APPROVED by
Resolution No. 1616
of the Government of the Republic of Lithuania
of 17 November 2010

# DAUGUVA RIVER BASIN DISTRICT MANAGEMENT PLAN

## CHAPTER I. GENERAL PROVISIONS

1. While implementing the provisions of the Law of the Republic of Lithuania on Water (Žin.*, 1997, No. 104-2615; 2000, No. 61-1816; 2003, No. 36-1544), which has also transposed the requirements of Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ 2004 special edition, Chapter 15, Volume 5, p. 275) (WFD) – the key European Union (EU) legal act in the field of water policy, the Environmental Protection Agency (EPA), in cooperation with the Lithuanian Geological Survey (LGS), has drawn up this Dauguva River Basin District (RBD) Management Plan.

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

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

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

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

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* *Valstybės žinios* [official gazette]

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

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

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

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

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

## CHAPTER II. CHARACTERISTICS OF THE DAUGUVA RIVER BASIN DISTRICT

### SECTION I. SURFACE WATER BODIES

2. The Dauguva RBD (Figure 1) comprises the Lithuanian parts of the Dysna, Laukesa and Lukšta catchments. The Dysna and the Laukesa are left tributaries of the Dauguva meanwhile the Lukšta (Ilūkstė) does not fall directly into the Dauguva; instead, having merged with the Dvietė River, it constitutes another left tributary of the Dauguva – the

Berezovka. Territories of a lower level, sub-basins, have not been singled out for the Dauguva RBD.

In Lithuania, the catchments of the Dysna, Laukesa and Lukšta lie at 55°7‘– 55°56‘ N and 25°59‘– 26°52‘ E. The total length of the Dysna is 173.4 km and its catchment area constitutes 8 179.5 $km^2$. 19.1 km of the upper Dysna belong to Lithuania, for 39.2 km the river flows along the Lithuanian-Belarusian border, and the remaining stretch of 115.1 km is situated in Belarus. The Lithuanian part of the catchment covers the area of 1 403.7 $km^2$. The total length of the Laukesa is 31.4 km, the catchment area is 761.5 $km^2$. A stretch of the Laukesa in the length of 2 km flows along the Lithuanian-Latvian border and the remaining stretch of 29.1 km is in Latvia. The Lithuanian part of the catchment covers the area of 310.4 $km^2$, of which 240.5 $km^2$ constitute the catchment of Lake Laukesas where the springs of the Laukesa are located, and 69.9 $km^2$ make up part of the catchment of the Kumpuotė, which is a right tributary of the Laukesa. The total length of the Lukšta River is 35.9 km, a stretch of the upper Lukšta in the length of 2.6 km flows in Lithuania, and the remaining part – in Latvia. The total area of the Lukšta catchment is 396.5 $km^2$, of which 142.7 $km^2$ are situated in Lithuania. The resulting total area of the Dauguva RBD is 1 856.8 $km^2$.


Figure 1. Dauguva RBD

## Characterisation of water bodies

3. 2.8% of the total area of the Dauguva River Basin, which consists of the upper reaches of the catchments of three left tributaries of the Dauguva River – the Dysna, the Laukesa and the Lukšta, is located in Lithuania. The Lithuanian parts of the catchments of the tributaries of the Dauguva River are situated in the eastern slope of the Baltic

Highlands (*Baltijos aukštumos*): Zarasai Upland (*Zarasų aukštuma*), Švenčionys Upland (*Švenčionių aukštuma*) and the plain of the Dysna (*Dysnos lyguma*).

The Dysna flows out of Lake Dysnykštis in Ignalina district; however, the hydrological springs of the Dysna are located in Lake Ažvintaitis (Lake Ažvintaitis → A-1 → Lake Ažvintis → S-1 → Lake Sągardas → the Notrynė → the Svetyčia → Lake Dysnai → the Dysnykščia → Lake Dysnykštis → the Dysna). The surface of the catchment is dominated by heavy-textured soils – clays and clay loams cover more than 80% of the catchment. The wood density is 11.2%, bogs, marshes and swamps comprise 13.4% of the territory. The bed slope is 0.036% in the upper reaches and 0.007% in the border zone.

The Laukesa flows out of Lake Zarasas, the largest tributary of which is the Nikajus, therefore this catchment is often called the Laukesa-Nikajus catchment. The average bed slope is 0.1%. There are 67 lakes in the catchment and the lake percentage is 9%. The forest density is 13.2%, bogs, marshes and swamps take up 16.9% of the catchment area. The average annual runoff rate is 5.25 l/s/$km^2$, the average annual discharge at the Lithuanian-Latvian border is 1.6 $m^3$/s.

The Lukšta (which is called Ilūkste in Latvia) flows out of Lake Lukštas in Zarasai district. The lake percentage of the catchment is 9%, there are 23 lakes with an area larger than 0.005 $km^2$. The wood density is 10%, bogs, marshes and swamps comprise 16.0% of the territory.

The river network in the Dauguva RBD is comprised of 125 rivers longer than 3 km and 510 ones which are shorter than 3 km. The total length of the rivers is 1 809 km. The density of the network of the rivers longer than 3 km totals to 0.48 km/$km^2$ and that of the smaller ones (i.e. shorter than 3 km) is 0.50 km/$km^2$.

The Drūkša and the Birvėta are the longest and the largest rivers according to their catchment areas in the Dauguva RBD on the territory of Lithuania. The length and the catchment size of the main rivers as well as the size of lakes with the surface area larger than 0.5 $km^2$ in the Dauguva RBD in Lithuania are given in the tables below:

Table 1. Length and catchment size of rivers in the Dauguva RBD

| River | Bank of inflow | Distance from the mouth, km | Length, km | | Catchment size, $km^2$ | |
|---|---|---|---|---|---|---|
| | | | total | in Lithuania | total | in Lithuania |
| Dysna catchment | | | | | | |
| Raukėta | l | 134.9 | 19.6 | 19.6 | 85.7 | 85.7 |
| Drūkša | l | 113.6 | 48.1 | 48.1 | 1 007.6 | 310.3 |
| Birvėta | r | 109.0 | 36.4 | 33.1 | 1 607.0 | 543.3 |
| Laukesa catchment | | | | | | |
| Nikajus[1] | - | - | 14.7 | 14.7 | 164.8 | 164.8 |
| Kumpuotė | r | 15.2 | 17.4 | 0.0 | 169.2 | 69.9 |
| Lukšta catchment | | | | | | |
| Stelmužė[2] | - | - | 11.6 | 11.6 | 49.1 | 49.1 |
| Rauda | k | 27.8 | 8.3 | 8.3 | 100.4 | 88.5 |

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

[1] [1] The Nikajus flows into Lake Zarasas (Lake Zarasas → Lake Zarasaitis → the upper reaches of the Laukesa → Lake Laukesa → the Laukesa).

[2] The Stelmužė flows into Lake Lukštas where the springs of the Lukšta are located.

Table 2. Largest lakes in the Dauguva RBD

| Lake | Inventory number | Direct stream | Depth, m | | Area, km$^2$ | | Volume, thou. m³ | Catchment size, km² |
|---|---|---|---|---|---|---|---|---|
| | | | max | average | in the plan | on the list | | |
| Dysna catchment | | | | | | | | |
| Drūkšiai | 33-7 | Drūkša | 33.30 | 8.21 | 44.80 | 36.222 | 367 650.0 | 470.0 |
| Dysnai | 32-189 | Dysnykščia | 6.00 | 3.00 | 24.394 | 24.009 | 74 927.0 | 231.0 |
| Parsvėtas | 32-173 | - | - | 5.1 | 0.893 | 0.874 | ? | ? |
| Prūtas | 33-13 | R-1 | - | 5.9 | 4.634 | 2.661 | ? | ? |
| Apvardai | 33-12 | Apyvardė | 4.97 | 2.65 | 5.502 | 4.248 | 14 596.0 | 134.5 |
| Dysnykštis | 32-190 | Dysna | 5.00 | 2.70 | 5.381 | 5.575 | 14 749.0 | 245.9 |
| Smalvas | 32-147 | Smalva | 26.90 | 8.20 | 3.275 | 3.36 | 26 908.0 | 38.6 |
| Ažvintis | 32-183 | S-1 | 23.00 | 5.70 | 2.621 | 2.636 | 15 018.0 | 17.6 |
| Rūžas | 32-195 | Rūžas stream | 4.32 | 2.47 | 2.29 | 2.192 | 5647.3 | 82.4 |
| Visaginas | 32-160 | Visaginas | 6.55 | 2.90 | 2.197 | 2.204 | 6 354.4 | 10.0 |
| Erzvėtas | 45-2 | Birvėta | 19.00 | 8.10 | 1.972 | 2.062 | 16 007.0 | 205.5 |
| Alksnas | 32-178 | R-2 | 4.60 | 2.56 | 1.781 | 1.761 | 4 741.0 | 22.2 |
| Lazdinių ežeras | 45-15 | Lazdauja | 12.00 | 4.70 | 1.322 | 1.323 | 5 991.7 | 32.8 |
| Sągardas | 32-184 | Notrynė | 26.50 | 7.60 | 1.228 | 1.139 | 9 385.0 | 34.4 |
| Žilmas | 32-180 | Žilma | 29.00 | 7.69 | 1.005 | 0.948 | 8 259.3 | 92.7 |
| Svirkų ežeras | 45-11 | Kamoja | 3.90 | 1.40 | 0.914 | 0.87 | 1 250.0 | 343.3 |
| Smalvykštis | 32-121 | Dulvas | 4.80 | 3.10 | 0.897 | 0.945 | 2 741.5 | 25.5 |
| Kančioginas | 44-67 | Kančiogina | 13.80 | 4.97 | 0.858 | 0.819 | 4 306.9 | 63.1 |
| Ilgiai | 32-177 | A-1 | 13.98 | 4.60 | 0.624 | 0.561 | 2 850.4 | 7.2 |
| Šakių ežeras | 33-1 | D-3 | 3.80 | 2.43 | 0.521 | - | 1 266.8 | 3.1 |
| Laukesa catchment | | | | | | | | |
| Avilys | 21-41 | Avilė | 13.50 | 3.00 | 12.580 | 12.241 | 36 294.0 | 73.7 |
| Zarasas | 21-49 | Zarasaitis | 36.60 | 11.50 | 3.266 | 3.234 | 37 704.0 | 198.3 |
| Auslas | 21-42 | Nikajus | 8.00 | 4.50 | 1.56 | 1.512 | 4 190.0 | 83.2 |
| Laukesas | 21-52 | Laukesa | - | 5.9 | 1.018 | 0.837 | ? | ? |
| Kumpuolis | 21-63 | Kumpuolėja | - | 5.1 | 0.566 | 0.501 | ? | ? |
| Ilgis | 21-75 | S-2 | 14.32 | 3.80 | 0.734 | 0.723 | 2 789.1 | 12.3 |
| Imbradas | 21-30 | Imbradėlė | 3.30 | 2.12 | 0.617 | 0.587 | 1 308.7 | 13.0 |
| Lukšta catchment | | | | | | | | |
| Čičirys | 21-11 | Upiškių stream | 39.20 | 7.70 | 6.996 | 6.885 | 53 679.2 | 60.9 |
| Lukštas | 21-7 | Lukšta | 3.54 | 1.98 | 1.164 | 1.085 | 2 305.3 | 58.4 |
| Suvieko ežeras | 21-2 | Z-1 | 8.90 | 3.60 | 1.086 | 1.068 | 3 338.0 | 71.2 |
| Ilgis | 21-16 | Č-2 | 18.80 | 5.98 | 0.95 | 0.89 | 5 686.0 | 11.8 |

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

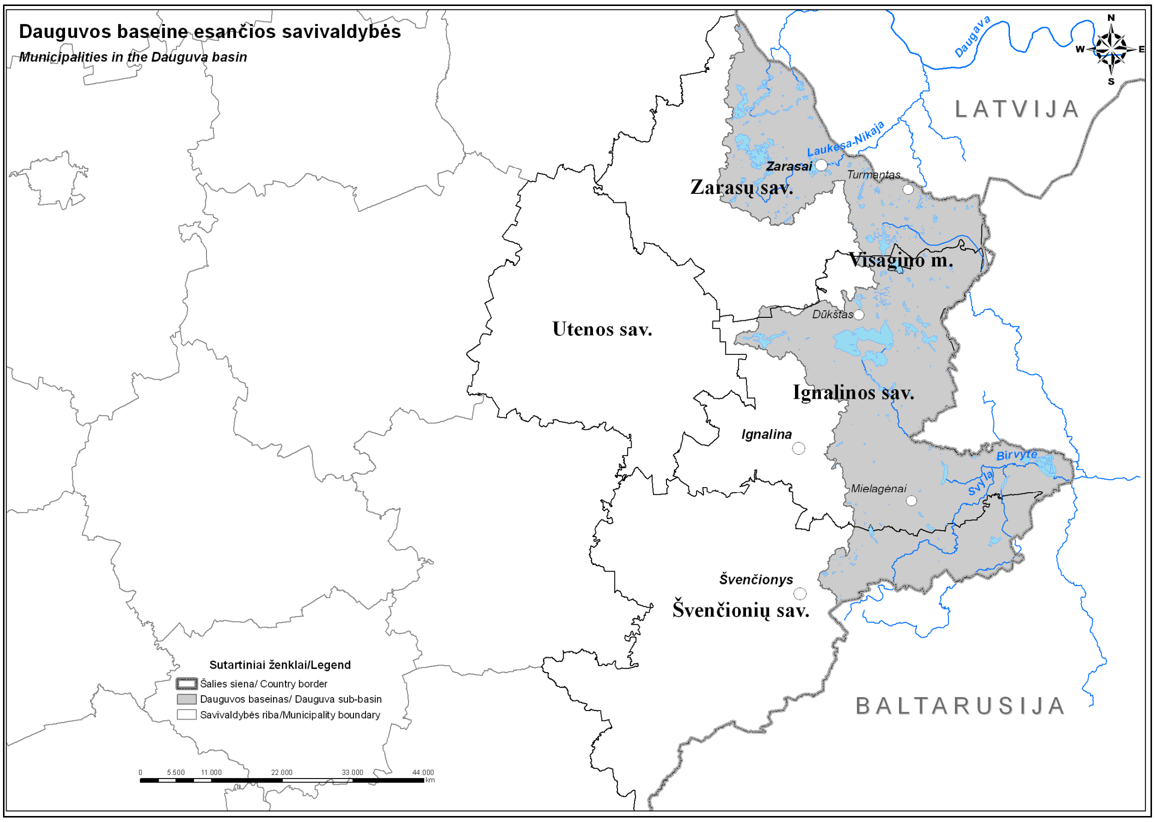


Figure 2. Municipalities situated in the Dauguva Basin

4. As shown in Figure 2, there are four municipalities within the Dauguva River Basin: municipalities of Zarasai, Visaginas town, Ignalina and Švenčionys. Half of the Dauguva Basin (52.7%) is situated in the municipality of Ignalina district, 31.7% of the territory is located in the municipality of Zarasai district and 17% – in the municipality of Švenčionys district. Visaginas town occupies only 0.5% of the Dauguva Basin area.

