0
Šiauliai distr.	0.5	100.0	529.0	1 174.0	30.0	9.0	20.0	20.0	0.0	1.7
Ukmergė distr.	13.2	84.4	799.0	1 807.0	185.0	0.0	0.0	0.0	0.0	0.0
TOTAL			**31 303.4**	**58 710.0**	**13 670.0**	**8 487.4**	**13 372.2**	**10 550.4**	**6 667.0**	

Notes:

1. The table lists all municipalities in the Nevėžis Sub-basin.

2. The share of domestic wastewater in the total municipal wastewater was calculated dividing the amount of water consumed for domestic and municipal needs by the aggregate amount of water consumed for industrial and domestic-municipal needs.

3. The municipality of Kaunas city is situated in three sub-basins (the Nemunas Small Tributaries Sub-basin, the Neris Small Tributaries Sub-basin, and the Nevėžis Sub-basin). Accordingly, water consumption in Kaunas city municipality was distributed in proportion to the respective shares of the municipal areas in each of these sub-basins.

4. The municipality of Panevėžys city is situated in two sub-basins (the Nevėžis Sub-basin and the Mūša Sub-basin). Accordingly, water consumption in this Panevėžys city municipality was distributed in proportion to the respective shares of the municipal area in each of these sub-basins.

5. Wastewater produced in Panevėžys city is discharged in the territory of the Panevėžys district municipality.

6. The municipality of Šiauliai city is situated in three sub-basins (the Nevėžis Sub-basin, the Dubysa Sub-basin, and the Mūša Sub-basin). Accordingly, water consumption in Šiauliai city municipality was distributed in proportion to the respective shares of the municipal area in each of these sub-basins

Table 134. National projects under the Measure Renovation and development of water supply and wastewater treatment systems in the Nevėžis Sub-basin in 2007-2013

Municipality	Settlement	Planned works							Project value, million LTL
		New WWTP, unit	Renovated WWTP, unit	New WW netw., km	Renovated WW netw., km	New water supply netw., km	Renovated water supply netw., km	New/renovated water improvement facilities	
Kaunas distr.	Domeikava			23.9		13.3			14.805
Kaunas distr.	Raudondvaris			7.2		2.8			8.152
Kėdainiai distr.	Kėdainiai			2.6		2.6			3.64
Panevėžys city	Panevėžys			31.4		31.4			43.96
Panevėžys distr.	Ramygala			2.0		2.0			2.8
Radviliškis distr.	Baisogala			2.0		0.9			3.146
TOTAL				**69.1**		**53**			**76.503**

Source: Order No. D1-462 of the Minister of the Environment of the Republic of Lithuania of 9 September 2008 on the approval of List No. 01 under Measure No VP3-3.1-AM-01-V Renovation and development of water supply and wastewater treatment systems (Žin., 2008, No. 109-4162, 2009, No. 47-1882)

Notes:

1. Development of Domeikava water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Kaunas district (Akademija, Domeikava, Garliava, Ringaudai).* The project also includes development of the infrastructure in Akademija, Garliava and Ringaudai settlements (the Nemunas Small Tributaries Sub-basin). The total value of the project is LTL 59.220 million. It is assumed that one fourth of the project amount will be invested in the Nevėžis Sub-basin.
2. Development of Raudondvaris water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Kaunas district (Karmėlava, Ramučiai, Neveronys, Raudondvaris, Vilkija, Šlienava).* The project also includes development of the infrastructure in Karmėlava settlement (The Neris Small Tributaries Sub-basin) and in Ramučiai, Neveronys, Vilkija, and Šlienava settlements (the Nemunas Small Tributaries Sub-basin). The total value of the project is LTL 40.76 million. It is assumed that one fifth of the project amount will be invested in the Nevėžis Sub-basin.
3. Two investment projects are planned to be implemented in Kaunas district. In the table, the information on these two projects is given in separate lines.
4. Development of Baisiogala water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Radviliškis district.* The project also includes development of the infrastructure in Radviliškis town. The total value of the project is LTL 6.291 million. It is assumed that half of the project amount will be invested in the Nevėžis Sub-basin.

Table 135 provides planned investment projects on development of sludge management infrastructures in towns located in the Nevėžis Sub-basin.

Table 135. Projects on development of sludge management infrastructures in 2007-2013 in the Nevėžis Sub-basin

Municipality	Expected project outputs	Preliminary project value, million LTL
Kėdainiai distr.	1 rotting and air drying equipment	23.400
Panevėžys distr.	1 rotting and air drying equipment	17.900
TOTAL		**41.300**

Source: Order No. D1-659 of the Minister of the Environment of the Republic of Lithuania of 8 December 2008 on the approval of financing conditions for projects under the Measure Renovation and development of water supply and wastewater treatment systems, activity Development of a sludge management infrastructure (Žin., 2009, No. 6-186)

Šešupė Sub-basin

263. The information on the amounts of water consumed in the household sector and domestic/municipal wastewater discharged in the Šešupė Sub-basin is provided in Table 136.

The most significant pressure in the household sector in the Šešupė Sub-basin is made in Marijampolė municipality, which consumes 53 % of water consumed by the households in the entire sub-basin and discharges 70 % of respective domestic wastewater.

The difference between the consumption of water and discharge of wastewater (the amount of water supplied is less than the amount of wastewater discharged by 35 %) at the level of the sub-basin is close to the average indicators provided by water supply companies.

In comparison to other sub-basins of the Nemunas RBD, the level of water consumption in the Šešupė Sub-basin is low (about 5 % of household consumption in the Nemunas RBD).

Table 137 provides information on planned investment projects in towns and settlements in the Šešupė Sub-basin, including the required costs.

Table 136. Water consumption and wastewater discharges in the household sector in the Šešupė Sub-basin, 2007

Municipality	Share of the municipality in the sub-basin, %	Share of domestic wastewater in municipal wastewater, %	Water consumption and wastewater discharges in the territory of the municipality			Water consumption and wastewater discharges on the territory of the sub-basin				
			Total amount of water consumed for domestic and municipal needs, thou. m3/year	Total amount of domestic and municipal (excl. industrial) wastewater discharged, thou. m3/year	Total amount of surface runoff, thou. m3/year	Amount of water consumed for domestic needs, thou. m3/year	Amount of municipal (domestic and industrial)l wastewater discharged, thou. m3/year	Amount of domestic wastewater discharged, thou. m3/year	Amount of surface runoff, thou. m3/year	Share of wastewater in the total amount of wastewater (domestic-municipal) discharged in the territory of the municipality, %
Alytus distr.	10.0	75.7	357.8	3 939.2	55.4	3.7	40.5	30.6	0.0	1.0
Kalvarija	99.3	87.9	292.3	225.2	85.8	292.3	225.2	197.9	85.8	100.0
Kaunas distr.	7.5	99.4	1 178.0	26 786.0	561.0	0.0	0.0	0.0	0.0	0.0
Kazlų Rūda	99.1	96.0	289.0	397.1	42.5	289.0	397.1	381.3	42.5	100.0
Lazdijai distr.	33.1	100.0	162.3	184.2	5.2	135.9	154.2	154.2	5.2	83.7
Marijampolė	100.0	80.2	2 350.8	5 949.0	2 071.8	2 350.8	5 949.0	4 771.2	2 071.8	100.0
Prienai distr.	10.6	98.0	447.3	920.2	76.3	3.4	7.0	6.9	15.2	0.8
Šakiai distr.	76.2	100.0	1 029.0	558.0	87.6	759.8	412.0	412.0	79.5	73.8
Vilkaviškis distr.	100.0	92.6	622.3	919.7	458.5	622.3	919.7	852.1	458.5	100.0
TOTAL			**6 728.8**	**39 878.6**	**3 444.1**	**4 457.1**	**8 104.7**	**6 775.5**	**2 758.5**	

Notes:

1. The table lists all municipalities in the Šešupė Sub-basin.

2. The share of domestic wastewater in municipal wastewater was calculated dividing the amount of water consumed for domestic and municipal needs by the aggregate amount of water consumed for industrial and domestic-municipal needs

Table 137. National projects under the Measure *Renovation and development of water supply and wastewater treatment systems* in the Šešupė Sub-basin in 2007-2013

Municipality	Settlement	Planned works							Project value, million LTL
		New WWTP, unit	Renovated WWTP, unit	New WW netw.,	Renovated WW netw, km	New water supply netw., km	Renovated water supply netw., km	New/renovate water improvement facilities	
Alytus distr.	Simnas		1	2.6		3.0			7.46
Kalvarija	Kalvarija			4.6		1.8			4.48
Kazlų Rūda	Kazlų Rūda		1	6.0		5.0			13.42
Lazdijai distr.	Lazdijai			4.7		4.3			8.728
Marijampolė	Marijampolė		1	10.7		8.9			26.7
Prienai	Veiveriai				0.5				2.192
Šakiai distr.	Šakiai			2.3					
	Kudirkos Naumiestis		1	11.7		3.8			17.0
Vilkaviškis	Kybartai			5.6		4.7			22.2
	Vilkaviškis		1	12.1		6.9			
TOTAL			**5**	**31.7**	**0.5**	**15.4**			**102.18**

Source: Order No. D1-462 of the Minister of the Environment of the Republic of Lithuania of 9 September 2008 on the approval of List No. 01 under Measure No VP3-3.1-AM-01-V *Renovation and development of water supply and wastewater treatment systems* (Žin., 2008, No. 109-4162, 2009, No. 47-1882)

Notes:

1. Development of Lazdijai water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Lazdijai district.* The project also includes development of the infrastructure in Veisėjai settlement (the Nemunas Small Tributaries Sub-basin). The total value of the project is LTL 17.455 million. It is assumed that half of the project value will be invested in the Šešupė Sub-basin.
2. Development of Veiveriai water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Prienai district.* The project also includes development of the infrastructure in Prienai town and in Balbieriškis and Išlaužas settlements (the Nemunas Small Tributaries Sub-basin). The total value of the project is LTL 8.766 million. It is assumed that one forth of the project value will be invested in the Šešupė Sub-basin.

Table 138 provides planned investment projects on development of a sludge management infrastructure in towns located in the Šešupė Sub-basin.

Table 138. Projects on development of a sludge management infrastructure in 2007-2013 in the Šešupė Sub-basin

Municipality	Expected project outputs	Preliminary project value, million LTL
Marijampolė	1 rotting and air drying equipment	28.300
TOTAL		**28.300**

Source: Order No. D1-659 of the Minister of the Environment of the Republic of Lithuania of 8 December 2008 on the approval of financing conditions for projects under the Measure *Renovation and development of water supply and wastewater treatment systems*, activity *Development of a sludge management infrastructure* (Žin., 2009, No. 6-186)

Dubysa Sub-basin

264. Information on water consumption in the household sector and domestic/municipal wastewater discharges in the Dubysa Sub-basin is provided in Table 139.

The most significant pressure in the household sector in the Dubysa Sub-basin is made in Kelmė district municipality. Kelmė district accounts for 57 % of the total household water consumption and for 79 % of domestic/municipal wastewater discharges in the territory of the sub-basin. Practically, there is no difference between water consumption and wastewater discharge (in the household sector) in the Dubysa Sub-basin. An error in the water consumption/wastewater discharge balance is determined by Šiauliai city municipality (part of water consumption in Šiauliai city municipality was attributed to the Dubysa Sub-basin in proportion to the share of the municipal area in this sub-basin).

In comparison to other sub-basins of the Nemunas RBD, the level of water consumption in the Dubysa Sub-basin is low (about 1 % of the total household water consumption in the Nemunas RBD).

Table 140 provides information on planned investment projects in towns and settlements in the Dubysa Sub-basin, including the required costs.

Table 139. Water consumption and wastewater discharges in the household sector in the Dubysa Sub-basin, 2007

Municipality	Share of the municipality in the sub-basin, %	Share of domestic wastewater in municipal wastewater, %	Water consumption and wastewater discharge in the territory of the municipality			Water consumption and wastewater discharge in the territory of the sub-basin				
			Total amount of water consumed for domestic and municipal needs, thou. m^3/year	Total amount of domestic and municipal (excl. industrial) wastewater discharged, thou. m^3/year	Total amount of surface runoff, thou. m^3/year	Amount of water consumed for domestic needs, thou. m^3/year	Amount of municipal (domestic and industrial) wastewater discharged, thou. m^3/year	Amount of domestic wastewater discharged, thou. m^3/year	Amount of surface runoff, thou. m^3/year	Share of wastewater in the total amount of wastewater (domestic-municipal) discharged on the territory of the municipality, %
Jurbarkas distr.	2.6	98.9	737.0	943.0	421.0	0.0	0.0	0.0	0.0	0.0
Kaunas distr.	4.9	99.4	1 178.0	26 786.0	561.0	0.3	7.0	7.0	0.0	0.0
Kėdainiai distr.	1.7	37.5	1 479.0	2 164.0	1 295.0	0.0	0.0	0.0	0.0	0.0
Kelmė distr.	46.5	82.1	262.0	447.0	14.0	249.7	426.0	349.9	14.0	95.3
Radviliškis distr.	4.5	94.8	969.0	1471.0	124.0	7.2	11.0	10.4	0.0	0.7
Raseiniai distr.	45.2	83.5	687.5	635.0	62.0	59.5	55.0	45.9	23.0	8.7
Šiauliai city	3.0	95.4	3 619.0	9 599.0	515.0	108.6	0.0	0.0	0.0	0.0
Šiauliai distr.	13.0	100.0	529.0	1 174.0	30.0	14.4	32.0	32.0	0.0	2.7
Telšiai distr.	0.7	57.0	1 398.0	3 362.0	190.0	0.0	0.0	0.0	0.0	0.0
TOTAL			**10 858.5**	**46 581.0**	**3 212.0**	**439.8**	**531.0**	**445.2**	**37.0**	

Notes:

1. The table lists all municipalities in the Dubysa Sub-basin.

2. The share of domestic wastewater in the total municipal wastewater was calculated dividing the amount of water consumed for domestic and municipal needs by the aggregate amount of water consumed for industrial and domestic-municipal needs.

3. The municipality of Šiauliai city is situated in three sub-basins (the Nevėžis Sub-basin, the Dubysa Sub-basin, and the Mūša Sub-basin). Accordingly, water consumption in Šiauliai city municipality was distributed in proportion to the respective shares of the municipal area in each of these sub-basins

Table 140. National projects under the Measure *Renovation and development of water supply and wastewater treatment systems* in the Dubysa sub-basin in 2007-2013

Municipality	Settlement	Planned works							Project value, million LTL
		New WWTP, unit	Renovated WWTP, unit	New WW netw., km	Renovated WW netw., km	New water supply netw., km	Renovated water supply netw., km	New/renovated water improvement facilities	
Kelmė distr.	Kelmė			7.2		6.7			19.9
	Tytuvėnai		1	5.5		2.9			
Raseiniai distr.	Ariogala			1.8		1.8			3.433
TOTAL			**1**	**14.5**		**11.4**			**23.333**

Source: Order No. D1-462 of the Minister of the Environment of the Republic of Lithuania of 9 September 2008 on the approval of List No. 01 under Measure No VP3-3.1-AM-01-V *Renovation and development of water supply and wastewater treatment systems* (Žin., 2008, No. 109-4162, 2009, No. 47-1882)

Note:

Development of Ariogala water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Raseiniai district.* The project also includes development of the infrastructure in Raseiniai town and Viduklė settlement (the Jūra Sub-basin). The total value of the project is LTL 10.3 million. It is assumed that one third of the project amount will be invested in the Dubysa Sub-basin.

Table 141 provides planned investment projects on development of sludge management infrastructures in towns located in the Dubysa Sub-basin.

Table 141. Projects on development of sludge management infrastructures in 2007-2013 in the Dubysa Sub-basin

Municipality	Expected project outputs	Preliminary project value, million LTL
Kelmė distr.	1 composting site	6.600
TOTAL		**6.600**

Source: The database of pollution charges of the Ministry of the Environment

Jūra Sub-basin

265. Information on water consumption in the household sector and domestic/municipal wastewater discharges in the Jūra Sub-basin is provided in Table 142.

The most significant pressure in the household sector in the Jūra Sub-basin is made in Tauragė district municipality. The territory of this municipality accounts for 40 % of the total household water consumption and 63 % of domestic wastewater discharges in the territory of the sub-basin.

The difference between water consumption and wastewater discharge in the Jūra Sub-basin (the amount of water supplied is less than the amount of discharges by 29 %) is close to the average indicators provided by water supply companies.

In comparison to other sub-basins of the Nemunas RBD, the level of water consumption in the Jūra Sub-basin is low (about 3 % of the total household water consumption in the Nemunas RBD).

Table 143 provides information on planned investment projects in towns and settlements in the Jūra Sub-basin, including the required costs.

Table 142. Water consumption and wastewater discharges in the household sector in the Jūra Sub-basin, 2007

Municipality	Share of the municipality in the sub-basin, %	Share of domestic wastewater in municipal wastewater, %	Water consumption and wastewater discharge in the territory of the municipality			Water consumption and wastewater discharge in the territory of the sub-basin				
			Total amount of water consumed for domestic and municipal needs, thou. m^3/year	Total amount of domestic and municipal (excl. industrial) wastewater discharged, thou. m^3/year	Total amount of surface runoff discharged, thou. m^3/year	Amount of water consumed for domestic needs, thou. m^3/year	Amount of municipal (domestic and industrial) wastewater discharged, thou. m^3/year	Amount of domestic wastewater discharged, thou. m^3/year	Amount of surface runoff discharged, thou. m^3/year	Share of wastewater in the total amount of wastewater (domestic-municipal) discharged on the territory of the municipality, %
Jurbarkas distr.	26.7	98.9	737.0	943.0	421.0	16.4	21.0	20.8	0.0	2.2
Kelmė distr.	13.9	82.1	262.0	447.0	14.0	0.0	0.0	0.0	0.0	0.0
Klaipėda distr.	3.0	47.0	732.0	335.0	621.0	0.0	0.0	0.0	0.0	0.0
Pagėgiai	20.3	66.4	344.0	261.0	16.0	228.0	173.0	114.9	7.0	66.3
Plungė distr.	0.4	71.5	1 005.0	1 424.0	913.0	0.0	0.0	0.0	0.0	0.0
Raseiniai distr.	44.1	83.5	687.5	635.0	62.0	628.0	580.0	484.2	39.0	91.3
Rietavas	69.7	94.7	90.0	264.0	9.0	89.3	262.0	248.2	9.0	99.2
Šilalė distr.	85.2	84.7	412.3	411.0	219.0	412.3	531.0	348.3	219.0	100.0
Šilutė distr.	3.3	32.8	1 154.0	2 711.0	397.0	0.0	0.0	0.0	0.0	0.0
Tauragė distr.	87.7	96.8	911.0	2 102.0	578.2	908.0	2 095.0	2 028.2	578.2	99.7
Telšiai distr.	0.6	57.0	1 398.0	3 362.0	190.0	0.0	0.0	0.0	0.0	0.0
TOTAL			**7 732.8**	**12 895.0**	**3 440.2**	**2 282.0**	**3662.0**	**3 223.8**	**852.2**	

Notes:

1. The table lists all municipalities in the Jūra Sub-basin.

2. The share of domestic wastewater in the total municipal wastewater was calculated dividing the amount of water consumed for domestic and municipal needs by the aggregate amount of water consumed for industrial and domestic-municipal needs

Table 143. National projects under the Measure *Renovation and development of water supply and wastewater treatment systems* in the Jūra Sub-basin in 2007-2013

Municipality	Settlement	Planned works							Project value, million LTL
		New WWTP, unit	Renovated WWTP, unit	New WW netw., km	Renovated WW netw., km	New water supply netw., km	Renovated water supply netw., km	New/renovated water improvement facilities	
Raseiniai distr.	Raseiniai			2.6		1.8			6.867
	Viduklė		1	1.8		0.9			
Šilalė distr.	Šilalė			14.5		12.4			37.2
	Kvėdarna		1	11.0		11.0			
Tauragė distr.	Tauragė			13.1		12.2			35.2
	Skaudvilė	1		18.2		3.9			
TOTAL		**1**	**2**	**61.2**		**42.2**			**79.267**

Source: Order No. D1-462 of the Minister of the Environment of the Republic of Lithuania of 9 September 2008 on the approval of List No. 01 under Measure No VP3-3.1-AM-01-V *Renovation and development of water supply and wastewater treatment systems* (Žin., 2008, No. 109-4162, 2009, No. 47-1882)

Notes:

1. Development of Raseiniai and Viduklė water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Raseiniai district.* The project also includes development of the infrastructure in Ariogala settlement (the Dubysa Sub-basin). The total value of the project is LTL 10.3 million. It is assumed that two thirds of the project amount will be invested in the Jūra Sub-basin.

Table 144 provides planned investment projects on development of sludge management infrastructures in towns located in the Jūra Sub-basin.

Table 144. Projects on development of sludge management infrastructures in 2007-2013 in the Jūra Sub-basin

Municipality	Expected project outputs	Preliminary project value, million LTL
Raseiniai distr.	1 composting site	3.100
Tauragė distr.	1 rotting and air drying equipment	20.700
TOTAL		**23.800**

Source: Order No. D1-659 of the Minister of the Environment of the Republic of Lithuania of 8 December 2008 on the approval of financing conditions for projects under the Measure *Renovation and development of water supply and wastewater treatment systems*, activity *Development of a sludge management infrastructure* (Žin., 2009, No. 6-186)

Lithuanian Coastal Rivers Basin

266. Information on water consumption in the household sector and domestic/municipal wastewater discharges in the Lithuanian Coastal Rivers Basin is provided in Table 145.

The most significant pressure in the household sector in the Lithuanian Coastal Rivers Basin is made in the municipalities of Klaipėda city and Palanga town. Klaipėda city municipality accounts for 75 % of the total household water consumption in the basin. Municipal wastewater of Klaipėda city is discharged into the Curonian Lagoon, so the largest volume of wastewater discharged into the rivers of the Lithuanian Coastal Rivers Basin is produced in the municipality of Palanga town (which accounts for 84 % of the total household wastewater discharged in the basin).

The ratio of water consumption and wastewater discharges at the level of the basin (the amount of water supplied exceeds the amount of discharges by 2.4 times) is distorted by Klaipėda city municipality. As already pointed out above, wastewater produced in Klaipėda city is discharged into the Curonian Lagoon.

In comparison to other sub-basins of the Nemunas RBD, the level of water consumption in the Lithuanian Coastal Rivers Basin is high (about 11 % of the total household water consumption in the Nemunas RBD).

Table 146 provides information on planned investment projects in towns and settlements in the Lithuanian Coastal Rivers Basin, including the required costs.

Table 145. Water consumption and wastewater discharges in the household sector in the Lithuanian Coastal Rivers Basin, 2007

Municipality	Share of the municipality in the sub-basin, %	Share of domestic wastewater in municipal wastewater, %	Water consumption and wastewater discharge in the territory of the municipality			Water consumption and wastewater discharge in the territory of the sub-basin				
			Total amount of water consumed for domestic and municipal needs, thou. m^3/year	Total amount of domestic and municipal (excl. industrial) wastewater discharged, thou. m^3/year	Total amount of surface runoff, thou. m^3/year	Amount of water consumed for domestic needs, thou. m^3/year	Amount of municipal (domestic and industrial) wastewater discharged, thou. m^3/year	Amount of domestic wastewater discharged, thou. m^3/year	Amount of surface runoff, thou. m^3/year	Share of wastewater in the total amount of wastewater (domestic-municipal) discharged on the territory of the municipality, %
Klaipėda city	89.9	52.3	6 994.5	11.0	11 375.2	6 994.5	15.0	7.8	11 375.2	100.0
Klaipėda distr.	31.4	47.0	732.0	335.0	621.0	443.6	203.0	95.3	579.0	60.6
Kretinga distr.	41.7	85.1	682.0	594.0	441.0	641.8	797.0	476.0	428.0	94.1
Neringa distr.	100.0	100.0	168.0	0.0	0.0	168.0	0.0	0.0	0.0	0.0
Palanga town	49.0	97.4	1 019.4	3 268.0	1 397.0	1 019.4	3 268.0	3 183.7	1 388.0	100.0
Šilutė distr.	2.9	32.8	1 154.0	2 711.0	397.0	31.5	74.0	24.3	0.0	2.7
TOTAL			**10 749.9**	**6 919.0**	**14 231.2**	**9 298.8**	**4 357.0**	**3 787.0**	**13 770.2**	

Notes:

1. The table lists all municipalities in the Lithuanian Coastal Rivers Basin.

2. The share of domestic wastewater in the total municipal wastewater was calculated dividing the amount of water consumed for domestic and municipal needs by the aggregate amount of water consumed for industrial and domestic-municipal needs.

3. Wastewater produced in the municipalities of Neringa and Klaipėda city is discharged into the Curonian Lagoon

Table 146. National projects under the Measure *Renovation and development of water supply and wastewater treatment systems* in the Lithuanian Coastal Rivers Basin in 2007-2013

Municipality	Settlement	Planned works							Project value, million LTL
		New WWTP, unit	Renovated WWTP, unit	New WW netw., km	Renovated WW netw., km	New water supply netw., km	Renovated water supply netw., km	New/renovated water improvement facilities	
Klaipėda city	Klaipėda			13.0		9.0		1	52.0
Klaipėda distr.	Kretingalė		1	4.0		1.2		1	10.92
Kretinga distr.	Kretinga		1						18.911
	Vydmantai		1	4.3		4.3		1	
Neringa	Neringa			1.2	4.4	1.8	14.5		24.48
Palanga town	Palanga		1	6.2		6.2			15.1
TOTAL			**4**	**28.7**	**4.4**	**22.5**	**59.6**	**3**	**121.411**

Source: Order No. D1-462 of the Minister of the Environment of the Republic of Lithuania of 9 September 2008 on the approval of List No. 01 under Measure No VP3-3.1-AM-01-V *Renovation and development of water supply and wastewater treatment systems* (Žin., 2008, No. 109-4162, 2009, No. 47-1882)

Notes:

1. Development of Kretingalė water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Klaipėda district.* The project also includes development of the infrastructure in Vėžaičiai settlement (the Minija Sub-basin). The total value of the project is LTL 21.84 million. It is assumed that half of the project amount will be invested in the Lithuanian Coastal Rivers Basin.
2. Development of Kretinga and Vydmantai water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Kretinga district.* The project also includes development of the infrastructure in Salantai settlement (the Minija Sub-basin). The total value of the project is LTL 28.366 million. It is assumed that two thirds of the project amount will be invested in the Lithuanian Coastal Rivers Basin.

Table 147 provides planned investment projects on development of sludge management infrastructures in towns located in the Lithuanian Coastal Rivers Basin.

Table 147. Projects on development of sludge management infrastructures in 2007-2013 in the Lithuanian Coastal Rivers Basin

Municipality	Expected project outputs	Preliminary project value, million LTL
Klaipėda city, Klaipėda distr.	1 rotting and air drying equipment	27.500
TOTAL		**27.500**

Source: Order No. D1-659 of the Minister of the Environment of the Republic of Lithuania of 8 December 2008 on the approval of financing conditions for projects under the Measure *Renovation and development of water supply and wastewater treatment systems*, activity *Development of a sludge management infrastructure* (Žin., 2009, No. 6-186)

Nemunas Small Tributaries Sub-basin

267. Information on water consumption and wastewater discharges in the household sector in the Nemunas Small Tributaries Sub-basin is provided in Table 148.

The most significant pressure in the household sector in the Nemunas Small Tributaries Sub-basin is made in the municipalities of Kaunas city and Kaunas district (dischargers of municipal wastewater of Kaunas city are located in Kaunas district). Kaunas city accounts for 55 % of the total household water consumption and Kaunas district - for 75 % of domestic/municipal wastewater discharges in the territory of the sub-basin.

Water consumption for household purposes is less than wastewater discharges by 48 %. A certain error arises due to water consumption in Kaunas city. If all water consumption were attributed to the Nemunas Small Tributaries Sub-basin, the difference between the volumes of water consumed and wastewater discharged would go down to 36 %. A similar difference between the amounts of water sold and wastewater treated is also provided by the water company UAB Kaunas vandenys

In comparison to other sub-basins of the Nemunas RBD, the level of water consumption in the Nemunas Small Tributaries Sub-basin is very high (about 22 % of the total household water consumption in the Nemunas RBD).

Water supply services are provided to 87 % and those of wastewater treatment to 81 % of the inhabitants living in the territory serviced by eight water supply companies.

Table 148. Water consumption and wastewater discharges in the household sector in the Nemunas Small Tributaries Sub-basin, 2007

Municipality	Share of the municipality in the sub-basin, %	Share of domestic wastewater in municipal wastewater, %	Water consumption and wastewater discharge in the territory of the municipality			Water consumption and wastewater discharge in the territory of the sub-basin				
			Total amount of water consumed for domestic and municipal needs, thou. m^3/year	Total amount of domestic and municipal (excl. industrial) wastewater discharged, thou. m^3/year	Total amount of surface runoff, thou. m^3/year	Amount of water consumed for domestic needs, thou. m^3/year	Amount of municipal (domestic and industrial) wastewater discharged, thou. m^3/year	Amount of domestic wastewater discharged, thou. m^3/year	Amount of surface runoff, thou. m^3/year	Share of wastewater in the total amount of wastewater (domestic-municipal) discharged on the territory of the municipality, %
Alytus city	100.0	80.2	1 989.9	0.0	2 515.2	1 989.9	0.0	0.0	2 515.2	0.0
Alytus distr.	71.9	75.7	357.8	3 939.2	55.4	348.2	3 833.5	2 900.5	55.4	97.3
Birštonas	100.0	100.0	116.6	0.0	1.4	116.6	0.0	0.0	1.4	0.0
Druskininkai	99.7	99.6	1 142.6	1 673.6	978.5	1 142.6	1 673.6	1666.3	978.5	100.0
Elektrėnai	62.0	73.7	1 253.0	1356.0	227.0	77.6	84.0	61.9	118.0	6.2
Jurbarkas distr.	70.8	98.9	737.0	943.0	421.0	720.6	922.0	912.1	421.0	97.8
Kaišiadorys distr.	57.3	65.5	1 288.0	1 560.0	338.0	679.5	823.0	539.5	67.0	52.8
Kaunas city	70.0	76.7	14 184.0	95.0	5 323.0	9 928.8	274.0	42.2	4 012.0	57.9
Kaunas distr.	41.3	99.4	1 178.0	26 786.0	561.0	1 159.5	26 366.0	2 6210.3	270.0	98.4
Kazlų Rūda	0.9	96.0	289.0	397.1	42.5	0.0	0.0	0.0	0.0	0.0
Lazdijai distr.	66.8	100.0	162.3	184.2	5.2	26.4	30.0	30.0	0.0	16.3
Marijampolė	10.3	80.2	2 350.8	5 949.0	2 071.8	0.0	0.0	0.0	0.0	0.0
Pagėgiai	79.5	66.4	344.0	261.0	16.0	116.0	88.0	58.4	9.0	33.7
Prienai distr.	89.4	98.0	447.3	920.2	76.3	443.9	913.2	894.8	61.1	99.2
Raseiniai distr.	5.8	83.5	687.5	635.0	62.0	0.0	0.0	0.0	0.0	0.0
Šakiai distr.	23.8	100.0	1 029.0	558.0	87.6	269.2	226.0	146.0	8.1	26.2
Šalčininkai distr.	16.9	98.0	491.0	734.5	0.0	10.0	15.0	14.7	0.0	2.0
Šilutė distr.	47.5	32.8	1 154.0	2 711.0	397.0	1 026.7	4 212.0	1 380.5	374.0	89.0
Tauragė distr.	12.3	96.8	911.0	2 102.0	578.2	3.0	7.0	6.8	0.0	0.3
Trakai distr.	39.5	57.7	695.1	243.0	23.0	54.3	19.0	11.0	0.0	7.8
Varėna distr.	17.7	64.4	402.3	668.1	193.0	22.8	37.8	24.3	0.0	5.7
TOTAL			**31 210.2**	**51 715.9**	**13 973.1**	**18 135.8**	**39 524.1**	**34 899.2**	**8 890.7**	

Notes:

1. The table lists all municipalities in the Nemunas Small Tributaries Sub-basin.

2. The share of domestic wastewater in the total municipal wastewater was calculated dividing the amount of water consumed for domestic and municipal needs by the aggregate amount of water consumed for industrial and domestic-municipal needs.

3. Wastewater produced in the municipality of Alytus town is discharged in the territory of Alytus district municipality.

4. Wastewater produced in Birštonas municipality is discharged in the territory of Prienai district municipality.

5. The municipality of Kaunas city is situated in three sub-basins (the Nemunas Small Tributaries Sub-basin, the Neris Small Tributaries Sub-basin and the Nevėžis Sub-basin). Accordingly, water consumption in Kaunas city municipality was distributed in proportion to the respective shares of the municipal area in each of these sub-basins.

6. Wastewater produced in Kaunas city municipality is discharged in the territory of Kaunas district municipality.

Table 149 below provides information on planned investment projects in towns and settlements in the Nemunas Small Tributaries Sub-basin, including the required costs.

Table 149. National projects in the Nemunas Small Tributaries Sub-basin in 2007-2013

Municipality	Settlement	Planned works							Project value, million LTL
		New WWTP, unit	Renovated WWTP, unit	New WW netw., km	Renovated WW netw., km	New water supply netw., km	Renovated water supply netw., km	New/renovated water improvement facilities	
Alytus town	Alytus			28.9	5.0	31.3			49.764
Birštonas	Birštonas			3.2		3.0			4.34
Druskininkai	Druskininkai			2.1		1.5			2.52
Jurbarkas distr.	Jurbarkas			9.8		9.1			12.9
Kaunas city	Kaunas			44.5		39.8			72.8
Kaunas distr.	Ežerėlis			1.1		0.1			6.417
	Neveronys				0.3				
	Šlienava			4.0					
Kaunas distr.	Akademija			2.8		2.8			44.415
	Garliava			17.5		13.1			
	Ringaudai			5.6		5.6			
Kaunas distr.	Neveronys			5.8		4.9			24.456
	Vilkija			3.7					
	Šlienava			0.8					
Kaišiadorys	Rumšiškės			6.7		1.2			11.867
	Žiežmariai			0.9		0.9			
Lazdijai distr.	Veisiejai		1	3.6		2.3			8.728
Pagėgiai	Pagėgiai			2.6		2.6			3.64
Prienai distr.	Prienai			4.1	1.2	4.2			6.575
	Balbieriškis	1							
	Išlaužas		1						
Prienai distr.	Prienai			2.3		1.3			4.338
	Jieznas			1.3		1.3			
Šilutė distr.	Šilutė			17.9					13.067
	Rusnė		1	0.9		0.9			
Šakiai distr.	Gelgaudiškis	1		7.0		2.0			11.3
TOTAL		**2**	**3**	**177.1**	**6.5**	**127.9**	**0**	**0**	**277.127**

Source: Order No. D1-462 of the Minister of the Environment of the Republic of Lithuania of 9 September 2008 on the approval of List No. 01 under Measure No VP3-3.1-AM-01-V *Renovation and development of water supply and wastewater treatment systems* (Žin., 2008, No. 109-4162, 2009, No. 47-1882)

Notes:

1. Development of Akademija, Domeikava and Ringaudai water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Kaunas district (Akademija, Domeikava, Garliava, Ringaudai).* The project also includes development of the infrastructure in Domeikava settlement (the Nevėžis Sub-basin). The total value of the project is LTL 59.22 million. It is assumed that three fourths of the project amount will be invested in the Nemunas Small Tributaries Sub-basin.
2. Development of Neveronys, Vilkija and Šlienava water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Kaunas district (Karmėlava and Ramučiai, Neveronys, Raudondvaris, Vilkija, Šlienava).* The project also includes development of the infrastructure in Karmėlava and Ramučiai settlements (the Neris Small Tributaries Sub-basin) and in Raudondvaris. The total value of the project is LTL 40.76 million. It is assumed that three fifths of the project amount will be invested in the Nemunas Small Tributaries Sub-basin.
3. Three investment projects are planned to be implemented in Kaunas district: *Development of the water supply and wastewater management infrastructure in Kaunas district (Ežerėlis, Neveronys, Šlienava), Development of the water supply and wastewater management infrastructure in Kaunas district (Akademija, Domeikava, Garliava, Ringaudai),* and *Development of the water supply and wastewater management infrastructure in Kaunas district (Karmėlava and Ramučiai, Neveronys, Raudondvaris, Vilkija, Šlienava).* In the table above, the information on these three projects is given in separate lines.
4. Development of Rumšiškės and Žiežmariai water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Kaišiadorys district.* The project also includes development of the infrastructure in Kaišiadorys town (the Neris Small Tributaries Sub-basin). The total value of the project is LTL 17.8 million. It is assumed that two thirds of the project amount will be invested in the Nemunas Small Tributaries Sub-basin.
5. Development of Veisiejai water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Lazdijai district.* The project also includes development of the infrastructure in Lazdijai town (the Šešupė Sub-basin). The total value of the project is LTL 17.455 million. It is assumed that half of the project amount will be invested in the Nemunas Small Tributaries Sub-basin.
6. Development of Prienai, Balbieriškis and Išlaužas water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Prienai district.* The project also includes development of the infrastructure in Veiveriai settlement (the Šešupė Sub-basin). The total value of the project is LTL 8.766 million. It is assumed that three fourths of the project amount will be invested in the Nemunas Small Tributaries Sub-basin.
7. Two investment projects are planned to be implemented in Prienai district: *Development of the water supply and wastewater management infrastructure in Prienai district* and *Development of the water supply and wastewater management infrastructure in Prienai.* In the table above, the information on these projects is given in separate lines.
8. Development of Šilutė and Rusnė water supply and wastewater infrastructure is included in the project *Development of the water supply and wastewater management infrastructure in Šilutė district.* The project also includes development of the infrastructure in Švėkšna settlement (the Minija Sub-basin). The total value of the project is LTL 19.6 million. It is assumed that two thirds of the project amount will be invested in the Nemunas Small Tributaries Sub-basin.

Table 150 provides planned investment projects on development of sludge management infrastructures in towns located in the Nemunas Small Tributaries Sub-basin.

Table 150. Projects on development of sludge management infrastructures in 2007-2013 in the Nemunas Small Tributaries Sub-basin

Municipality	Expected project outputs	Preliminary project value, million LTL
Alytus town, Alytus district	1 rotting and air drying equipment	41.530
Druskininkai	1 composting site	4.300
Kaunas city	1 rotting and air drying equipment	49.000
Šilutė district	1 rotting and air drying equipment	13.000
TOTAL		**107.83**

Source: Order No. D1-659 of the Minister of the Environment of the Republic of Lithuania of 8 December 2008 on the approval of financing conditions for projects under the Measure *Renovation and development of water supply and wastewater treatment systems,* activity *Development of a sludge management infrastructure* (Žin., 2009, No. 6-186)

Industry

268. A description of pollution loads by pollutant amounts from industry has been provided earlier in the text. The present sub-section reviews companies by industrial branches, companies subject to the requirements of IPPC, and charges for pollution by sub-basins. The charges paid for pollution of waters, especially those subject to the so-called higher tariff, show a certain degree of the pollution load on water resources.

Also, the outputs of the project *Identification of substances dangerous for the aquatic environment in Lithuania* (2006) were distributed by individual sub-basins. The said project conducted an analysis of dangerous substances discharged with wastewater in various wastewater treatment facilities and in certain places of rivers. The results indicated detection of such substances as phenols and ethoxylates, polycyclic aromatic hydrocarbons, organotin compounds and phthalates in the wastewater treatment plants of several towns.

Minija Sub-basin

269. The importance of industry in respect of water consumption in the Minija Sub-basin is almost twice lower than the household sector.

The highest percentage of companies (excl. public institutions, trade companies, companies providing other services, or similar companies) is operating in manufacturing (Figure 67). According to the data of Statistics Lithuania provided by counties and adjusted for municipalities, almost 2000 companies were operating in the municipalities of Plungė and Klaipėda districts in 2008.

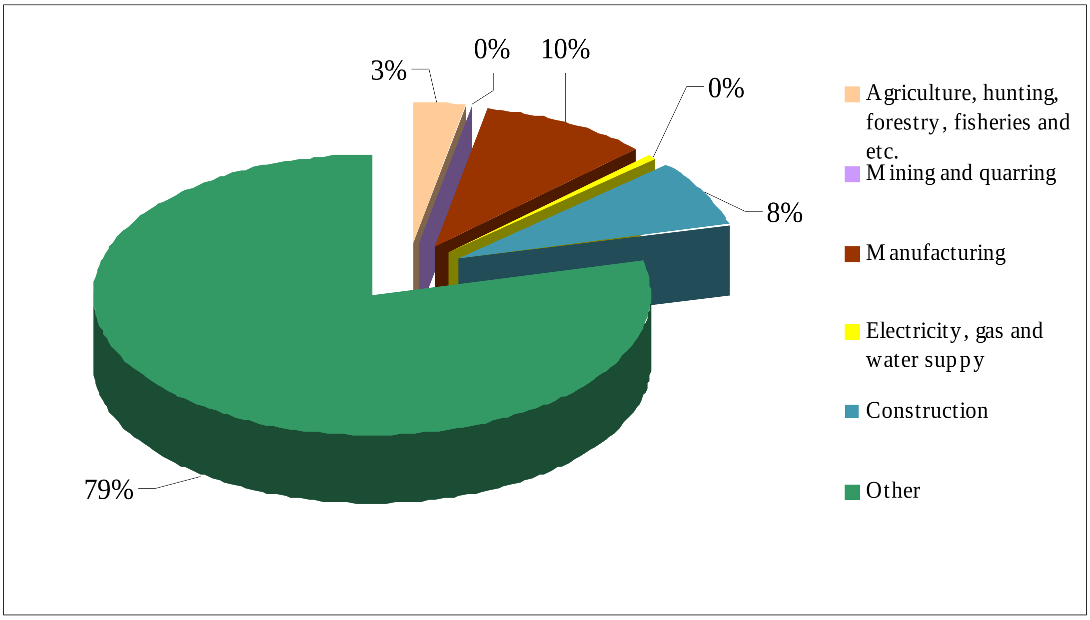

Figure 67. Distribution of companies by industries in the Minija Sub-basin, 2008
Source: Data of Statistics Lithuania by counties, revised by the Consultant

During the project *Identification of substances dangerous for the water environment in Lithuania* carried out in 2006, no examination of the Minija Sub-basin for potential "exotic" dangerous substances was carried out. As to wastewater, no metals, phenols and their ethoxylates, polycyclic aromatic hydrocarbons, organotin compounds, phthalates, or ecotoxicity was detected in the wastewater discharged by the water company Plungės vandenys.

There are nine companies in the Minija Sub-basin which have been issued integrated pollution prevention and control (IPPC) permits. Table 151 below presents the number of installations subject to the IPPC requirements by individual types specified in the IPPC legislation.

Table 151. The number of companies with IPPC permits by types of installations in the Minija Sub-basin, 2008

Installation type	Number of installations
Installations for the disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day	1
Animal raw materials (other than milk) with a finished product production capacity greater than 75 tonnes per day	2
Landfills receiving more than 10 tonnes per day or with a total capacity exceeding 25 000 tonnes, excluding landfills of inert waste	1
Installations for the intensive rearing of poultry with more than 40 000 places for poultry	3
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

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

The amounts of the water pollution charges paid, especially those subject to the so-called higher tariff, also indicate a certain level of pressure on water resources. Table 152 below provides the number of payers of charges for water pollution and the payable amounts. In 2008, both the number of payers and the amounts paid went down as compared to the figures of 2007.

The largest amounts of the pollution charges in Plungė district in 2008 were paid for organic pollution with BOD_7 – as much as 46 % of the total amount. In 2007, the largest amount – 32 % – was paid for pollution with phosphorus. In Klaipėda district, the highest amounts during the last years were paid for pollution with oil and oil products – about 30 % of the total water pollution charges paid in Klaipėda district. The amounts paid in this district under a higher tariff totalled to almost 7 % of the total declared amount of the pollution charge, and in 2008 this figure was nearly 10 %.

Table 152. Payments of the pollution charge in the Minija Sub-basin

District	Number of payers		Payable amounts, LTL (rounded up)	
	2007	2008	2007	2008
Klaipėda distr.	24	22	26 000	13 500
Plungė distr.	14	9	88 000	69 000
Total	**67**	**56**	**432 000**	**255 000**

Source: Database of pollution charges of the Ministry of the Environment

Merkys Sub-basin

270. The importance of industry (excl. fisheries) in respect of water consumption in the Merkys Sub-basin is almost four times lower than the household sector.

The highest percentage of companies (excl. public institutions, trade companies, companies providing other services, or similar companies) is operating in manufacturing (Figure 68). According to the data provided by Statistics Lithuania by counties and adjusted for municipalities, almost 1 000 companies were operating in Varėna and Šalčininkai districts in 2008.

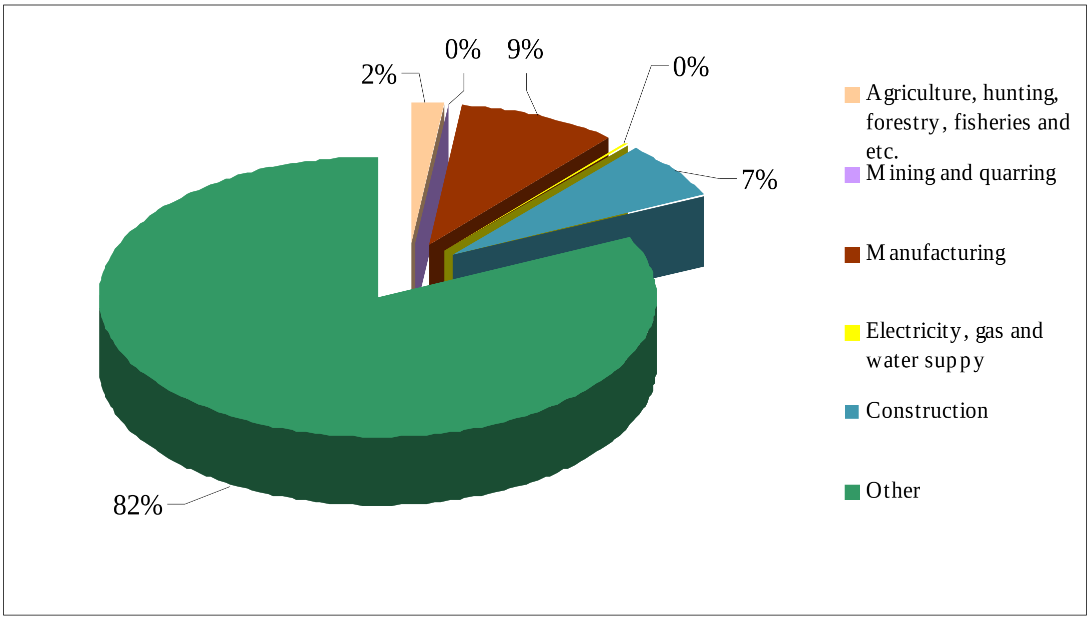

Figure 68. Distribution of companies by industries in the Merkys Sub-basin, 2008
Source: Data of Statistics Lithuania by counties, revised by the Consultant

During the project *Identification of substances dangerous for the aquatic environment in Lithuania* carried out in 2006, no examination of the Merkys Sub-basin for potential “exotic” dangerous substances was carried out. As to wastewater, a few dangerous substances of concern, namely, monobutyltin compounds and dibutyltin compounds were detected in the wastewater discharged by the water company Varėnos vandenys. The concentrations of these compounds were close to the maximum allowable concentrations. Speaking about other pollutants, the concentrations of metals, phenols and their ethoxylates, polycyclic aromatic hydrocarbons, phthalates and VOC did not exceed the established norms. The water examined was not ecotoxic either.

There are two companies in the Merkys Sub-basin which have been issued IPPC permits. Table 153 below presents the number of installations subject to the IPPC requirements by individual types specified in the IPPC legislation.

Table 153. The number of companies with IPPC permits by types of installations in the Merkys Sub-basin, 2008

Installation type	Number of installations
Installations for the intensive rearing of poultry with more than 40 000 places for poultry	1
Installations for the intensive rearing of pigs with more than 2 000 places for production pigs (over 30 kg), or 750 places for sows	1

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

The water pollution charges paid, especially those subject to the so-called higher tariff, also indicate a certain level of pressure on water resources. Table 154 below provides the number of payers of charges for water pollution and the payable amounts. In 2008, both the number of payers and the amounts paid went down as compared to the figures of 2007.

Table 154. Payments of the pollution charge in the Merkys Sub-basin

District	Number of payers		Payable amounts, LTL (rounded up)	
	2007	2008	2007	2008
Varėna distr.	6	5	44 125	42 272
Šalčininkai distr.	5	3	42 465	35 945
Total	**11**	**8**	**86 590**	**78 217**

Source: Database of pollution charges of the Ministry of the Environment

The largest amounts of the pollution charges in Varėna district in 2008 were paid for pollution with phosphorus – 34 %, and in 2007 for pollution with BOD_7 – 29 % of the total charges paid. In Šalčininkai district, the only payment both in 2008 and in 2007 was the charge for organic pollution with BOD_7..

Žeimena Sub-basin

271. The importance of industry (excl. fisheries) in respect of water consumption in the Žeimena Sub-basin is twice lower than that of the household sector.

The highest percentage of companies (excl. public institutions, trade companies, companies providing other services, or similar companies) is operating in manufacturing (Figure 69). According to the data provided by Statistics Lithuania by counties and adjusted for municipalities, almost 1 900 companies were operating in Švenčionys district in 2008.

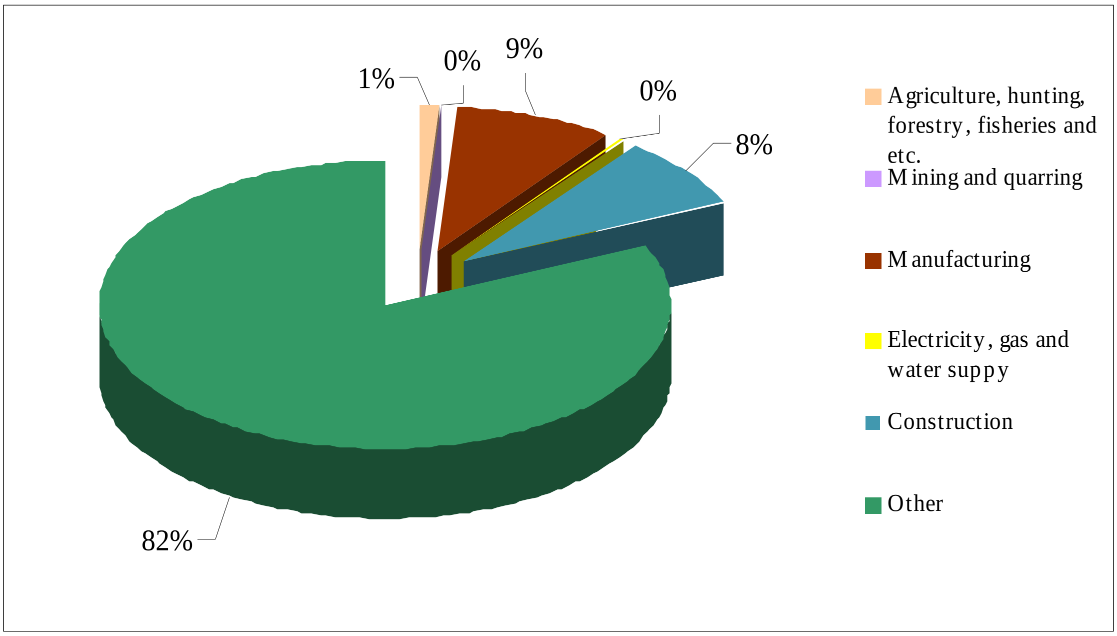

Figure 69. Distribution of companies by industries in the Žeimena Sub-basin, 2008
Source: Data of Statistics Lithuania by counties, revised by the Consultant

The project *Identification of substances dangerous for the water environment in Lithuania* (2006) carried out examination of wastewater discharged from Švenčionėliai and Pabradė WWTP into the Žeimena Sub-basin. The amount of di-(2-ethylhexyl) phthalate exceeded the Lithuanian standards and the amount of iso-nonylphenol was disturbing. One of the biological tests applied indicated slight toxicity of wastewater. No exceeded amounts of metals, polycyclic aromatic hydrocarbons, or organotin compounds were detected. In wastewater discharged from Pabradė WWTP, the amounts of metals, phenols and their ethoxylates, polycyclic aromatic hydrocarbons, organotin compounds, phthalates and their ethoxylates, or brominated biphenyl ethers were not exceeded either, though one of the biological tests applied indicated minor toxicity of the wastewater.

There are four companies in the Žeimena Sub-basin which have been issued IPPC permits. Table 155 below presents the number of installations subject to the IPPC requirements by individual types specified in the IPPC legislation.

Table 155. The number of companies with IPPC permits by types of installations in the Žeimena Sub-basin, 2008

Installation type	Number of installations
Installations for the manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tonnes per day, and/or with a kiln capacity exceeding 4 m^3 and with a setting density per kiln exceeding 300 kg/m^3	1
Landfills receiving more than 10 tonnes per day or with a total capacity exceeding 25 000 tonnes, excluding landfills of inert waste	2
Installations for the intensive rearing of pigs with more than 2 000 places for production pigs (over 30 kg), or 750 places for sows	1

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

Table 156 below provides the number of payers of the water pollution charge and the payable amounts. In 2008, both the number of payers and the amounts paid went down as compared to the figures of 2007.

The largest amounts of the pollution charge in Švenčionys district both in 2007 and 2008 were paid for pollution with BOD_7 – 94 % and 99 % of the total amount paid, respectively.

Table 156. Payments of the pollution charge in the Žeimena Sub-basin

District	Number of payers		Payable amounts, LTL (rounded up)	
	2007	2008	2007	2008
Švenčionys distr.	15	11	49 899	38 896
Total	**15**	**11**	**49 899**	**38 896**

Source: Database of pollution charges of the Ministry of the Environment

Šventoji Sub-basin

272. The importance of industry (excl. fisheries) in respect of water consumption in the Šventoji Sub-basin is almost twice lower than that of the household sector.

The highest percentage of companies (excl. public institutions, trade companies, companies providing other services, or similar companies) in the Šventoji Sub-basin is operating in manufacturing (Figure 70). According to the data provided by Statistics Lithuania by counties and adjusted for municipalities, more than 4 200 companies were operating in Anykščiai, Molėtai, Širvintos, Ukmergė, Utena, and Zarasai districts in 2008.

The project *Identification of substances dangerous for the water environment in Lithuania* (2006) carried out examination of the Šventoji water downstream of Anykščiai and wastewater discharged by the water companies Utenos vandenys, Anykščių vandenys and Ukmergės vandenys. The amounts of nickel and hexachlorobenzene in the Šventoji downstream of Anykščiai exceeded the EU EQS. No exceedance of the amounts of phenols and their ethoxylates, polycyclic aromatic hydrocarbons, organotin compounds, and phthalates was detected in the wastewater of Utenos vandenys, although one of the biological tests applied indicated minor toxicity of the wastewater. The amount of di-(2-ethylhexyl) phthalate in the wastewater of Anykščių vandenys exceeded the Lithuanian standards, and that of diisononylphthalate - the EU EQS. One of the biological tests applied also indicated slight toxicity of the wastewater. The amount of di-(2-ethylhexyl) phthalate in the wastewater of Utenos vandenys exceeded the Lithuanian standards. The biological tests applied also indicated slight toxicity of the wastewater.

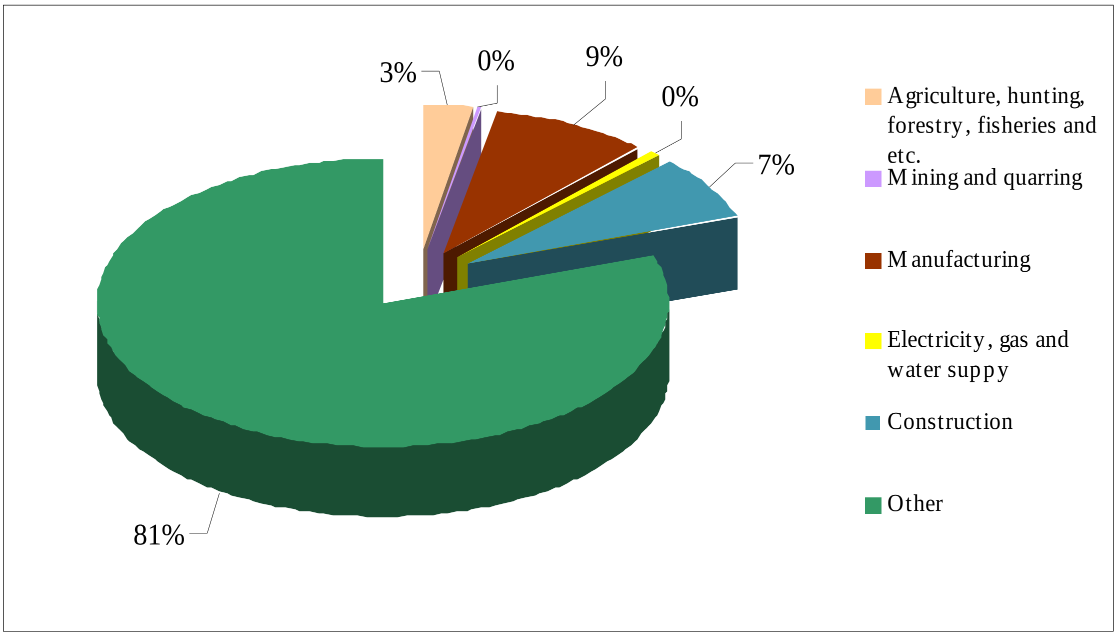

Figure 70. Distribution of companies by industries in the Šventoji Sub-basin, 2008
Source: Data of Statistics Lithuania by counties, revised by the Consultant

There are 13 companies in the Šventoji Sub-basin which have been issued IPPC permits. Table 157 below presents the number of installations subject to the IPPC requirements by individual types specified in the IPPC legislation.

Table 157. The number of companies with IPPC permits by types of installations in the Šventoji Sub-basin, 2008

Installation type	Number of installations
Large combustion installations with a rated thermal input exceeding 50 MW	1
Landfills receiving more than 10 tonnes per day or with a total capacity exceeding 25 000 tonnes, excluding landfills of inert waste	4
Slaughterhouses with a carcase production capacity greater than 50 tonnes per day	1
Treatment and processing of milk, the quantity of milk received being greater than 200 tonnes per day (average value on an annual basis)	2
Installations for the intensive rearing of poultry with more than 40 000 places for poultry	3
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

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

The number of payers of charges for water pollution and the payable amounts are given in Table 158 below. Both the number of payers and the amounts paid in 2008 in the majority of the municipalities in Lithuania went down as compared to the figures of 2007. The same is true for the Šventoji Sub-basin.

The largest amounts of the pollution charge in Zarasai district both in 2007 and 2008 were paid for pollution with phosphorus – 57 % and 42 % respectively. The charge paid in Anykščiai district mostly covered pollution with nitrogen and BOD_7 and in Utena district – for pollution with BOD_7 and oils. The amounts for oil and its products paid in Molėtai district in 2008 accounted for 37 % of the total charges, and in 2007 the highest amount, 39 %, was paid for pollution with suspended particles. The charges paid in Širvintos district mainly covered pollution with phosphorus – as much as 68.5 % in

2007. In Ukmergė district, the payments were highest for oil and its products, and the amount paid for oils under a higher tariff accounted even for 24 % of the total payments.

Table 158. Payments of the pollution charge in the Šventoji Sub-basin

District	Number of payers		Payable amounts, LTL (rounded up)	
	2007	2008	2007	2008
Zarasai distr.	10	6	12 122	5 218
Anykščiai distr.	12	12	23 619	14 322
Utena distr.	9	8	129 331	58 790
Molėtai distr.	7	4	8 277	309
Širvintos distr.	4	5	9 889	5 636
Ukmergė distr.	7	8	45 078	24 115
Total	**49**	**43**	**228 316**	**108 390**

Source: Database of pollution charges of the Ministry of the Environment

Neris Small Tributaries Sub-basin

273. The importance of industry (excl. fisheries) in respect of water consumption in the sub-basin is almost 1 ½ times lower than that of the household sector.

The highest percentage of companies (excl. public institutions, trade companies, companies providing other services, or similar companies) in the Neris Small Tributaries Sub-basin is operating in manufacturing (Figure 71). According to the data provided by Statistics Lithuania by counties and adjusted for municipalities, approximately 24 thousand companies were operating in Vilnius city, Vilnius district and in the districts of Jonava and Kaišiadorys in 2008, which accounts for as much as 29 % of the total number of companies in Lithuania. A very high percentage of “other” companies in Lithuania, 87 %, are located in the Neris Small Tributaries Sub-basin.