## Typology of water bodies

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

## Water bodies in the category of rivers

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

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

8. The river types within the Dauguva RBD and the corresponding characterising factors are provided in Table 3 below.

Table 3. Typology of rivers in the Dauguva RBD

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

Source: experts' analysis results

Taking into account the typology and impacts of human activity on the status of rivers, 20 water bodies (including heavily modified ones) have been identified in the Dauguva RBD with the total length of 281.6 km. The aggregate length of smaller rivers within the Dauguva RBD, which were not grouped into distinct water bodies, totals to 2 393 km.

The number and length of river water bodies of different types within the Dauguva RBD are given in Table 4 and the river types are demonstrated in Figure 3.

Table 4. Number and length of river water bodies in the Dauguva RBD

| Type | No. of water bodies | Total length of water bodies, km |
|---|---|---|
| 1 | 15 | 175.2 |
| 2 | 4 | 99.4 |
| 3 | 1 | 7 |

Source: experts' analysis results

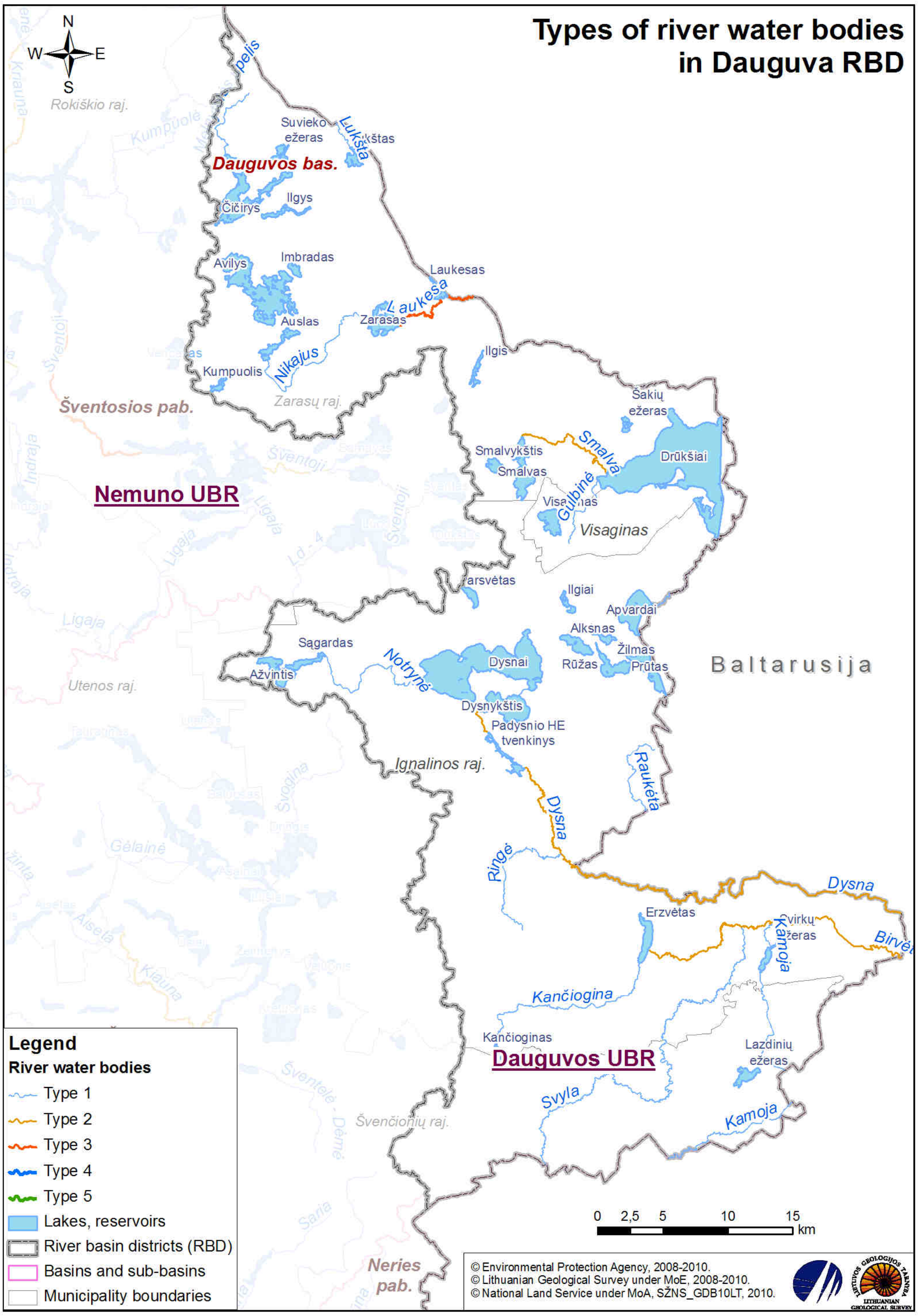



Figure 3. Types of rivers in the Dauguva RBD

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

**Water bodies in the category of lakes and ponds**

9. Three main types of lakes have been identified in the Dauguva RBD. The major factor that determines the most significant differences between the communities of aquatic organisms is the average depth of lakes. As in the case of rivers, the characterisation of the types of lakes also involves other obligatory factors, such as

absolute altitude, geology, and surface area. By absolute altitude (obligatory factor), all Lithuanian lakes belong to one type. By geology, almost all lakes (with individual exceptions) are classified as calcareous, i.e. also belong to one type. All lakes are classified into one group of lakes larger than 0.5 $km^2$ (50 ha) (pursuant to the Description of the Types of Surface Water Bodies, Description of the Indicators of Reference Conditions of the Quality Elements for Surface Waters, and the Description of the Criteria for the Identification of Artificial, Heavily Modified Water Bodies and Water Bodies at Risk, only the lakes with an area >0.5 $km^2$ shall be classified) because the differences in the aquatic communities in lakes larger than 0.5 $km^2$ within the Dauguva RBD are determined by the depth and not by the size of the lake. By average depth, lakes are differentiated into three groups: lakes with an average depth less than 3 m, within the range of 3-9 m, and more than 9 m.

The types of lakes within the Dauguva RBD and the factors characterising the types are presented in Table 5.

Table 5. Typology of lakes in the Dauguva RBD

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

Source: experts' analysis results

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

There are 31 lakes and 1 pond within the Dauguva RBD. These include 16 lakes and 1 pond of Type 1, 14 lakes of Type 2 and 1 lake of Type 3.

Apart from the said water bodies, there are 351 lakes smaller than 0.5 $km^2$ within the Dauguva RBD, with the total area of 28.7 $km^2$. These lakes were not categorised into individual water bodies because most of them are included in larger drainage basins, which serve as the basis for the management of their status. Therefore, status improvement measures applied in the drainage basins of larger (with an area >0.5 $km^2$) lakes will also affect the quality of the smaller ones situated in the respective basins.

Table 6. Number and area of lakes and ponds in the Dauguva RBD

| **Type** | **Lakes** | | **Ponds** | |
|---|---|---|---|---|
| | **Number of water bodies** | **Area, $km^2$** | **Number of water bodies** | **Area, $km^2$** |
| 1 | 16 | 61.166 | 1 | 1.093 |
| 2 | 14 | 60.535 | - | - |
| 3 | 1 | 3.253 | - | - |
| **Total** | **31** | **124.954** | **1** | **1.093** |

Source: experts' analysis results

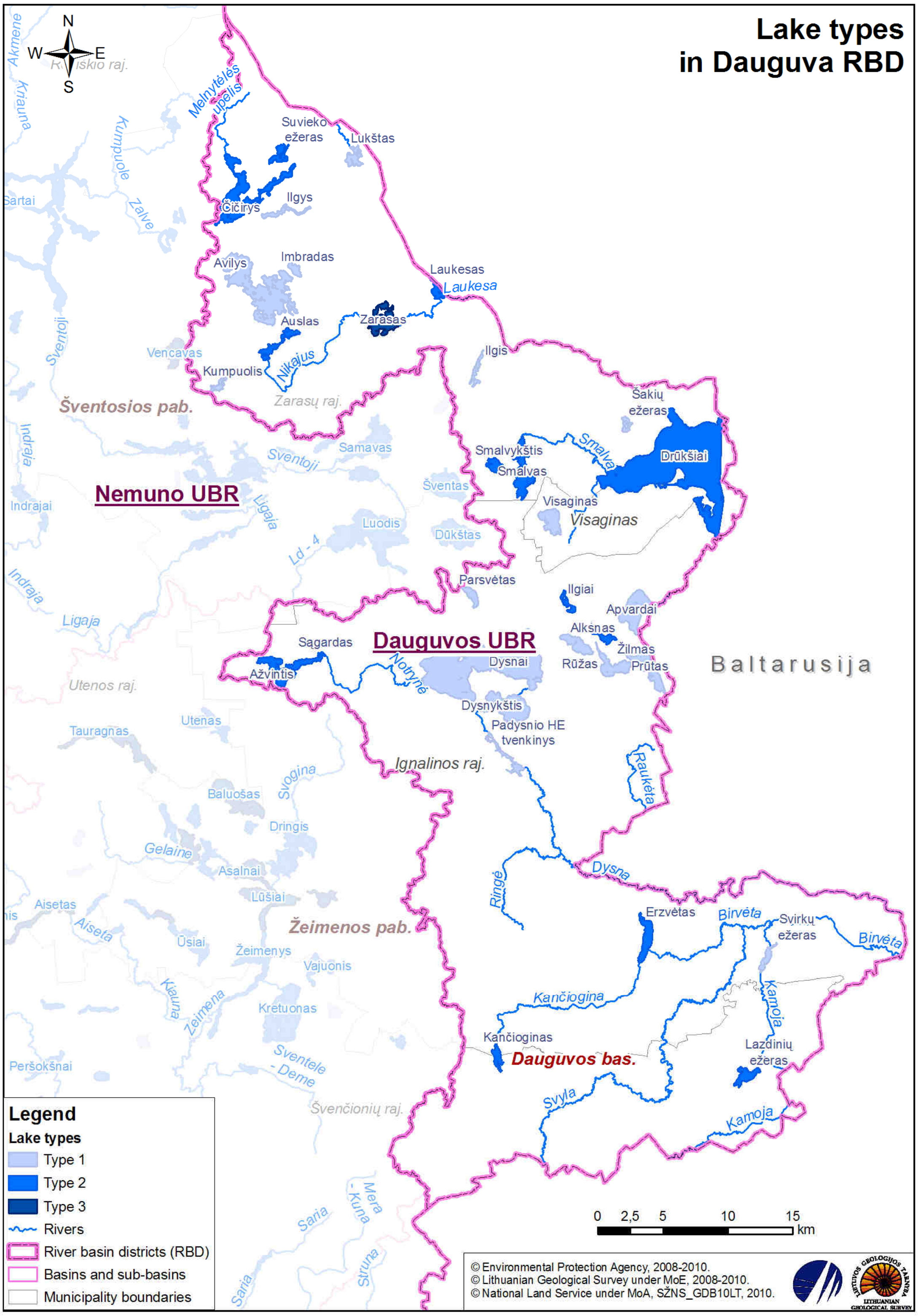



Figure 4. Types of lakes and ponds in the Dauguva RBD

## Heavily modified water bodies

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

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

There are a number of rivers with straightened beds in the Dauguva RBD; however, monitoring data on the status of aquatic organisms therein is scarce. An analysis of physico-chemical, hydromorphological and biological elements carried out on the basis of data from other river basin districts showed that the ecological status of aquatic organisms (zoobenthos, fish fauna) in rivers that meet good ecological status criteria according to the physico-chemical indicators but have a low slope (lower than 1.5 m/km) is worse than good. The major part of the Dauguva RBD on the territory of Lithuania is situated in uplands where river slopes are rather high (>1.5 m/km). According to the monitoring data, the status of zoobenthic communities in straightened rivers – even those with a bed slope lower than 1.5 m/km – is good. On the other hand, there is no data on other aquatic organisms. Following the general principle of the assigning of straightened rivers to the category of HMWB, straightened rivers with a bed slope lower than 1.5 m/km and flowing over urbanised areas (artificial restoration of beds in urbanised areas is difficult due to limited remeandering possibilities) in the Dauguva RBD are assigned to HMWB .

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

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

The HMWB designation process consisted of the following steps:

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

10.2. Characterisation of the user(s) benefiting from the changes;

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

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

10.5. Test: Are the impacts significant?

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

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

11. The following HMWB have been identified within the Dauguva RBD:

11.1. One river water body – the Nikajus River, comprising 5% of the total number of river water bodies within the Dauguva RBD. Its length, which is 12 km, makes up 4% of the total length of all river water bodies in the basin.

11.2. Heavily modified water bodies also include ponds larger than 0.5 $km^2$. There is only ones such pond in the Dauguva RBD – the pond of Padysnis hydropower plant (HPP) (1.088 $km^2$), which is important for electricity generation and recreation.

Heavily modified water bodies within the Dauguva RBD are demonstrated in Figure 5.

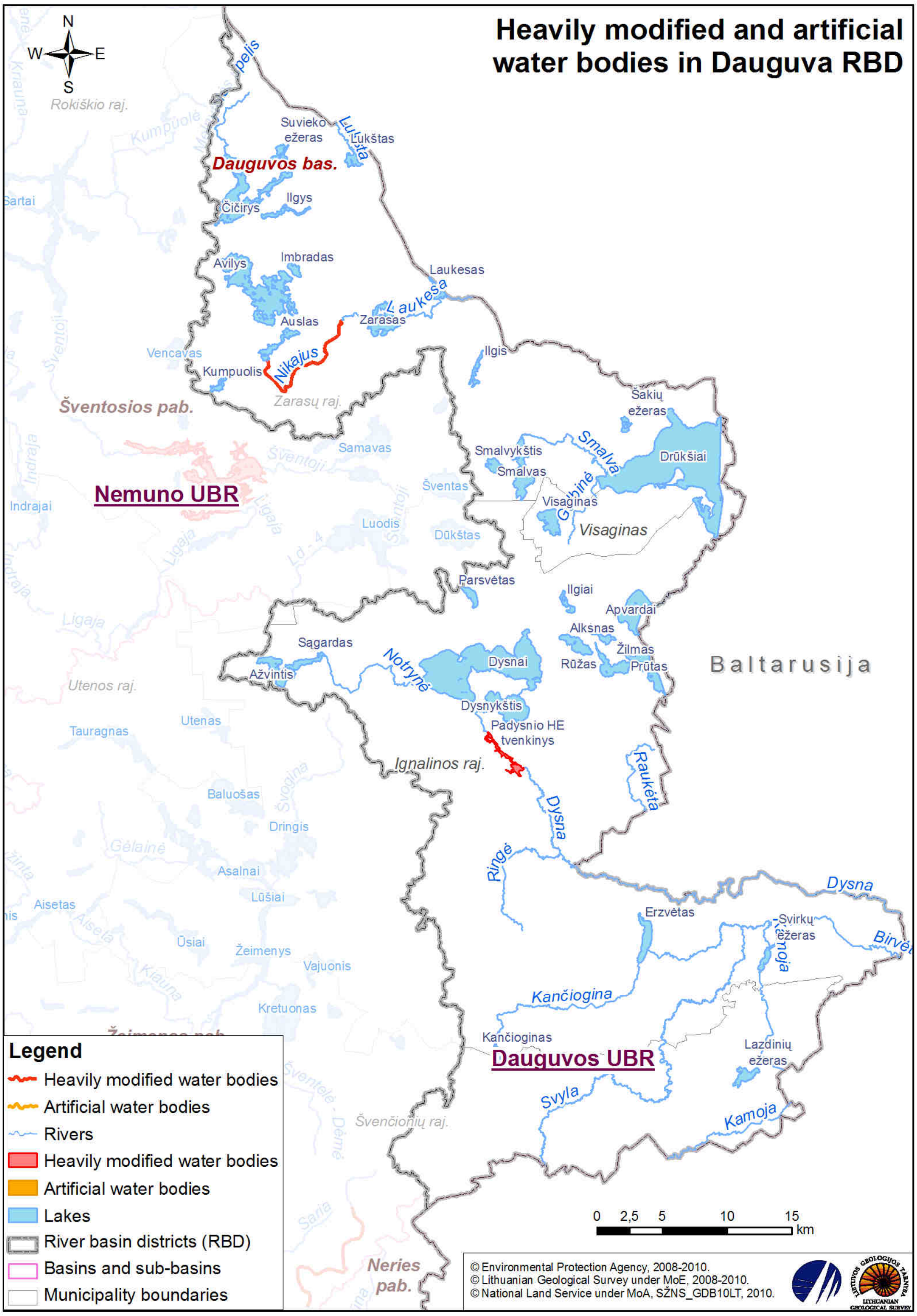



Figure 5. Heavily modified water bodies in the Dauguva RBD

## Artificial water bodies

12. There are no artificial water bodies within the Dauguva RBD.

## Reference conditions for surface water bodies

13. Successful planning and introduction of measures required for the ensuring of good ecological status of surface waters directly depend on adequate selection of quality elements (biological, physico-chemical, hydromorphological) for status assessment, and on establishment of the criteria for the parameters of these elements. However, the main precondition of correct ecological status assessment is the establishment of a reference point. The reference point means values typical of the parameters for quality elements under natural, i.e. reference conditions with no anthropogenic impacts. As water bodies of different types are habitats for diverse aquatic communities, each of them requires reference values of the parameters for water quality elements.

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

## Rivers

14. In rivers, values of reference conditions for the biological elements were established only for the parameters for fish and zoobenthos (no reference conditions were established for macrophyte parameters due to shortage of data). Parameter values of reference conditions for macrophytes will have to be specified when more data is collected. Values of parameters indicative of the physico-chemical quality elements characterising the quality of water, which ensure reference conditions for the biological elements, were established as well. Reference conditions for rivers were also characterised in accordance with the hydromorphological and chemical status criteria. Values and characterisation of reference conditions for river types according to the parameters of the water quality elements are provided in Table 7.

Table 7. Values and characterisation of the reference conditions for river types according to parameters of water quality elements

| No. | Quality element | | Parameter | River type | Spatial assessment scale | Value/characterisation of reference conditions |
|---|---|---|---|---|---|---|
| 1. | Biological | Taxonomic composition, abundance and age structure of fish fauna | Average value of the Lithuanian Fish Index (LFI) | 1-3 | monitoring site | 1 |
| 2. | | | Relative abundance of intolerant fish individuals in the community (NTOLE n), | 1 | | 61 |
| | | | | 2 | | 22 |
| | | | | 3 | | 45 |

| No. | Quality element | | | Parameter | River type | Spatial assessment scale | Value/characterisation of reference conditions |
|---|---|---|---|---|---|---|---|
| | | | | % | | | |
| 3. | | | | Absolute number of intolerant fish species in the community (NTOLE sp), unit | 1 | | 3 |
| | | | | | 2 | | - |
| | | | | | 3 | | 5 |
| 4. | | | | Relative abundance of tolerant fish individuals in the community (TOLE n), % | 1 | | 1 |
| | | | | | 2 | | 33 |
| | | | | | 3 | | 2 |
| 5. | | | | Relative number of tolerant fish species in the community (TOLE sp), % | 1 | | - |
| | | | | | 2 | | 18 |
| | | | | | 3 | | 14 |
| 6. | | | | Relative abundance of omnivorous fish individuals in the community (OMNI n), % | 1 | | 3 |
| | | | | | 2 | | 37 |
| | | | | | 3 | | 4 |
| 7. | | | | Absolute number of reophilic fish species in the community (RH sp), unit | 1 | | - |
| | | | | | 2 | | 5 |
| | | | | | 3 | | 8 |
| 8. | | | | Relative abundance of litophilic fish individuals in the community (LITH n), % | 1 | | 96 |
| | | | | | 2 | | 52 |
| | | | | | 3 | | 93 |
| 9. | | | | Relative number of litophilic fish species in the community (LITH sp), % | 1 | | 83 |
| | | | | | 2 | | 41 |
| | | | | | 3 | | 72 |
| 10. | | Taxonomic composition and abundance of zoobenthos | | Average annual value of the ecological quality ratio (EQR) of the Danish Stream Fauna Index (DSFI) | 1-3 | monitoring site | 1 |
| 11. | | | | Average annual value of DSFI | 1-3 | | 7 |
| 12. | Hydromorphological | Hydrological regime | Quantity and dynamics of water flow | Quantity of water flow | 1-3 | 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, |

| No. | Quality element | | | Parameter | River type | Spatial assessment scale | Value/characterisation of reference conditions |
|---|---|---|---|---|---|---|---|
| | | | | | | | the minimum natural flow during the dry period (average of 30 days). |
| 13. | | River continuity | | River continuity | 1-3 | stretch* | There are no artificial barriers for fish migration. |
| 14. | | Morphological conditions | Structure of the riparian zone | Structure of the river bed | 1-3 | stretch * | Natural bed (unregulated, no shore embankments) |
| 15. | | | | Length and width of the natural riparian vegetation zone | 1-3 | stretch* | The zone of natural riparian vegetation (forests) covers at least 70% of the length of the shoreline of the river bed. The width of the forest zone must be at least 50 m. |
| 16. | Physico-chemical | General | Nutrient conditions | Annual average value of nitrate nitrogen ($NO_3$-N), mg/l | 1-3 | monitoring site | ≤ 0.90 |
| 17. | | | | Annual average value of ammonium nitrogen ($NH_4$-N, mg/l | 1-3 | | ≤ 0.06 |
| 18. | | | | Annual average value of total nitrogen ($N_t$), mg/l | 1-3 | | ≤ 1.40 |
| 19. | | | | Annual average value of phosphate phosphorus ($PO_4$-P), mg/l | 1-3 | | ≤ 0.03 |
| 20. | | | | Annual average value of total phosphorus ($P_t$), mg/l | 1-3 | | ≤ 0.06 |
| 21. | | | Organic matter | Annual average value of biological oxygen demand in 7 days ($BOD_7$), mg/l | 1-3 | monitoring site | ≤ 1.80 |
| 22. | | | Oxygenation conditions | Annual average value of dissolved oxygen in water ($O_2$), mg/l | 1,3 | monitoring site | ≥ 9.5 |
| | | | | | 2 | | ≥ 8.5 |
| 23. | | Specific pollutants | | Values of priority substances listed in Annex 1 and Part A of Annex 2 to the Wastewater Management Regulation | 1-3 | monitoring site | Measured values are below the quantitative assessment limit for the respective substance (detection limit). |
| 24. | | | | Values of other substances regulated in | 1-3 | monitoring site | Measured concentrations do |

| No. | Quality element | | Parameter | River type | Spatial assessment scale | Value/characterisation of reference conditions |
|---|---|---|---|---|---|---|
| | | | Lithuania which are listed in part B of Annex 2 to the Wastewater Management Regulation approved by Order No. D1-236 of the Minister of Environment of the Republic of Lithuania of 17 May 2006 (Žin., 2006, No. 59-2103; 2010, No. 59-2938), with the exception of nutrients | | | not exceed the natural level and values of synthetic polluting substances are below the quantitative assessment limit for the respective substance (detection limit). |

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

## Lakes

15. In lakes, values of reference conditions for the biological water quality elements were specified only for the parameter of phytoplankton meanwhile reference values established for the parameters for other biological elements are only preliminary ones, with the parameters currently being tested. Parameter values for reference conditions will have to be specified when more data is available. Also, values of parameters indicative of the physico-chemical water quality elements, which should ensure reference conditions for the biological elements, were established, as well as parameters for the hydromorphological quality elements and criteria for chemical status were characterised. Values and characterisation of reference conditions for lake types according to the parameters of the water quality elements are given in Table 8.