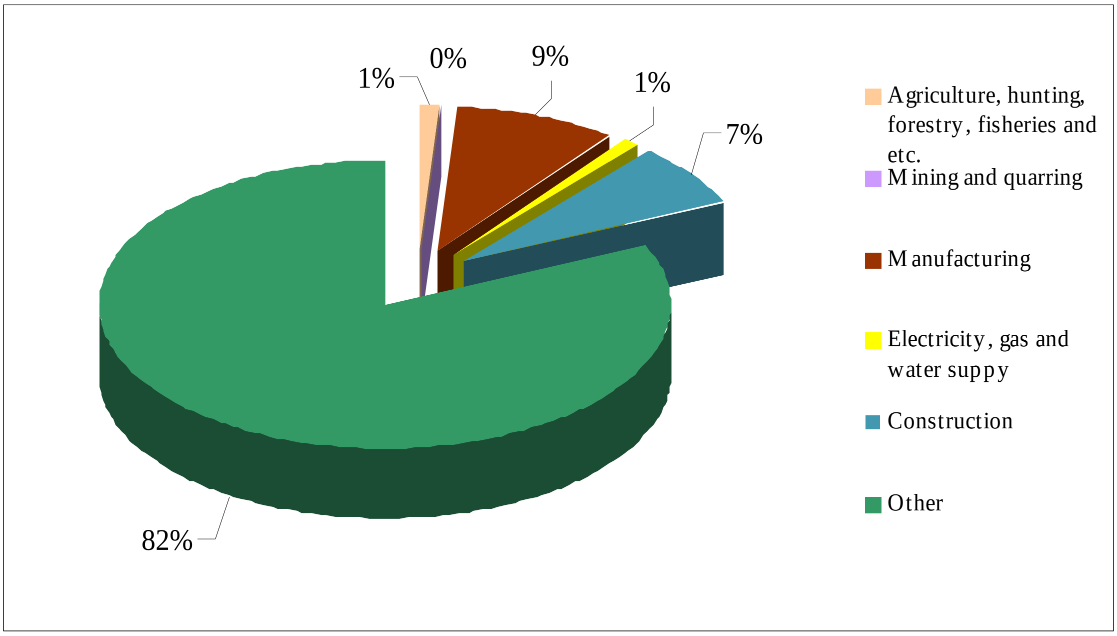

Figure 71. Distribution of companies by industries in the Neris Small Tributaries Sub-basin, 2008. Source: Data of Statistics Lithuania by counties, revised by the Consultant

The project *Identification of substances dangerous for the water environment in Lithuania* (2006) carried out examination of the Neris water at Buivydžiai and wastewater discharged into the Neris Small Tributaries Sub-basin from Jonava and Vilnius. The amount of di-(2-ethylhexyl) phthalate in the Neris water exceeded the Lithuanian standards, and those of tributyltin compounds were higher than the EQS of the EU. In addition, the concentration of dibutyl phthalate was close to the established norm. No exceedances were found in the wastewater discharged from the water company Vilniaus vandenys, meanwhile the amounts of monobutyltin compounds and dibutyltin compounds in the wastewater discharged from the water company Jonavos vandenys were close to the established norms.

There are 26 companies in the Neris Small Tributaries Sub-basin which have been issued IPPC permits. Table 159 below presents the number of installations subject to the IPPC requirements by individual types specified in the IPPC legislation.

Table 159. The number of companies with IPPC permits by types of installations in the Neris Small Tributaries Sub-basin, 2008

Installation type	Number of installations
Large combustion installations with a rated thermal input exceeding 50 MW	6
Installations for melting mineral substances including the production of mineral fibres with a melting capacity exceeding 20 tonnes per day	1
Chemical installations for the production of phosphorous-, nitrogen- or potassium-based fertilisers (simple or compound fertilisers)	2
Installations for the disposal of non-hazardous waste, with a capacity exceeding 50 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	4
Industrial plants for the production of paper and board with a production capacity exceeding 20 tonnes per day	2
Installations for the intensive rearing of poultry with more than 40 000 places for poultry	5
Installations for the intensive rearing of pigs with more than 2 000 places for production pigs (over 30 kg), or 750 places for sows	4
Installations for the manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tonnes per day, and/or with a kiln capacity exceeding 4 m^3 and with a setting density per kiln exceeding 300 kg/m^3.	1

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

The number of payers of water pollution charges and the payable amounts are provided in Table 160 below. In 2008, both the number of payers and the amounts paid went down as compared to the figures of 2007.

The largest amounts of the pollution charges in Vilnius city in 2008 were paid for pollution with nitrogen (over 24 %), meanwhile in 2007 – for pollution with copper (more than 20 %). In Vilnius district, the highest pollution level was that of BOD_7 – the amounts paid in 2008 and 2007 accounted for as much as 84 % and 74 % of the total pollution charges paid, respectively. 54 % and 77 % of the total amount respectively were payments at a higher tariff. The largest amounts paid in Jonava district are those for pollution with nitrogen – almost 50 % and 39 % of the total charges paid in 2008 and 2007 respectively. The amount paid in 2007 at a higher tariff accounted for more than 8 %.

Table 160. Payments of the pollution charge in the Neris Small Tributaries Sub-basin

District	Number of payers		Payable amounts, LTL (rounded up)	
	2007	2008	2007	2008
Vilnius city	19	14	1 788 969	925 219
Vilnius district	24	18	236 393	28 693
Jonava district	9	7	297 237	228 472
Total	**52**	**39**	**2 322 599**	**1 182 384**

Source: Database of pollution charges of the Ministry of the Environment

Nevėžis Sub-basin

274. The importance of industry (excl. fisheries) in respect of water consumption in the Nevėžis Sub-basin is 1 ½ times lower than that of the household sector.

The highest percentage of companies (excl. public institutions, trade companies, companies providing other services, or similar companies) in the Nevėžis district is operating in manufacturing (Figure 72). According to the data provided by Statistics Lithuania by counties and adjusted for municipalities, more than 5 800 companies were operating in the municipalities of Kėdainiai, Panevėžys city and district, and Radviliškis in 2008.

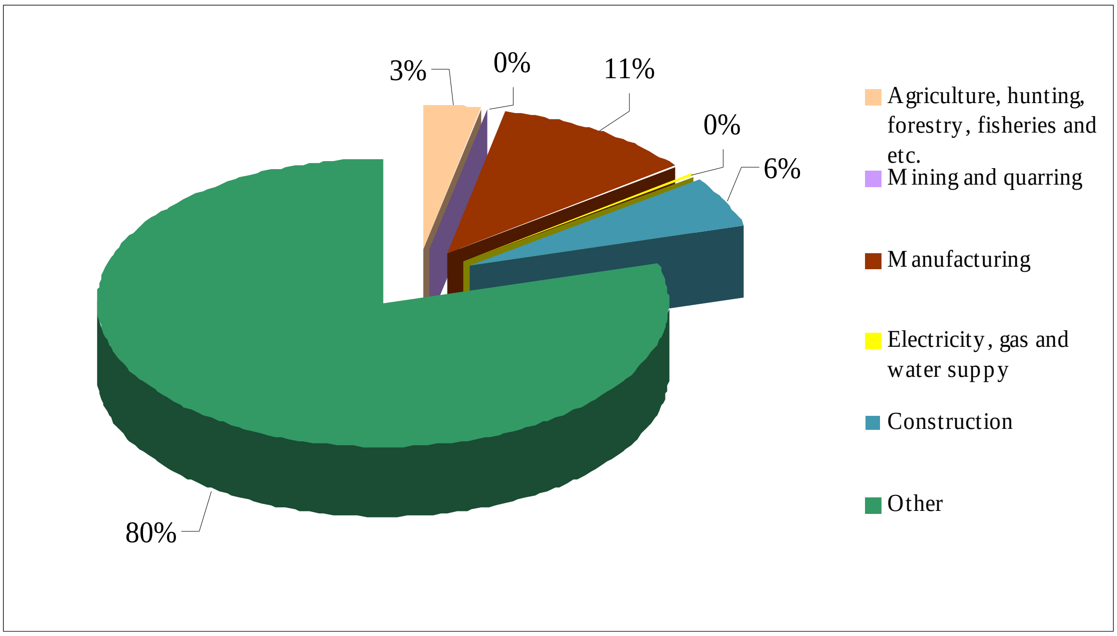

Figure 72. Distribution of companies by industries in the Nevėžis Sub-basin, 2008. Source: Data of Statistics Lithuania by counties, revised by the Consultant

The project *Identification of substances dangerous for the water environment in Lithuania* (2006) carried out examination of the Nevėžis water downstream of Panevėžys and wastewater discharged by the water companies Aukštaitijos vandenys and Kėdainių vandenys. The amounts of tributyltin compounds and di-(2-ethylhexyl) phthalate in the Nevėžis downstream of Panevėžys exceeded the Lithuanian standards, and those of nickel, iso-nonylphenol and tributyltin compounds were higher than the EU EQS. The biological tests applied indicated slight toxicity of the water.

In wastewater discharged from Aukštaitijos vandenys, the amount of di-(2-ethylhexyl) phthalate exceeded the Lithuanian standards. Some of the biological tests applied indicated average toxicity of the wastewater.

No exceedances of the established standard were found in wastewater of the water company Kėdainių vandenys. However, the amounts of monobutyltin compounds and dibutyltin compounds were disturbing. One of the biological tests applied indicated slight toxicity of the wastewater. The amounts of metals, phenols and their ethoxylates, phthalates and VOC did not exceed the established standards.

There are 21 companies in the Nevėžis Sub-basin which have been issued IPPC permits. Table 161 below presents the number of installations subject to the IPPC requirements by individual types specified in the IPPC legislation.

Table 161. The number of companies with IPPC permits by types of installations in the Nevėžis Sub-basin, 2008

Installation type	Number of installations
Large combustion installations with a rated thermal input exceeding 50 MW	5
Installations for the manufacture of glass including glass fibre with a melting capacity exceeding 20 tonnes per day	1
Chemical installations for the production of phosphorous-, nitrogen- or potassium-based fertilisers (simple or compound fertilisers)	2
Plants for the pre-treatment (operations such as washing, bleaching, mercerization) or dyeing of fibres or textiles where the treatment capacity exceeds 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	2
Slaughterhouses with a carcase production capacity greater than 50 tonnes per day	1
Installations for the intensive rearing of poultry with more than 40 000 places for poultry	1
Installations for the intensive rearing of pigs with more than 2 000 places for production pigs (over 30 kg), or 750 places for sows	3
Treatment and processing intended for the production of food products from vegetable raw materials with a finished product production capacity greater than 300 tonnes per day (average value on a quarterly basis)	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 surface treatment of substances, objects or products using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating, with a consumption capacity of more than 150 kg per hour or more than 200 tonnes per year	1

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

The number of payers of the water pollution charge and the payable amounts are given in Table 162 below. In 2008, both the number of payers and the amounts paid went down as compared to the figures of 2007. The largest amounts of the pollution charge in Panevėžys district are paid for pollution with nitrogen – about 50 % of the total payment. In Panevėžys city, the highest amounts in 2008 were paid for pollution with oil and oil products – as much as 37 %, and in 2007 – for pollution with BOD_7 – 39 % of the total pollution charge paid. The charges paid for oil and oil products in Radviliškis district in 2008 accounted for almost 49 % of the total amount paid. Kėdainiai district demonstrates a rather even distribution of payments for pollution with major pollutants.

Table 162. Payments of the pollution charge in the Nevėžis Sub-basin

District	Number of payers		Payable amounts, Lt (rounded up)	
	2007	2008	2007	2008
Panevėžys distr.	16	13	241 073	59 197
Radviliškis distr.	13	13	37 482	3 784
Panevėžys city	22	18	274 464	101 738
Kėdainiai distr.	19	14	255 233	171 084
Total	**70**	**58**	**808 300**	**336 000**

Source: Database of pollution charges of the Ministry of the Environment

Šešupė Sub-basin

275. The importance of industry (excl. fisheries) in respect of water consumption in the Šešupė Sub-basin is almost seven times lower than that of the household sector.

The highest percentage of companies (excl. public institution, trade companies, companies providing other services, or similar companies) is operating in manufacturing (Figure 73). According to Statistics Lithuania, almost 3 000 companies were operating in the municipalities of Marijampolė region in 2008.

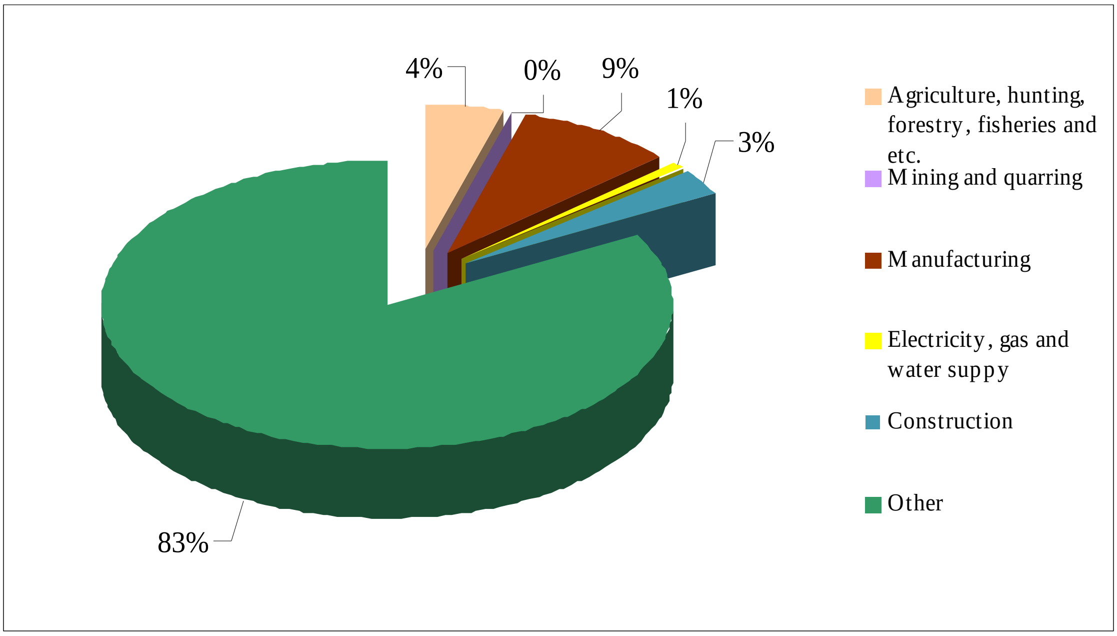

Figure 73. Distribution of companies by industries in the Šešupė Sub-basin, 2008
Source: Data of Statistics Lithuania by counties, revised by the Consultant

The project *Identification of substances dangerous for the water environment in Lithuania* (2006) performed examination of the Siesartis water downstream of Šakiai as well as wastewater in Marijampolė WWTP, Vilkaviškis WWTP, Šakiai WWTP, and Kazlų Rūda WWTP.

The amounts of nickel and tributyltin in the Siesartis downstream of Šakiai exceeded the level permitted in the Lithuanian standards, and the amounts of monobutyltin, dibutyltin, dioctyltin, and di-2-ethylhexyl phthalate were disturbing. The biological tests applied indicated slight toxicity of water.

The amounts of pollutants detected in wastewater of Marijampolė WWTP, Vilkaviškis WWTP, Šakiai WWTP, and Kazlų Rūda WWTP did not exceed the established limit values, but the amounts of monobutyltin and dibutyltin were disturbing. One of the biological tests applied indicated average toxicity of wastewater in Marijampolė WWTP meanwhile wastewater in Vilkaviškis WWTP was slightly toxic. Biological tests applied to Šakiai WWTP and Kazlų Rūda WWTP showed minor toxicity.

There are 12 companies in the Šešupė Sub-basin which have been issued IPPC permits. Table 163 below presents the number of installations subject to the IPPC requirements by individual types specified in the IPPC legislation.

Table 163. The number of companies with IPPC permits by types of installations in the Šešupė Sub-basin, 2008

Installation type	Number of installations
Large combustion installations with a rated thermal input exceeding 50 MW	2
Landfills receiving more than 10 tonnes per day or with a total capacity exceeding 25 000 tonnes, excluding landfills of inert waste	3
Installations for the incineration of municipal waste with a capacity exceeding 3 tonnes per hour	1
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	1
Installations for the intensive rearing of pigs with more than 2 000 places for production pigs (over 30 kg), or 750 places for sows	3
Chemical installations for the production of basic organic chemicals, such as oxygen-containing hydrocarbons such as alcohols, aldehydes, ketones, carboxylic acids, esters, acetates, ethers, peroxides, epoxy resins	1

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

Table 164 below provides the number of payers of charges for water pollution and the payable amounts. In 2008, both the number of payers and the payable amounts went down as compared to the figures of 2007.

The largest amounts of the pollution charges in Marijampolė municipality in 2007 and 2008 were paid for pollution with BOD_7 and nitrogen (over 20 % of the total amount). The charges paid in Kalvarija municipality practically covered only BOD_7 – 96 % in 2008 and 77 % in 2007. The amounts paid applying a higher tariff totalled to as much as 24 %. In Kazlų Rūda, the payments were highest for biogenic substances as well – 46 % for pollution with nitrogen in 2008 and 57 % for pollution with BOD_7 in 2007. In Vilkaviškis district, the dominating charge was for nitrogen and BOD_7 – 27-36 %. Šakiai district was noted for the charge for phosphorus, which made up 42 % in 2008. Also, a significant amount in 2008 was paid for BOD_7 (25 %). In 2007, the charges for pollution with nitrogen made up 27 % and for pollution with BDS_7 – 25 % of the total amount paid for water pollution in Šakiai district.

Table 164. Amounts of the charge for water pollution in the Šešupė Sub-basin

District	Number of payers		Payable amounts, LTL (rounded up)	
	2007	2008	2007	2008
Marijampolė munic.	22	13	155 567	108 287

Kalvarija munic.	5	4	15 697	4041
Kazlų Rūda munic.	7	2	12 326	12 038
Vilkaviškis distr. munic.	14	7	20 752	12 091
Šakiai distr. munic.	8	4	14 266	3649
Total	**56**	**30**	**218 608**	**140 106**

Source: Database of pollution charges of the Ministry of the Environment

Dubysa Sub-basin

276. The importance of industry (excl. fisheries) in respect of water consumption in the Dubysa Sub-basin is almost seven times lower than the household sector.

The largest number of companies (excl. public institution, trade companies, companies providing other services, or similar companies) in the Dubysa Sub-basin operate in manufacturing (Figure 74). According to the data of Statistics Lithuania, almost 2 200 companies were operating in the municipalities of Kelmė and Raseiniai districts in 2008.

The project *Identification of substances dangerous for the water environment in Lithuania* (2006) did not involve analysis of water in the Dubysa Sub-basin.

There are two companies in the Dubysa Sub-basin which have been issued IPPC permits. Table 165 below presents the number of installations subject to the IPPC requirements by individual types specified in the IPPC legislation.

Table 165. The number of companies with IPPC permits by types of installations in the Dubysa Sub-basin, 2008

Installation type	Number of installations
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

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

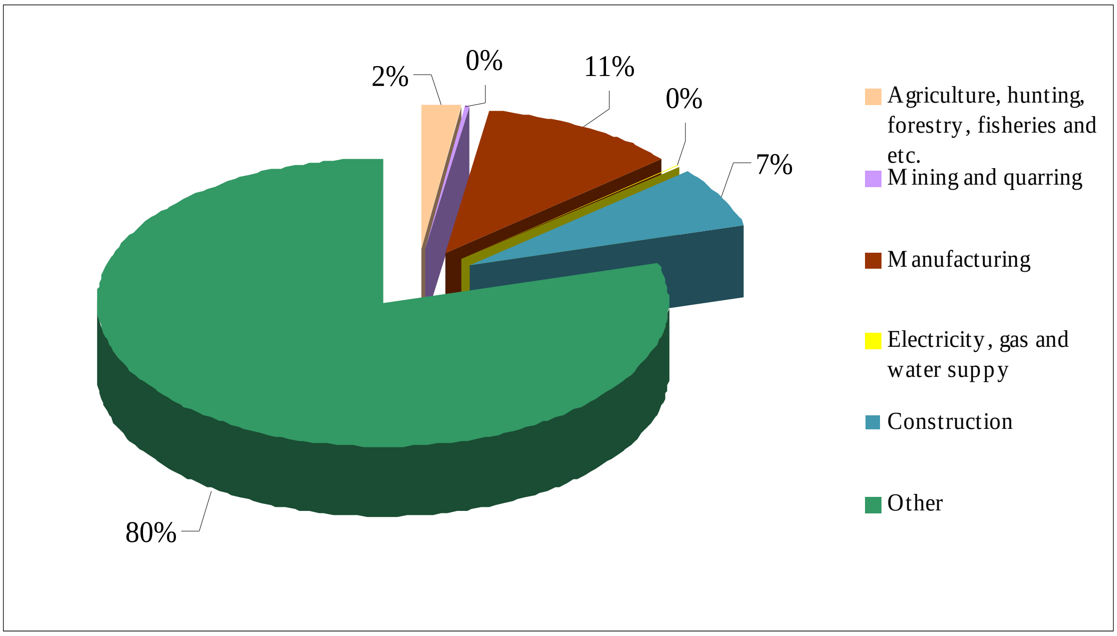

Figure 74. Distribution of companies by industries in Kelmė and Raseiniai municipalities together, 2008. Source: Data of Statistics Lithuania by counties, revised by the Consultant.

The number of payers of the water pollution charge and the payable amounts are provided in Table 166 below. In 2008, both the number of payers and the payable amounts went down as compared to the figures of 2007.

The largest amount of the pollution charge in Kelmė district municipality in 2008 was paid for pollution with oil and its products – over 50 % of the total payment for water pollution in Kelmė district. 18 % of the declared total pollution charge in this district accounted for payments at a higher tariff. In 2007, the largest amount was paid for organic pollution – as much as 57 % of the total amount paid. Most of the amount paid in Raseiniai district in 2008 also accounted for organic pollution with BOD_7 – even 43 % of the total amount.

Table 166. Payments of the pollution charge in the Dubysa Sub-basin

District	Number of payers		Payable amounts, Lt (rounded up)	
	2007	2008	2007	2008
Kelmė distr.	8	4	17 584	10 319
Raseiniai distr.	8	6	21 113	1 618
Total	**16**	**10**	**38 697**	**11 937**

Source: Database of pollution charges of the Ministry of the Environment

Jūra Sub-basin

277. The importance of industry (excl. fisheries) in respect of water consumption in the Jūra Sub-basin is almost thirteen times lower than the household sector. The highest percentage of companies (excl. public institutions, trade companies, companies providing other services, or similar companies) in the Jūra Sub-basin operate in manufacturing (Figure 75). According to the data of Statistics Lithuania, almost 1 500 companies were operating in the municipalities of Telšiai and Tauragė districts in 2008.

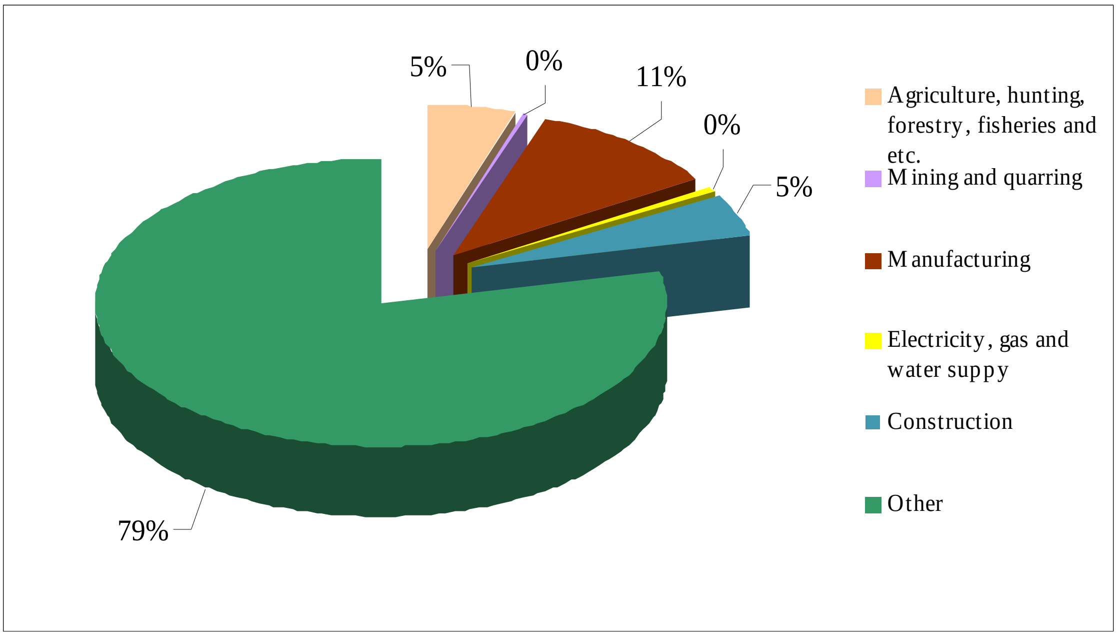

Figure 75. Distribution of companies by industries in the Jūra Sub-basin, 2008
Source: Data of Statistics Lithuania by counties, revised by the Consultant

The project *Identification of substances dangerous for the water environment in Lithuania* (2006) performed an analysis of water discharged into the Jūra Sub-basin from the water company Tauragės vandenys. The amounts of metals and polycyclic aromatic hydrocarbons examined did not exceed any established standards; however, one of the biological tests applied indicated average toxicity.

There are five companies in the Jūra Sub-basin which have been issued IPPC permits. Table 167 below presents the number of installations subject to the IPPC requirements by individual types specified in the IPPC legislation.

Table 167. The number of companies with IPPC permits by types of installations in the Jūra Sub-basin, 2008

Installation type	Number of installations
Installations for the manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tonnes per day, and/or with a kiln capacity exceeding 4 m^3 and with a setting density per kiln exceeding 300 kg/m^3	1
Installations for the disposal or recycling of animal carcases and animal waste with a treatment capacity exceeding 10 tonnes per day	1
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 pigs with more than 2 000 places for production pigs (over 30 kg), or 750 places for sows	2

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

The number of payers of charges for water pollution and the payable amounts are provided in Table 168 below. In 2008, both the number of payers and the payable amounts went down as compared to the figures of 2007.

The largest amount of the pollution charge in Rietavas district in 2008 was paid for organic pollution with BOD_7 – 83 % of the total amount. As much as 83 % of the declared amount of the pollution charge accounted for payments at a higher tariff. Most of the payments in 2007 also covered organic pollution with BOD_7 – 56 % of the total amount paid.

In Šilalė district, 26 % of the payments in 2008 covered BOD_7 and almost 29 % – total nitrogen. Even 28 % of the total declared amount of the pollution charge accounted for payments at a higher tariff. In 2007, the largest amount was paid for BOD_7 – 30 % of the total amount paid, and the amount paid at a higher tariff accounted for almost 48 % of the total declared pollution charge.

The largest amount in Tauragė district was paid for pollution with phosphorus – about 40 %.

Table168. Payments of the pollution charge in the Jūra Sub-basin

District	Number of payers		Payable amounts, LTL (rounded up)	
	2007	2008	2007	2008
Rietavas distr.	4	1	2 764	558
Šilalė distr.	19	13	36 656	10 563
Tauragė distr.	26	23	93 220	33 364

Total	**49**	**37**	**132 640**	**44 485**

Source: Database of pollution charges of the Ministry of the Environment

Lithuanian Coastal Rivers Basin

278. The importance of industry (excl. fisheries) in respect of water consumption in the Lithuanian Coastal Rivers Basin is almost the same as that of the household sector. The largest number of companies (excl. public institutions, trade companies, companies providing other services, or similar companies) in the Lithuanian Coastal Rivers Basin operate in manufacturing (Figure 76). According to the data of Statistics Lithuania, almost 5 000 companies were operating in the municipalities of Telšiai and Tauragė districts in 2008.

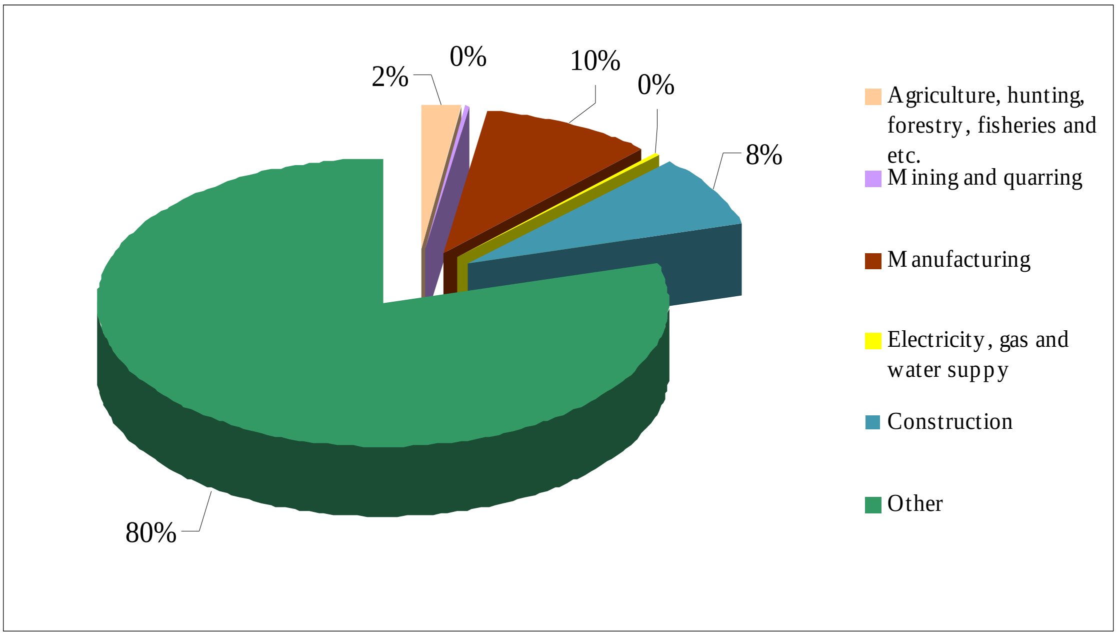

Figure 76. Distribution of companies by industries in the Lithuanian Coastal Rivers Basin, 2008. Source: Data of Statistics Lithuania by counties, revised by the Consultant

The project *Identification of substances dangerous for the water environment in Lithuania* (2006) performed an analysis of water in the estuary of the Akmena-Danė and in Klaipėda Canal at the outlet of the fishery company Baltijos kolūkis, and of wastewater discharged by the water company Klaipėdos vanduo.

The amounts of diethylhexyl phthalate in the water at the estuary of the Akmena-Danė exceeded the Lithuanian standards, and that of tributyltin compounds – the EU EQS. The amounts of monobutyltin, dibutyltin, tetrabutyltin compounds and diisononylphthalate were disturbing. No exceedance was detected in the amounts of polycyclic aromatic hydrocarbons.

The amount of nickel in the water of Klaipėda Canal at the outlet of Baltijos kolūkis exceeded the EU EQS. No exceedance was detected in the amounts of polycyclic aromatic hydrocarbons.

The amounts of metals examined, phenols and their ethoxylates, polycyclic aromatic hydrocarbons, organotin compounds, phthalates, and volatile organic compounds did not exceed any established standards. The biological tests applied did not indicate any toxicity either.

There are 20 companies in the Lithuanian Coastal Rivers Basin which have been issued IPPC permits. Table 169 below presents the number of installations subject to the IPPC requirements by individual types specified in the IPPC legislation.

Table 169. The number of companies with IPPC permits by types of installations in the Lithuanian Coastal Rivers Basin, 2008

Installation type	Number of installations
Large combustion installations with a rated thermal input exceeding 50 MW	4
Installations for the disposal or recovery of hazardous waste, with a capacity exceeding 10 tonnes per day	3
Installations for the application of protective fused metal coats with an input exceeding 2 tonnes of crude steel per hour	1
Chemical installations for the production of basic organic chemicals	3
Installations for the disposal of non-hazardous waste, with a capacity exceeding 50 tonnes per day	1
Treatment and processing intended for the production of food products from animal raw materials (other than milk) with a finished product production capacity greater than 75 tonnes per day	1
Installations for the surface treatment of substances, objects or products using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating, with a consumption capacity of more than 150 kg per hour or more than 200 tonnes per year	3
Installations for the intensive rearing of poultry with more than 40 000 places for poultry	2
Treatment and processing intended for the production of food products from vegetable raw materials with a finished product production capacity greater than 300 tonnes per day (average value on a quarterly basis)	1
Industrial plants for the production of paper and board with a production capacity exceeding 20 tonnes per day	1

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

The number of payers of charges for water pollution and the payable amounts are provided in Table 170 below. In 2008, both the number of payers and the payable amounts went down as compared to the figures of 2007.