Table 8. Values and characterisation of reference conditions for lake types according to parameters of water quality elements

| No. | Quality elements | | | Parameter | Lake type | Value/characterisation of reference conditions |
|---|---|---|---|---|---|---|
| 1. | Biological | Taxonomic composition, abundance and biomass of phytoplankton | | Mean value of the EQR of the average annual value and the EQR of the maximum value of chlorophyll *a* | 1-3 | 1 |
| 2. | | | | Average annual value of chlorophyll *a*, µg/l | 1, 2 | 2.5 |
| | | | | | 3 | 2.0 |
| 3. | | | | Maximum value of chlorophyll *a*, µg/l | 1, 2 | 5.0 |
| | | | | | 3 | 4.0 |
| 4. | Hydromorphological | Hydrological regime | Quantity and dynamics of water flow | Changes in the water level | 1-3 | 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 |

| No. | Quality elements | | | Parameter | Lake type | Value/characterisation of reference conditions |
|---|---|---|---|---|---|---|
| | | | | | | average annual water level), or there is no anthropogenic impact which would determine the said alteration of the water level. There is no unnatural fluctuation of the water level (fluctuation conditioned by the operation of a HPP constructed on an effluent or tributary of the lake), or such fluctuation is within the limits of the minimum and maximum natural average annual water level. |
| 5. | | Morphological conditions | Structure of the lake shore | Changes in the shoreline | 1-3 | The shoreline is natural (not straightened, no shore embankments), or changes are insignificant (≤5% of the lake shoreline) |
| 6. | | | | Length of the natural riparian vegetation zone | 1-3 | The zone of natural riparian vegetation (forests) covers at least 70% of the length of the lake shoreline. |
| 7. | Physico-chemical | General | Nutrient conditions | Annual average value of total nitrogen ($N_t$), mg/l | 1, 2 | ≤ 1.00 |
| | | | | | 3 | ≤ 0.75 |
| 8. | | | | Annual average value of total phosphorus ($P_t$), mg/l | 1, 2 | ≤ 0.020 |
| | | | | | 3 | ≤ 0.015 |
| 9. | | Specific pollutants | | Values of priority substances listed in Annex 1 and Part A of Annex 2 to the Wastewater Management Regulation | 1-3 | Measured values are below the quantitative assessment limit for the respective substance (detection limit). |

Source: experts' analysis results

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

## Maximum ecological potential of artificial and heavily modified water bodies

16. Hydrological and morphological characteristics in artificial and heavily modified water bodies directly depend on the objectives of the formation or modification of such water bodies. Any change in the hydromorphological characteristics results in corresponding changes in the aquatic communities which live in the water bodies. Hence the ecological status of such water bodies should be assessed on the basis of the criteria applied for the evaluation of the ecological status of the water body type with the most similar characteristics. On the other hand, conditions formed in artificial or heavily modified water bodies are usually not identical to the ones in natural water bodies therefore characterisation of their status employs the notion of ecological potential instead of ecological status. The reference point for classifying the ecological potential for AWB and HMWB is maximum ecological potential (equivalent of reference conditions in natural water bodies). Since the hydromorphological conditions of such water bodies often do not allow attaining the same status of aquatic organisms as in natural water bodies, less stringent requirements may be set for the parameters indicative of the biological elements. However, if the hydromorphological conditions occurring in AWB and HMWB are identical to the conditions in natural water bodies of a respective type, maximum ecological potential of aquatic communities is considered to be corresponding to high ecological status, i.e. it has to conform to the same criteria. The requirements for the parameters indicative of the physico-chemical water quality elements and chemical status in all cases remain the same as those for natural water bodies, unless they cannot be met due to the nature of an individual AWB or HMWB. In bodies of water where the hydromorphological conditions prevent attainment of the same status of aquatic organisms as in natural water bodies, good ecological potential is deemed to be ensured only in the event of introduction of at least minimum measures that allow for mitigation of impacts of hydromorphological modifications (e.g. restoring woody riparian vegetation where it has been completely destroyed, or providing for at least minimum obstacles for the water flow that determine at least minimum heterogeneity of the composition of the river soil), i.e. measures which will not have any negative impact on anthropogenic objectives pursued when constructing an artificial water body or 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

17. There are no artificial water bodies within the Dauguva RBD.

## Heavily modified water bodies

18. HMWB are ponds with an area larger than 0.5 $km^2$. There is one such pond within the Dauguva RBD – the pond of Padysnis HPP.

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. Accordingly, the parameters indicative of the hydromorphological elements in the pond of Padysnis HPP are failing the characterisation of maximum ecological potential. However, maximum ecological potential of the biological and physico-chemical quality elements in such water bodies should conform to the high ecological status criteria applicable for natural lakes.

Table 9. Characterisation of maximum ecological potential in the pond of Padysnis HPP which is designated as a heavily modified water body

| **No.** | **Quality element** | **Parameter** | | | **Value of maximum ecological potential** |
|---|---|---|---|---|---|
| 1. | Biological | Taxonomic composition, abundance and biomass of phytoplankton | | Mean value of the EQR of the average annual value and the EQR of the maximum value of chlorophyll *a* | >0.67 |
| 2. | Physico-chemical | General | Nutrient conditions | Annual average value of total nitrogen ($N_t$), mg/l | <1.30 mg/l |
| 3. | | | | Annual average value of total phosphorus ($P_t$), mg/l | <0.040 mg/l |

The ecological potential of the heavily modified Nikajus River stretch should be defined following the criteria applicable for the assessment of the types of rivers of the corresponding catchment size and bed slope. High ecological status by the biological quality elements cannot be achieved in this river due to the absence of certain specific habitats and changes in the natural hydrological regime. Monitoring data indicates that maximum ecological potential of the biological quality elements should be conforming to the values of the criteria for good ecological status which are applied to natural rivers, i.e. DSFI EQR ≥0.63, and LFI ≥0.70 (Table 9). Maximum ecological potential for the hydromorphological elements has to meet the criteria for good ecological status. The maximum ecological potential requirements for the physico-chemical water quality elements correspond to the good ecological status criteria for rivers with natural beds.

Table 10. Characterisation of maximum ecological potential in the Nikajus River stretch which is designated as a heavily modified water body

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

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

* the length of the river stretches where the parameters for hydromorphological quality elements are assessed: 0.5 km upstream and 0.5 km downstream of the monitoring site

** EQR – ecological quality ratio

Source: experts' analysis results

## Methodology for identifying the status of surface water bodies

### Criteria for assessment of the ecological status of rivers

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

The ecological status of rivers is assessed on the basis of the physico-chemical quality elements, which are parameters characterising general conditions (nutrients, organic matter, oxygenation): $NO_3$-N, $NH_4$-N, $N_{total}$, $PO_4$-P, $P_{total}$, $BOD_7$, and $O_2$. Water bodies are assigned to one of five ecological status classes on the basis of the average annual values of each parameter (Table 11). The criteria given in Table 11 have been agreed with the neighbouring country Latvia.

Table 11. Ecological status classes of rivers according to parameters indicative of physico-chemical quality elements

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

Source: experts' analysis results

The ecological status of rivers is assessed on the basis of the following parameters characterising hydromorphological quality elements, such as hydrological regime (quantity and dynamics of water flow), river continuity, and morphological conditions (shoreline structure): quantity of flow, river continuity, structure of the river bed, and length and width of the natural riparian vegetation zone. When all parameters indicative of the hydromorphological quality elements are consistent with the characterisation of high ecological status, such water body is deemed to be at high ecological status according to the hydromorphological quality elements (Table 12). 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 12. Characterisation of high ecological status of rivers according to parameters indicative of hydromorphological quality elements

| No. | Quality element | | Parameter | Spatial assessment scale | Characterisation of high ecological status of rivers according to parameters for hydromorphological quality elements |
|---|---|---|---|---|---|
| 1 | Hydrological regime | Quantity and dynamics of water flow | Quantity of water flow | monitoring site | There are no alterations in the quantity of the natural flow due to human activities (water intake, operation of HPP, water discharge from ponds, or an impact of the head), or fluctuation is insignificant (≤10% of the average flow during a period in question). However, the flow quantity may not be less than the minimum natural flow during the dry period (average of 30 days). |
| 2 | River continuity | | River continuity | stretch * | There are no artificial barriers for fish migration. |
| 3 | Morphological conditions | Shoreline structure | Structure of the river bed | stretch * | The bed is natural (not straightened, no shore embankments). |
| 4 | | | Length and width of the natural riparian vegetation zone | stretch * | The zone of natural riparian vegetation (forests) covers at least 70% of the length of the bed shore. The width of the forest zone must be at least 50 m. |

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

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

The indicator used to assess the ecological status of rivers by the taxonomic composition, abundance, age structure of fish fauna is LFI. Observing the average annual value of LFI, water bodies are assigned to one of five ecological status classes (Table 13).

Table 13. Ecological status classes of rivers according to taxonomic composition, abundance and age structure of fish fauna

| Quality element | Indicator | River type | Criteria for ecological status classes of rivers according to parameter values for fish fauna | | | | |
|---|---|---|---|---|---|---|---|
| | | | High | Good | Moderate | Poor | Bad |
| Taxonomic composition, abundance and age structure of fish fauna | LFI | 1-3 | >0.93 | 0.93-0.71 | 0.70-0.40 | 0.39-0.11 | <0.11 |

Source: experts' analysis results

The indicator used to assess the ecological status of rivers according to the taxonomic composition and abundance of zoobenthos is DSFI. Observing the average annual value of DSFI EQR, water bodies are assigned to one of five ecological status classes (Table 14).

Table 14. Ecological status classes of rivers according to taxonomic composition and abundance of zoobenthos

| Quality element | Indicator | River type | Criteria for ecological status classes of rivers according to the EQR of parameter values for zoobenthos | | | | |
|---|---|---|---|---|---|---|---|
| | | | High | Good | Moderate | Poor | Bad |
| Taxonomic composition and abundance of zoobenthos | DSFI | 1-3 | ≥ 0.78 | 0.77-0.64 | 0.63-0.50 | 0.49-0.35 | <0.35 |

Source: experts' analysis results

## Criteria for assessment of the ecological status of lakes

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

The parameters characterising general conditions (nutrients), which is a physico-chemical element, are as follows: total nitrogen ($N_{total}$) and total phosphorus ($P_{total}$). Water bodies are assigned to one of five ecological status classes on the basis of the average annual values of each parameter measured in samples of the surface water layer (Table 15).

Table 15. Ecological status classes of lakes according to parameters indicative of the physico-chemical quality element

| No. | Quality element | | Parameter | Lake type | Parameter value for reference conditions | Criteria for ecological status classes of lakes according to parameter values for the physico-chemical quality element | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | High | Good | Moderate | Poor | Bad |
| 1 | General | Nutrient conditions | $N_{total}$, mg/l | 1, 2 | 1.00 | <1.30 | 1.30-1.80 | 1.81-2.30 | 2.31-3.00 | >3.00 |
| 2 | | | $N_{total}$, mg/l | 3 | 0.75 | <0.90 | 0.90-1.20 | 1.21-1.60 | 1.61-2.00 | >2.00 |
| 3 | | | $P_{total}$, mg/l | 1, 2 | 0.020 | <0.040 | 0.040-0.060 | 0.061-0.090 | 0.091-0.140 | >0.140 |
| 4 | | | $P_{total}$, mg/l | 3 | 0.015 | <0.030 | 0.030-0.050 | 0.051-0.070 | 0.071-0.100 | >0.100 |

Source: experts' analysis results

The ecological status of lakes is assessed on the basis of the following parameters indicative of hydromorphological quality elements, such as hydrological regime (quantity and dynamics of water flow) and morphological conditions (structure of the lake shoreline): changes in the water level, alterations of the shoreline, the length of the natural riparian vegetation zone. When all parameters for the hydromorphological quality elements are consistent with the characterisation of high ecological status, such water body is deemed to be at high ecological status according to the hydromorphological quality elements (Table 16). 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 16. Characterisation of high ecological status of lakes according to parameters indicative of hydromorphological quality elements

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

Source: experts' analysis results

The ecological status of lakes is assessed on the basis of the following parameter indicative of biological quality elements, such as the taxonomic composition, abundance and biomass of phytoplankton: the average annual value and the maximum value of chlorophyll *a*. Observing the mean of the EQR of the annual average value and of the EQR of the maximum value of the parameter, water bodies are assigned to one of five ecological status classes (Table 17).

Table 17. Ecological status classes of lakes according to taxonomic composition, abundance and biomass of phytoplankton

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

Source: experts' analysis results

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

21. The ecological potential of the Nikajus River stretch, which has been designated as a heavily modified water body, 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 the heavily modified Nikajus River stretch are as follows: $NO_3$-N, $NH_4$-N, $N_{total}$, $PO_4$-P, $P_{total}$, $BOD_7$, and $O_2$. The water body is assigned to one of five ecological potential classes on the basis of the average annual values of each parameter (Table 18).

Table 18. Ecological potential classes of the heavily modified Nikajus River stretch according to parameters indicative of physico-chemical quality elements

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

Source: experts' analysis results

The ecological potential of the heavily modified Nikajus River stretch is assessed on the basis of the following parameters indicative of hydromorphological quality elements, such as hydrological regime (quantity and dynamics of water flow), river continuity, and morphological conditions (shoreline structure): quantity of flow, river continuity, structure of the river bed, length of the natural riparian vegetation zone. When all parameters for the hydromorphological quality elements are consistent with the characterisation of maximum ecological potential, such water body is deemed to be of maximum ecological potential according to the hydromorphological quality elements (Table 19). When at least one parameter for the hydromorphological quality elements fails the characterisation of maximum ecological potential, such water body is considered to be failing maximum ecological potential according to the hydromorphological quality elements.

Table 19. Characterisation of maximum ecological potential of the heavily modified Nikajus River stretch according to parameters indicative of hydromorphological quality elements

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

| No. | Quality element | | Parameter | Spatial assessment scale | Characterisation of maximum ecological potential according to parameters for hydromorphological quality elements |
|---|---|---|---|---|---|
| 4 | | | Length of the natural riparian vegetation zone | stretch * | The zone of natural riparian vegetation (forests) covers at least 50% of the length of the bed shoreline. |

* the length of the river stretches where the parameters for hydromorphological quality elements are assessed: 0.5 km upstream and 0.5 km downstream of the monitoring site

Source: experts' analysis results

The ecological potential of the heavily modified Nikajus River stretch 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 the heavily modified Nikajus River stretch according to the taxonomic composition, abundance, age structure of fish fauna is the LFI. The water body is assigned to one of five ecological status classes on the basis of the average annual value of the LFI (Table 20).

Table 20. Ecological potential classes of the heavily modified Nikajus River stretch according to taxonomic composition, abundance and age structure of fish fauna

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

Source: experts' analysis results

The indicator used to assess the ecological potential of rivers designated as heavily modified water bodies according to the taxonomic composition and abundance of zoobenthos is the DSFI. Water bodies are assigned to one of five ecological potential classes on the basis of the average annual value of the DSFI EQR (Table 21).

Table 21. Ecological potential classes of the heavily modified Nikajus River stretch 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 | ≥ 0.64 | 0.63-0.50 | 0.49-0.36 | 0.35-0.21 | <0.21 |

Source: experts' analysis results

22. The ecological potential of Padysnis HPP pond designated as a heavily modified water body is assessed on the basis of physico-chemical 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 Padysnis HPP pond designated as a heavily modified water body are as follows: $N_{total}$ and $P_{total}$. The water body is assigned to one of five ecological potential classes on the basis of the average annual values of each parameter in samples of the surface water layer (Table 22).

Table 22. Ecological potential classes of the heavily modified pond of Padysnis HPP according to parameters indicative of physico-chemical quality elements

| No. | Quality element | | Parameter | Type of water body | Criteria for ecological potential classes by parameter values for physico-chemical quality elements | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Maximum | Good | Moderate | Poor | Bad |
| 1 | General data | Nutrients | $N_{total}$, mg/l | 1 | <1.30 | 1.30-1.80 | 1.81-2.30 | 2.31-3.00 | >3.00 |
| 2 | | | $P_{total}$, mg/l | 1 | <0.040 | 0.040-0.060 | 0.061-0.090 | 0.091-0.140 | >0.140 |

Source: experts' analysis results

The parameters for assessing the ecological potential of Padysnis HPP pond, which is identified as a heavily modified water body, according to biological quality elements, such as the taxonomic composition, abundance and biomass of phytoplankton, is the average annual value and the maximum value of chlorophyll *a*. Observing the mean of the EQR of the annual average value and of the EQR of the maximum value of chlorophyll *a*, the water body is assigned to one of five ecological potential classes (Table 23).

Table 23. Ecological potential classes of the heavily modified pond of Padysnis HPP according to taxonomic composition, abundance and biomass of phytoplankton

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

Source: experts' analysis results

### Criteria for assessment of the chemical status of surface waters

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

The chemical status of surface waters is divided into two quality classes. Where a body of water achieves compliance with all environmental quality standards established under 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 environmental quality standards of specific pollutants (priority and other regulated substances) listed in

Annexes 1 and 2 to the Wastewater Management Regulation approved by Order No. D1-236 of the Minister of Environment of the Republic of Lithuania of 17 May 2006 (Žin., 2006, No. 59-2103; 2010, No. 59-2938) in a receiving water body.

**Status classification rules for surface water bodies**

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

24.1. 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.

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

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

24.4. 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.

24.5. When parameters indicative of biological and/or physico-chemical quality elements fail the criteria for high ecological status, the assessment of the ecological status of the water body shall not consider parameters for hydromorphological quality elements, except in the cases specified in paragraphs 24.6.2, 24.6.3, 24.6.5, 24.6.6 and 24.9 of these rules.

24.6. 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:

24.6.1. 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;

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

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

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

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

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

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

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

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

24.7.1. 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;

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

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

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

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

24.7.6. 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.

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

24.9. 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:

24.9.1. 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;

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

24.14. The ecological potential of heavily modified water bodies shall be classified into maximum, good, moderate, poor and bad. The level of confidence in the assessment of the ecological potential shall be determined observing the classification rules for the ecological status of rivers and lakes given in paragraphs 24.3-24.11.

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

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

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

## SECTION II. GROUNDWATER BODIES

25. There are two groundwater bodies (GWB) within the Dauguva RBD (Figure 5): Dauguva GWB of Upper-Middle Devonian deposits (code: LT001004500) and Dauguva GWB of Quaternary deposits of South-Eastern Lithuania (code: LT005004500).

These GWB were identified taking into account occurrence of productive aquifers where the largest volume of groundwater is abstracted.

### Status of groundwater wellfields

26. The largest amount of groundwater within the territory of the Dauguva RBD is abstracted from a deeply situated Šventoji-Upninkai aquifer complex which has limited hydraulic connection with surface water bodies, therefore the boundaries of the GWB within this RBD do not coincide with the boundaries of the surface water basins (see Figure 5). Data on the areas of the GWB is given in Table 24.

Table 24. Groundwater bodies in the Dauguva RBD

| GWB | Area of the groundwater body | |
|---|---|---|
| | $km^2$ | % of the RBD area |
| 1. GWB of Quaternary deposits of South-Eastern Lithuania (Dauguva) | 1 122.134 | 63.9 |
| 2. GWB of Upper-Middle Devonian deposits (Dauguva) | 752.8223 | 36.1 |
| Total: | 1 874.9563 | 100 |

Source: Register of the Earth Entrails of the LGS and experts' calculations

43 wellfields situated within the Dauguva RBD were on the Register of the Earth Entrails as on 1 April 2010 in Quaternary (Q) and Šventoji-Upninkai ($D_{3-2}$ šv-up) aquifers (aquiferous complexes) (Figure 7). The largest are Visaginas and Zarasai wellfields which abstract groundwater from Šventoji-Upninkai aquifer. More detailed information about the distribution of groundwater wellfields in groundwater bodies and aquifers within this RBD is provided in Table 25.

Table 25. Groundwater wellfields in the Dauguva RBD

| GWB | Geological index of the aquifer | Number of groundwater wellfields |
|---|---|---|
| GWB of Upper-Middle Devonian deposits (Dauguva) | Q | 12 |
| | $D_{3-2}$šv-up | 9 |
| | **Total in GWB:** | **21(48.8)** |
| GWB of Quaternary deposits of South-Eastern Lithuania (Dauguva) | Q | 20 |
| | $D_{3-2}$šv-up | 2 |
| | **Total in GWB:** | **22 (51.2)** |
| | **Total in RBD:** | **43** |

* per cent of the number of groundwater wellfields within the RBD

Source: Register of the Earth Entrails of the LGS and experts' estimations

Abstraction of groundwater in individual groundwater wellfields during recent years has been varying between a few hundreds and several thousands $m^3$/d. The average abstraction within the RBD totals to 9 191 $m^3$/d (Table 26).

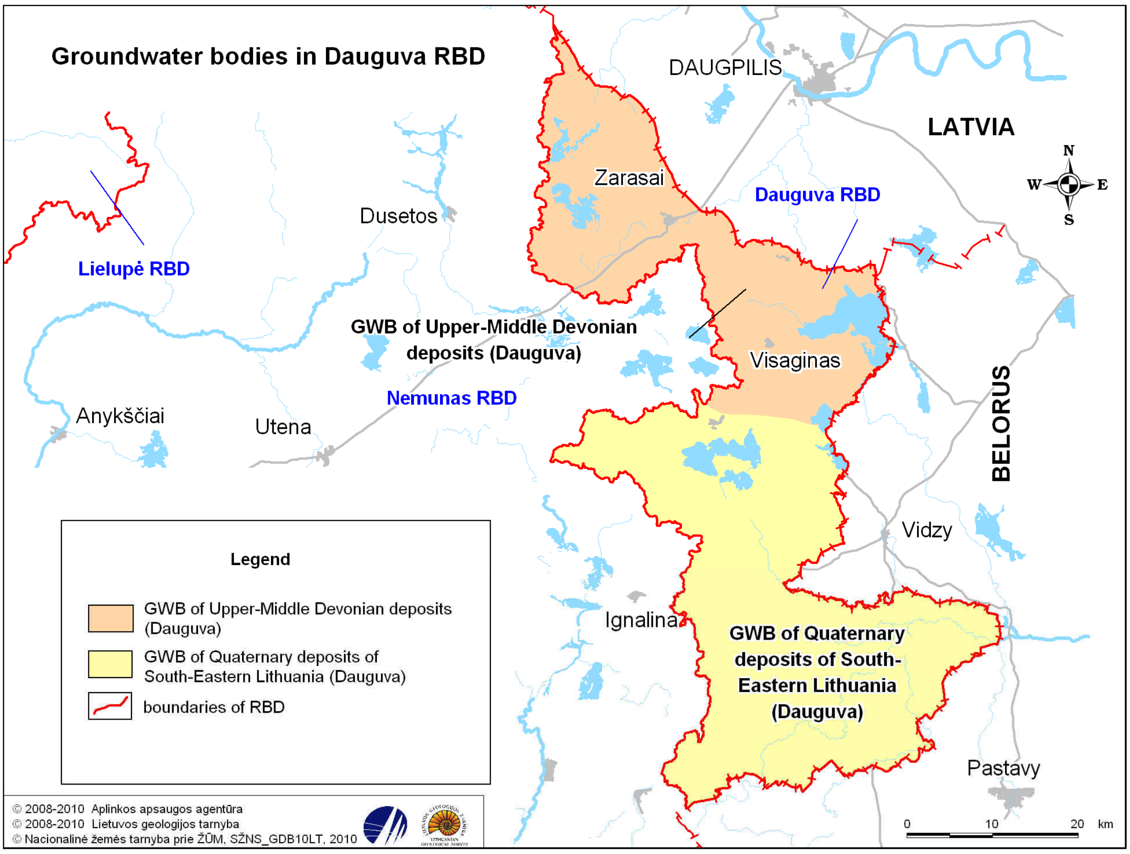


Figure 6. Groundwater bodies in the Dauguva RBD

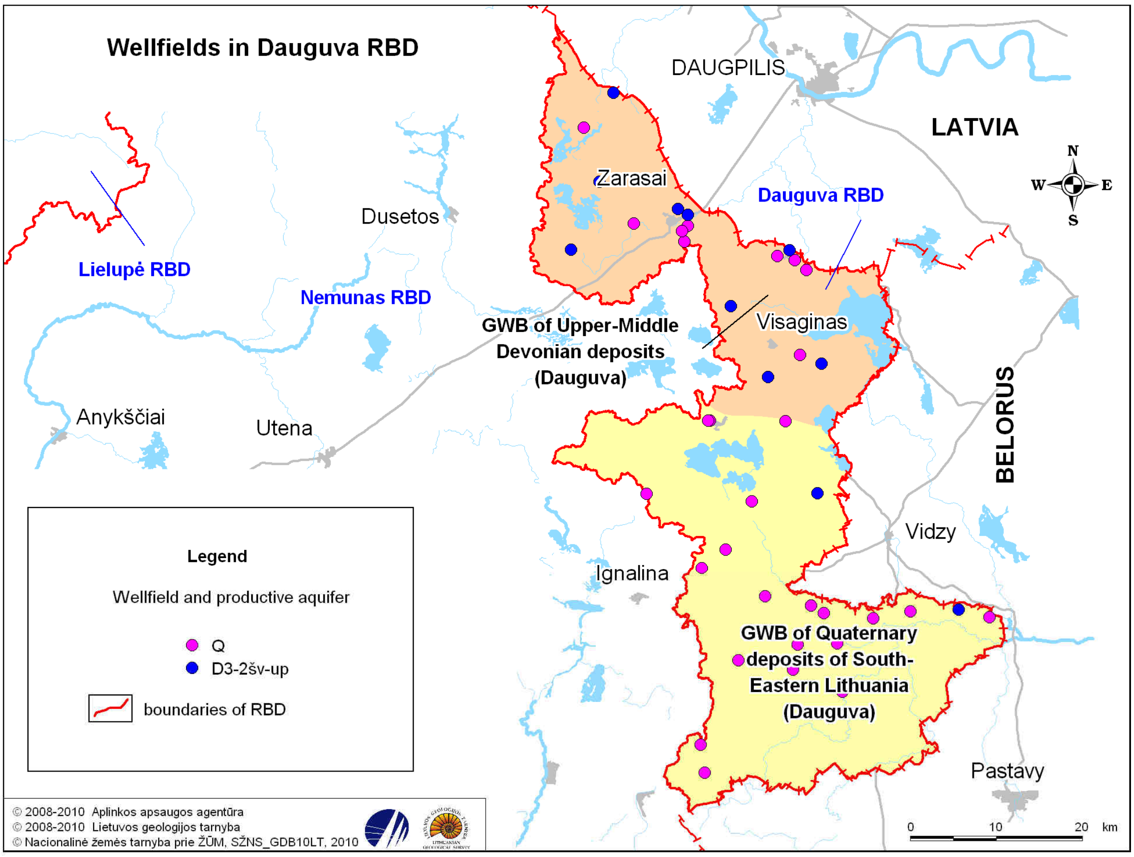



Figure 7. Groundwater wellfields in the Dauguva RBD

Table 26. Water abstraction in groundwater wellfields in the Dauguva RBD

| GWB | Geological index of the aquifer | Groundwater abstraction* | | |
|---|---|---|---|---|
| | | $m^3$/day | % from the volume abstracted in the GWB | % from the volume abstracted in the RBD |
| GWB of Upper-Middle Devonian deposits (Dauguva) | Q | 161 | 1.9 | 1.8 |
| | $D_{3-2}$šv-up | 8 232 | 98.1 | 89.6 |
| | **Total in GWB:** | **8 393** | **100.0** | **91.3** |
| GWB of Quaternary deposits of South-Eastern Lithuania (Dauguva) | Q | 778 | 97.5 | 8.5 |
| | $D_{3-2}$šv-up | 20 | 2.5 | 0.2 |
| | **Total in GWB:** | **798** | **100.0** | **8.7** |
| | **Total in RBD:** | **9 191** | | |

* average of the period 2008-2009

Source: Register of the Earth Entrails of the LGS and experts' estimations

Significant groundwater resources within the Dauguva RBD have been surveyed and approved observing the procedure laid down by the LGS and total to 64 010 $m^3$/day (Table 27).