Both in Klaipėda and in Neringa, the largest amounts were paid for organic pollution with BOD_7 – between 24 and 77 %. A large amount was also paid for pollution with nitrogen – 27 % in Klaipėda in 2007. 4 % of the declared charges in 2007 accounted for payments at a higher tariff.

Table 170. Payments of the pollution charge in the Lithuanian Coastal Rivers Basin

District	Number of payers		Payable amounts, Lt (rounded up)	
	2007	2008	2007	2008
Klaipėda city	31	25	836 228	454 692
Neringa munic.	2	2	111 918	98 633
Total	**33**	**27**	**948 146**	**553 325**

Source: Database of pollution charges of the Ministry of the Environment

Nemunas Small Tributaries Sub-basin

279. The importance of industry (excl. fisheries) in respect of water consumption in the Nemunas Small Tributaries Sub-basin is 1 ½ times lower than that the household sector. The largest number of companies (excl. public institutions, trade companies, companies providing other services, or similar companies) operate in manufacturing (Figure 77). According to the data provided by Statistics Lithuania by counties and adjusted for municipalities, more than 16 000 companies were operating in 12 municipalities of this sub-basin in 2008, which makes up as many as 20 % of the total number of Lithuanian companies.

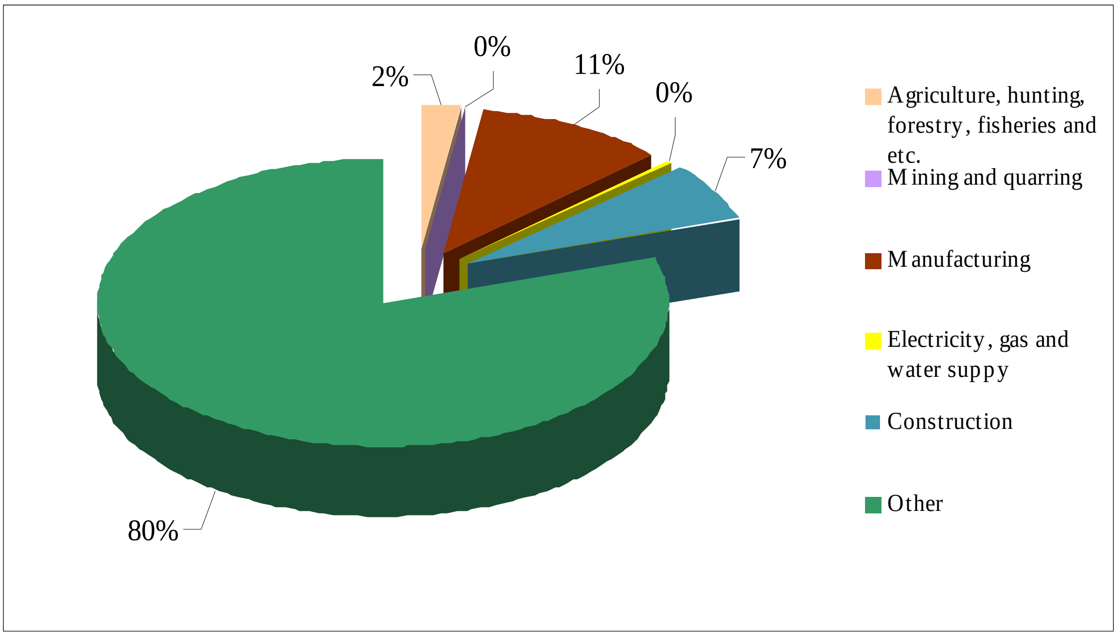

Figure 77. Distribution of companies by industries in the Nemunas Small Tributaries Sub-basin, 2008. Source: Data of Statistics Lithuania by counties, revised by the Consultant.

The project *Identification of substances dangerous for the water environment in Lithuania* (2006) performed an analysis of the Nemunas water at the border, at Rusnė, downstream of Sovetsk, downstream of Kaunas, as well as wastewater discharged by the water companies Dzūkijos vandenys, Birštono vandentiekis, Šilutės vandenys, and Kauno vandenys.

The amounts of di-(2-ethylhexyl) phthalate in the Nemunas water in the border zone exceeded the Lithuanian standards, and the amounts of monobutyltin compounds, diisobutyl phthalate, diisononyl phthalate, and benzyl butyl phthalate were disturbing. One of the biological tests applied indicated slight toxicity of the wastewater.

In the Nemunas at Rusnė, the amount of di-(2-ethylhexyl) phthalate exceeded the Lithuanian standards, and the amounts of isononylphenol and tributyltin compounds exceeded the EU EQS. Also, the amounts of monobutyltin compounds, dibutyltin compounds, tetrabutyltin compounds and monooctyltin compounds were disturbing. All biological tests applied indicated slight toxicity.

In the Nemunas downstream of Sovetsk, the amount of the same di-(2-ethylhexyl) phthalate exceeded the Lithuanian standards and nickel – the EU EQS, meanwhile the amount of diisobutyl phthalate was disturbing. All biological tests applied indicated slight toxicity.

In the Nemunas downstream of Kaunas, the amounts of tributyltin compounds exceeded the Lithuanian standards and the EU EQS. No metals, phenols and their ethoxylates, polycyclic aromatic hydrocarbons, or phthalates targeted by the analysis were detected in the water.

In the wastewater discharged by the water company Dzūkijos vandenys, the amounts of zinc and anthracene exceeded the Lithuanian standards, and the detected amounts of concern were those of monobutyltin and dibutyltin. One of the biological tests applied indicated average toxicity of the wastewater. No exceedances were detected in phenols and their ethoxylates and in phthalates targeted by the analysis.

The amounts of monobutyltin and dibutyltin detected in the wastewater discharged by the water company Birštono vandenys were disturbing. One of the biological tests applied indicated average toxicity of the wastewater. No metals, phenols and their ethoxylates, polycyclic aromatic hydrocarbons, or phthalates targeted by the analysis were detected in the water.

The analysis performed in wastewater discharged from the water company Šilutės vandenys covered metals, polycyclic aromatic hydrocarbons, organotin compounds and phthalates. No exceedances were established.

In the wastewater discharged by the water company Kauno vandenys, the amount of di-(2-ethylhexyl) phthalate exceeded the Lithuanian standards, and the amounts of isononylphenol, nonylphenol mono-ethoxylate, monobutyltin compounds and dibutyltin coonhounds were disturbing. The biological tests applied indicated slight and average toxicity. No metals and polycyclic aromatic hydrocarbons were detected.

There are 27 companies in the Nemunas Small Tributaries Sub-basin which have been issued IPPC permits. Table 171 below presents the number of installations subject to the IPPC requirements by individual types specified in the IPPC legislation.

Table 171. The number of companies with IPPC permits by types of installations in the Nemunas Small Tributaries Sub-basin, 2008

Installation type	Number of installations
Large combustion installations with a rated thermal input exceeding 50 MW	5
Landfills receiving more than 10 tonnes per day or with a total capacity exceeding 25 000 tonnes, excluding landfills of inert waste	1
Installations for the manufacture of glass including glass fibre with a melting capacity exceeding 20 tonnes per day	1
Installations for the manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tonnes per day, and/or with a kiln capacity exceeding 4 m^3 and with a setting density per kiln exceeding 300 kg/m^3	2
Installations for the disposal or recovery of hazardous waste, with a capacity exceeding 10 tonnes per day	2
Installations for the production of pig iron or steel (primary or secondary fusion) including continuous casting, with a capacity exceeding 2.5 tonnes per hour	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	6
Treatment and processing intended for the production of food products from vegetable	1

Installation type	Number of installations
raw materials with a finished product production capacity greater than 300 tonnes per day (average value on a quarterly basis)	
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 surface treatment of substances, objects or products using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating, with a consumption capacity of more than 150 kg per hour or more than 200 tonnes per year	1
Installations using a chemical or biological process for the production of basic pharmaceutical products	1
Industrial plants for the production of paper and board with a production capacity exceeding 20 tonnes per day	1

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

The number of payers of charges for water pollution and the payable amounts are given in Table 172 below. In 2008, both the number of payers and the payable amounts went down as compared to the figures of 2007.

Table 172. Payments of the pollution charge in the Nemunas Small Tributaries Sub-basin

District	Number of payers		Payable amounts, LTL (rounded up)		Dominant pollutant which accounted for the largest amount paid	
	2007	2008	2007	2008	2007	2008
Birštonas town	3	2	66 774	48 659	phosphorus – 27%	phosphorus and nitrogen – 24% each
Pagėgiai distr.	3	2	32 866	11 711	BOD_7 – 5 %	surfactants – 72.5%,
Šilutė distr.	25	21	57 478	26 709	BOD_7 – 52%, paid at a higher tariff – 16.5%	BOD_7 – 45%
Jurbarkas distr.	5	5	26 529	13 352	BOD_7 – 55%, paid at a higher tariff – 27%	BOD_7 – 36%
Kaišiadorys distr.	13	10	63 416	59 091	BOD_7 – 32%	oil and its products – 24 %, paid at a higher tariff - 6%
Kaunas city	27	24	2 191 899	1 322 044	BOD_7 – 42%	BOD_7 – 37%
Elektrėnai municip.	13	13	50 918	24 039	BOD_7– 32%, paid at a higher tariff – 13%	nitrogen – 28%
Prienai distr.	10	7	14 042	3 755	BOD_7 – 40%	BOD_7 – 47%, paid at a higher tariff – 14%
Alytus distr.	9	8	278 137	146 309	suspended matters – 52%	BOD_7 – 39%
Alytus town	10	6	21 033	4 552		BOD_7 – 31%
Lazdijai distr.	5	4				BOD_7 – 27%
Druskininkai town	4	4	59 662	34 654	BOD_7– 22%	oils – 44%
Total	**127**	**106**	**2 873 854**	**1 702 667**		

Source: Database of pollution charges of the Ministry of the Environment

Energy and dams

280. This sector is the main driver of pressures related to the modifications of the hydromorphological regime due to dams and similar obstructions. About 93 % of all water abstracted in the Nemunas River Basin District is used for energy generation.

Minija Sub-basin

281. There are two hydropower plants in the Minija Sub-basin – Gondinga HPP and Plungė HPP, both of which are constructed on the Babrungas River. The area of the dam of Gondinga HPP is more than 0.5 km^2. This dam has been assigned to heavily modified bodies of water. The area of the second one is only 0.015 km^2. The installed capacity of Gondinga HPP is 1 530 310 kWh, and the capacity totals to 950 kW; the installed capacity of Plungė HPP is 12 kW. Another pond larger than 0.5 km^2 is situated in the part of Šilutė district which belongs to the Minija Sub-basin – Ramučių pond. The distance from the pond to the mouth of the river is 22.7 km. The area of the pond is 0.51 km^2 and the height of the head – 8.2 m. This pond has been leased out for construction of a hydropower plant. The pond constitutes a barrier for local fish. However, over the time the characteristics of the pond have become similar to those of lakes.

Merkys Sub-basin

282. There are four hydropower plants in the Merkys Sub-basin. The basic data on these HPP and their respective ponds is given in the table below.

Table 277. Hydropower plants in the Merkys Sub-basin

Municipality	Pond	River	Distance to the mouth	Installed capacity, kW	Area of the pond, km^2	Height of the pond, m
Šalčininkai	Eišiškių	Verseka	22.3	180	1.286	9.7
Varėna distr.	Krūminių	Verseka	7.5	160	0.53	6.6
Varėna distr.	Varėnos (Senosios)	Varėnė	2.1	111	0.208	5.6
Varėna distr.	pond of Pamuselis HPP	Musė	~2 km	30	not available	not available

Source: Website of the company AB Lietuvos energija, and the Consultant

HPP dams are always barriers for local fish, and those in Eišiškių and Krūminių ponds also pose obstacles to potamodromous species.

Eišiškės HPP is one of those few plants in Lithuania which were built about 50 years ago.

The Verseka River down to the dam of Eišiškės HPP is an ichtiological reserve. There is a dam (and a HPP) built on the Verseka in the neighbourhood of the village Krūminiai which poses a barrier to migrating fish. The dam nearby the resort *Merkys* built in the lower reaches of the Duobupis River (the right one) 0.2 km away from the mouth blocks the way to migrating fish to the entire catchment of the stream. Another dam, the one of Rudnia mill located on an ichtiologically significant river stretch of the Ūla-Pelesa, also poses a barrier to migrating fish.

Žeimena Sub-basin

283. There are two hydropower plants in the Žeimena Sub-basin. The main data on these HPP and their respective ponds is given in Table 174 below.

Table 174. Hydropower plants in the Žeimena Sub-basin

Municipality	Pond	River	Distance to the mouth	Installed capacity, kW	Pond area, km^2	Pond height, m
Švenčionys	Pabradės	Dubinga	1.4	310	0.296	10
Švenčionys	Pond of Pabradė cardboard factory	Dubinga	1.0	132	not available	not available

Source: Website of the company AB Lietuvos energija, and the Consultant

HPP dams are always barriers for local fish. Both hydropower plants were built/reconstructed during the last decade.

Šventoji Sub-basin

284. There are nine hydropower plants in the Šventoji Sub-basin. The main data on these HPP and their respective ponds is given in Table 175 below.

HPP dams are always barriers for local fish, and Motiejūnų, Širvintų and Kavarsko ponds also pose obstacles to potamodromous and anadromous species. In addition, there are at least three big dams in the Šventoji Sub-basin: the dams in Beičiai (the area of 2.17 km^2), Utena (1.01 km^2) – which has been leased out for construction of a HPP, and Nemeikščiai (0.82 km^2). Over the time the characteristics of the ponds have become similar to those of lakes.

Table 175. Hydropower plants in the Šventoji Sub-basin

Municipality	Pond	River	Distance to the mouth	Installed capacity, kW	Pond area, km^2	Pond height, m
Zarasai distr.	Antalieptės Marios	Šventoji	211	3,220	15.72	8
Ukmergė distr.	Kadrėnų	Mūšia	1,6	80	0.93	5
Anykščiai distr.	Kavarsko	Šventoji	69	1,000	0.78	4.3
Širvintos distr.	Motiejūnų	Širvinta	86.5	220	0.87	6.5
Širvintos distr.	Širvintų	Širvinta	82	180	0.52	5.5
Molėtai	Spiečiūnų	Virinta	55	10	0.01	2.5
Molėtai	Svobiškio	Virinta	51	22	7.6	4.6
Utena	Užpalių	Šventoji	154	180	not available	not available
Ukmergė	Valtūnų	Siesartis	11	170	1.42	10.7

Source: Website of the company AB Lietuvos energija, and the Consultant

Neris Small Tributaries Sub-basin

285. There are four hydropower plants in the Neris Small Tributaries Sub-basin. The main data on these HPP and their respective ponds is given in Table 176 below.

Table 176. Hydropower plants in the Neris Small Tributaries Sub-basin

Municipality	Pond	River	Distance to the mouth	Installed capacity, kW	Pond area, km^2	Pond height, m
Vilnius	Grigiškių	Vokė	2.6	282	0.097	4.4
Vilnius	Rokantiškių	Vilnia	11.6	225	0.134	4.7
Trakai distr.	Lentvario	Bevardis F-1	7.8	75	not available	not available
Širvintos distr.	Bartkuškio	Musė	31	150	0.61	8

Source: Website of the company AB Lietuvos energija, and the Consultant

HPP dams are always barriers for local fish. In addition, there is at least one big dam in the Neris Small Tributaries Sub-basin – a dam in Margiai with the area of 0.56 km^2, which is also an obstacle to potamodromous species.

Nevėžis Sub-basin

286. There are five hydropower plants in the Nevėžis Sub-basin. The main data on these HPP and their respective ponds is given in Table 177 below.

Table 177. Hydropower plants in the Nevėžis Sub-basin

Municipality	Pond	River	Distance to the mouth	Installed capacity, kW	Pond area, km^2	Pond height, m
Kėdainiai distr.	Angirių	Šušvė	25	1 300	2.48	16
Kėdainiai distr.	Bublių	Obelis	10.5	160	1.52	12.4
Kėdainiai distr.	Juodkiškių	Obelis	5.35	510	0.834	12.3
Kėdainiai distr.	Labūnavos	Barupė	5	160	1.099	11
Radviliškis distr.	Vaitiekūnų	Šušvė	60	370	1.416	10.7

Source: Website of the company AB Lietuvos energija, and the Consultant

HPP dams are always barriers for local fish, and those in Angiriai (Angirių pond) and Vaitiekūnai (Vaitiekūnų pond) also pose barriers to potamodromous and/or anadromous species. In addition, there are at least seven large dams in the Nevėžis Sub-basin: the dam of the plant Ekranas (0.81 km^2), the dams in Stepanioniai (Stepanionių pond; 0.60 km^2), Liberiškis (Liberiškio pond; 0.63 km^2), Montviliškis (Montviliškio pond; 0.75 km^2), Janušoniai (Janušonių pond; 0.55 km^2), Krivėnai (Krivėnų pond; 0.67 km^2), and Pienionys (Pienionių pond; 0.70 km^2).

It should also be noted that over the time the characteristics of the ponds have become similar to those of lakes.

Šešupė Sub-basin

287. There are eight hydropower plants in the Šešupė Sub-basin. The main data on these HPP and their respective ponds is given in Table 178 below.

Table 178. Hydropower plants in the Šešupė Sub-basin

Municipality	Pond	River	Distance to the mouth	Installed capacity, kW	Area of the pond, km^2	Height of the pond, m
Marijampolė	Antanavo	Šešupė	177	400	1.08	5.5
Kalvarija	Lakinskų	Šešupė	243.4	150	0.06	3.5
Marijampolė	Liudvinavo	Šešupė	218	230	not available	not available
Marijampolė	Marijampolės I	Šešupė	201	150	0.112	3.5
Marijampolė	Marijampolės II	Šešupė	201	600	75	9.5
Marijampolė	Netičkampio	Dovinė	0.6	240	15.4	5.7
Vilkaviškis	Pilviškių	Šešupė	157	220	not available	not available
Marijampolė	Puskelnių	Šešupė	189	264	not available	not available

Source: Website of the company AB Lietuvos energija and the Consultant

HPP dams are always barriers for local fish, and those in Antanavas (Antanavo pond) and Marijampolė I (Marijampolės I pond) pose obstacles to potamodromous species (fish that migrate within the boundaries of a river catchment). In addition, there are at least three large dams in this sub-basin: on the rivers Pilvė-Vabalkšnė (Pilvės-Vabalkšnės pond; 0.55 km^2), in Totorviečiai village (Totorviečių pond; 0.55 km^2) and in Stebuliškės village (Stebuliškės pond; 0.55 km^2).

In the long run the characteristics of the ponds have become similar to those of lakes.

Dubysa Sub-basin

288. There are two hydropower plants in the Dubysa Sub-basin, both of which are located in Raseiniai district. The main data on these HPP and their respective ponds is given in Table 179 below.

Table 179. Hydropower plants in the Dubysa Sub-basin

Municipality	Pond	River	Distance to the mouth	Installed capacity, kW	Pond area, km^2	Pond height, m
Raseiniai	Kaulakių	Luknė	4	165	0.365	16.3
Raseiniai	Plikių	Gynėvė	2	98	0.425	16

Source: Website of the company AB Lietuvos energija and the Consultant

These hydropower plats were built or reconstructed at least twenty years ago. HPP dams are always barriers to local fish.

There are no large dams with an area of more than 0.5 km^2 to be assigned to heavily modified water bodies in the Dubysa Sub-basin.

Jūra Sub-basin

289. There is one hydropower plant in the Jūra Sub-basin, which was built/reconstructed more than twenty years ago. The main data on this HPP and its pond is given in Table 180 below.

Table 180. Hydropower plant in the Jūra Sub-basin

Municipality	Pond	River	Distance to the mouth	Installed capacity, kW	Pond area, km^2	Pond height, m
Tauragė	Balskų	Jūra	78	2914	2.80	14.5

Source: Website of the company AB Lietuvos energija and the Consultant

Balskų pond blocks the way for migration of local, anadromous[6] and potamodromous species. In addition, there are two more dams in the Jūra sub-basin which have formed ponds larger than 0.5 km^2: Paupio pond (the height of the head is 3.9 m, the surface area of the pond is 0.74 km^2) and Sujainių pond (the height of the head is 8 m, the surface area of the pond is 0.662 km^2). Both dams are built on the Šešuvis River.

Over the time, the characteristics of the ponds have become similar to those of lakes.

Lithuanian Coastal Rivers Basin

290. There are no hydropower plants in the Lithuanian Coastal Rivers Basin. However, there are two dams here which have formed ponds with the surface area larger than 50 km^2: Padvarių pond (the height of the head is 10.5 m, the surface area of the pond is 0.82 km^2) and Tūbausių pond (the height of the head is 10.5 m, the surface area of the pond is 0.849 km^2). Both dams are built on the river Akmena-Danė.

Nemunas Small Tributaries Sub-basin

291. There are 16 hydropower plants in the Nemunas Small Tributaries Sub-basin. The main data on these HPP and their ponds is given in Table 181 below.

Table 181. Hydropower plants in the Nemunas Small Tributaries Sub-basin

Municipality	Pond	River	Distance to the mouth	Installed capacity, kW	Pond area, km^2	Pond height, m
Birštonas	Jundeliškių	Verknė	6	375	0.148	6
Elektrėnai	Elektrėnų	Strėva	40.5	200	13.89	11.1
Jurbarkas distr.	Jurbarkų	Mituva	7.5	675	2.195	10
Kaišiadorys distr.	Bublių	Strėva	9	450	0.217	6.8
Kaišiadorys distr.	Pastrėvio	Strėva	30.4	320	0.185	10.5
Kaunas distr.	pond of Pajiesis HPP	Jiesia	21	100	0.648	7.5
Kaunas	pond of Kaunas HPP	Nemunas	223.4	4x25.2MW	63.50	20.5
Lazdijai distr.	Kapčiamiesčio	Nieda	0.9	150	0.21	5
Lazdijai distr.	Baltosios Ančios	B. Ančia	4.3	650	2.495	12
Šalčininkai	Eišiškių	Verseka	22.3	180	1.286	9.7
Trakai distr.	Aukštadvario	Verknė	56.5	180	2.934	3.5
Trakai distr.	Bagdononys	Strėva	60.5	90	0.955	11.1
Trakai distr.	pond of Semeliškių mill	Strėva	53	20	not available	not available
Trakai distr.	Semeliškių (pond of the trout farm)	S-2	0.5	8	not available	not available
Varėna distr.	Krūminių	Verseka	7.5	160	0.53	6.6

[6] Migration of fish for spawning from the sea to rivers is called anadromous migration.

Municipality	Pond	River	Distance to the mouth	Installed capacity, kW	Pond area, km^2	Pond height, m
Varėna distr.	Druskininkų	Ratnyčėlė	1.7	40	not available	not available

Source: Website of the company AB Lietuvos energija and the Consultant

HPP dams are always barriers for migration of local fish. The ponds of Jurbarkai HPP and Kaunas HPP also pose obstacles for migration of anadromous and potamodromous species, and the ponds of Baltoji Ančia HPP (Baltosios Ančios pond), Eišiškės HPP (Eišišių pond), Bagdanonys HPP (Bagdanonių pond), and Krūminiai HPP (Krūminių pond) – for migration of potamodromous species (fish that migrate within the boundaries of a river catchment).

In addition to the above-listed ponds, there are two more dams in the Nemunas Small Tributaries Sub-basin which have formed ponds larger than 0.5 km^2: the pond of Girdžiai HPP (the height of the head 8.7 m, the surface area of the pond 0.575 km^2), Volungiškių pond (the height of the head 10.2 m, the surface area of the pond 0.681 km^2), Krokialaukio pond (the height of the head 8.1 m, the surface area of the pond 0.753 km^2), and the pond of Kruonis PSP (the height of the head 52 m, the surface area of the pond 3.03 km^2).

Over the time, the characteristics of the ponds has become similar to those of lakes (except for the pond of Kruonis PSP).

One of the hydropower plants listed in the table above, Kapčiamiestis HPP, was constructed a very long time – 40 years – ago. This power plant would require replacement of turbines.

Agriculture

292. Agriculture is a driver of economic pressures related to both point and diffuse agricultural pollution. In addition, this sector encompasses canalisation of streams for reclamation purposes. Agricultural pressures are a very important, yet little analysed factor in Lithuania.

Minija Sub-basin

293. Diffuse agricultural pollution does not have any significant impact on the quality of rivers of the Minija Sub-basin. In total, 95.7 km of straightened stretches were identified in the Minija Sub-basin. However, many of the streams are so small that in the long run they regain their natural beds due to failure to maintain reclamation installations. No water bodies are proposed to be designated as heavily modified water bodies, that is, those which would be subject to supplementary measures for the achievement of good ecological potential.

Merkys Sub-basin

294. There are no intensive agricultural activities in this sub-basin; consequently, the rivers do not face the risk of failure to conform to the good status requirements due to pressures diffuse pollution. In total, 295 km of straightened stretches were identified in the Merkys Sub-basin. However, many of the streams are so small that in the long run they regain their natural beds due to failure to maintain reclamation installations. The length of the stretches proposed to be designated as heavily modified water bodies, that

is, those subject to supplementary measures for the achievement of good ecological potential, totals to 97.5 km.

Žeimena Sub-basin

295. Agricultural activities in the Žeimena Sub-basin are of minor importance, so diffuse pollution has no significant impact on the water quality of its rivers. In total, 86.3 km of straightened stretches were identified in the Žeimena Sub-basin. However, many of the streams are so small that in the long run they regain their natural beds due to failure to maintain reclamation installations. The length of the stretches proposed to be designated as heavily modified water bodies, that is, those subject to supplementary measures for the achievement of good ecological potential, totals to 13.8 km.

Šventoji Sub-basin

296. Though the level of agricultural activities in the Šventoji Sub-basin is not very high, concentrations of nitrate nitrogen in some rivers which flow over the lands where agriculture is developed more intensively – in the Mūšia and Armona – fail to conform to the good status requirements because of diffuse agricultural pollution. The water quality monitoring data of 2008 indicates that concentrations of BOD_7 in the Mūšia may also be exceeded; however, no reason of such exceedance has been found with the help of mathematical modelling yet. As to the remaining rivers in the Šventoji Sub-basin, diffuse agricultural pollution does not have any impact on their water quality. In total, 267 km of straightened stretches were identified in the Šventoji Sub-basin. However, many of the streams are so small that in the long run they regain their natural beds due to failure to maintain reclamation installations. The length of the stretches proposed to be designated as heavily modified water bodies, that is, those subject to supplementary measures for the achievement of good ecological potential, totals to 30.1 km.

Neris Small Tributaries Sub-basin

297. The rivers of the Neris Small Tributaries Sub-basin are not subject to significant pressures from agricultural diffuse pollution because agricultural activities here are not very intensive. However, agricultural pollution does exert a significant impact on the water quality of three rivers – Lomena, Laukysta and Lokys, which are situated in the territories of intensive agricultural development. Due to this reason, concentrations of nitrate nitrogen in the said rivers fail to conform to the good ecological status requirements. In total, 225.4 km of straightened stretches were identified in the Neris Small Tributaries Sub-basin. However, many of the streams are so small that in the long run they regain their natural beds due to failure to maintain reclamation installations. No stretches have been proposed to be designated as heavily modified water bodies, that is, those subject to supplementary measures for the achievement of good ecological potential.

Nevėžis Sub-basin

298. Agricultural pollution in the Nevėžis Sub-basin is an especially important factor which exerts a significant impact on the quality of the rivers of the Nevėžis Sub-basin. This basin accounts for one of the largest pollution loads in the entire Nemunas RBD. Due to this reason, concentrations of nitrate nitrogen fail to conform to the good ecological status requirements nearly in all rivers of this sub-basin. Concentrations of nitrate nitrogen do meet the said requirements only in a couple of rivers (Urka, Gynia, Gomerta, and Žadikė) which flow over the areas of less intensive agricultural activities.

Mathematical modelling results show that concentrations of nitrate nitrogen in the rivers in such areas in the upper reaches of the Nevėžis Sub-basin are lower (totalling to 2.5-4 mg/l) and the level of exceedance of the good ecological status requirements therein is comparatively low, whereas in the remaining rivers (especially small ones) these requirements may be exceeded more than twice. Concentrations of nitrate nitrogen in different sections of the Nevėžis vary between 3 and 4 mg/l. The concentration in the largest tributary of the Nevėžis, the Šušvė River, totals to about 3 mg/l. In total, 747.2 km of straightened stretches were identified in the Nevėžis Sub-basin. However, many of the streams are so small that in the long run they regain their natural beds due to failure to maintain reclamation installations. The length of the stretches proposed to be designated as heavily modified water bodies, that is, those subject to supplementary measures for the achievement of good ecological potential, totals to 430.1 km.

Šešupė Sub-basin

299. Agricultural activity in the Šešupė Sub-basin is intensive, and even though its impact is not significant for the quality of the Šešupė itself, many of its tributaries are polluted due to pressures from diffuse pollution from agricultural sources, that is, concentrations of nitrate nitrogen in this area fail to meet the requirements for good ecological status. However, it should also be noted that the said concentrations in the tributaries of the Šešupė are not as high as the ones in the Nevėžis Sub-basin, which is also an area of intensive agriculture. Mathematical modelling results show that agricultural pollution may have a significant impact on the quality of the Sasna the Rausvė and its tributary Paikis, the Šeimena and its tributary Vilkauja, the Širvinta and its tributaries Zanyla and Aista, the Nova and its tributaries Penta and Nopaitis, the Siesartis, the Jotija and its tributary Orija. Concentrations of nitrate nitrogen in the Širvinta and its tributaries fail to meet the requirements for good ecological status only to a very small extent, and the average annual concentrations in other rivers listed above may be approximately 3-4.5 mg/l. In total, 490.4 km of straightened stretches were identified in the Šešupė Sub-basin. However, many of the streams are so small that in the long run they regain their natural beds due to failure to maintain reclamation installations. The length of the stretches proposed to be designated as heavily modified water bodies, that is, those subject to supplementary measures for the achievement of good ecological potential, totals to 199.5 km.

Dubysa Sub-basin

300. Mathematical modelling results show that agricultural diffuse pollution does not have any significant impact on the quality of the main river Dubysa. However, concentrations of nitrate nitrogen in some of its tributaries – Šiaušė, Gryžuva, Kirkšnovė, Gynėvė, Lazduona, and Vilbėnas – might be failing the good ecological status requirements. It should be pointed out, however, that the exceedances of the good status criteria in the said tributaries are very insignificant. The average annual concentrations of nitrate nitrogen here total up to 3 mg/l. In total, 150.1 km of straightened stretches were identified in the Dubysa Sub-basin. However, many of the streams are so small that in the long run they regain their natural beds due to failure to maintain reclamation installations. The length of the stretches proposed to be assigned to heavily modified water bodies, that is, those subject to supplementary measures for the achievement of good ecological potential, totals to 36 km.