Table 27. Demand and resources of groundwater in the Dauguva RBD

| GWB | Average abstraction of groundwater in 2008-2009, $m^3$/day | Demand of groundwater for 2015, thousand $m^3$/day* | Groundwater resources surveyed and approved, thousand $m^3$/day |
|---|---|---|---|
| GWB of Upper-Middle Devonian deposits (Dauguva) | 8 393 | 9 526 | 63 900 |
| GWB of Quaternary deposits of South-Eastern Lithuania (Dauguva) | 798 | 425 | 510 |
| Total: | 9 191 (14.4) | 9 951 (15.5) | 64 010 |

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

The data in the table above shows that the groundwater volume currently abstracted within the Dauguva RBD accounts for 14.4% of the surveyed and approved groundwater resources. In future (2015) this volume could go up to 15.5% of the surveyed and approved groundwater resources. This indicates good quantitative status of the groundwater bodies and wellfields because the groundwater resources are much more abundant than the current or planned groundwater abstraction.

The qualitative status of the groundwater bodies and wellfields in the Dauguva RBD is also good, there are no major problems related to the groundwater quality in this RBD.

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

27. During the study, climate forecasts were developed for Utena, a Lithuanian meteorological station situated closest to the Dauguva RBD. Prognostic values of the weather temperature, precipitation amount, minimum relative humidity, wind speed and sunshine duration for all months for the years 2001-2010 and 2011-2020 were estimated and compared to the climate norm values (1971-2000).

It was established that impacts of the climatic factors on the variation of water quality in the Dauguva RBD should be of minor importance. A more significant impact on the quality can be expected only in the event of change of the precipitation and evaporation ratio.

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

27.1. The weather temperature in the Dauguva RBD will be rising during all seasons. The most significant changes in the weather temperature are forecasted for winters (up to 2 ºC) and springs (up to 1.5 ºC), meanwhile changes during other seasons will not be higher than 1 ºC;

27.2. The annual precipitation in Lithuania in 2001-2010 will be lower (39.0 mm) as compared to the end of the 20th century. Increase of precipitation by 15-26 mm is expected in the second decade of the 21st century. The amount of precipitation should increase at the beginning of the year and go down in the second half of summer and at the beginning of autumn.

27.3. No significant changes in the annual average runoff or in the runoff during individual seasons and months until 2020 due to climate changes are expected. Potential major changes forecasted in the Dauguva RBD are related to potential runoff distribution during a year and to the ratio of the constituents of the water balance.

27.4. River runoff modelling results showed that in 2020 the runoff will be more naturally regulated than it is today (the maximum runoff values will be lower and the minimum ones – higher than today) hence reduced maximum runoff of floods and high waters as well as generally increased runoff during low waters is expected.

27.5. Earlier beginning of spring floods is expected around 2020 in the rivers of the Dauguva RBD due to climate changes (floods will often begin already in winter but will last longer ending at the same time as today).

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

27.7. In 2020, the maximum water level of the lakes with larger feeding basins in the Dauguva RBD during a flood can be lower. No major changes in the annual average of the water level in the Dauguva RBD are expected.

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

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

27.10. Available information allows assuming that the tendency of more frequent prolonged and strong droughts that result in decrease of the river runoff and water level of lakes will also remain in the coming years.

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

## CHAPTER III. SUMMARY IMPACTS OF ECONOMIC ACTIVITIES

### SECTION I. SIGNIFICANT IMPACT ON RIVERS AND LAKES

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

#### Pollution loads and their impact on the status of water bodies

29. Pollution sources exerting significant impacts are those which individually or together determine lower than good ecological status of water bodies.

The criteria for good ecological status of water bodies in the category of rivers are as follows:

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

29.2. average annual concentration of $NH_4$-N $\leq 0.2$ mg/l;

29.3. average annual concentration of $NO_3$-N $\leq 2.3$ mg/l;

29.4. average annual concentration of $N_{total} \leq 3.0$ mg/l;

29.5. average annual concentration of phosphates $\leq 0.09$ mg/l ;

29.6. average annual concentration of $P_{total} \leq 0.14$ mg/l;

29.7. The criteria for good ecological status of water bodies in the category of lakes are as follows:

29.7.1. average annual concentration of $N_{total} \leq 1.8$ mg/l;

29.7.2. average annual concentration of $P_{total} \leq 0.060$ mg/l.

## Point pollution sources and loads

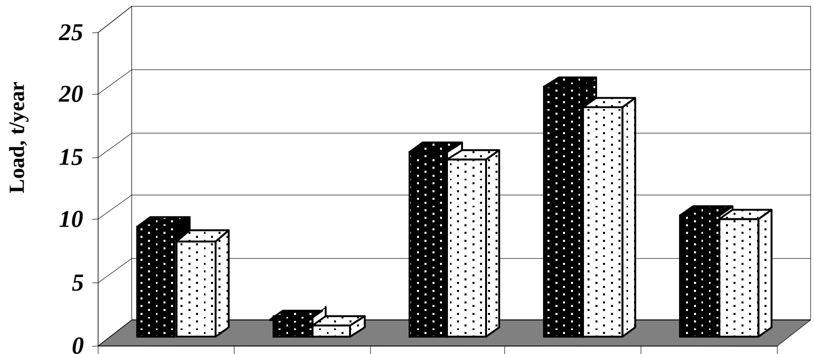
30. According to the data provided by the EPA, there were 24 wastewater dischargers on the territory of Lithuania emitting effluents to surface water bodies within the Dauguva RBD in 2009. 9 outlets were discharging household wastewater from towns and settlements, 3 outlets – industrial wastewater, 7 outlets – surface runoff, and 5 ones – mixed wastewater (industrial wastewater and stormwater runoff). The number and designation (codes) of the dischargers within the Dauguva RBD are provided in Table 28 below.

Table 28. Number of point pollution dischargers in the Dauguva RBD

| Basin | Total number of dischargers | of which the number of dischargers with the following designation (code) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| **Dauguva RBD** | | | | | | | | |
| Dauguva Basin | 24 | 4 | 3 | - | 4 | 6 | 7 | - |
| **TOTAL:** | **24** | **4** | **3** | **0** | **4** | **6** | **7** | **0** |

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

31. There are two agglomerations within the Dauguva RBD with a population equivalent (p.e.) of more than 2 000: Zarasai and Visaginas towns. Visaginas is an agglomeration with a p.e. from 10 000 to 100 000 and Zarasai is an agglomeration with a p.e. from 2 000 to 10 000. Wastewater dischargers of these towns emit the major part of domestic effluents into water bodies. The aggregate loads of pollution emitted into surface water bodies from towns and rural areas and pollution loads of large agglomerations (>2 000 p.e.) in 2009 are demonstrated in Figure 8.




| | BOD7 | NH4-N | NO3-N | Ntotal | Ptotal |
|---|---|---|---|---|---|
| ■ Aggregate pollution loads from WWTP in urban and rural areas, t/year | 8.8 | 1.7 | 14.8 | 20.05 | 9.7 |
| ■ Pollution loads from WWTP in agglomerations >2000 p.e., t/year | 7.75 | 0.9 | 14.2 | 18.4 | 9.45 |

Figure 8. Aggregate pollution loads from WWTP in urban and rural areas and pollution loads in settlements with a p.e. >2 000 within Dauguva RBD (2009)
Source: EPA data (2009) and experts' estimations carried out to fill in data gaps

32. The major share of urban industrial wastewater enters wastewater treatment plants together with municipal wastewater. However, a number of enterprises have their own wastewater treatment facilities wastewater from which is discharged directly into water bodies. There are three industrial wastewater outlets in Dauguva RBD: industrial wastewater enters bodies of water from a fishery company, electricity generation company and textile manufacturing company. In addition, there are five wastewater outlets of energy companies within the Dauguva RBD which discharge mixed wastewater, i.e. stormwater (surface) runoff and industrial wastewater. In 2009, about 21.8 tonnes of $BOD_7$, 5.7 tonnes of ammonium nitrogen, 4.5 tonnes of nitrate nitrogen, 15.1 tonnes of total nitrogen and 0.7 tonnes of total phosphorus were emitted from the industrial wastewater outlets to the water bodies in the Dauguva RBD. However, it should be pointed out that the majority of the pollution loads was discharged by a pond fish farming company UAB Birvėtos tvenkiniai. The annual volume of wastewater discharged by this company in 2009 totalled to 5.6 million $m^3$ and the pollution loads were: 20.1 tonnes of $BOD_7$, 5.6 tonnes of $NH_4$-N, 4.2 tonnes of $NO_3$-N, 14 tonnes of total nitrogen and 0.6 tonnes of total phosphorus. The area of the ponds used for fishery purposes and other data of the company Birvėtos tvenkiniai is provided in Tables 29 and 30.

Table 29. The area of fishery ponds in the Dauguva RBD

| River | Fish farming company | Annual fish output*, kg | Pond area[+], ha | |
|---|---|---|---|---|
| | | | Certified for ecological fish farming[□] | Total |
| Dysna | UAB Birvėtos tvenkiniai | 793 600 | 457.60 | 793.6 |

*estimated as a multiplication of the average annual productivity (1 000 kg/ha) in ponds of various types according to fish maturity age and the area of the ponds in the fish farming region in northern Lithuania;

[+] Resolution No. 826 of the Government of the Republic of Lithuania of 3 July 2001 on the approval of the List of commercial fish farming ponds and pond areas ( Žin., 2001, No. 58-2087);

[□] Order of the Minister of Agriculture of the Republic of Lithuania on the approval the Rules for Ecological Agriculture of 18 March 2003 (Žin., No. 1-21; 2004, No. 74-2561).

Table 30. Pond fish sales

| Fisheries company | Annual production sales, kg | | | | |
|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 |
| UAB Birvėtos tvenkiniai | 153 800 | 153 800 | 209 000 | 196400 | 267 400 |

Source: Lithuanian Institute of Agrarian Economics

33. According to the EPA data (2009), there are seven surface runoff outlets within the Dauguva RBD, which mainly discharge surface runoff collected from the most polluted industrial territories to surface water bodies. It is estimated that the annual amount of pollutants which enter water bodies within the Dauguva RBD with surface runoff total to about 11.9 tonnes of $BOD_7$, 9.6 tonnes of total nitrogen and 1.2 tonnes of total phosphorus.

34. The percentage distribution of point pollution loads discharged into surface water bodies from municipal, industrial wastewater and surface runoff outlets is demonstrated in Figure 9, the pollution loads are summarised in Table 31. The table data shows that industrial wastewater in the Dauguva RBD accounts for about 42% of $P_{total}$, 40% of $N_{total}$ and as much as 52% of the total point pollution with $BOD_7$. However, it should be noted that the major part of the pollution loads is discharged by the fishery company UAB Birvėtos tvenkiniai. Another significant source of pollution with $N_{total}$ and $P_{total}$ is domestic wastewater: around 58% of all point pollution with $N_{total}$ and approximately 52% of $P_{total}$ enters water bodies within the Dauguva RBD with domestic wastewater. The data of the last couple of years shows that surface runoff can be a significant source of pollution with $BOD_7$ and account for as much as up to 25% of all point pollution loads with $BOD_7$.