Jūra Sub-basin

301. The main river Jūra in this sub-basin does not suffer from any significant pressures from agricultural diffuse pollution. In total, 195.7 km of straightened stretches were identified in the Jūra Sub-basin. However, many of the streams are so small that in the long run they regain their natural beds due to failure to maintain reclamation installations. The length of the stretches proposed to be designated as heavily modified water bodies, that is, those subject to supplementary measures for the achievement of good ecological potential, totals to 35.6 km.

Lithuanian Coastal Rivers Basin

302. No agricultural pollution which would pose a risk to the implementation of the WFD has been identified in this sub-basin.

In total, 80.3 km of straightened stretches have been identified in the Lithuanian Coastal Rivers Basin. The length of the stretches proposed to be designated as heavily modified water bodies, that is, those subject to supplementary measures for the achievement of good ecological potential, totals to 50.7 km.

Nemunas Small Tributaries Sub-basin

303. In the Nemunas Small Tributaries Sub-basin, a significant impact of agricultural diffuse pollution is made on the quality of the Jiesia, though concentrations of nitrate nitrogen exceed the good ecological status requirements only in a small section of the river and only to a little extent. BOD_7 concentrations in the Jiesia are also affected by diffuse pollution. Calculations show that concentrations of nitrate nitrogen as a result of diffuse pollution might also be exceeded in the rivers Dievogala and Armena. No significant impact of agricultural diffuse pollution is made on the remaining rivers of the Nemunas Small Tributaries Sub-basin.

In total, 485.9 km of straightened stretches have been identified in the Nemunas Small Tributaries Sub-basin. However, many of the streams are so small that in the long run they regain their natural beds due to failure to maintain reclamation installations. The length of the stretches proposed to be designated as heavily modified water bodies, that is, those subject to supplementary measures for the achievement of good ecological potential, totals to 46.8 km.

Fisheries

Minija Sub-basin

304. There are no commercial fish breeding companies in the Minija Sub-basin.

Merkys Sub-basin

305. Commercial fishery is rather intensive in the Merkys Sub-basin. Information on the areas of the ponds that belong to the main fishery companies is provided in Table 182.

Table 182. Fishery companies and the area of ponds in the Merkys Sub-basin

Fishery company	Pond area, km^2	Municipality
UAB Juodasis gandras	5.062	Šalčininkai
UAB Šalčininkų žuvis	2.790	Šalčininkai
UAB Kabelių žuvis	6.718	Varėna

Source: Resolution No. 826 of the Government of the Republic of Lithuania of 3 July 2001 on the approval of the list of commercial fishery ponds and pond areas (Žin., 2001, No 58-2087, 2006, No 144-5481)

Žeimena Sub-basin

306. There are no commercial fish breeding companies in the Žeimena Sub-basin. However, a branch of the Lithuanian State Pisciculture and Fisheries Research Centre, the Žeimena salmon breeding plant, is located in this sub-basin. Consequently, water consumption for fishery needs here is relatively high. No negative impact of this breeding plant has been identified.

Šventoji Sub-basin

307. Commercial fishery is rather intensive in the Šventoji Sub-basin. Information on the areas of the ponds that belong to the main fishery companies is provided in Table 183.

Table 183. Fishery companies and the area of ponds in the Šventoji Sub-basin

Fishery company	Pond area, km^2	Municipality
UAB Vasaknos	4.83	Zarasai
UAB Armolė	7.19	Molėtai

Source: Resolution No. 826 of the Government of the Republic of Lithuania of 3 July 2001 on the approval of the list of commercial fishery ponds and pond areas (Žin., 2001, No. 58-2087, 2006, No. 144-5481)

Neris Small Tributaries Sub-basin

308. Commercial fishery is rather intensive in the Neris Small Tributaries Sub-basin. Water consumed for fishery purposes accounts for 19.2 % of the total water consumption in this sub-basin. Information on the areas of the ponds that belong to the main fishery companies is provided in Table 184.

Table 184. Fishery companies and the area of ponds in the Neris Small Tributaries Sub-basin

Fishery company	Pond area, km^2	Municipality
UAB Arvydai	5.191	Vilnius
UAB Akvilegija	6.818	Vilnius

Source: Resolution No. 826 of the Government of the Republic of Lithuania of 3 July 2001 on the approval of the list of commercial fishery ponds and pond areas (Žin., 2001, No 58-2087, 2006, No 144-5481)

Nevėžis Sub-basin

309. There is only one fishery company in the Nevėžis Sub-basin – UAB Kaplių žuvys. Accordingly, water is used for fishery purposes (1 750 thousand m^3 per year) only in one of the four districts situated in the Nevėžis Sub-basin, in Kėdainiai district.

As already indicated, the EPA data shows that the quality parameters (BOD_7, N_{total} and P_{total}) of water released from the fishery ponds seldom exceed the established limit values.

Šešupė Sub-basin

310. The type of fisheries developed in the Šešupė Sub-basin is commercial fishery. Table 185 provides information on the single fishery company engaged in this activity.

Table 185. Fishery company and the area of its pond in the Šešupė Sub-basin

Fishery company	Pond area, km^2	Municipality
UAB Karpis	4.989	Marijampolė

Source: Resolution No. 826 of the Government of the Republic of Lithuania of 3 July 2001 on the approval of the list of commercial fishery ponds and pond areas (Žin., 2001, No 58-2087, 2006, No 144-5481)

The EPA data shows that the quality parameters (BOD_7, N_{total} and P_{total}) of water released from the fishery ponds seldom exceed the established limit values.

Dubysa Sub-basin

311. Commercial fishery is rather intensive in the Dubysa Sub-basin. Information on the areas of the ponds that belong to the main fishery companies is provided in Table 186.

Table 186. Fishery companies and the area of ponds in the Dubysa Sub-basin

Fishery company	Pond area, km^2	Municipality
UAB Šilo pavėžupis	8.068	Kelmė
UAB Raseinių žuvininkystė	11.556	Raseiniai

Source: Resolution No. 826 of the Government of the Republic of Lithuania of 3 July 2001 on the approval of the list of commercial fishery ponds and pond areas (Žin., 2001, No. 58-2087, 2006, No. 144-5481)

The EPA data shows that the quality parameters (BOD_7, N_{total} and P_{total}) of water released from these fishery ponds seldom exceed the established limit values.

Jūra Sub-basin

312. There are no commercial fish breeding companies in the Jūra Sub-basin.

Lithuanian Coastal Rivers Basin

313. There are no commercial fish breeding companies in the Lithuanian Coastal Rivers Basin.

Nemunas Small Tributaries Sub-basin

314. Commercial fishery is rather intensive in the Nemunas Small Tributaries Sub-basin. Information on the areas of the ponds that belong to the main fishery companies is provided in Table 187.

Table 187. Fishery companies and the area of ponds in the Nemunas Small Tributaries Sub-basin

Fishery company	Pond area, km^2	Municipality
UAB Daugų žuvis	6.158	Alytus
UAB Kintai	4.82	Šilutė
UAB Bartžuvė	3.284	Elektrėnai
UAB Išlaužo žuvis	2.35	Prienai

Fishery company	Pond area, km^2	Municipality
UAB Išlaužo žuvis	1.516	Kaunas

Source: Resolution No. 826 of the Government of the Republic of Lithuania of 3 July 2001 on the approval of the list of commercial fishery ponds and pond areas (Žin., 2001, No. 58-2087, 2006, No. 144-5481)

As in other sub-basins, the quality parameters (BOD_7, N_{total} and P_{total}) of water released from these fishery ponds seldom exceed the established limit values, according to the EPA data. However, this is the sub-basin where the river Jiesia has been identified as a water body at risk due to the impact of fishery.

Recreation

Minija Sub-basin

315. There are 55 ponds with an area from 0.01 to 0.88 km^2 in the Minija Sub-basin. Most of them are used for fishing and/or bathing. However, there is only one official bathing site – at Lake Plateliai – identified as such in accordance with the Bathing Water Directive.

Up to 30 thousand people can use two largest ponds in the sub-basin – Gondingos and Ramučių ponds. The estimation is based on the *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. The number of population living at the distance of 5 km from the said ponds totals to about 55 thousand.

The Minija is included in the Special Plan of the National Water Tourism Routes, which provides for measures for developing knowledge-oriented and recreational water tourism as well as the infrastructure of tourism and recreation. A proposal for the Minija route includes construction/reconstruction of one camping, 16 campsites, 2 leisure areas, 2 resting places and 2 quays. The investment costs required for these objects total to approximately LTL 4.68 million. It is expected that the development of this route should be funded by municipal administrations, administrations of regional parks, and private persons.

The above-said measures are included among the basic measures of the implementation of the WFD.

Merkys Sub-basin-basin

316. There are 175 lakes and 56 ponds larger than 0.5 km^2 in the Merkys Sub-basin. Most of them are used for fishing and/or bathing. However, there are only two official bathing sites identified as such in accordance with the Bathing Water Directive – those of Lake Didžiulis (in Daugai) and in Varėna town 1 (the Derežnyčia Stream, Varėna)[7].

Up to 40 500 people are using the lakes and ponds in the sub-basin. The estimation is based on the assumption that about 55 % of the local population use water bodies for recreation[8].

[7] The source of information about bathing sites here and further in the text is the Report of Lithuania to the European Commission on the implementation of the Bathing Waters Directive.

[8] Here and further in the text, the considerations on recreation are based on the Willingness to Pay Study in the Neris and Nevėžis sub-basins carried out by the Centre for Environmental Policy. The study

Rivers also play an important role in the Merkys Sub-basin. The rivers Merkys and Ūla are on the list of the National Water Tourism Routes[9] (see Figure 50), which provides for measures for developing knowledge-oriented and recreational water tourism as well as the infrastructure of tourism and recreation. A proposal for the Merkys and Ūla water tourism route includes construction of 30 objects of infrastructure: 20 campsites, 3 leisure areas, 1 camping, 1 resting place, 1 observation site, and 4 parking areas. Preliminary investment costs total to LTL 5.6 million. It is expected that the development of this route should be funded by municipal administrations, administrations of regional parks, and private persons.

The above-said measures are included among the basic measures of the implementation of the WFD.

Žeimena Sub-basin

317. There are 479 lakes and 17 ponds larger than 0.005 km^2 in the Žeimena Sub-basin. Their aggregate area totals to about 180 km^2. However, there are only four official bathing sites identified as such in accordance with the Bathing Water Directive – those of Lake Tauragnas (in Tauragnai), Lake Galvis (in Ignalina), Lake Lūšiai (in Ignalina), and the Žeimena River (in Švenčionėliai).

Up to 27 500 people are using the lakes and ponds in the sub-basin. The estimation is based on the assumption that about 55 % of the local population use water bodies for recreation.

Rivers also play an important role in the recreation sector in the Žeimena Sub-basin. The lake district Aukštaitijos Ežerynas and the Žeimena River are on the list of the National Water Tourism Routes (the tourist route of Aukštaitijos Ežerynas and the Žeimena (including the Lakaja and the Dubinga) (see Figure 50), which provides for measures for developing knowledge-oriented and recreational water tourism as well as the infrastructure of tourism and recreation. A proposal for the development of the Žeimena water tourism route includes construction/reconstruction of 35 objects of infrastructure: 1 quay, 23 campsites, 2 leisure areas, 9 resting places. Preliminary investment costs total to LTL 2.79 million. It is expected that the development of this route should be funded by municipal administrations, administrations of regional parks, and private persons.

The above-said measures are included among the basic measures of the implementation of the WFD.

Šventoji Sub-basin

318. There are 60 lakes larger than 0.5 km^2 and 118 ponds larger than 0.01 km^2 in the Šventoji Sub-basin. The total lake density of the sub-basin is 3 %. There are nine official bathing sites identified as such in accordance with the Bathing Water Directive:

revealed that about 55 % of the local population use water bodies for recreation in one or another way. Taking into account high density of lakes and reservoirs in the Merkys sub-basin, the average distance to the closest water body is relatively short, therefore the estimations used the total number of the population in the sub-basin.

[9] Here and further in the text, the considerations on tourism are based on the 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).

those of Lake Alaušas (in Utena, Sudeikiai), Lake Sartai (in Zarasai, Dusetos), Lake Pastovis (in Molėtai), Lake Bebrusai (in Molėtai, Luokesa), Klovinių pond (in Utena), Lake Sartai (in Rokiškis, Kriauniai), the Šventoji River (in Anykščiai), Lake Rubikių Ežeras (in Skiemonys, Anykščiai), and Širvintų pond (in Širvintos).

Up to 42 500 people are using the lakes and ponds in the sub-basin. The estimation is based on the assumption that about 55 % of the local population use water bodies for recreation.

Rivers also play an important role in the recreation sector in the Šventoji Sub-basin. The Šventoji River is on the list of the National Water Tourism Routes (the tourist route of the Šventoji (including Antalieptės Marios Lagoon and Lake Sartai) (see Figure 50), which provides for measures for developing knowledge-oriented and recreational water tourism as well as the infrastructure of tourism and recreation. A proposal for the development of the Šventoji water tourism route includes construction/reconstruction of 62 objects of infrastructure: 4 camping places, 27 campsites, 12 leisure areas, 4 resting places, 7 quays. Preliminary investment costs total to LTL 10.042 million. It is expected that the development of this route should be funded by municipal administrations, administrations of regional parks, and private persons.

The above-said measures are included among the basic measures of the implementation of the WFD.

Neris Small Tributaries Sub-basin

319. The lake density of the Neris Small Tributaries Sub-basin is 2.5 %. There 103 ponds larger than 0.005 km^2 in this sub-basin, with the aggregate area of 8.1 km^2. The majority of the ponds are small – only two ponds are larger than 0.50 km^2 (the ponds in Margiai and of Bartkuškis HPP). There are ten official bathing sites identified as such in accordance with the Bathing Water Directive: those of the Neris (in Valakampiai, Vilnius), Lake Balsys (the Green Lakes, in Vilnius), Lake Salotė (in Vilnius), Lake Tapelių Ežeras (in Vilnius), Lake Akmena (in Trakai), Lake Skaistis (in Trakai), Lake Luka (in Trakai), Lake Galvė (in Trakai), Lake Lentvario Ežeras (in Lentvaris), Lake Totoriškių Ežeras (in Trakai).

Up to 2.1 thousand people can use the two largest ponds (with an area larger than 0.50 km^2) in the sub-basin (Margių pond and of the pond of Bartkuškis HPP). The estimation is based on the assumption that about 55 % of the local population use water bodies for recreation. The number of population living at the distance of 5 km from the said ponds totals to about 3.8 thousand.

The Neris River plays a very important role in the recreation sector in the Neris Small Tributaries Sub-basin. The Neris is on the list of the National Water Tourism Routes (the tourist route of the Neris, including the lower reaches of the Vokė) (see Figure 50). The Special Plan of the National Water Tourism Routes provides for measures for developing knowledge-oriented and recreational water tourism as well as the infrastructure of tourism and recreation. A proposal for the development of the Neris (including the lower reaches of the Vokė) water tourism route includes construction/reconstruction of 36 objects of infrastructure: 11 quays, 1 camping, 10 campsites, 6 leisure areas, 9 resting places, 1 observation site, and 1 parking area. Preliminary investment costs total to LTL 8.9 million. It is expected that the development of this route should be funded by municipal administrations, administrations of regional parks, and private persons.

The above-said measures are included among the basic measures of the implementation of the WFD.

Nevėžis Sub-basin

320. There are 89 lakes in the Nevėžis Sub-basin; however, their aggregate area totals only to 5.28 km^2, therefore an important role in the recreation sector is played by ponds. There are 100 ponds larger than 0.01 km^2 in this basin, their aggregate area totals to 21.41 km^2. There are only two official bathing sites in this sub-basin, identified as such in accordance with the Bathing Water Directive: those of the Ašarėna Stream (in Kėdainiai) and of the factory Ekranas (in Panevėžys).

Up to 100 thousand people can use thirteen largest ponds (larger than 0.50 km^2) in the sub-basin for recreation purposes. The estimation is based on the assumption that about 55 % of the local population use water bodies for recreation. The number of population living at the distance of 5 km from the said ponds totals to about 183 thousand.

No national water tourism routes have been planned for the Nevėžis Sub-basin.

Šešupė Sub-basin

321. There are 269 lakes and 97 ponds larger than 0.005 km^2 in the Šešupė Sub-basin. Their aggregate area totals to 78.69 km^2 (68.2 km^2 of lakes and 10.5 km^2 of ponds). There are only five official (in accordance with the Bathing Water Directive) bathing sites in this sub-basin: Lake Ygla (in Igliauka), Lake Žaltytis (in Liudvinavas), Lake Orija (Kalvarija), Marijampolės II pond (the Šešupė II, in Marijampolė), Lake Paežerių Ežeras (the Šeimena, in Vilkaviškis).

Up to 39 thousand people can use the five largest ponds in the sub-basin with the surface area larger than 0.5 km^2 (Pilvė-Vabalkšnės, Stebuliškių, Totorviečių, Marijampolės II ponds, and the pond of Antanavas HPP) for recreation purposes. The estimation is based on the assumption that about 55 % of the local population use water bodies for recreation. The number of population living at the distance of 5 km from the said ponds totals to about 71.5 thousand.

No national water tourism routes have been planned for the Šešupė Sub-basin.

Dubysa Sub-basin

322. There 40 lakes and 46 ponds larger than 0.005 km^2 in this sub-basin, with the aggregate area of 8.68 km^2 (5.28 km^2 of lakes and 3.41 km^2 of ponds). The area of the largest pond (Plikių pond) totals only to 0.4 km^2. The majority of these water bodies are used for recreation (bathing, fishing).

There are seven official bathing sites identified as such in accordance with the Bathing Water Directive: those of the Dubysa (in Ariogala), Lake Geluva (in Šiauliai, Bubiai), Lake Gauštvinis (in Kelmė, Tytuvėnai parish), Lake Bridvaišis (in Kelmė, Tytuvėnai parish), Lake Gilius (in Kelmė, Tytuvėnai parish), a bathing site of Kelmė town I (in Kražantė, Kelmė), a bathing site in Pašiaušė (in Kelmė, Tytuvėnai parish).

Rivers play an important role in the recreation sector in the Dubysa Sub-basin. The Dubysa is on the list of the National Water Tourism Routes (the tourist route of the Dubysa) (see Figure 50). The Special Plan of the National Water Tourism Routes provides for measures for developing knowledge-oriented and recreational water tourism as well as the infrastructure of tourism and recreation. A proposal for the development of the Dubysa water tourism route includes construction/reconstruction of 27 objects of infrastructure: 2 camping places, 13 campsites, 3 leisure areas, 4 resting places, 6 parking areas, and 1 observation site. Preliminary investment costs total to LTL 5.16 million. It is expected that the development of this route should be funded by municipal administrations, administrations of regional parks, and private persons.

The above-said measures are included among the basic measures of the implementation of the WFD.

Jūra Sub-basin

323. The lake density of the Jūra Sub-basin is only 0.04 %. There are 20 lakes and 104 ponds larger than 0.005 km^2 in this sub-basin, with the aggregate area of 11.74 km^2 (1.75 km^2 of lakes and 9.49 km^2 of ponds). The majority of the ponds are small – only three ponds are larger than 0.5 km^2 (Sujainių, Paupio and Balskų ponds). There are only two official bathing sites identified as such in accordance with the Bathing Water Directive: those of the Jūra (in Tauragė) and Lake Dievytis (Šilalė, Laukuva).

Up to 3 000 people can use the two largest ponds (with the surface area larger than 0.5 km^2) in the sub-basin. The estimation is based on the assumption that about 55 % of the local population use water bodies for recreation. The number of population living at the distance of 5 km from the said ponds totals to about 6.2 thousand.

Rivers play a very important role in the recreation sector in the Jūra Sub-basin. The Jūra is on the list of the National Water Tourism Routes (the tourist route of the Jūra) (see Figure 50). The Special Plan of the National Water Tourism Routes provides for measures for developing knowledge-oriented and recreational water tourism as well as the infrastructure of tourism and recreation. A proposal for the development of the Jūra water tourism route includes construction/reconstruction of 43 objects of infrastructure: 2 camping laces, 13 campsites, 9 leisure areas, 9 resting places, 3 quays, 3 observation sites, and 6 car-parking areas. Preliminary investment costs total to LTL 9.05 million. It is expected that the development of this route should be funded by municipal administrations, administrations of regional parks, and private persons.

The above-said measures are included among the basic measures of the implementation of the WFD.

Lithuanian Coastal Rivers Basin

324. There are 20 ponds larger than 0.005 km^2 in this basin, with the aggregate area of 2.6 km^2. There is only one official bathing site identified as such in accordance with the Bathing Water Directive: the bathing site of the Akmena-Danė (the Danė, in Klaipėda).

Up to 15.8 thousand people can use the two largest ponds (with the surface area larger than 0.50 km^2) in the basin – Padvarių and Tūbausių ponds. The estimation is based on the assumption that about 55 % of the local population use water bodies for recreation.

The number of population living at the distance of 5 km from the said ponds totals to about 28.7 thousand.

No national water tourism routes have been planned for the Lithuanian Coastal Rivers Basin.

Nemunas Small Tributaries Sub-basin

325. There 57 lakes larger than 0.5 km^2 and 118 ponds larger than 0.01 km^2 in this sub-basin. The aggregate area of the ponds totals to 98.5 km^2. As many as eleven ponds are larger than 0.50 km^2. There are ten official bathing sites identified as such in accordance with the Bathing Water Directive: those of Lake Dailidė (in Alytus), Lake Vijūnėlio Ežeras (in Druskininkai), the Nemunas (in Kaunas), Kauno Marios Lagoon (in Kaunas), Lampėdžių pond (in Kaunas), Žemaičių Naumiesčio pond (in Žemaičių Naumiestis), a bathing site in Elektrėnai (Elektrėnai Lagoon, in Elektrėnai), Lake Dusia (in Seirijai), Lake Metelys (in Seirijai), the Anččia (in Seirijai).

Up to 191 thousand people can use the nine largest ponds (with the surface area larger than 0.50 km^2) in the sub-basin – the ponds of Aukštadvaris HPP, Bagdononys HPP, Baltoji Ančia HPP, Elektrėnai Lagoon, Girdžių, Jurbarkų, Krokialaukio ponds, the pond of Kaunas HPP, Pajiesio and Volungiškių ponds). The estimation is based on the assumption that about 55 % of the local population use water bodies for recreation. The number of population living at the distance of 5 km from the said ponds totals to about 347.9 thousand.

The Nemunas River plays a very important role in the recreation sector in the Nemunas Small Tributaries Sub-basin. The Nemunas is on the list of the National Water Tourism Routes (the tourist route of the Nemunas (including the Ančia, lake district Veisiejų Ežerynas and the Nemunas delta) (see Figure 50). The Special Plan of the National Water Tourism Routes provides for measures for developing knowledge-oriented and recreational water tourism as well as the infrastructure of tourism and recreation. A proposal for the development of the Nemunas (including the Ančia, lake district Veisiejų Ežerynas and the Nemunas delta) water tourism route includes construction/reconstruction of 129 objects of infrastructure: 51 quays, 8 camping places, 16 campsites, 10 leisure areas, 33 resting places, 25 observation sites, and 14 car-parking area. Preliminary investment costs total to LTL 29.557 million. It is expected that the development of this route should be funded by municipal administrations, administrations of regional parks, and private persons.

The above-said measures are included among the basic measures of the implementation of the WFD.

Groundwater quality

Šešupė Sub-basin

326. It was determined that abnormally high concentrations of two indicators, sulfates (SO_4) and chlorides (Cl), in Suvalkija groundwater body (which is roughly assigned to the Šešupė surface water sub-basin, see Figure 19) are of a natural origin, therefore the status of water is considered to be “good” following the environmental criteria and coloured in green in groundwater status maps as required by the WFD.

However, there are a number of groundwater wellfields in the Šešupė Sub-basin in which concentrations of the said two indicators (SO_4 and Cl) fail to conform to the requirements for the drinking water quality. In our opinion, such wellfields should be assigned to a risk group though on the other hand, the available monitoring data is far from sufficient for assessment of changes/trends determined by human activity nearly in all wellfields. Nevertheless, this groundwater body has been designated as a body at risk.

Dubysa Sub-basin

327. The Dubysa Sub-basin contains a lager part of the problematic Kėdainiai-Dotnuva groundwater body and about one third of Stipinai groundwater body of Upper Devonian deposits (see Figure 19). Abnormally high concentrations of chlorides (Cl) and sulfates (SO_4) are registered in both groundwater bodies. It was established that these anomalies are of a natural origin, therefore the status of water in these groundwater bodies is treated as "good" following the environmental criteria, and marked in green in maps of groundwater bodies, as required by the WFD. A poor chemical composition of groundwater in individual bore wells is determined by the geological structure of the territory. The area consists of Upper Devonian aquifers and aquifer separating layers, the most important of which are gypseous water-containing deposits as well as those consisting of sand and clay strata. In the southern part of this groundwater body, chloride (and a little of sulfate) water intrusion occurs through tectonic faults from below into the lower parts of the aquiferous complexes.

The monitoring information (data) currently available is not sufficient to be able to evaluate changes/trends determined by water exploitation and to assign the groundwater bodies to a risk group. Nevertheless, this groundwater body has been designated as a body at risk.

Jūra Sub-basin

328. It was established that the abnormally high concentrations of two problematic indicators – sulfates (SO_4) and chlorides (Cl) – in the problematic Stipinai groundwater body of Upper Devonian deposits, which is more or less equally situated in the Nevėžis, Dubysa and Jūra Sub-basins, are of a natural origin, therefore the status of water in these groundwater bodies is treated as "good" following the environmental criteria, and marked in green in maps of groundwater bodies, as required in the WFD.

However, there are a few groundwater wellfields (in Bedančiai, Anžiliai, Skėmiai, and Šiauliai (Bubiai)) where the concentrations of the above-said indicators (SO_4 and Cl) fail to conform to the drinking water quality requirements. Such wellfields should be assigned to water bodies at risk; however, the monitoring information (data) currently available is not sufficient to be able to evaluate changes/trends determined by water exploitation. Nevertheless, this groundwater body has been designated as a body at risk.

SECTION III. ECONOMIC IMPORTANCE OF INDIVIDUAL SECTORS

329. As demonstrated further in the text in more detail, there is a slight difference in the importance of individual industries in creating GDP or job places among the sub-basins of the Nemunas RBD, though general tendencies are very similar.

The economic importance of the sectors is in a way characterised by such indicators as the number of employees in a relevant sector and the value added. Indicators characterising the importance of each sector within the entire Nemunas RBD are provided in Tables 188 and 189, and the situation in each sub-basin is discussed in the subsequent sub-sections.

Table 188. Employed population in the Nemunas RBD, thousand, 2008

Total	Hunting, agriculture, fisheries, forestry	%	Industry	%	Construction	%	Services, etc.	%
1278.92	90.702	7 %	244.06	19 %	137.97	11 %	806.16	63 %

Source: Statistics Lithuania and Consultant’s calculations

Table 180. Value added in the Nemunas RBD by industries, million LTL, 2008

Total	Hunting, agriculture, fisheries, forestry	%	Industry	%	Construction	%	Services, etc.	%
87 500	3 384	4 %	18 014	21 %	8 465	10 %	57 591	65 %

Source: Statistics Lithuania and Consultant’s calculations

The values of the indicators given above were recalculated using county data. The figures in the tables demonstrate that the most important sector by employment is the sector of services, followed by industry which employs 19 % of the labour force. The sector of agriculture and forestry which accounts for about 7 % of the total employed population in the districts under consideration creates only 4 % of the value added. In 2008, the sector of industry with 19 % of the total labour force created about 21 % of the value added.

Since pollution generated by agriculture and industry differs in its character, it is difficult to compare the importance of these sectors taking into account damage done to natural sources and not only the monetary value of the product created without additional detailed research. In addition, industrial pollution often affects natural resources through centralised wastewater treatment facilities, including inputs from the household sector.

The characterisation of pollution loads given in Chapter 2, the key indicators discussed in this section as well as the package of measures provided in the Programme of Measures leads to the conclusion that so far agricultural pollution has been slightly less “effective”. Further, the importance of different industries is discussed by individual sub-basins.

Minija Sub-basin

330. A brief description of the main sectors which may have a negative impact on the water resources in the Minija Sub-basin allows concluding that this sub-basin is one of the cleanest surface water sub-basins in Lithuania. The impact of agricultural pollution here is not significant and the main efforts should be focused on proper treatment of wastewater discharged from small settlements in Plungė and Klaipėda district.

The economic importance of the said sectors is in a way characterised using such indicators as the number of employees engaged in the sector in question and the value added created thereby. The indicators characterising the importance of each sector are given in Tables 190 and 191.

Table 190. Employed population in the Minija Sub-basin, 2008

Municipality	Employed population, thousand								
	Total	Hunting, agriculture, fisheries, forestry	%	Industry	%	Constru ction	%	Services	%
Plungė distr.	17.6	1.6	9.0%	4.3	24.4%	2.7	15.3%	9.0	51.4%
Klaipėda distr.	21.5	1.8	8.2%	5.2	24.2%	2.1	9.8 %	12.4	57.9%
Total	39.1	3.3	8.6%	9.5	24.3%	4.8	12.3%	21.5	54.9%

Source: Statistics Lithuania and Consultant’s calculations

Table 191. Value added in municipalities of the Minija Sub-basin by industries, 2008

Municipal ity	GDP and value added, million LTL									
	Total	Per capita, thousand LTL	Hunting, agriculture, fisheries, forestry	%	Industry	%	Constru ction	%	Services, etc.	%
Plungė distr.	1057.9	27.2	44.4	4.2	341.1	32.2	185.0	17.5	487.5	46.1
Klaipėda distr.	1506.2	33.1	42.0	2.8	352.8	23.4	148.0	9.8	963.3	64.0
On average/ total	2564.1	30.4	86.4	3.4	693.9	27.1	333.0	13.0	1450.8	56.6

Source: Statistics Lithuania and Consultant’s calculations

The values of the indicators above were recalculated using the data provided at the county level. The data in the tables shows that the most important sector by employment in the Minija Sub-basin is industry (the area of services excluded). The sector of agriculture and forestry with about 8.6 % of all employed people in the districts in question creates only 3.7 % of the value added. In the sector of industry with more than 24 % of all employed population, the value added created in 2008 totalled to 27,1 %. Inputs of pressures from industry and agriculture into the general pollution level correspond to the proportions of the contributions into the total economy in Plungė and Klaipėda districts provided herein.

Merkys Sub-basin

331. Like the Minija Sub-basin, the Merkys Sub-basin is also one of the cleanest surface water sub-basins in Lithuania. The impact of agricultural pollution here is not significant and the main efforts should be focused on proper treatment of wastewater discharged from Šalčininkai WWTP.

The economic importance of the said sectors is in a way characterised using such indicators as the number of employees engaged in the sector in question and the value added created thereby. The indicators characterising the importance of each sector are given in Tables 192 and 193.

Table 192. Employed population in the Merkys Sub-basin, 2008

Municipality	Employed population, thousand								
	Total	Hunting, agriculture, fisheries, forestry	%	Industry	%	Construction	%	Services	%
Varėna distr.	12.14	1.08	8.9%	2.85	23.5%	1.34	11.0%	6.86	56.5%
Šalčininkai distr.	60.20	1.53	2.5%	9.60	15.9%	6.83	11.3%	42.26	70.2%
Total	72.34	2.61	3.6%	12.45	17.2%	8.17	11.3%	49.12	67.9%

Source: Statistics Lithuania and Consultant's calculations

Table 193. Value added in municipalities of the Merkys Sub-basin by industries, 2008

Municipality	GDP and value added, million LTL									
	Total	Per capita, thousand LTL	Hunting, agriculture, fisheries, forestry	%	Industry	%	Constru ction	%	Services, etc.	%
Varėna distr.	560.3	22.1	28.4	5.1	126.7	22.6	70.0	12.5	335.2	59.8
Šalčininkai distr.	5 557.0	51.1	85.8	1.5	891.2	16.0	502.4	9.0	4 077.6	73.4
On average/ in total	6 117.3	38.6	114.2	1.9	1 017.9	16.6	572.4	9.4	4 412.8	72.1

Source: Statistics Lithuania and Consultant's calculations

The values of the indicators above were recalculated using the data provided at the county level. The data in the tables shows that the most important sector by employment in the Merkys Sub-basin is industry (the area of services excluded). The sector of agriculture and forestry with about 3.6 % of all employed people in the districts in question creates 3.7 % of the value added. This is a higher indicator in comparison to other sub-basins where the percentage of the employed in agriculture and fisheries is much higher than the value added created thereby. On the other hand, this indicator is adjusted ("improved") by the employed population in Vilnius city and the value added created in this city. In the sector of industry with 17.2 % of all employed population, the value added created in 2008 totalled to 16.6 %. Contributions of pressures from industry and agriculture into the general pollution level correspond to the proportions of the contributions into the total economy in Varėna and Šalčininkai districts provided herein.

Žeimena Sub-basin

332. The Žeimena Sub-basin is also one of the cleanest surface water sub-basins in Lithuania. The impact of agricultural pollution here is not significant and the main efforts should be focused on proper treatment of wastewater discharged from Švenčionys WWTP.

The indicators characterising the economic importance of each sector are given in Tables 194 and 195.

Table 194. Employed population in the Žeimena Sub-basin, 2008

Municipality	Employed population, thousand								
	Total	Hunting, agriculture, fisheries, forestry	%	Industry	%	Construction	%	Services	%
Švenčionys	28.68	0.73	2.5%	4.57	15.9%	3.25	11.3%	20.13	70.2%

distr.									
Total	28.68	0.73	2.5%	4.57	15.9%	3.25	11.3%	20.13	70.2%

Source: Statistics Lithuania and Consultant's calculations

Table 195. Value added in municipalities of the Žeimena Sub-basin by industries, 2008

Municipality	GDP and value added, million LTL									
	Total	Per capita, thousand LTL	Hunting, agriculture, fisheries, forestry	%	Indus try	%	Constru ction	%	Services, etc.	%
Švenčionys distr.	2 646.9	51.1	40.9	1.5	424.5	16.0	239.3	9.0	1 942.2	73.4
On average/ in total	2 646.9	51.1	40.9	1.5	424.5	16.0	239.3	9.0	1 942.2	73.4

Source: Statistics Lithuania and Consultant's calculations

The values of the indicators above were recalculated using the data provided at the county level. The data in the tables above shows that the most important sector, both by employment and the value created, is industry (the area of services excluded). The sector of agriculture and forestry with about 2.5 % of all employed people in the district in question creates only 1.3 % of the value added. In the sector of industry with 15.9 % of all employed population, the value added created in 2008 totalled only to 16 %.

Šventoji Sub-basin

333. The impact of agricultural pollution in the Šventoji Sub-basin is not significant either and the main efforts should be focused on identification of point pollution sources in Utena.

The indicators characterising the economic importance of each sector are given in Tables 196 and 197.

Table 196. Employed population in the Šventoji Sub-basin, 2008

Municipality	Employed population, thousand								
	Total	Hunting, agriculture, fisheries, forestry	%	Industry	%	Construction	%	Services	%
Zarasai distr.	9.03	0.91	10.0%	2.11	23.4%	1.24	13.7%	4.78	53.0%
Anykščiai distr.	14.10	1.42	10.0%	3.30	23.4%	1.94	13.7%	7.47	53.0%
Utena distr.	21.03	2.11	10.0%	4.92	23.4%	2.89	13.7	11.14	53.0%
Molėtai distr.	10.17	1.02	10.0%	2.38	23.4%	1.40	13.7%	5.39	53.0%
Širvintos distr.	9.51	0.24	2.5%	1.52	15.9%	1.08	11.3%	6.68	70.2%
Ukmergė distr.	22.79	0.58	2.5%	3.63	15.9%	2.59	11.3%	16.00	70.2%
Total	86.63	6.27	7.2%	17.85	20.6%	11.13	12.8%	51.45	59.4%

Source: Statistics Lithuania and Consultant's calculations

Table 197. Value added in municipalities of the Šventoji Sub-basin by industries, 2008

Municipality	GDP and value added, million LTL

	Total	Per capita, thousand LTL	Hunting, agriculture, fisheries, forestry	%	Industry	%	Construction	%	Services, etc.	%
Zarasai distr.	498.8	27.2	21.5	4.3	198.6	39.8	49.4	9.9	229.3	46.0
Anykščiai distr.	778.4	27.2	33.5	4.3	310.0	39.8	77.1	9.9	357.8	46.0
Utena distr.	1161.0	27.2	50.0	4.3	462.3	39.8	115.0	9.9	533.7	46.0
Molėtai distr.	561.6	27.2	24.2	4.3	223.6	39.8	55.6	9.9	258.2	46.0
Širvintos distr.	877.9	51.1	13.6	1.5	140.8	16.0	79.4	9.0	644.2	73.4
Ukmergė distr.	2 103.6	51.1	32.5	1.5	337.4	16.0	190.2	9.0	1 543.6	73.4
On average/ in total	5 981.3	23.3	175.1	2.9	1 672.7	28.0	566.7	9.5	3 566.8	59.6

Source: Statistics Lithuania and Consultant's calculations

The values of the indicators above were recalculated using the data provided at the county level. The data in the tables above shows that the most important sector by employment (the area of services excluded) is industry. The sector of agriculture and forestry with about 7.2 % of all employed people in the districts in question creates only 3 % of the value added. In the sector of industry with 21 % of all employed population, the value added created in 2008 totalled to 28 %.

Neris Small Tributaries Sub-basin

334. A brief description of the main sectors which may have a negative impact on water resources in the Neris Small Tributaries Sub-basin indicates that such sectors include households, industry, agriculture, fisheries and tourism. The main efforts should be focused on proper treatment of wastewater discharged from Kaišiadorys WWTP, reduction of agricultural pollution as well as identification and removal of sources of entry of dangerous substances into water bodies if this is confirmed by longer-term monitoring results.

The indicators characterising the importance of each sector are given in Tables 198 and 199.

Table 198. Employed population in the Neris Small Tributaries Sub-basin, 2008

Municipality	Employed population, thousand								
	Total	Hunting, agriculture, fisheries, forestry	%	Industry	%	Construction	%	Services	%
Vilnius city	276.13	7.01	2.5%	44.03	15.9%	31.32	11.3%	193.83	70.2%
Vilnius distr.	47.24	1.20	2.5%	7.53	15.9%	5.36	11.3%	33.16	70.2%
Jonava distr.	23.29	1.24	5.3%	4.44	19.1%	2.43	10.5%	15.18	65.2%
Kaišiadorys distr.	16.16	0.86	5.3%	3.08	19.1%	1.69	10.5%	10.53	65.2%
On average/ in total	362.82	10.31	2.8%	59.09	16.3%	40.80	11.2%	252.70	69.6%

Source: Statistics Lithuania and Consultant's calculations

Table 199. Value added in municipalities of the Neris Small Tributaries Sub-basin by industries, 2008

Municipality	GDP and value added, million LTL									
	Total	Per capita, thousand LTL	Hunting, agriculture, fisheries, forestry	%	Industry	%	Construction	%	Services, etc.	%
Vilnius city	25 487.5	51.1	393.6	1.5	4 087.5	16.0	2 304.3	9.0	18 702.2	73.4
Vilnius distr.	4 360.6	51.1	67.3	1.5	699.3	16.0	394.2	9.0	3 199.7	73.4
Jonava distr.	1 480.1	32	67.3	4.5	366.0	24.7	147.5	10.0	899.3	60.8
Kaišiadorys distr.	1 027.0	32	46.7	4.5	254.0	24.7	102.3	10.0	624.0	60.8
On average/ in total	32 355.2	42.3	574.9	1.	5 406.7	16.7	2 948.4	9.1	23 425.1	72.4

Source: Statistics Lithuania and Consultant's calculations

The values of the indicators above were recalculated using the data provided at the county level. The data in the tables above shows that the most important sector by employment (the area of services excluded) is industry. The sector of agriculture and forestry with about 2.8 % of all employed people in the districts in question (which is much less than in other sub-basins) creates only 1.5 % of the value added. In the sector of industry with 16.3 % of all employed population, the value added created in 2008 totalled to 16.7 %.

Nevėžis Sub-basin

335. The Nevėžis Sub-basin is one of those sub-basins which suffer from the most significant pressures in the Nemunas River Basin District. The sub-basin requires reduction of pollution by households and major environmental improvement of agricultural activities.

The economic importance of the said sectors is in a way characterised by such indicators as the number of employees engaged in various economic activities and the value added created thereby. The indicators characterising the importance of each sector are given in Tables 200 and 201.

Table 200. Employed population in the Nevėžis Sub-basin, 2008

Municipality	Employed population, thousand								
	Total	Hunting, agriculture, fisheries, forestry	%	Industry	%	Construction	%	Services	%
Kėdainiai distr.	28.37	1.51	5.3%	5.41	19.1%	2.97	10.5%	18.49	65.2%
Panevėžys distr.	18.96	2.06	10.8%	4.36	23.0%	1.71	9.0%	10.86	57.3%
Panevėžys city	50.14	5.44	10.8%	11.52	23.0%	4.52	9.0%	28.71	57.3%
Radviliškis district	22.35	3.46	15.5%	4.04	18.1%	2.51	11.2%	12.33	55.2%
Total	119.83	12.46	10.4%	25.32	21.1%	11.70	9.9%	70.39	58.7%

Source: Statistics Lithuania and Consultant's calculations

Table 201. Value added in municipalities of the Nevėžis Sub-basin by industries, 2008

Municipality	GDP and value added, million LTL									
	Total	Per capita, thousand LTL	Hunting, agriculture, fisheries, forestry	%	Industry	%	Construction	%	Services, etc.	%
Kėdainiai distr.	1 802.9	32.0	82.0	4.5	445.8	24.7	179.7	10.0	1 095.4	60.8
Panevėžys distr.	900.3	23.5	85.6	9.5	204.6	22.7	110.8	12.3	499.4	55.5
Panevėžys city	2 380.4	23.5	226.2	9.5	540.9	22.7	292.8	12.3	1320.4	55.5
Radviliškis distr.	1 048.4	23.8	114.5	10.9	208.1	19.8	101.2	9.6	624.6	59.6
On average/ in total	6 132.1	25.5	508.3	8.3	1 399.5	22.8	684.4	11.2	3539.9	57.7

Source: Statistics Lithuania and Consultant's calculations

The values of the indicators above were recalculated using the data provided at the county level. The data in the tables above shows that the most important sector by employment (the area of services excluded) in the Nevėžis Sub-basin, as in the rest of Lithuania, is industry. The sectors of agriculture, fishery and forestry with as many as 10.4 % of all employed people in the districts in question create 7.2 % of the value added. In the sector of industry with 21.6 % of all employed population, the value added created in 2008 totalled to 22.8 %.

Šešupė Sub-basin

336. The Šešupė Sub-basin has been identified as one of those which suffer from rather significant pressures in the Nemunas RBD. It requires further reduction of pollution from households and considerable environmental improvement of agricultural activities.

The economic importance of the said sectors is in a way characterised using such indicators as the number of employees engaged in various economic activities and value added created thereby. The indicators characterising the importance of each sector are given in Tables 202 and 203.

Table 202. Employed population in the Šešupė Sub-basin, 2008

Municipality	Employed population, thousand								
	Total	Hunting, agriculture, fisheries, forestry	%	Industry	%	Construction	%	Services	%
Marijampolė	29.54	4.99	16.9%	5.44	18.4%	2.89	9.8%	16.18	54.8%
Kalvarija	5.74	0.97	16.9%	1.06	18.4%	0.56	9.8%	3.14	54.8%
Kazlų Rūda	6.21	1.05	16.9%	1.14	18.4%	0.61	9.8%	3.40	54.8%
Vilkaviškis distr.	20.54	3.47	16.9%	3.79	18.4%	2.01	9.8%	11.25	54.8%
Šakiai distr.	15.57	2.63	16.9%	2.87	18.4%	1.53	9.8%	8.53	54.8%
In total / on average	45.11	7.61	16.9%	8.31	18.4%	4.42	9.8%	24.70	54.8%

Source: Statistics Lithuania and Consultant's calculations

Table 203. Value added in municipalities of the Šešupė Sub-basin by industries, 2008

Municipality	GDP and value added, million LTL

	Total	Per capita, thousand LTL	Hunting, agriculture, fisheries, forestry	%	Industry	%	Constru ction	%	Services, etc.	%
Marijampolė	1 216.9	20.5	172.5	14.2	288.3	23.7	92.7	7.6	663.4	54.5
Kalvarija	236.5	20.5	33.5	14.2	56.0	23.7	18.0	7.6	129.0	54.5
Kazlų Rūda	255.8	20.5	36.3	14.2	60.6	23.7	19.5	7.6	139.4	54.5
Vilkaviškis distr.	846.5	20.5	120.0	14.2	200.5	23.7	64.5	7.6	461.5	54.5
Šakiai distr.	641.6	20.5	91.0	14.2	152.0	23.7	48.9	7.6	349.8	54.5
Total / on average	3 197.3	20.5	453.3	14.2	757.4	23.7	243.5	7.6	1 743.1	54.5

Source: Statistics Lithuania and Consultant's calculations

The values of the indicators above were recalculated using the data provided at the county level. The data of the tables show that the most important sector by employment in the Šešupė Sub-basin, as in all river sub-basins in Lithuania, is industry. However, the number of people working in the sectors of agriculture, fisheries and forestry is also rather high – almost 17 % of all employed people in the region in question, who create only 7 % of the value added. In the sector of industry with 18.4 % of all employed population, the value added created in 2008 was 23.7 %.

Dubysa Sub-basin

337. The Dubysa Sub-basin is one of the sub-basins suffering from major pressures within the Nemunas River Basin District. The sub-basin requires further reduction of pollution by households and major environmental improvement of agricultural activities.

The economic importance of the said sectors is in a way characterised by such indicators as the number of employees engaged in different economic activities and the value added created thereby. The indicators characterising the importance of each sector are given in Tables 204 and 205.

Table 204. Employed population in the Dubysa Sub-basin, 2008

Municipality	Employed population, thousand								
	Total	Hunting, agriculture, fisheries, forestry	%	Industry	%	Constru ction	%	Services	%
Kelmė distr.	17.27	2.68	15.5%	3.12	18.1%	1.94	11.2%	9.53	55.2%
Raseiniai distr.	18.85	1.00	5.3%	3.59	19.1%	1.97	10.5%	12.29	65.2
Total/ on average	36.13	3.68	10.2%	6.72	18.6%	3.91	10.8%	21.82	60.4 %

Source: Statistics Lithuania and Consultant's calculations

Table 205. Value added in municipalities of the Dubysa Sub-basin by industries, 2008

Municipality	GDP and value added, million LTL									
	Total	Per capita, thousand LTL	Hunting, agriculture, fisheries, forestry	%	Industry	%	Construction	%	Services, etc.	%
Kelmė distr.	810.2	23.8	88.5	10.9	160.8	19.8	78.2	9.6	482.7	59.6
Raseiniai distr.	1 198.3	32	54.5	4.5	296.3	24.7	119.4	10.0	728.1	60.8
Total/ on average	2 008.5	28.1	143.0	7.1	457.1	22.8	197.6	9.8	1 210.7	60.3

Source: Statistics Lithuania and Consultant's calculations

The values of the indicators above were recalculated using the data provided at the county level. The data in the tables shows that the most important sector by employment (the area of services excluded) in the Dubysa Sub-basin, as generally in the rest of Lithuania, is industry. However, there is quite a large number of people working in the sectors of agriculture, fisheries and forestry – about 10 % of all employed people in the municipalities in question who create only 6 % of the value added. In the sector of industry, which is very small in the respective districts with 18.6 % of all employed population, the value added created in 2008 totalled to 22.8 %.

Jūra Sub-basin

338. The Jūra Sub-basin is one of the sub-basins suffering from minor pressures within the Nemunas River Basin District. The sub-basin requires further reduction of pollution by households and some environmental improvement of agricultural activities.

The economic importance of the said sectors is in a way characterised by such indicators as the number of employees engaged in different economic activities and the value added created thereby. The indicators characterising the importance of each sector are given in Tables 206 and 207.

Table 206. Employed population in the Jūra Sub-basin, 2008

Municipality	Employed population, thousand								
	Total	Hunting, agriculture, fisheries, forestry	%	Industry	%	Construction	%	Services	%
Rietavas distr.	4.08	0.37	9.0%	0.99	24.4%	0.62	15.3%	2.09	51.4%
Šilalė distr.	10.43	1.92	18.4%	1.82	17.5%	0.83	7.9%	5.84	56.0%
Tauragė distr.	17.55	3.22	18.4%	3.06	17.5%	1.39	7.9%	9.83	56.0%
Total/ on average	14.51	2.28	15.7%	2.82	19.4%	1.45	10.0%	7.94	54.7%

Source: Statistics Lithuania and Consultant's calculations

Table 207. Value added in municipalities of the Jūra Sub-basin by industries, 2008

Municipality	GDP and value added, million LTL									
	Total	Per capita, thousand LTL	Hunting, agriculture, fisheries, forestry	%	Industry	%	Construction	%	Services, etc.	%

Rietavas distr.	245.6	27.2	10.3	4.2	79.2	32.2	42.9	17.5	113.2	46.1
Šilalė distr.	406.6	15.1	47.3	11.6	80.0	19.7	36.7	9.0	242.5	59.6
Tauragė distr.	684.0	15.1	79.7	11.6	134.5	19.7	61.8	9.0	408.0	59.6
Total/ on average	1336.2	16.4	137.3	10.3	293.7	22.0	141.5	10.6	763.7	57.2

Source: Statistics Lithuania and Consultant's calculations

The values of the indicators above were recalculated using the data provided at the county level. The data in the tables above shows that the most important sector by employment (the area of services excluded) in the Jūra Sub-basin, as generally in the rest of Lithuania, is industry. However, there is quite a large number of people working in the sectors of agriculture, fishery and forestry – almost 16 % of all employed people in the county in question, who create 12 % of the value added. In the sector of industry with 19.4 % of all employed population, the value added created in 2008 totalled also to 22 %.

Lithuanian Coastal Rivers Basin

339. A brief description of the main sectors which may have a negative impact on water resources in Lithuania allows concluding that the Lithuanian Coastal Rivers Basin is one of those that suffer from minor pressures in the Nemunas River Basin District. The basin requires further reduction of pollution by households, industry, and surface runoff.

The economic importance of the said sectors is in a way characterised by such indicators as the number of employees engaged in different economic activities and the value added created thereby. The indicators characterising the importance of each sector are given in Tables 208 and 209.

Table 208. Employed population in the Lithuanian Coastal Rivers Basin, 2008

Municipality	Employed population, thousand								
	Total	Hunting, agriculture, fisheries, forestry	%	Industry	%	Construction	%	Services	%
Klaipėda city	82.03	6.73	8.2%	19.84	24.2%	8.04	9.8%	47.48	57.9%
Neringa town	1.50	0.12	8.2%	0.36	24.2%	0.15	9.8%	0.87	57.9%
Total/ on average	83.53	6.85	8.2%	20.20	24.2%	8.19	9.8%	48.34	57.9%

Source: Statistics Lithuania and Consultant's calculations

Table 209. Value added in municipalities of the Lithuanian Coastal Rivers Basin by industries, 2008

Municipality	GDP and value added, million LTL									
	Total	Per capita, thousand LTL	Hunting, agriculture, fisheries, forestry	%	Industry	%	Construction	%	Services, etc.	%
Klaipėda city	5 494.9	33.1	153.3	2.8	1 287.2	23.4	540.1	9.8	3 514.3	64.0
Neringa town	100.3	33.1	2.8	2.8	23.5	23.4	9.9	9.8	64.2	64.0
Total/ on average	5 595.2	33.1	156.1	2.8	1 310.7	23.4	549.9	9.8	3578.5	64.0

Source: Statistics Lithuania and the Consultant's calculations

The values of the indicators above were recalculated using the data provided at the county level. The data in the tables above shows that the most important sector by employment (the area of services excluded) in the Lithuanian Coastal Rivers Basin sub-basin, as generally in the rest of Lithuania, is industry. In 2008, this sector with about 24 % of all employed population created 23.4 % of the value added.

Nemunas Small Tributaries Sub-basin

340. The sectors which may have a negative impact on the water resources in the Nemunas Small Tributaries Sub-basin include households, industry, agriculture, and fisheries. The main efforts should be focused on proper treatment of wastewater discharged from WWTP of a few small settlements, reduction of agricultural pollution, as well as identification and removal of sources of entry of dangerous substances into water bodies if this is confirmed by longer-term monitoring results.

The economic importance of the said sectors is in a way characterised by such indicators as the number of employees engaged in different economic activities and the value added created thereby. The indicators characterising the importance of each sector are given in Tables 210 and 211.

Table 210. Employed population in the Nemunas Small Tributaries Sub-basin, 2008

Municipality	Employed population, thousand								
	Total	Hunting, agriculture, fisheries and forestry	%	Industry	%	Constru ction	%	Service s	%
Alytus distr.	13.23	1.18	8.9%	3.11	23.5%	1.46	11.0%	7.48	56.5%
Alytus town	29.09	2.58	8.9%	6.83	23.5%	3.20	11.0%	16.44	56.5%
Lazdijai distr.	10.57	0.94	8.9%	2.48	23.5%	1.16	11.0%	5.97	56.5%
Druskininkai	10.37	0.92	8.9%	2.43	23.5%	1.14	11.0%	5.86	56.5%
Kaunas city	160.03	8.50	5.3%	30.51	19.1%	16.73	10.5%	104.29	65.2%
Birštonas town	2.37	0.13	5.3%	0.45	19.1%	0.25	10.5%	1.54	65.2%
Prienai distr.	15.11	0.80	5.3%	2.88	19.1%	1.58	10.5%	9.85	65.2%
Kaišiadorys	16.16	0.86	5.3%	3.08	19.1%	1.69	10.5%	10.53	65.2%
Šilutė distr.	23.53	1.93	8.2%	5.69	24.2%	2.31	9.8%	13.62	57.9%
Jurbarkas distr.	12.17	2.24	18.4%	2.13	17.5%	0.97	7.9%	6.82	56.0%
Pagėgiai distr.	5.20	0.95	18.4%	0.91	17.5%	0.41	7.9%	2.91	56.0%
Elektrėnai	13.87	0.35	2.5%	2.21	15.9%	1.57	11.3%	9.73	70.2%
Alytus distr.	13.23	1.18	8.9%	3.11	23.5%	1.46	11.0%	7.48	56.5%
On average/ total	311.70	21.38	6.9%	62.70	20.1%	32.47	10.4%	195.04	62.6%

Source: Statistics Lithuania and Consultant's calculations

Table 211. Value added in municipalities of the Nemunas Small Tributaries Sub-basin by industries, 2008

Municipality	GDP and value added, million LTL

	Total	Per capita, thousand LTL	Hunting, agriculture, fisheries, forestry	%	Industry	%	Construction	%	Services, etc.	%
Alytus distr.	610.9	22.1	30.9	5.1	138.2	22.6	76.3	12.5	365.5	59.8
Alytus m.	1 342.9	22.1	68.0	5.1	303.7	22.6	167.8	12.5	803.4	59.8
Lazdijai distr.	488.0	22.1	24.7	5.1	110.4	22.6	61.0	12.5	292.0	59.8
Druskininkai	478.6	22.1	24.2	5.1	108.2	22.6	59.8	12.5	286.3	59.8
Kaunas city	10 170.8	32	462.7	4.5	2 515.0	24.7	1 013.6	10.0	6 179.6	60.8
Birštonas town	150.5	32	6.8	4.55	37.2	24.7	15.0	10.0	91.4	60.8
Prienai distr.	960.5	32	43.7	4.5	237.5	24.7	95.7	10.0	583.6	60.8
Kaišiadorys	1 027.0	32	46.7	4.5	254.0	24.7	102.3	10.0	624.0	60.8
Šilutė distr.	1 575.9	33.1	44.0	2.8	369.2	23.4	154.9	9.8	1007.9	64.0
Jurbarkas distr.	474.4	15.1	55.2	11.6	93.3	19.7	42.9	9.0	283.0	59.6
Pagėgiai distr.	202.6	15.1	23.6	11.6	39.8	19.7	18.3	9.0	120.8	59.6
Elektrėnai	1 280.1	51.1	19.8	1.5	205.3	16.0	115.7	9.0	939.3	73.4
On average/ total	18 762.2	30.9	850.3	4.5	4 411.8	23.5	1 923.3	10.3	11 576.8	61.7

Source: Statistics Lithuania and Consultant’s calculations

The values of the indicators above have been recalculated using the data provided at the county level. The data in the tables above shows that the most important sector by employment (the area of services excluded) is industry. The sector of agriculture and forestry with about 7 % of all employed people in the districts in question creates 3.6 % of the value added. In the sector of industry with 20 % of all employed population, the value added created in 2008 also totalled to 23.5 %.

SECTION IV. BENEFITS OF ACHIEVING GOOD STATUS IN WATER BODIES

341. 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 *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 (that is, the benefits which cannot be estimated using conventional economic-commercial methods).

The said two sub-basins are situated in the Nemunas RBD so the benefits derived therein may be directly transferred into other sub-basins due to highly similar geographical and social conditions in all sub-basins of the Nemunas RBD.

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.

342. The *Study on willingness to pay for improvement of the Neris River water quality to achieve good status* identified four scenarios:

342.1. Willingness to pay for improvement of all water bodies in the Neris Sub-basin to achieve good ecological status;
342.2. 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;
342.3. Willingness to pay for improvement of the water quality of Lake Riešės to achieve good ecological status;
342.4. Willingness to pay for improvement of the water quality of Lake Riešės and Lake Didžiulis to achieve good ecological status.

343. 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.

344. 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 (that is, 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.

Table 212 below provides information on the number of inhabitants living in each sub-basin making assumption on an average size of a household and estimated benefits on the basis of the above-said Neris Study.

It should be pointed out that these figures are provided for the purposes of information on how people in the Nemunas RBD view good status in water bodies.

At the present stage of the development of the plan for the Nemunas RBD, 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 WFD. As demonstrated in the affordability analysis, other measures cannot be introduced because of insufficient affordability and/or acceptability and therefore a cost-benefit analysis and the figures illustrating the benefit which are given in this section were not required at this stage.

Table 212. Benefits of achieving good status in water bodies in individual sub-basin

Indicator	**Minija**	**Merkys**	**Žeimena**	**Šventoji**	**Neris**	**Nevėžis**	**Šešupė**	**Dubysa**	**Jūra**	**Lithuanian Coastal Rivers**	**Nemunas Small Tributaries**	**Total, million LTL**
Population, thou.	94	70	31	190	740	270	180	80	90	188	710	2.643
Average household size	2.4	2.63	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.5	2.7	
Benefit, million LTL/year	1.9	1.3	0.55	3.4	13.0	6	3.2	1.4	1.6	3.6	12.7	48.65

CHAPTER VIII. SUMMARY PROGRAMME OF MEASURES

SECTION I. INTRODUCTION

345. The programme of measures is one of the pillars of river basin management planning. A MIKE BASIN model was used to identify bodies of water which will fail to conform to the good water status criteria after the implementation of the main (basic) measures (that is, the requirements laid down in the key water directives). With a view to improve 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. Certain measures have also been suggested for the improvement of groundwater status; however, these are more of an advisory character and have been designed for municipal authorities responsible for supply of drinking water of good quality to population.

346. An integrated programme of measures consists of specific measures or studies suggested for selection of supplementary measures for the following:

346.1. agriculture,

346.2. sources of point pollution,

346.3. hydromorphological changes,

346.4. navigation and recreation,

346.5. groundwater,

346.6. transitional and coastal waters

SECTION II. BASIC MEASURES

347. Following Part A of Annex VI to Water Framework Directive 2000/60/EC, the basic measures are the ones which must be implemented in order to meet the requirements of the following directives:

1) Directive 2006/7/EC of the European Parliament and of the Council concerning the management of bathing water quality and repealing directive 76/160/EEC;

2) Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds;

3) Council Directive 98/83/EC on the quality of water intended for human consumption;

4) Council Directive 96/82/EC on the control of major-accident hazards involving dangerous substances as amended by Directive 2003/105/EC of the European Parliament and of the Council of 16 December 2003;

5) Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment as amended by Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009;

6) Council Directive 86/278/EEC on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture as amended by Council Directive 91/692/EEC of 23 December 1991;

7) Council Directive 91/271/EEC of 21 May 1991 concerning urban wastewater treatment as amended by the Commission Directive 2010/42/EEC of 27 February 1998;

8) Council Directive 91/414/EEC concerning the placing of plant protection products on the market as amended by the Commission Directive 2010/42/EU of 28 June 2010;

9) Council Directive 91/676/EEC concerning the protection of water against pollution caused by nitrates from agricultural sources;

10) Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora as amended by the Council Directive 97/62/EC of 27 October 1997;

11) Directive 2008/1/EC of the European Parliament and of the Council concerning integrated pollution prevention and control as amended by Directive 2009/31/EC of the European Parliament and of the Council of 23 Aril 2009.

348. Seven directives out of eleven ones the implementation of which also means introduction of the basic measures are related to high costs. The largest investments are required for the Urban Wastewater Treatment Directive and the Nitrates Directive. The impact of the implementation of these two directives is described in the sections below. 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.

Effect of the implementation of the Urban Waste Water Treatment (UWWT) Directive

349. Under the EU Accession Agreement, Lithuania has been granted a transitional period for the implementation of the requirements of the UWWT Directive. Lithuania shall collect and adequately treat wastewater as follows:

349.1. as from 31 December 2007, wastewater in agglomerations with a p.e. of 10 000 or more shall be treated following the established requirements;

349.2. as from 31 December 2009, agglomerations with a p.e. of 2 000 or more shall be provided with collecting systems in conformity with the established requirements;

349.3. as from 31 December 2009, wastewater in agglomerations with a p.e. between 2 000 and 10 000 shall be treated following the established requirements;

349.4. in newly planned agglomerations, all wastewater treatment requirements shall be observed from the moment of wastewater generation.