Table 31. Point pollution loads from different pollution sources in the Dauguva RBD (industrial wastewater does not include the water emitted from Ignalina NPP)

| Basin | $BOD_7$, t/year | | | $N_{total}$, t/year | | | $P_{total}$, t/year | | |
|---|---|---|---|---|---|---|---|---|---|
| | Domestic WW | Industrial WW | Surface runoff | Domestic WW | Industrial WW | Surface runoff | Domestic WW | Industrial WW | Surface runoff |
| Dauguva | 8.8 | 21.8 | 11.9 | 20.0 | 15.1 | 9.6 | 9.7 | 0.7 | 1.2 |

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

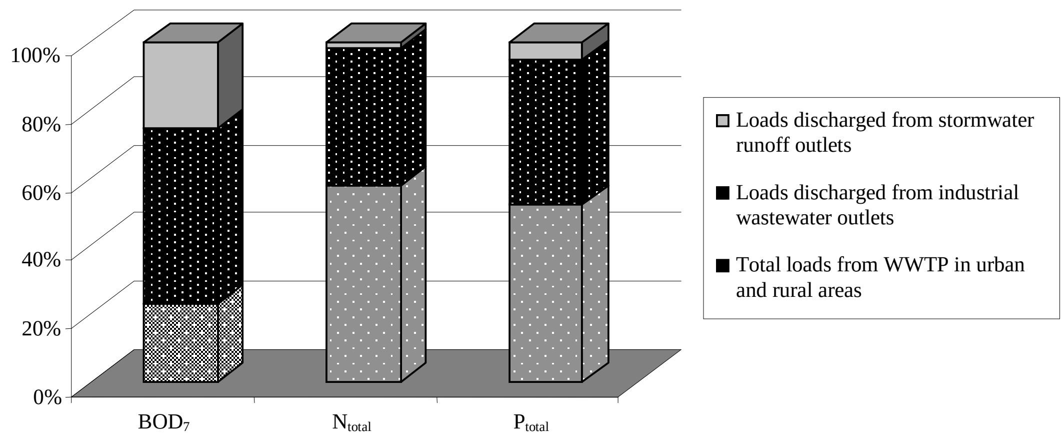



Figure 9. Distribution of pollution loads discharged to water bodies within the Dauguva RBD from outlets of municipal and industrial wastewater and surface runoff (excl. water emitted from Ignalina NPP)

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

## Impacts of point pollution sources

35. The largest point pollution loads within the Dauguva RBD are discharged into surface water bodies from WWTP of Visaginas, Didžiasalis and Zarasai towns, Ignalina Nuclear Power Plant and the fisheries company UAB Birvėtos tvenkiniai. Assessment results show that currently none of the point pollution dischargers exerts any significant impact on the river water quality in the Dauguva RBD.

Though water emitted from the nuclear power plant is assigned to industrial wastewater, in fact it is not polluted and so it does not constitute a significant source of chemical pollution. Pollution from Zarasai WWTP results in higher concentrations of $P_{total}$ in the Laukesa-Nikaja River in summer time. Under the present pollution loads, concentrations of $P_{total}$ in the Laukesa-Nikaja River in the summer season can be as high as 0.2 mg/l, however, the annual concentration conforms to the good ecological status criteria (i.e. <0.14 mg/l). Concentrations of nitrogen compounds and $BOD_7$ in the Laukesa-Nikaja are very small and are practically not affected by point pollution loads.

Following the EPA data of 2000-2008, the quality parameters (concentrations of $BOD_7$, $N_{total}$ and $P_{total}$) of water discharged from the fish farming ponds of the company UAB Birvėtos tvenkiniai seldom exceed the allowable values (see Table 32).

Table 32. Quality parameters of water discharged from fish farming ponds*

| Fisheries company | Receiving waters | Annual effluent volume, thou. $m^3$ | $BOD_7$, $mgO_2/l$ | Suspended matter, mg/l | Total nitrogen, mg/l | Total phosphorus, mg/l |
|---|---|---|---|---|---|---|
| UAB Birvėtos tvenkiniai | Birvėta River | 4 715 | 3.1-6.21 | 18.0-28.9 | 1.1-2.9 | 0.095-0.20 |
| Allowable norms (established pursuant to the Rules for the Issuing, Renewal and Revocation of Integrated Pollution Prevention and Control Permits (Žin., 2002, No. 85-3684; 2005, No.103-3829) | Surface water bodies | - | 7.0 | 15 | 5 | 0.4 |

*average annual values

Source: experts' estimations

It was established that pollution by UAB Birvėtos tvenkiniai does not have any significant impact on the quality of the Birvėta River where concentrations of $BOD_7$, nitrate compounds and $P_{total}$ are very small and conform to the good ecological status criteria.

## Diffuse pollution sources and loads

36. Diffuse pollution does not exert any significant impact on the quality of water bodies within the Dauguva RBD.

36.1. Information about the land use within the Dauguva RBD is provided in Table 33. The information on the areas of built, nature and agricultural territories was estimated using the CORINE land cover database. The data on the declared agricultural land was obtained from the National Paying Agency. Since now a large number of farmers declare their crop areas, the area of the declared agricultural land is expected to reflect the area of currently cultivated land.

Cultivated agricultural land within the Dauguva RBD constitutes only 27% of the total area of the RBD. Arable land accounts for about 29% of the total agricultural land.

Table 33. Land use in the Dauguva RBD

| Basin | Area, $km^2$ | Built areas, $km^2$ | Nature areas, $km^2$ | Agricultural areas, $km^2$ | Declared agricultural land, $km^2$ | | |
|---|---|---|---|---|---|---|---|
| | | | | | Total area, $km^2$ | Area of arable land, $km^2$ | Area of grassland and pastures, $km^2$ |
| Dauguva | 1 875 | 41 | 583.4 | 1 064 | 498 | 143.8 | 354.2 |

Source: CORINE data of 2006 and data on declared crop areas for 2008 provided by the National Paying Agency (NPA)

36.2. Intensity of agriculture in the Dauguva RBD is one of the lowest in the country. The number of livestock units (LSU) for the total area of the basin is as low as 0.06 LSU/ha.

Loads which enter the soil with animal manure are calculated taking into account the number of LSU and assuming that one LSU produces 546 kg of $BOD_7$, 100 kg of $N_{total}$ and 17 $P_{total}$ per year. The total number of LSU and the number of LSU kept on farms of different size within the Dauguva RBD is provided in Table 34 below.

Table 34. Total number of LSU in the Dauguva RBD and the number of LSU on farms of different size

| RBD | Basin | LSU | LSU on farms with more than 300 LSU | LSU on farms with 10 to 300 LSU | LSU on farms with up to 10 LSU |
|---|---|---|---|---|---|
| Dauguva | Dauguva | 12 129.63 | 1 220.96 | 2 035.45 | 8 873.22 |
| **Total in Dauguva RBD:** | | **12 129.63** | **1 220.96** | **2 035.45** | **8 873.22** |

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

The annual input of $BOD_7$ into the soil with animal manure within the Dauguva RBD is estimated to be 35.4 kg/ha and the inputs of $N_{total}$ and $P_{total}$ – 6.48 kg/ha and 1.1 kg/ha respectively.

Table 35. Livestock pollution loads in Dauguva RBD

| RBD | Basin | $BOD_7$ | | $N_{total}$ | | $P_{total}$ | |
|---|---|---|---|---|---|---|---|
| | | t/year | kg/ha | t/year | kg/ha | t/year | kg/ha |
| Dauguva | Dauguva | 6 622.78 | 35.40 | 1 212.96 | 6.48 | 206.20 | 1.10 |
| **Total in Dauguva RBD:** | | **6 622.78** | | **1 212.96** | | **206.2** | |

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

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

Prevention of agricultural pollution will be promoted by national diffuse pollution reduction measures set forth in the Programme for Achieving Water Protection

Objectives within the Nemunas River Basin District approved by Resolution No. 1098 of the Government of the Republic of Lithuania (Žin., 2010, No. 90-4756).

The estimated demand of mineral fertilisers in the Dauguva RBD is provided in Table 36.

Table 36. Demand of mineral fertilisers estimated taking into account the crop structure

| RBD | Basin | Mineral nitrogen fertilisers | | Mineral phosphorus fertilisers | |
|---|---|---|---|---|---|
| | | t/year | kg/ha | t/year | kg/ha |
| Dauguva | Dauguva | 2 413.32 | 12.9 | 389.38 | 2.1 |
| **Total in Dauguva RBD:** | | **2 413.32** | **12.9** | **389.38** | **2.1** |

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

The summarised agricultural pollution loads within the Dauguva RBD are demonstrated in Figures 10 to 12.

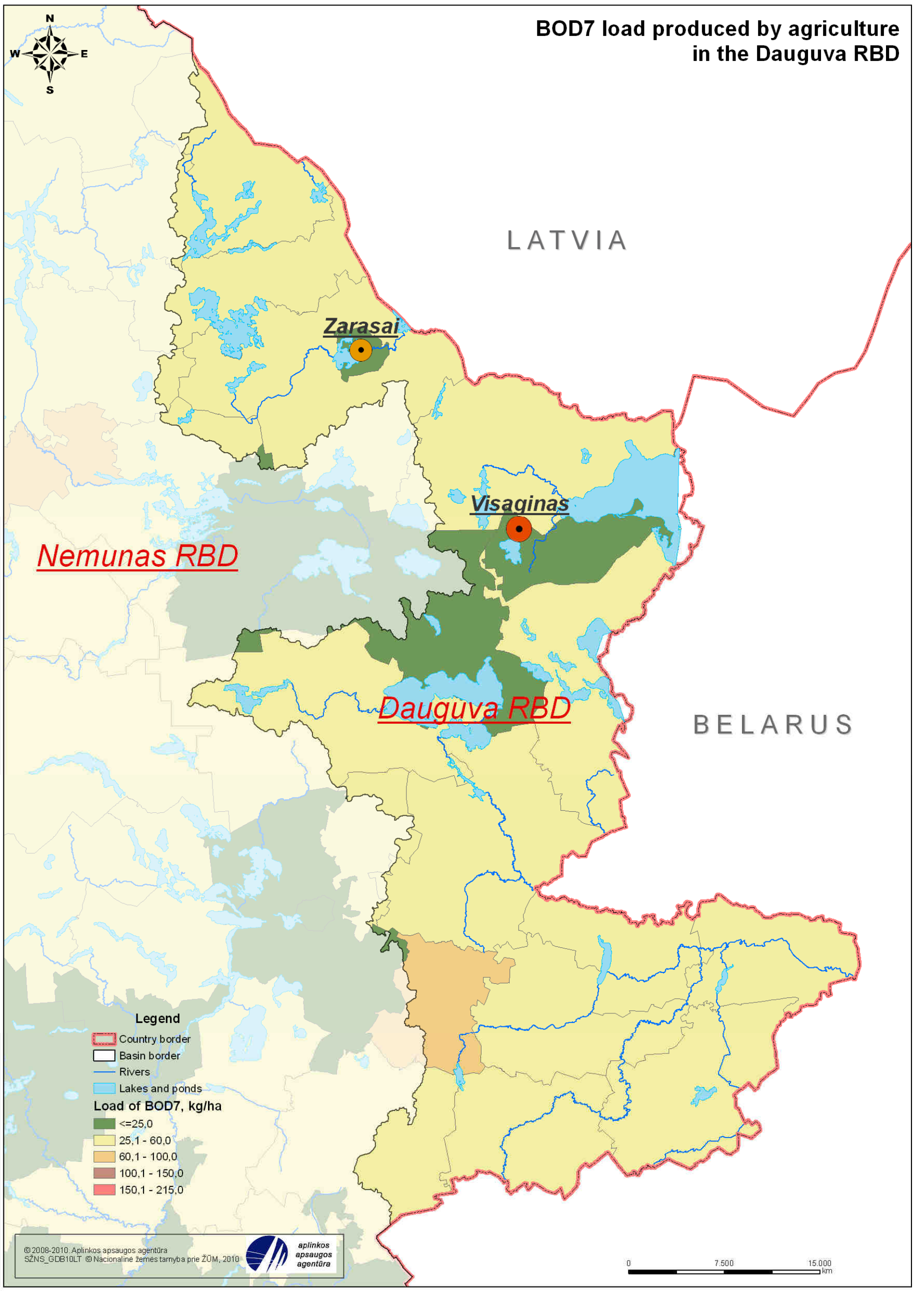



Figure 10. $BOD_7$ loads generated in agriculture in wards of the Dauguva RBD

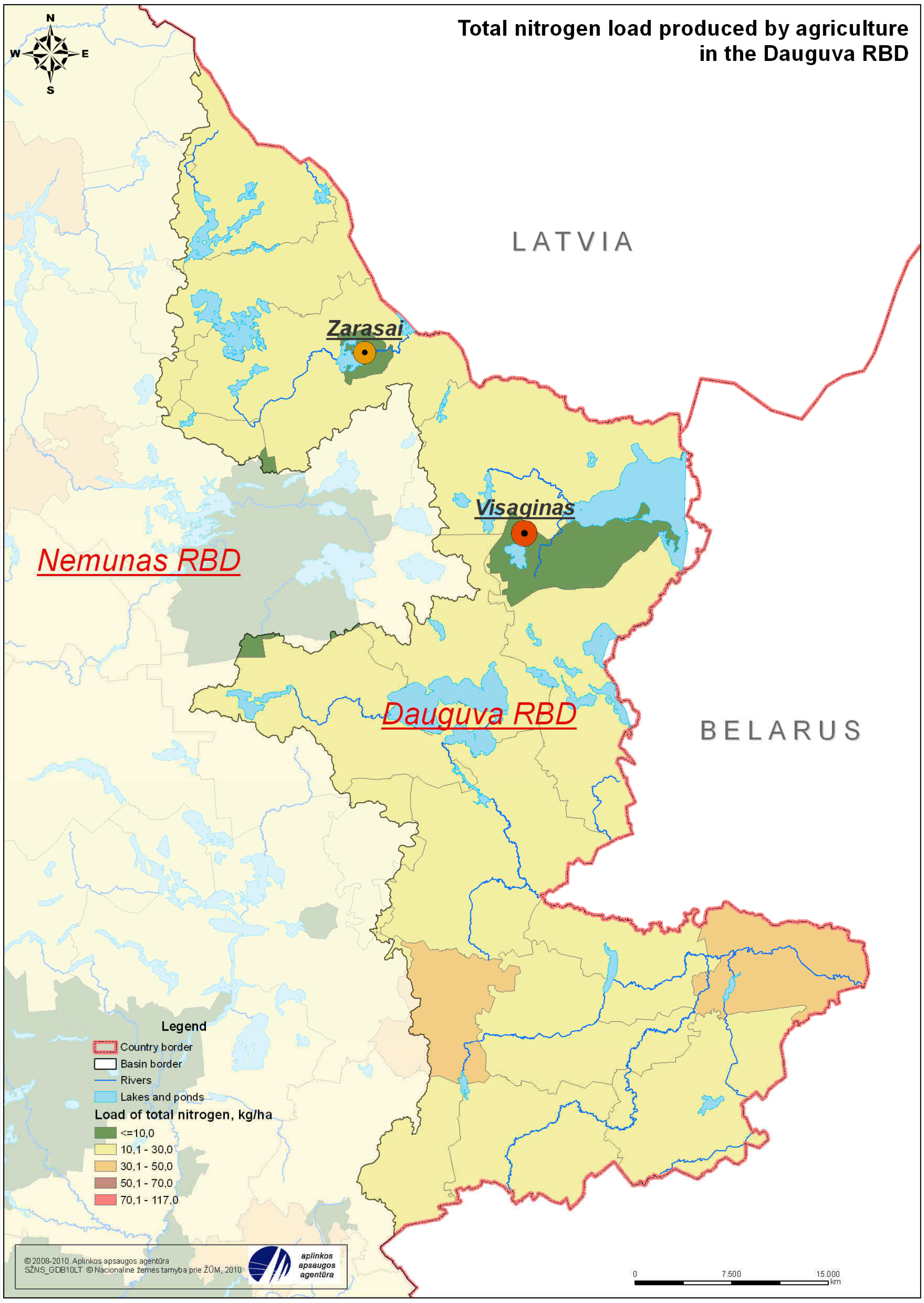



Figure 11. Total nitrogen loads generated in agriculture in wards of the Dauguva RBD