350. Assessments of impacts of the implementation of the basic measures provided for in the UWWTD forecast that wastewater discharged to surface water bodies from all agglomerations of more than 10 000 p.e. will meet the quality requirements laid down in the Wastewater Regulation under all regulated parameters. It is also forecasted that concentrations of BOD_7 in wastewater discharged from agglomerations of between 2 000 and 10 000 p.e. will not exceed the MAC laid down in the Wastewater Regulation. Concentrations of total phosphorus and total nitrogen in wastewater discharged from agglomerations of less than 10 000 p.e. are regulated only when good ecological status of the receiving water body must be attained. Requirements for loads from dischargers taking into account the status of the receiving water body have not been laid down yet, so it is assumed that the implementation of the basic measures of the UWWTD will not cover reduction of the loads of total nitrogen and total phosphorus in the said agglomerations. Pollution loads are forecasted to go down only in

agglomerations of less than 10 000 p.e. where reconstruction of the existing WWTP or construction of new ones has been planned.
Identification of investments and works planned for the water management sector was carried out on the basis of Order No. D1-462 of the Minister of the Environment of the Republic of Lithuania of 9 September 2008 on the approval of List No. 01 of national projects under Measure VP3-3.1-AM-01-V *Renovation and Expansion of Water Supply and Wastewater Management Systems* (Žin., 2008, No. 109-4162; 2009, No. 47-1882).

The present loads of point pollution and the ones forecasted after the implementation of the basic measures under the UWWTD are provided in Table 213.

Table 213. Present point pollution loads (2007-2008) and pollution loads forecasted after implementation of the basic measures under the UWWTD in the Nemunas RBD

Pollution sources	BOD_7, t/year		Total nitrogen, t/year		Total phosphorus, t/year	
	Present	Forecasted	Present	Forecasted	Present	Forecasted
Agglomerations of > 100 000 p.e.	1 064.2	773.1	1 039.8	878.8	73.74	58.54
Agglomerations of between 10 000 and 100 000 p.e.	245.5	240.5	381.1	354	44.88	37.58
Agglomerations of between 2 000 and 10 000 p.e.	182.3	83.7	170.2	164.7	30.67	28.17
Other pollution sources	1 063.8	1 063.6	875.6	874.76	103.35	103.04
TOTAL:	**2 555.8**	**2 160.9**	**2 466.7**	**2 272.3**	**252.6**	**227.3**

Impacts of surface (stormwater) runoff

351. Outlets of surface (stormwater) runoff comprise the largest group of dischargers in the Nemunas RBD totalling to as many as 795. The runoff emitted from these outlets accounts for around 24 % of the total point pollution discharges; however, it is difficult to assess surface runoff pollution loads because little analysis of such runoff has been carried out so far. The largest volumes of surface runoff enter water bodies from WWTP of larger agglomerations (with a population equivalent of more than 2 000), which discharge approximately 69 % of the total amount of wastewater.

Calculations of surface runoff loads indicate that these loads may be accounting for about 22 % of the total point pollution loads of BOD_7, 23 % of total phosphorus and 16 % of total nitrogen.

According to the data of 2007, only 10 % of surface runoff is treated, meanwhile the remaining amount is discharged into bodies of water without any treatment. An assessment of impacts of surface runoff on the ecological status of water bodies established that individual dischargers do not have any significant impact on the status of rivers. However, larger groups of outlets of surface runoff which are usually encountered in larger cities may be significantly contributing to discharges from WWTP of large cities, which are already noted for large amounts of effluents. The problem of management of surface runoff should be dealt with by reducing the total number of outlets of surface runoff in cities and towns diverting part of the runoff to wastewater treatment facilities.

Effect of the implementation of the Nitrates Directive

352. Mathematical modelling results indicate only a minor impact of the implementation of the basic measures of the Nitrates Directive on water bodies. A major impact is expected from new manure storages in farms with more than 10 LSU. After the implementation of the Nitrates Directive, supplementary measures will be required in five sub-basins of the Nemunas RBD (Table 214).

Table 214. Required supplementary measures to reduce diffuse agricultural pollution in the Nemunas RBD

Sub-basin	Area which requires reduction of diffuse pollution, km^2	Required average reduction of NO_3-N loads, kg/ha
Nevėžis	5 295.3	3.3
Šešupė	2 067.1	1.9
Dubysa	745.9	0.46
Jūra	189.9	1.0
Neris Small Tributaries	260.3	1.6
Šventoji	347.7	1.3

Summary impacts of the supplementary measures

353. An analysis of the scope of the basic measures provided for in the UWWTD and their forecasted impact on the quality of surface water bodies indicates that the impact will be of a minor importance, which is mainly because of the fact that many larger agglomerations (>2 000 p.e.), which are the object of the said basic measures, already comply with the requirements set for their discharges. Although the allowable concentrations in wastewater are still exceeded in some agglomerations, the exceedances are usually very low.

One of the basic measures of the implementation of the UWWTD is construction of new WWTP or reconstruction of the existing ones. However, the number of such WWTP planned for the nearest future is rather small (around 30). It is difficult to forecast decrease of pollution loads after the implementation of the said projects. Still, the available data indicates that pollutant concentrations in the discharges of a number of WWTP subject to reconstruction at the moment are not high and hence no significant pollution reduction can be expected.

Another basic measure of the UWWTD is expansion of the wastewater collection infrastructure. This measure is expected to protect water bodies against illegal discharges and those occurring in unauthorised places. On the other hand, however, additional subscribers may increase loads of discharges from urban wastewater treatment facilities. Consequently, it is difficult to assess positive impacts of this measure.

The pollution reduction potential of the basic measures provided for in the UWWTD is rather small and hence impacts of these measures on the ecological status of water bodies will be hardly noticeable. A number of water bodies in the Nemunas RBD will still be failing good ecological status due to pressures from diffuse pollution even after the implementation of the basic measures of the UWWTD. The reason is that the basic measures simply ensure cleanup of wastewater to a certain level, but there are cases when even such treatment is not sufficient to achieve good status in the receiving waters. Such situation is typical of small streams or river stretches in the upper reaches which receive wastewater from larger cities and towns. In such cases more stringent requirements should be set for wastewater quality than those provided for in the Wastewater Regulation.

The overall potential of the reduction of diffuse agricultural pollution after the implementation of the basic measures provided for in the Nitrates Directive is not big either. Although there is no actual data on the use of mineral fertilisers, an analysis of crop data and the respective required amount of fertilisers demonstrated that mineral fertilisers may account for more than 50 % of the overall loads of total phosphorus and total nitrogen generated by diffuse agricultural pollution. The amounts of mineral fertilisers and methods of their use are not likely to change after the implementation of the basic measures of the Nitrates Directive because the use of mineral fertilisers is not subject to strict regulation. Consequently, decrease in diffuse agricultural pollution can be expected only as a result of the construction of manure storages in animal husbandry farms with more than 10 LSU. Construction of manure storages should affect pollution by 34 % of the LSU within the Nemunas RBD. Pollution generated by the remaining 66 % of the LSU is not likely to change because animals are kept in farms smaller than 10 LSU (51.5 %) or in farms which already have manure storages (14.5 %). Taking into account that pollution generated by animal husbandry accounts for less than half of the total agricultural pollution loads as well as that the basic measures of the Nitrates Directive will result in reduction of only part of the pollution by livestock farming (around 34 %) and that the decrease will be about 20-30 %, the pollution reduction potential of the basic measures of the Nitrates Directive is estimated to be rather small.

After the implementation of the basic measures, water bodies at risk due to water quality problems will include 320 water bodies in the category of rivers with the total length of 5 053 km.

Table 215. Measures required to implement the Community legislation for protection of water

	Measure	Implementation costs
Directive on the assessment of the effects of certain public and private projects on the environment (85/337/EEC)	Environmental impact assessment in all relevant cases	No need of supplementary investments
Integrated Pollution Prevention and Control Directive	Application of IPPC permits, implementation of BAT in all relevant cases	Acc. to preliminary estimates in 2000, implementation costs of the IPPC Directive must have ranged from LTL 1 200 to 2 000 million. Investment costs of the IPPC Directive currently in force have not been recalculated.
Directive on the control of major-accident hazards involving dangerous substances (96/82/EC)	Development of safety reports and emergency plans; measures for accident prevention	No need of supplementary investments
Directive concerning the placing of plant protection products on the market (91/414/EEC)	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;	Implementation costs have not been estimated

	Measure	Implementation costs
	withdrawal/banning of harmful substances	
Bathing Water Directive	Monitoring of bathing water quality; provision of information to the public on bathing water quality. Validation of bathing sites, improvement of water quality, restoration of poor water quality to good status, development of an information system	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 and reporting to the Commission (LTL 500 thousand).
Directive on the conservation of wild birds	Establishment of sites important for the conservation of birds, development and implementation of management plans for protected areas	Required investment costs total to ca. LTL 7 million; annual operational costs – ca. LTL 4.8 million
Directive on the conservation of natural habitats and of wild fauna and flora (92/43/EEC)	Establishment of sites important for the conservation of habitats; development of protected area management plans	Required investment costs total to ca. LTL 5 million; annual operational costs – ca. LTL 8.4 million
Directive on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture (86/278/EEC)	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 costs are estimated to be about LTL 300 million.
Urban Wastewater Treatment Directive	Assurance of centralised wastewater treatment in agglomerations larger than 2 000 p.e.	Investment costs for 2003-2009 are about LTL 1 billion. In 2007-2013, about LTL 903 million 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 the Nemunas RBD.
Directive concerning the protection of waters against pollution caused by nitrates from agricultural sources (91/676/EEC)	Construction of manure and slurry storages in 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 - ~LTL 430 million
Directive on the quality of water intended for human consumption	Drinking water quality surveillance and control; agricultural monitoring; application of the Code of Good Agricultural Practice	According to estimates in 2001, costs for addressing problems of fluoride and iron totalled to LTL 100 million. However, removal of iron, as of an indicative parameter, is not obligatory under the Drinking Water Directive.

Table 216. 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 on Drinking Water Supply and Wastewater Management (Žin., 2006, No. 82-3260).)	The main measure for the implementation of Article 9 of the WFD is introduction of the cost recovery principle for all consumers. The present report was prepared on the basis of data available at that time and hence the cost recovery level in the public water supply and wastewater management sector in individual sub-basins as well as the average one within the entire Nemunas RBD has been estimated to be lower than it actually is today when a number of changes have taken place as a result of both revising the tariffs for water supply and wastewater management services and modernisation of water supply and wastewater management companies. Data of 2007 shows that the cost recovery level in the public water supply and wastewater management sector in the Nemunas RBD totalled to about **96 %** of costs and the cost recovery level in the sector of industry was 100 %. As new tariffs for water supply and wastewater management services were adopted in 2009 – beginning of 2010 following the opinion of municipalities and of the National Control Commission for Prices and Energy, it can be maintained that the cost recovery principle has been fully implemented. The cost recovery level in the sector of agriculture totals to **98.2 %.**

354. The tariffs for water supply and wastewater collection and treatment in Lithuania are calculated following the cost recovery principle which has been fully implemented observing the Law of the Republic of Lithuania on Water, Law of the Republic of Lithuania on Drinking Water Supply and Wastewater Management and the Methodology for the Pricing of Drinking Water Supply and Wastewater Management Services.

Lithuanian legislation which regulates the water supply and wastewater management sector provides for amalgamation of water supply companies and revision of price tariffs. These measures have provided for the background for increasing cost recovery to 100 %. Larger water supply companies are better able to manage the water supply and wastewater management sector to achieve cost-effectiveness as well as to coordinate the issue of prices with relevant interested parties.

Environmental costs are included into the cost recovery mechanism through charges for the use of national natural resources and for pollution of the environment.

An assessment carried out in the sector of agriculture identified both the costs to be borne by farmers until 2015 and supplementary costs proposed to be covered by the state in the Nevėžis Sub-basin where water bodies suffer from more significant agricultural pressures than in other sub-basins. 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.

An analysis of cost recovery in the water supply and wastewater management sector in the Nemunas RBD established that, following the data of 2007, a number of water supply and wastewater management companies were failing to implement the cost recovery principle.

Table 217. The cost recovery level in the sector of water supply and wastewater management in the Nemunas RBD, %, 2007

Basin/sub-basin	Water supply	Wastewater management	Total costs
Minija	86	73	64
Merkys	100	102	101
Žeimena	101	102	102
Šventoji	106	89	91
Neris Small Tributaries	100	101	101
Dubysa	86	78	81
Nevėžis	89	82	85
Šešupė	95	97	92
Jūra	94	87	88
Lithuanian Coastal Rivers	80	102	94
Nemunas Small Tributaries	96	89	93

Source: Estimations by the Consultant on the basis of data on prices and cost prices of water supply companies

Table 218. Measures to meet the requirements of Article 7 of the WFD

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);	Monitoring of water bodies where abstraction exceeds 100 m3 per day
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)	Relevant protection of water bodies

Table 219. 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 the Environment of the Republic of Lithuania of 31 March 2004 (Žin., 2004, No. 104-3848)	Water abstracting entities report information on the abstraction volume. The Environmental Protection Agency (EPA) stores information received in its data bases.
Rules on the Issuing, Renewal and Revocation of Integrated Pollution Prevention and Control Permits approved by Order No. 80 of the Minister of the Environment of the Republic of Lithuania of 27 February 2002 (*Žin.*, 2002, No. 85-3684; 2005, No. 103-3829) ;	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

Relevant legislation	Measure
Regulations of the Register of the Earth Entrails Resources 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); 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).	provide for measures for rational water use and protection. 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 (Žin., 1997, No. 104-2615; 2009, No. 154-6955) Standard Rules for the Use and Maintenance of Ponds (LAND 2-95) approved by Order No. 33 of the Minister of the Environment of the Republic of Lithuania of 7 March 1995 (Žin., 1997, No. 70-1790; 2004, No. 96-3563; 2006, No. 101-3915); 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 Law on Water defines both preventive and hard control measures for impoundment. The Minister of the Environment lays down a procedure for use and maintenance of ponds by issuing relevant legislation. 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. The Resolutions prohibits impoundment for any purposes in 169 rivers and their stretches.

Measures intended to prevent or control potential discharge of pollutants from diffuse pollution sources

355. 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

356. 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. The permitting procedure is regulated observing the Procedure for 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 the Environment of 3 February 2003 (Žin., 2003 No.17-770).

Summary of controls over point source discharges and other activities with an impact on the status of water

357. Pollution from point sources is regulated by the Wastewater Management Regulation approved by Order No. D1-236 of the Minister of the Environment of the

Republic of Lithuania of 17 May 2006 (Žin., 2006, No. 59-2103; 2007, No. 110-4522), the Rules on the Issuing, Renewal and Revocation of Integrated Pollution Prevention and Control Permits approved by Order No. 80 of the Minister of the Environment of the Republic of Lithuania of 27 February 2002 (Žin., 2002, No. 85-3684; 2005, No. 103-3829), and the Surface Runoff Management Regulation approved by Order No. D1-193 of the Minister of the Environment of the Republic of Lithuania of 2 April 2007 (Žin., 2007, No. 42-1594).

Flood control measures

358. With a view to prepare for floods and to eliminate consequences thereof, the Programme on Preparation of Klaipėda and Tauragė Counties for Floods and Response to Flood Consequences for 2007-2015 was approved by Resolution No. 1202 of the Government of the Republic of Lithuania of 30 November 2006 (Žin., 2006, No. 132-5007). The objective of this programme is to reduce losses incurred by floods in the said counties, to ensure operation of the polder system employing organisational and technical measures, to preserve people's lives, health, property, and to protect the environment from a negative impact of floods.

Table 220. Summary of measures implemented under Article 16 on priority substances

Relevant legislation	Measure
Wastewater Management Regulation adopted by Order No. D1-236 of the Minister of the Environment of the Republic of Lithuania of 17 May 2006 (Žin., 2006, No. 59-2103; 2007, No. 110-4522) Order No. D1-71 of the Minister of the Environment of 13 February 2004 on the approval of the Programme on Reduction of Pollution of Waters with Hazardous Substances (Žin., 2004, No. 46-1539	Regulation of maximum allowable concentrations of priority substances. Self-regulation of priority substances in wastewater.

Table 221. Measures which prevent or reduce impacts of accidental pollution incidents

Relevant legislation	Measure
Regulation on the Prevention, Response to and Investigation of Industrial Accidents approved by the Government of the Republic of Lithuania Resolution No. 966 of 17 August 2004 (Žin., 2004, No. 130-4649; 2009, No. 90-3855) Programme on 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

359. The 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

360. So far, a potential impact of hydrotechnical 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 installations for fish migration are required and of the list of the remains of former dams where barriers for fish migration are to be removed (Žin., 2007, No. 102-4180). It should be noted that installation of fish by-passes only mitigates but does not fully eliminate the negative effect on the river continuity. More specific measures ensuring conformity of hydromorphological conditions of water bodies with good ecological status or good ecological potential in water bodies designated as artificial or heavily modified will be analysed in the next stage of the development of the Programme of Measures.

Controls over artificial recharge or augmentation of groundwater bodies

361. 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

362. Lithuanian legislation provides for certain derogations for water bodies where water protection objectives cannot be achieved or are disproportionally expensive:

362.1. postponing of an objective (maximum until 2027) if accomplishment thereof is prevented by technical possibilities, disproportionate costs or natural conditions;

362.2. in the procedure laid down by the Minister of the 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.

363. Extension of the deadline and establishment of less stringent objectives may be applied only in rare cases, upon performance of an economic analysis and well-founded proof of the necessity of the derogation.

The extension of the deadline for the achievement of environmental objectives in the Nemunas RBD has been discussed in Chapter VI, Section V herein.

During the first stage of the implementation of the Programme of Measures (2010-2015) good status is expected to be achieved in 56 water bodies in the category of rivers and 1 body of water in the category of lakes. Extension of the deadline for achieving environmental objectives until 2021 or 2027 will be requested for 264 water bodies at risk in the category of rivers, 63 lakes larger than 0.5 km^2, 26 ponds, 4 transitional water bodies, and 2 coastal water bodies. The status of these water bodies will be subject to investigative and monitoring measures. The achievement of the tasks of the first planning cycle will be followed by assessment of the level of achievement of the water protection objectives. The monitoring and assessment of changes in the status of water bodies will enable a better understanding of targets to be aimed at during the second and the third cycles. The objectives for the second stage will be set taking into account the outputs of the first stage and those for the third cycle will be based on the outputs of the first two stages.

Details of supplementary measures identified as necessary to meet the environmental objectives

364. 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 an impact of recreation. These are described in Chapter VIII, Section IV below.

Details of measures to stop pollution of marine waters in accordance with Article 11 (6)

365. 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 UWWT 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, 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.

Table 222. Other basic measures

Measure	Short description
Implementation of measures set in the Lithuanian Rural Development Programme for 2007-2013: Axes I and II. Improvement of the environment and landscape	Landscape management programme measures; management of water bodies protection zones and meadows; measure of the Agri-Environmental Programme for improvement of water bodies at risk: transformation of the arable land into pastures; Measure: first afforestation of the agricultural land and afforestation abandoned land
Implementation of the Dovinė River Basin Management Plan prepared under the project *Management and Restoration of NATURA 2000 sites through an Integrated River Basin Management Plan of the Dovine River*	Measures: implementation of the Dovinė River Basin Management Plan provided for in the project funded by the LIFE programme.
HELCOM measures (Baltic Sea countries)	
Implementation of the HELCOM Recommendation 28E/5 on Municipal Wastewater Treatment	Waste water treatment measures aiming at reduction of loads of BOD, phosphorus and nitrogen in the agglomerations from 300 to 200 000 p.e.
Implementation of the HELCOM Recommendation 28E/6 concerning on-site wastewater treatment of single family houses, small businesses and settlements up to 300 p.e.	Measures on improvement of on-site wastewater treatment of single-family houses, small businesses and settlements up to 300 p.e., for instance, use of dry toilets, phosphate-free detergents, on-site grey water treatment in

Measure	Short description
	single-family houses, etc.
Implementation of the HELCOM Recommendation 28E/7 concerning measures aimed at the substitution of phosphorus in detergents	Measures on substitution of polyphosphates as builders in laundry detergents.
Implementation of the HELCOM Recommendation 28E/4 on amendments to Annex III “Criteria and Measures Concerning the Prevention of Pollution from Land Based Sources”	Measures aiming at prevention of pollution from agriculture, application of Best Environmental Practice (BEP) and Best Available Technology (BAT) in agriculture
Implementation of the HELCOM Recommendation 28E/8 on reduction of emissions of dioxins and other hazardous substances from small-scale combustion	Measures intended for the use of use of low-emission combustion appliances; enhancing the public awareness in order to avoid pollution with hazardous substances
Implementation of the HELCOM Recommendation 28E/10 on application of the no-special-fee system to ship-generated wastes and marine litter; HELCOM Recommendation 28E/12 on strengthening of sub-regional co-operation in response field (in relation to incidents at sea); HELCOM Recommendation 28E/13 on introducing economic incentives to reduce emissions from ships; HELCOM Recommendation 28E/14 on quantifying losses of nutrients from diffuse pollution sources	These measures are intended to improve the status of coastal waters and contribute to the implementation of the objectives of the WFD
Banning of the use, production and marketing of: - endosulfane; - pentabromodiphenylether (pentaBDE); - octabromodiphenylether (octaBDE).	Measure: banning of the use, production and marketing of chemical substances

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

366. The Programme on Preparation of Klaipėda and Tauragė Counties for Floods and Response to Flood Consequences for 2007-2015 approved by Resolution No. 1202 of the Government of the Republic of Lithuania of 30 November 2006 (*Žin.*, 2006, No. 132-5007) was developed for dealing with both unforeseen and natural floods and elimination of their consequences.

Plans have been made to create an effective system for the forecasting of flood risks and for the provision of information to rescue services and population, to improve the technical base and measures for the organisation of rescue operations.

367. Measures for the prevention and mitigation of pollution arising from unforeseen accidents (which are always unpredictable) have been provided for in the following legislation:

1) Regulations on 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; 2009, No. 90-3855), and

2) Programme on Inspection of Dangerous Installations 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).

368. Emergency plans provide for 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.

More effective coordination of the activities of responsible institutions, potential polluting entities and other related organisations are recommended in order to strengthen response capacities in cases of ship accidents and other pollution incidents at sea as well as to improve the system of response to oil spills at sea (e.g. by joint training programmes, coordination of acquisitions of equipment, exchange of the latest information, etc.).

SECTION III. OTHER PROGRAMMES IN THE CATEGORY OF BASIC MEASURES

369. The following available programmes which are currently implemented can be classified as basic measures:

369.1. 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 the Environment of the Republic of Lithuania of 9 December 2008 (Žin., 2008, No. 143-5741);

369.2. 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);

369.3. 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; 2008, No. 104-3976);

369.4. 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, 104-3975; 2009, No. 121-5201);

369.5. Programme on the preparation of Klaipėda and Tauragė Counties for floods and response to flood consequences for 2007-2015 approved by Resolution No. 1202 of the Government of the Republic of Lithuania of 30 November 2006 (Žin., 2006, No. 132-5007);

369.6. 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);

369.7. Long-term (until 2025) strategy for the development of the Lithuanian transport system approved by Resolution No. 692 of the Government of the Republic of Lithuania of 23 June 2005 (Žin., 2005, No. 79-2860);

369.8. Lithuanian Rural Development Programme for 2007-2013 (hereinafter – RDP) approved at the EU Rural Development Committee on 19 September 2007;

369.9. Cohesion Promotion Action Programme approved by the Commission Resolution of 30 July 2007;

369.10. National strategy on the protection of the marine environment of the Baltic Sea and an action plan for the implementation thereof are planned to be developed by 2010 pursuant to the HELCOM Baltic Sea Action Plan and Directive 2008/56/EC.

SECTION IV. SUPPLEMENTARY MEASURES

370. Supplementary measures have been proposed for water bodies which will fail to meet the good water status requirements after the implementation of the basic measures, and environmental and economic efficiency of these measures has been evaluated. Supplementary measures have been considered and proposed for the following main areas:

370.1. reduction of an impact of household wastewater;

370.2. mitigation of impacts of agricultural pollution;

370.3. mitigation and regulation of hydromorphological changes;

370.4. improvement of the status of lakes and ponds;

370.5. reduction of an impact of recreation;

370.6. improvement of the status of groundwater wellfields;

370.7. improvement of the status of coastal and transitional waters;

370.8. reduction of an impact of industrial enterprises.

371. The programme of supplementary measures encompasses measures which can be grouped together on the basis of the following aspects:

371.1. type of the measure: measures can be legal and administrative; technical (investments); various studies, educational and pilot projects, and economic measures;

371.2. application scope of the measure: measures can be national; applicable to problematic areas; applicable to specific areas only;

371.3. time of application;

371.4. sector of economy responsible for the implementation of the respective measure: measures can be implemented by national institutions, municipal administrations, including water supply companies, and the private sector (farmers, owners of hydropower plants, industrial enterprises).

372. In addition, supplementary measures can also be selected according to the type of water bodies (lakes, rivers, transitional and coastal waters) and individually for certain specific pollution types (like pollution with hazardous substances).

As already demonstrated in Chapter VI, Section V, the extension of the deadline for the achievement of water protection objectives in the first cycle of the implementation of the WFD is recommended for 353 bodies of water (264 rivers, 63 lakes and 26 ponds).

The same result was also obtained during the screening of measures on the basis of indicators of their effectiveness and applicability. Such analysis was the most successful in the sector of agriculture because it contains a longer list of potential measures than actually required for the achievement of the relevant objectives. Measures against agricultural pollution were selected according to the ratio of the pollution reduction effect of the measure (e.g. reduction of kgN in one hectare) to the costs required to obtain such effect in each catchment. Relatively cheapest measures should be implemented first. If a cheap measure is not sufficient taking into account the potential area of its implementation, other, more expensive, measures are proposed.

As already described in the relevant section on assumptions, two alternative technologies are proposed for the reduction of point pollution. The first one is based on wider application of mechanical/automatic devices which consume more energy but ensure higher reliability of the cleanup and may be regulated on the actual demand. The other method involves natural measures which need little energy but require a larger area and the treatment process itself is more difficult to regulate. Another aspect taken into consideration is the implementation of the basic measures: have they actually been implemented or were they not required due to, for example, a small size (in p.e.) of a settlement. Consequently, three measures are proposed. The costs were estimated using average prices. In each case, selection of a specific technology in an individual settlement would require detailed examination of the location and of the applicability of the technology.

Measures for the mitigation of hydromorphological changes were selected following specific technical proposals put forward by experts and thus have not involved alternative estimations of costs. However, the costs of one measure – renaturalisation – will be known after the implementation of the pilot projects proposed for the first WFD implementation cycle.

Supplementary measures to reduce impacts of wastewater discharged from small settlements

373. Measures to reduce impacts of point pollution provided in the Programme are intended for the upgrading of wastewater and/or surface runoff treatment facilities in towns and settlements where the present cleanup level is not sufficient according to the modelling results (that is, taking into account the implementation of the basic measures). This usually happens due to insufficient ability of receiving waters to dilute wastewater. Two alternative technologies are proposed for most facilities: the first one is based on wider application of mechanical/automatic devices and the second one involves natural measures. Another aspect taken into consideration is the implementation of the basic measures: have they actually been implemented or were they not required due to, for example, a small size (in p.e.) of a settlement.

A feasibility study is planned to be conducted to assess an impact of the reduction or prohibition of the use of phosphorus in detergents on the quality of wastewater.

Supplementary measures to reduce point pollution by individual sub-basins of the Nemunas RBD are described in detail in the Programme of Measures and the required costs are given in Table 216.

Supplementary measures to reduce impacts of agriculture

374. Water bodies in part of the Nemunas RBD fail the good status requirements due to impacts of agricultural pollution loads. This problem is most acute in the Nevėžis Sub-basin as well as in Šventoji and Šešupė sub-basins (though to a smaller extent). Agricultural pollution is also exceeding the allowed thresholds in individual areas of the Neris Small Tributaries Sub-basin, Dubysa Sub-basin, and Jūra Sub-basin (Figure 78).

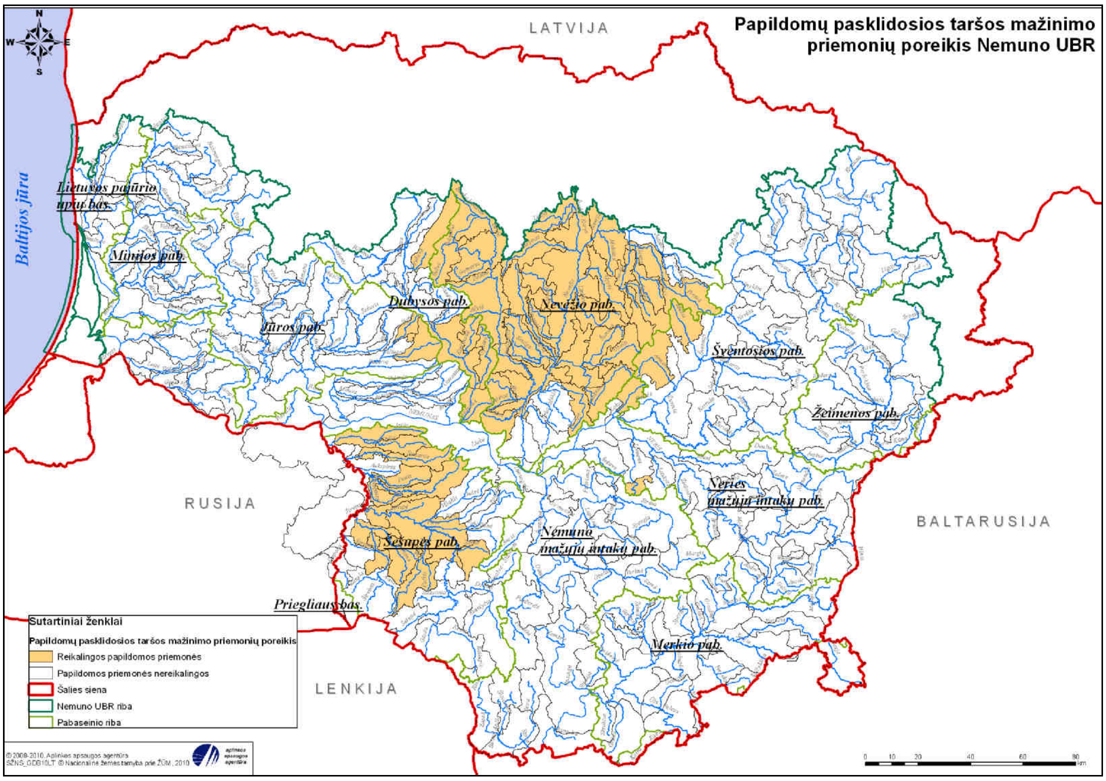

Figure 78. Areas in the Nemunas RBD where diffuse agricultural pollution should be reduced

Diffuse agricultural pollution pressures should be first of all subject to measures which help introducing the polluter pays principle common in many EU Member States. Such measures are proposed for the entire Lithuania independently of the intensiveness of agricultural activity because these measures also play a preventive role.

375. Implementation of such measures would also become a reference point for the application of other measures showing the amount and type of substances entering the soil. The measures proposed are as follows:

375.1. Validation of the maximum allowed amounts of nitrogen and phosphorus in one hectare irrespective of whether organic or mineral fertilisers are applied;

375.2. Revision and validation of a methodology which should become mandatory for the development of fertilisation plans, indicating the areas where fertilisation norms lower than the ones calculated in accordance with the approved methodology by 20 % are recommended until 2015;

375.3. Introduction of the requirement to develop fertilisation plans for farms with more than 10 ha of arable land;

375.4. Introduction of the requirement to manage manure pursuant to the good farming rules for farms with more than 10 LSU (that is, for farms which are not subject to the requirements of the Nitrates Directive).

376. The measures common for the entire Lithuania would be mandatory and not subject to compensation. Since diffuse agricultural pollution will still persist after the implementation of common measures in part of the district, more measures will be required. All supplementary measures which are proposed to be applied only in a limited area should be independent and reimbursable irrespective of who is

implementing these measures. A mandatory provision for the achievement of the established objectives is well-formulated assistance conditions, attractive compensations and measure implementation control.

One of the most important criteria for the screening of measures is the indicator of effectiveness, including its cost component, therefore it is important to ensure targeted implementation of measures which contribute to the reduction of diffuse agricultural pollution and which have already been granted funding, that is, some of the activities supported by the Rural Development Programme (RDP) for 2007-2013, to the maximum extent. It is proposed to amend the rules of the schemes of the said programme so as to provide for more favourable conditions for farmers to use the assistance in areas where diffuse agricultural pollution will persist after the implementation of the measures common for the whole of Lithuania. It is recommended that not only funding priority is given to the specifically distinguished areas but also certain other changes are introduced ensuring that assistance is used as efficiently as possible in respect of the improvement of water status.

Different measures, grouped by their efficiency, are proposed for the Nevėžis Sub-basin in areas where the above-said measures are not sufficient for the ensuring of good water status. First of all, it is recommended to reduce the fertilisation norms calculated pursuant to the approved methodology by 20 %. Where this measure is not sufficient, cultivation of catch crops should be encouraged in sandy land, and places with little sandy land – cultivation of catch crops in mixed land. The measure would require a new scheme of assistance.

In some places of the Nevėžis Sub-basin, pollution cannot be reduced to the required level with the help of the said measures because of intensive agricultural activities and low flow. Therefore technical measures suitable for places suffering from especially high agricultural pollution pressures are proposed. Several individual or combined solutions (such as artificial wetlands/sedimentation ponds, regulated drainage, etc.) can be opted for, though the objective is the same – to prevent drainage runoff from entering directly the head ditch, river or any other receiving water body. Since these technical measures require considerable investments and such solutions have never been applied in Lithuania before, it is recommended to begin with pilot projects, postponing the implementation of these measures (if proven effective) for the next planning period.

Along with the said measures, it is important to take supportive measures, namely, education and information, as well as control measures. Even though they do not produce direct effects, they are very important for introducing other measures. Their implementation is recommended throughout Lithuania, focusing on areas affected by significant diffuse pollution pressures from agriculture.

A more detailed description of the measures is provided in the Programme of Measures.

Measures to improve hydromorphological status

377. The main reasons which determine hydromorphological changes in water bodies and hence prevent the achievement of good ecological status in some bodies of water are related to:

377.1. large reservoirs,

377.2. hydropower plants,

377.3. straightened rivers.

378. For the purpose of elimination of causes specified in paragraph 377 or mitigation of their impact, the following measures are proposed:

378.1. Restoring/ensuring river continuity and discharge;
378.2. Reduction of the impact of hydropower plants;
378.3. Naturalisation of river beds.

Restoring/ensuring river continuity and discharge

379. The most important measure which ensures river continuity is construction of fish bypass channels. 21 fish migration facilities were constructed until 2008: sluices, rock channels with weirs, and vertical-slot pool fish passes.

Fish bypass channels should be first of all installed in rivers which are the most important for fish migration

Fish bypass channels should be constructed following the results of special feasibility studies conducted to select the most suitable technological solution for a bypass channel in question. The construction of a facility should also take into account the data of monitoring performed both before and after the construction of such facilities to be able to assess an impact thereof on the ecological status of the river and thus select the best option. However, no such information is currently available in Lithuania hence an impact analysis should be postponed for the second stage of the development of the Nemunas River Basin Plan, i.e. the planning cycle from 2015.

Remeandering of rivers

380. Using GIS methods, it was established that the total length of straightened rivers and streams in the Nemunas RBD is around 3 119 km.

381. Naturalisation of river beds is an expensive process and can be not cost-efficient as compared to its benefits. Hence the Programme of Measures for the Nemunas RBD recommends the following:

381.1. To leave stretches of rivers flowing in the upper reaches of rivers, in hilly, springy, laky and protected areas which are already in the process of natural regaining of their original state for complete self-naturalisation;

381.2. 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);

381.3. 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;

381.4. To carry out pilot projects in the Grūda (the Merkys Sub-basin) stretches for the purpose of assessing impacts of the renaturalisation on the river status.

Reduction of impacts of hydropower plants

382. There is little information about impacts of hydropower plants on the ecological status of water bodies. Hence the first stage of the implementation of the directive

envisages performing investigative monitoring of water bodies affected by hydropower plant upstream of the dam, which will allow assessing the impact thereof on water bodies.

Measures to reduce pollution of lakes and ponds

383. 64 lakes out of 243 ones larger than 0.5 km^2 situated within the Nemunas RBD have been assigned to water bodies at risk. Water bodies at risk also include 26 ponds out of 42 ones larger than 0.5 km^2 in this river basin district.

384. To be able to improve the status of lakes and ponds, first of all, causes of pollution should be identified and eliminated. Measures are required:

384.1. to stop pollution from point pollution sources (WWTP, rainwater sewerage) and from settlements or homesteads which are not connected to wastewater treatment facilities;

384.2. to optimise the land use in the basin (to minimise leaching of biogenic substances from agriculture);

384.3. to manage lake shore areas (to restore water protective (buffer) zones of woody riparian vegetation).

385. Very often, however, causes of poor ecological status of lakes and ponds at risk are not known and hence the first task should be to identify these by carrying out relevant studies and monitoring.

Supplementary measures to reduce impacts of the industrial sector

386. There is little information on impacts of Lithuanian industrial enterprises on water bodies because companies usually discharge their effluents into centralised wastewater treatment facilities of towns and settlements.

Since practically no data is available on impacts of specific industrial enterprises on water bodies, it is suggested that measures to reduce industrial pollution in this stage are applied at the national level. A description of common measures is provided in the Programme of Measures.

Supplementary measures for recreation

387. 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 expansion of knowledge-oriented and recreational water tourism as well as the infrastructure of tourism and recreation. The measures of the National Plan and their costs are provided in the chapter on economic analysis in the present Nemunas RBD Management Plan.

Countryside tourism, as a separate load type, is not expected to have any negative impact on the environment provided that the established requirements are observed.

Supplementary measures for groundwater

388. The status of groundwater wellfields is usually good. Three groundwater bodies have been identified as water bodies at risk: Suvalkija GWB, Kėdainiai-Dotnuva GWB and Stipinai GWB of Upper Devonian deposits. It is recommended to draft a piece of legislation obligating water supply companies which abstract > 10 m^3 of groundwater per day and which exploit wellfields situated in groundwater bodies at risk to perform monitoring of problematic quality indicators (Cl and SO4) and provide the data to the Lithuanian Geological Survey (LGS). The LGS would analyse the data and decide whether the wellfields identified should be classified as being at risk.

Measures to improve the status of coastal and transitional waters

389. Measures for reduction and prevention of pollution of coastal and transitional waters have been proposed and preliminary costs of the implementation of the proposed measures have been estimated on the basis of an analysis of all available information on anthropogenic loads affecting the ecological status of coastal and transitional waters.

The measures designed for improvement of the status of coastal and transitional waters discussed in the Programme of Measures are provided in Table 223 below.

Table 223. Measures for improving the status of transitional and coastal waters

Measure	**Institution responsible for the implementation of the measure**	**One-time costs, LTL**	**Operating costs, LTL/year**	**Total annual costs, LTL/year**	**Comments / assumptions**
To develop a methodology for the monitoring of the invasive species specified in Order No. D1-663 of the Minister of the Environment of 9 November 2009 in surface water bodies	Environmental Protection Agency	30 000		4 000	A methodology for the monitoring of the invasive species in surface water bodies will be developed.
To conduct a detailed study on the identification of the causes of water status problems in the water area of Klaipėda Seaport and selection of measures for addressing the water status problems	Ministry of the Environment, Ministry of Transport of the Republic of Lithuania	340 000		46 000	The study will help to identify potential causes of pollution in the port water area and dispersion of the soil pollution.
To organise clearing of macrophyte overgrowth in the coastal zone of the Curonian Lagoon	Relevant municipalities in the Nemunas RBD	0	300 000	300 000	Deterioration in the status of surface water of the Curpnian Lagoon will be prevented.
To develop a methodology for the growing and collection of filtering molluscs (Dreissenidae) intended for removing biogenic substances from water bodies	Ministry of the Environment of the Republic of Lithuania	60 000		8 000	A methodology for the growing and collection of filtering molluscs (Dreissenidae) will be developed which will help to assess the amounts of biogenic substances which can be removed from the Curonian Lagoon.
TOTAL:		**430 000**	**300 000**	**360 000**	

Summary costs of implementation of supplementary measures in the Nemunas RBD

390. A summary of all supplementary measures required for the implementation of the WFD assessed herein and their costs is provided in Table 224 below. The summary cost lines provide the total costs and the costs of the priority measures for the first WFD implementation cycle. As demonstrated in the chapter on affordability, the measures of the upgrading of HPP turbines, renaturalisation of river beds and reduction of diffuse pollution are not to be implemented during the first cycle both due to lack of funds and acceptability.

The table demonstrates that in the event of the scenario which excludes investments into HPP and river renaturalisation the investment costs would go down almost by three times. The costs of the total set of the measures do not constitute a large amount on the national scale. According to the data of November 2009, the amount "saved" on investment projects which are on the list of national projects on water supply and wastewater management due to decreased prices of construction totals to LTL 600 million. Therefore, the burden of investments for the implementation of the WFD is not big as compared to the implementation costs of various existing environmental measures. However, as demonstrated in the affordability analysis, only the supplementary measures under the minimum scenario are proposed for the first implementation cycle because funds for 2007-2013 have already been distributed and in many cases it would be problematic to utilise funds in due time, as well as because municipalities have limited possibilities to afford the said measures.

It should be noted that exclusion of the measures for hydropower plants and renaturalisation practically does not result in any significant change in the operational costs and hence the annual burden of maintenance of the supplementary measures remains the similar to the one under the maximum scenario.

Table 224. Preliminary costs of implementation of supplementary measures in the Nemunas RBD: maximum scenario

Sub-basin / basin	Group of measures	Investment costs until 2015, LTL	Operational costs, LTL/year	Annual costs, LTL/year
MINIJA	HPP	3 800 000	114 000	241 000
	Fish passes	493 300	11 880	43 000
	Renaturalisation	2 270 000	0	137 000
	Point pollution sources	0	0	0
	Measures against diffuse pollution	0	1 558 853	1 558 853
	Groundwater	0	0	0
Total		**6 563 000**	**1 685 000**	**1 980 000**
MERKYS	HPP	700 000	21 000	44 000
	Fish passes	324 700	9 741	31 000
	Renaturalisation	7 420 000	0	471 000
	Point pollution sources	1 200 000	60 000	140 000
	Measures against diffuse pollution	0	778 581	778 581
	Groundwater	0	0	0
Total		**9 645 000**	**869 000**	**1 465 000**
ŽEIMENA	HPP	0	0	0
	Fish passes	12 000	360	1 100

Sub-basin / basin	Group of measures	Investment costs until 2015, LTL	Operational costs, LTL/year	Annual costs, LTL/year
	Renaturalisation	1 500 000	0	95 000
	Point pollution sources	8 000 000	400 000	932 000
	Measures against diffuse pollution	0	508 766	508 766
	Groundwater	0	0	0
Total		**9 512 000**	**909 000**	**1 537 000**
ŠVENTOJI	HPP	1 080 000	32 400	69 000
	Fish passes	127 600	2580	10 640
	Renaturalisation	8 810 000	0	559 000
	Point pollution sources	0	0	0
	Measures against diffuse pollution	0	2 544 663	2 544 663
	Groundwater	0	0	0
Total		**10 018 000**	**2 580 000**	**3 183 000**
NERIS SMALL TRIBUTARIES	HPP	0	0	0
	Fish passes	915 327	21 800	80 000
	Renaturalisation	1 940 000	0	123 000
	Point pollution sources	3 960 000	198 000	461 000
	Measures against diffuse pollution	0	607 599	607 599
	Groundwater	0	0	0
Total		**6 815 000**	**827 000**	**1 272 000**
NEVĖŽIS	HPP	1 480 000	44 400	138 000
	Fish passes	0	0	0
	Renaturalisation	17 190 000	0	1 091 000
	Point pollution sources	6 000 000	300 000	730 000
	Measures against diffuse pollution	0	1 946 122	1 946 122
	Groundwater	0	0	0
Total		**24 670 000**	**2 291 000**	**3 905 000**
ŠEŠUPĖ (incl. Prieglius)	HPP	0	0	0
	Fish passes	220 000	6 600	21 000
	Renaturalisation	13 060 000	0	829 000
	Point pollution sources	1 150 000	57 500	133 500
	Measures against diffuse pollution	0	2 719 934	2 677 328
	Groundwater	0	0	0
Total		**14 430 000**	**2 784 000**	**3 661 000**
DUBYSA	HPP	1 052 000	31 600	99 000
	Fish passes	165 400	3 400	10 500
	Renaturalisation	6 130 000	0	389 000
	Point pollution sources	0	0	0
	Measures against diffuse pollution	0	1 126 291	1 126 291
	Groundwater	0	0	0
Total		**7 374 000**	**1 161 000**	**1 625 000**
NEMUNAS SMALL TRIBUTARIES	HPP	80 000	2 400	7 000
	Fish passes	298 380	8 300	18 900
	Renaturalisation	10 800 000	0	685 000
	Point pollution sources	17 100 000	855 000	1 992 000
	Measures against diffuse	0	3 836 253	3 836 253

Sub-basin / basin	Group of measures	Investment costs until 2015, LTL	Operational costs, LTL/year	Annual costs, LTL/year
	pollution			
	Groundwater	0	0	0
Total		**28 278 000**	**4 702 000**	**6 539 000**
JŪRA	HPP	0	0	0
	Fish passes	870 486	25 600	80 800
	Renaturalisation	2 820 000	0	179 000
	Point pollution sources	800 000	40 000	93 000
	Measures against diffuse pollution	0	1 185 754	1 185 754
	Groundwater	0	0	0
Total		**4 490 000**	**1 251 000**	**1 539 000**
COASTAL RIVERS	HPP	0	0	0
	Fish passes	0	0	0
	Renaturalisation	0	0	0
	Point pollution sources	2 340 000	117 000	273 000
	Measures against diffuse pollution	0	420 154	420 154
	Groundwater	0	0	0
Total		**2 340 000**	**537 000**	**693.000**
NEMUNAS RBD	**Hydropower plants**	**8 192 000**	**245 800**	**598 000**
	Fish passes	**3 427 200**	**90 300**	**297 000**
	Renaturalisation	**71 940 000**	**0**	**4 558 000**
	Point pollution sources	**40 550 000**	**2 027 500**	**4 754 500**
	Measures against diffuse pollution	**0**	**17 230 000**	**17 230 000**
	Groundwater	**0**	**0**	**0**
	Studies on reduction of pollution of coastal and transitional waters	**430 000**	**300 000**	**360 000**
	Research, studies and pilot projects (excl. studies coastal waters)	**1 015 000**	**155 000**	**268 000**
Total (maximum scenario)		**125 550 000**	**20 050 000**	**28 070 000**
Grand total until 2015 (excl. replacement of turbines and river naturalisation)		**45 418 000**	**19 804 200**	**22 914 000**

Source: Consultant

391. Table 225 provides the costs to be borne by the public sector – the state or municipalities.

Table 225. Preliminary costs of the implementation of measures in the Nemunas RBD to be borne by the state and municipalities

Group of measures	Investment costs until 2015, LTL	Operational costs, LTL/year	Annual costs, LTL/year
HPP	0	0	0
Fish passes	3 207 205	83 661	275 940
Renaturalisation	0	0	0
Point pollution sources	40 550 000	2 027 500	4 754 500
Measures against diffuse pollution	0	293 000	293 000

Measure implementation control		200 000	200 000
Groundwater	0	0	0
Reduction of pollution of coastal and transitional waters	430 000	300 000	360 000
Research, studies and pilot projects (excl. studies on transitional and coastal waters)	1 015 000	455 000	568 000
Total	**45 200 000**	**3 100 000**	**6 200 000**

CHAPTER IX. CROSS-BORDER COOPERATION

Cooperation with the neighbouring EU Member States (Latvia and Poland)

392. Cooperation in the field of the protection of the environment (including water bodies) with Poland has been going on since 1992 pursuant to the Agreement between the Ministry of Environmental Protection, Natural Resources and Forestry of the Republic of Poland and the Department of Environmental Protection of the Republic of Lithuania on cooperation in the field of the protection of the environment signed on 24 January 1992, and cooperation with Latvia is based on the Agreement signed between the Government of the Republic of Lithuania and the Government of the Republic of Latvia on cooperation in the field of the protection of the environment signed on 1 October 1999. Plans on cooperation in environmental protection are drawn up between the Ministry of the Environment of the Republic of Lithuania and the Ministry of the Environment of the Republic of Latvia and the Ministry of Environmental Protection of the Republic of Poland every two years. In addition, an Inter-institutional agreement was signed on 4 October 2006 between the Latvian Environment, Geology and Meteorology Centre and the Lithuanian Environmental Protection Agency on cooperation in the monitoring of transboundary water bodies and exchange of information. Pursuant to the provisions of the said cooperation agreement, the countries exchange information on the monitoring of transboundary surface water bodies situated in the border zone and data on the status of water bodies and on pollution loads entering Lithuania from the territory of Latvia. Joint sampling is conducted in transboundary surface water bodies situated in the border zone and inter-laboratory comparative tests are performed with Polish environmental institutions.

393. The Nemunas project also involved exchange of information and experience in the development of RBD management plans with representatives of various Polish institutions. Specialists from the Environmental Protection Agency and project experts took part in a number of workshops and meetings both in Poland and Lithuania, where Polish and Lithuanian RBD management plans were presented and discussed as well as criteria for the assessment of the status of water bodies were analysed. The said criteria were also addressed in the following international workshops, seminars, conferences and working meetings:

393.1. Conference on the presentation of Polish RBD management plans, 25-26 March 2009, Rawa Mazowiecka, Poland, with participation of four Nemunas project experts and the Director of the River Basin Management Department of the Environmental Protection Agency;

393.2. Seminar “Sustainable Wastewater Management in River Basin Management Plans in the Baltic Sea Region”, 19-20 November 2009, Gdynia, Poland. The Nemunas project manager presented the Nemunas RBD Management Plan and the status assessment criteria for water bodies;

393.3. Seminar “Meeting of Interested Parties for a Discussion on the Management of Drūkšiai Lake Basin”, 21-22 April 2009, Visaginas, Lithuania, with the participation of three Nemunas project experts and representatives of the Environmental Protection Agency. Director of the River Basin Management Department presented a draft Nemunas RBD Management Plan and the status assessment criteria for water bodies.

Cooperation with the neighbouring non-member States (Belarus and Russian Federation)

394. While implementing the provisions of the WFD on coordination of actions in managing transboundary water bodies with the neighbouring countries, Lithuania initiated preparation of an agreement between the governments of the Russian Federation, Belarus and Lithuania, and the European Commission on cooperation in the use and protection of water bodies within the Nemunas River Basin District. Such draft has been drawn up.

Cooperation in the field of the protection of the environment (including water bodies) with Belarus and Russian Federation has been going for a number of years on the basis of cooperation agreements signed by the Ministry of the Environment of the Republic of Lithuania with the Ministry of Natural Resources of the Republic of Belarus and with the Ministry of Natural Resources of the Russian Federation. In addition, a working group for the monitoring of transboundary surface water bodies and groundwater bodies under the Commission on Environmental Protection of the Board on Long-term Cooperation of Lithuanian-Russian Regional and Local Authorities has been set up to address issues of the monitoring of water bodies and identification of pollution sources.

395. The following agreements on inter-institutional cooperation have been signed with Belarus and Kaliningrad Region of the Russian Federation:

395.1. Technical Protocol between the Ministry of the Environment of the Republic of Lithuania and the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus on cooperation in the field of monitoring and exchange of data on the status of transboundary surface water bodies, signed by the Ministers of the Environment of both countries on 10 April 2008;

395.2. Agreement between the Environmental Protection Agency, Lithuanian Hydrometeorological Service under the Ministry of the Environment of the Republic of Lithuania and the federal state institution Kaliningrad Hydrometeorological and Environmental Monitoring Centre of the Russian Federal Service for Hydrometeorology and Environmental Monitoring on cooperation in the field of monitoring and exchange of data on the status of transboundary surface water bodies, signed on 21 October 2003.

396. Implementation of the provisions of the above-listed inter-institutional agreements includes exchange of information on the monitoring of water bodies situated in the border zone and data on parameters indicative of physico-chemical quality elements and pollution of water bodies, joint sampling in transboundary surface water bodies situated in the border zone and inter-laboratory comparative tests. The project also involved exchange of information and experience in the development of RBD management plans with representatives of various Belarusian institutions. Criteria (BOD concentrations) were discussed in September 2009 in Druskininkai at the meeting of specialists of the Ministry of the Environment, Environmental Protection Agency and project experts

with representatives from Belarus who presented the EIA of the construction Grodno HPP for the Nemunas River in Lithuania. Although the project experts were not able to meet Russian experts directly, such meetings were held with specialists and officials of the Environmental Protection Agency.

CHAPTER X. PUBLIC INFORMATION AND CONSULTATION

397. The process of public information on river basin management started back in 2005 when RBD Coordination Councils were formed. The main task of the Coordination Councils is to facilitate the implementation of river basin district management plans.

398. Much attention was paid to public information upon the start of a transitional-period project *Strengthening of Institutional Capacities in Management of the Nemunas River Basin* in 2006. A few large information events took place in 2007:

398.1. A seminar was arranged for the main interested parties: municipalities, REPD, NGO, Coordination Councils of the Nemunas, Lielupe, Venta and Dauguva RBD. Altogether 97 participants took part in the seminar. This event was highlighted by the mass media. The seminar covered the following main topics:

398.1.1. River basin management principles and implementation of the WFD;

398.1.2. Public participation in the management of water resources;

398.1.3. Beginning of the development of the Nemunas RBD Management Plan.

398.2. Interested parties within the Nemunas RBD were identified in 2007 and an analysis of their knowledge and expectations was performed. The project experts received over 120 comments and suggestions from the interested parties, including farmers, businessmen, water supply companies and municipal representatives.

398.3. The Environmental Protection Agency signed cooperation agreements with six NGO active in the water field: Station of Nature Research and Ecological Education (Marijampolė), Lithuanian Green Movement, ECAT Lietuva (both located in Kaunas), ecological club Žvejonė (Klaipėda), public establishment Vandens namai, and Baltic Environmental Forum (Vilnius). These organisations have become information centres. Activity plans of the information centres were developed for 2006-2015 m.

398.4. A popular leaflet outlining the importance of good water management and changes in water policy was prepared for the public and printed in 5 000 copies. The leaflet was distributed during information campaigns and workshops.

398.5. On the occasion of the World Water Day, an information campaign on the Nemunas Management Plan under development, river basin districts and pollution sources was held in March 2007 and information was distributed on the policy of management and protection of water bodies in 6 cities of Lithuania: Klaipėda, Kaunas, Alytus, Kėdainiai, Vilnius and Marijampolė. The campaign was run by the information centres. The main attraction of the public and mass media representatives during the campaign was an info-minibus which presented a mobile exposition: a film on water issues was shown as well as leaflets about water were distributed. Representatives of the REPD answered people's questions, gave interviews for different national and regional newspapers as well as TV and radio broadcasts.

398.6. A couple of workshops were organised for the interested parties:

398.6.1. Integration of the spatial planning and river basin management. The workshop was addressed for the staff of the counties and municipalities administration, REPD, EPA and MoE. Altogether 55 persons participated in the workshop;

398.6.2. Training of trainers. Participants from information centres, REPD, EPA and municipal association were invited to this workshop (10 people). The training programme consisted of two parts: aspects related to water management and protection and issues of communication of various interested groups.

398.6.3. A draft Nemunas RBD Management Plan was presented to the public and interested groups in November 2007. The participants of the seminar included 110 representatives of ministries, municipalities and county administrations, regional environmental protection departments, Coordination Councils of the Nemunas RBD and private companies, members of NGOs and professional associations.

398.7. The main water protection problems within the RBD were formulated and presented on the website of the EPA at the end of 2007. The information on the Internet was maintained for 8 months. Water protection problems of the Lithuanian river basin districts were discussed in spring 2008 at the Environmental Protection Agency with representatives of RBD Coordination Councils who provided a number of comments and suggestions regarding identification and solution of water protection problems.

398.8. A preliminary Nemunas RBD Management Plan and Programme of Measures were placed on the website of the EPA at the beginning of 2009. The public was asked to provide their comments and proposals on these documents by 31 May 2009. Written comments were provided by the State Environmental Health Centre, Environmental Protection Department of Vilnius Region under the MoE, Ministry of Agriculture, Union of Land Management and Hydraulic Engineers of Lithuania, Lithuanian Hydropower Association.

398.9. A meeting was held at the EPA on 13 May 2009 with representatives of the Water Problems Council, the majority of whom are also members of the Nemunas RBD Coordination Council. The draft Nemunas RBD Management Plan and Programme of Measures were presented and comments and proposals on the said documents by the Board members were received.

398.10. A meeting of the Nemunas RBD Coordination Councils was held on 6 November 2009 to present and discuss the draft Management Plan and Programme of Measures.

Summary of public information and consultation measures, their outputs and amendments of the Plan as a result of these measures

399. Written comments on the draft Nemunas RBD Management Plan and Programme of Measures which were twice published on the website of the EPA have been provided:

399.1. The State Environmental Health Centre made four comments, all of which were accepted and taken into account when preparing the drafts of the Plan and Programme of Measures.

399.2. The Environmental Protection Department of Vilnius Region under the Ministry of the Environment sent a letter saying that the Department had no comments or proposals either on the Management Plan or the Programme of Measures.

399.3. The Ministry of Agriculture provided one comment on 30 April 2009 regarding the use of the term “wetlands“. The comment was accepted and taken into account.

399.4. The Union of Land Management and Hydraulic Engineers of Lithuania provided 13 comments, most of which were accepted and taken into account when preparing the final draft of the Management Plan.

399.5. A member of the Water Problems Council under the Academy of Science of the Republic of Lithuania Mr. A.S. Šileika provided 25 comments, mainly of a technical nature, both on the Management Plan and Programme of Measures. Substantial comments were taken into account when preparing the final draft of the Management Plan and Programme of Measures. Some comments were not acceptable, e.g. a suggestion to change the structure of the Management Plan since the structure is regulated in Annex VII to the WFD. A number of technical comments could not have been included in the Plan due to failure to conform to the requirements of the Terms of Reference (e.g. a suggestion to assess impacts of economic activities using two models, etc.).

399.6. The Lithuanian Hydropower Association provided one comment on the conservation of old dams which are heritage objects. The comment was acceptable and taken into account. The draft Management Plan suggests conserving old dams included in the list of heritage objects.

399.7. The Administration of Municipality of Palanga town put forward a proposal of editorial type for the Management Plan. The comment was taken into account.

399.8. The Council of Birštonas Municipality suggested considering the need to clean bottom sediments in the Nemunas at Birštonas where Kauno Marios Lagoon starts. In experts’ opinion, the comment is subject to discussions.

399.9. The Administration of the Governor of Marijampolė County provided a few comments of editorial type and put forward a proposal to describe the status of the rivers Neris, Šventoji, Šešupė and the Nemunas at their entry into the Republic of Lithuania. The comments were taken into account when amending the Management Plan.

CHAPTER XI. COMPETENT AUTHORITIES

400. The role of the Environmental Protection Agency 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.

Coastal and transitional waters also fall under the responsibility of the Environmental Protection Agency and its subdivision Marine Research Department. The main task of the Marine Research Department is to ensure continuous and complex chemical and biological analyses of the environmental status, air and other environmental components of the Baltic Sea, Curonian Lagoon and fresh surface waters in Klaipėda region, objective assessment of the data obtained, producing forecasts and provision of information to public authorities for the purpose of formulation of environmental policy, validation of environmental measures and assessment of their effectiveness.

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.

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.

401. Names and addresses of the competent authorities:

Table 226. Environmental Protection Agency

Name	Official name	Environmental Protection Agency
	Acronym	EPA
	CA Code(1)	
Address	Number	9
	Street	A. Juozapavičiaus
	City	Vilnius
	Lithuania	Lithuania
	Postal Code	09311
	Website	http://aaa.am.lt
Additional information	Contact person	Mindaugas Gudas
	Job title of the contact person	Director of the Environment Status Assessment Department
	Contact information (email, telephone)	m.gudas@aaa.am.lt +370-5-2662814

Table 227. Lithuanian Geological Survey

Name	Official name	Lithuanian Geological Survey
	Acronym	LGS
	CA Code(1)	
Address	Number	35
	Street	Konarskio
	City	Vilnius
	Lithuania	Lithuania
	Postal Code	LT-03123
	Website	www.lgt.lt
Additional information	Contact person	Kęstutis Kadūnas
	Job title of the contact person	Head of the Hydrogeological Division
	Contact information (email, telephone)	Kestutis.kadunas@lgt.lt +370-5-2136272

Table 228. Regional Environmental Protection Departments

No.	**Name**	**Address**
1.	Environmental Protection Department of Klaipėda Region	Birutės 16, Klaipėda Phone (8-46) 466453, fax (8-46) 46 64 52 rastine@klrd.am.lt
2.	Environmental Protection Department of Marijampolė Region	Dariaus ir Girėno g. 4, Marijampolė Phone (8-343) 97808, fax (8-343) 91955 mraad@mrd.am.lt
3.	Environmental Protection Department of Panevėžys Region	Žvaigždžių g. 1, Panevėžys Phone (8-45) 514481, fax (8-45) 581401, el.

No.	Name	Address
		p. el. v.jakstas@prd.am.lt
4.	Environmental Protection Department of Vilnius Region	A.Juozapavičiaus 9, LT-09311 Vilnius Phone (8-5) 2728536, fax (8-5) 272 8389 r.masilevicius@vrd.am.lt
5.	Environmental Protection Department of Alytus Region	Kauno g. 69, LT-62107 Alytus. Phone 8-315 56730, fax 56732 alytus@ard.am.lt
6.	Environmental Protection Department of Kaunas Region	Rotušės a. 12, Kaunas Phone (8-37) 320704, fax (8-37) 320854 kauno.raad@krd.am.lt ,
7.	Environmental Protection Department of Šiauliai Region	Čiurlionio 3, LT-76303, Šiauliai Phone (8-41) 524143 , fax (8-41) 503705 Srd@srd.am.lt
8.	Environmental Protection Department of Utena Region	Metalo g.11, 28217 Utena. Phone 8-389 69106, fax 8-389 69662 utena@urd.am.lt