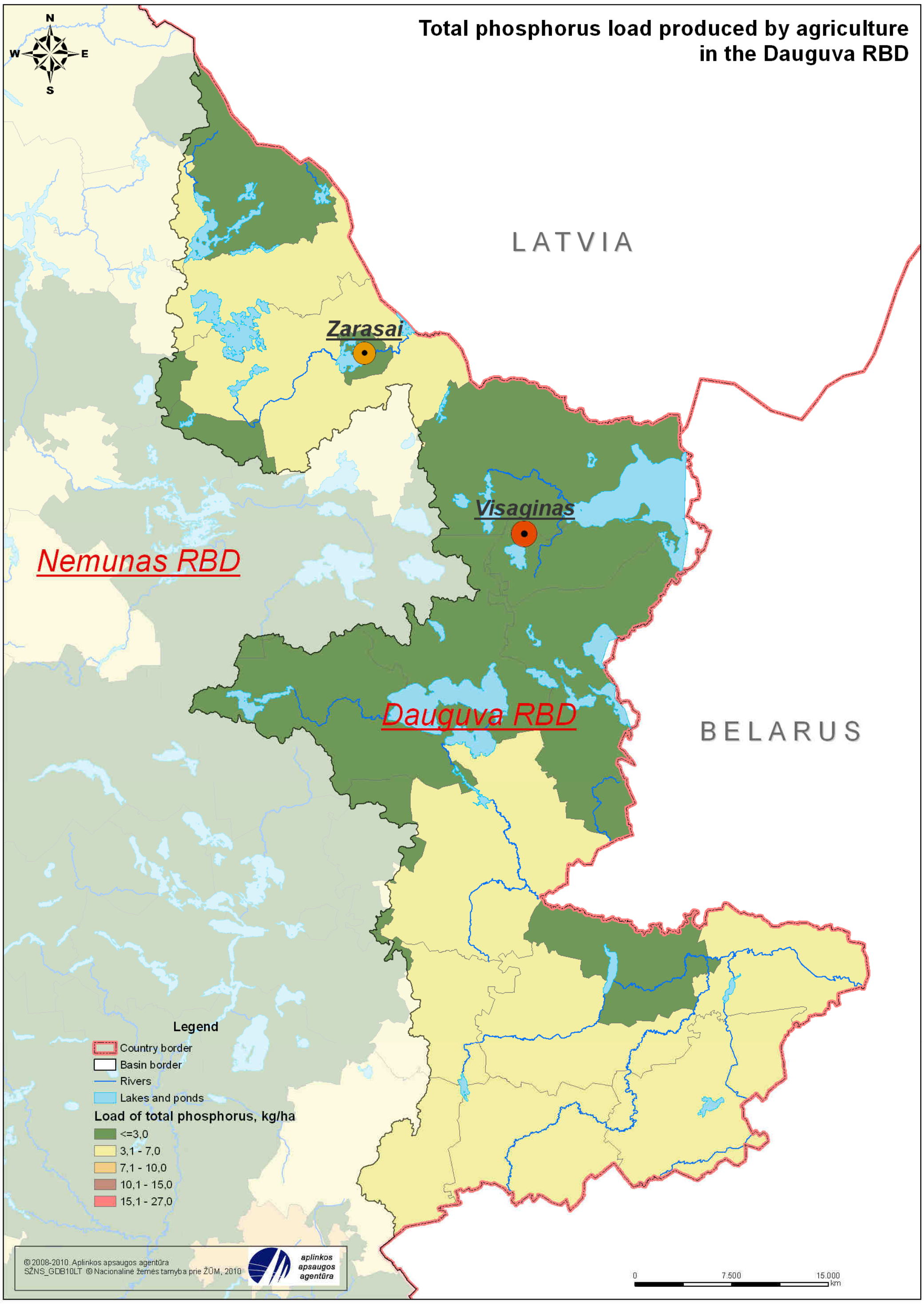



Figure 12. Total phosphorus loads generated in agriculture in wards of the Dauguva RBD

36.3. Inhabitants whose sewerage is not collected and diverted to sewerage networks usually use outdoor toilets. As a result, pollution from these toilets as diffuse pollution can be transported with surface runoff to water bodies. According to the information provided by municipalities, there are 10 487 people whose sewerage is not centrally collected in settlements with more than 100 inhabitants within the Dauguva RBD, which accounts for about 22% of the total number of the population in the basin. The number of non-sewered population in the Dauguva RBD is provided in Table 37 below.

Table 37. Total number of inhabitants and the number of non-sewered inhabitants in settlements with population of more than 100 in the Dauguva RBD

| Basin | Total number of inhabitants in settlements with population of more than 100 | Number of inhabitants with no central collection of sewerage in settlements with population of more than 100 |
|---|---|---|
| Dauguva | 48 204 | 10 487 |
| **TOTAL:** | **48 204** | **10 487** |

Source: information provided by municipalities (2007)

36.4. Diffuse pollution loads from different pollution sources are summarised in Table 38 below. The table data demonstrates that pollution by non-sewered population accounts for a minor share of diffuse pollution, i.e. only a few percent of the aggregate diffuse pollution load. The main source of diffuse pollution is agriculture. It is estimated that up to 34% of diffuse $N_{total}$ and $P_{total}$ loads may be entering water bodies within the Dauguva RBD with animal manure. However, this figure may be not precise because the exact amounts of mineral fertilisers used are not available.

Table 38. Diffuse pollution loads from different pollution sources in the Dauguva RBD

| Basin | $BOD_7$, t/year | | | $N_{total}$, t/year | | | $P_{total}$, t/year | | |
|---|---|---|---|---|---|---|---|---|---|
| | Manure | Mineral fertilis. | Population | Manure | Mineral fertilis. | Population | Manure | Mineral fertilis. | Population |
| Dauguva | 6 622.8 | - | 268.5 | 1 213 | 2 413 | 46.1 | 206.2 | 389.4 | 9.4 |

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

## Impact of diffuse pollution sources

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

37.1. There is one large animal husbandry company in the Dauguva RBD – UAB Rupinskai (LSU=840). The amount of $BOD_7$ in the liquid fraction of organic fertilisers (OF) totals to 6 000-9 000 $mgO_2$/l, the amount of $N_{total}$ is 1 000-1 400 mg/l, $P_{total}$ – 200-300 mg/l, potassium – 400-600 mg/l, dry matter – up to 10 g/l.

The average annual leaching of nitrogen and phosphorus compounds transferred with drainage runoff estimated on the basis of the available information on the number of LSU of UAB Rupinskai and the area of the application of organic fertilisers is provided in Table 39 below.

Table 39. Annual leaching of nitrogen and phosphorus compounds transferred with drainage runoff in animal husbandry areas

| Basin | Company | LSU, units | Area of application of organic fertilisers, ha | Annual leaching with drainage runoff, kg | |
|---|---|---|---|---|---|
| | | | | $N_{total}$ | $P_{total}$ |
| Dauguva | UAB Rupinskai | 840 | 1 189.96 | 936 | 108 |

Source: experts’ estimations

Estimations of the average annual volume of leaching with drainage runoff from areas where OF are spread show that the average annual concentrations of $N_{total}$ and $P_{total}$ in drainage water do not exceed the maximum allowable concentrations ($N_{total}$ <15 mg/l; $P_{total}$ <2.0 mg/l) specified in the Environmental Requirements for Manure and Slurry Management approved by Order No. D1-367 / 3D-342 of the Minister of Environment of the Republic of Lithuania and the Minister of Agriculture of the Republic of

Lithuania of 14 July 2005 (Žin., 2005, No. 92-3434; 2010, No. 85-4492). Accordingly, it can be maintained that the impact of animal husbandry complexes on the quality of drainage water is of a minor significance. However, the assessment of leaching with drainage from animal husbandry areas should not be based on the annual average concentrations as it is done now; instead, pollutant concentrations should be measured and assessed in samples taken immediately after the OF application.

37.2. An analysis of impacts of different pollution sources demonstrated that agriculture exerts only a minor impact on the quality of surface water bodies within the Dauguva RBD: diffuse agricultural pollution loads are among the lowest in the country due to low intensity of agricultural activities. Concentrations of nitrogen compounds, which are usually highly affected by agricultural pollution, in rivers within the Dauguva RBD are very low (about 0.8 mg/l) and are largely determined by the natural background. Calculations show that agricultural pollution loads account for about 64% of the total nitrate nitrogen loads in rivers meanwhile 33% is the natural background. The natural background constitutes about 28% of $P_{total}$ load; a similar amount – 25% – enters the rivers from agricultural pollution sources. Agriculture determines around 14% of the total $BOD_7$ pollution load. Accordingly, diffuse agricultural pollution has a minor effect on both $BOD_7$ and $P_{total}$ concentrations.

37.3. Average annual leaching of nitrogen and phosphorus and the total input of substances into water bodies from drainage systems within the Dauguva RBD are given in Tables 40 and 41. The amounts of nitrogen and phosphorus leached with drainage were estimated using expert judgement – having identified respective shares of nitrogen and phosphorus in the total pollutant load, which was done on the basis of the available information on the annual nitrogen and phosphorus loads in the RBD, soil characteristics, drained areas, etc.

Table 40. Nitrogen leaching with drainage in the Dauguva RBD

| Basin | Average annual leaching with drainage, kg/ha | Total amount, kg |
|---|---|---|
| Dauguva | 6.45 | 386 452.45 |

Source: experts' estimations

Table 41. Phosphorus leaching with drainage in the Dauguva RBD

| Basin | Average annual leaching with drainage, kg/ha | Total amount, kg |
|---|---|---|
| Dauguva | 0.115 | 6 890.02 |

Source: experts' estimations

When agricultural areas are drained using land drainage systems, the water which filters from upper soil layers into lower ones carries soluble substances to the drainage systems thus facilitating their rapid entry to surface water bodies. The larger is the drainage runoff volume, the higher is the level of leaching and pollution of surface water bodies.

The average annual nitrogen and phosphorus leaching with drainage in the Dauguva RBD is not high. The average annual concentration of $N_{total}$ in the Dauguva Tributaries Sub-basin is 0.34 mg/l and that of phosphorus – 0.006 mg/l. Such low leaching of transferred pollutants is determined by their small loads in the catchments. Hence, it can be maintained that the input of nitrogen and phosphorus leached with drainage into pollution of surface water is of a minor significance.

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

### Background pollution loads

38. Mathematical modelling results demonstrated that the annual background pollution load transported by rivers within the Dauguva RBD may be around 558 tonnes of $BOD_7$, 4 tonnes of ammonium nitrogen, 76 tonnes of nitrate nitrogen, and 9 tonnes of total phosphorus. The share of the background pollution accounts for about 80% of the total load of $BOD_7$, 26% of ammonium nitrogen, 32% of nitrate nitrogen, and 34% of total phosphorus transported by rivers.

### Significant impact of river straightening

39. In addition to the impact of pollution loads, morphological changes in water bodies were identified. Rivers are first of all affected by the straightening of their beds because specific habitats of aquatic organisms are destroyed and hence species variety and abundance of aquatic organisms is reduced.

Morphological changes were assessed using the criterion $K_3$:

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

where $\Sigma L_{reg}$ is the aggregate length of regulated river stretches, km; $L_u$ is the total length of the river.

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

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

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

It was established that river straightening has a significant impact on the ecological status of six water bodies in the category of rivers with the total length of 59 km. One of these water bodies, a stretch of the Nikajus with a length of 12 km, flows over an urbanised area and hence is assigned to HMWB. Other five water bodies (47 km) were identified as water bodies at risk because of the straightening impact.

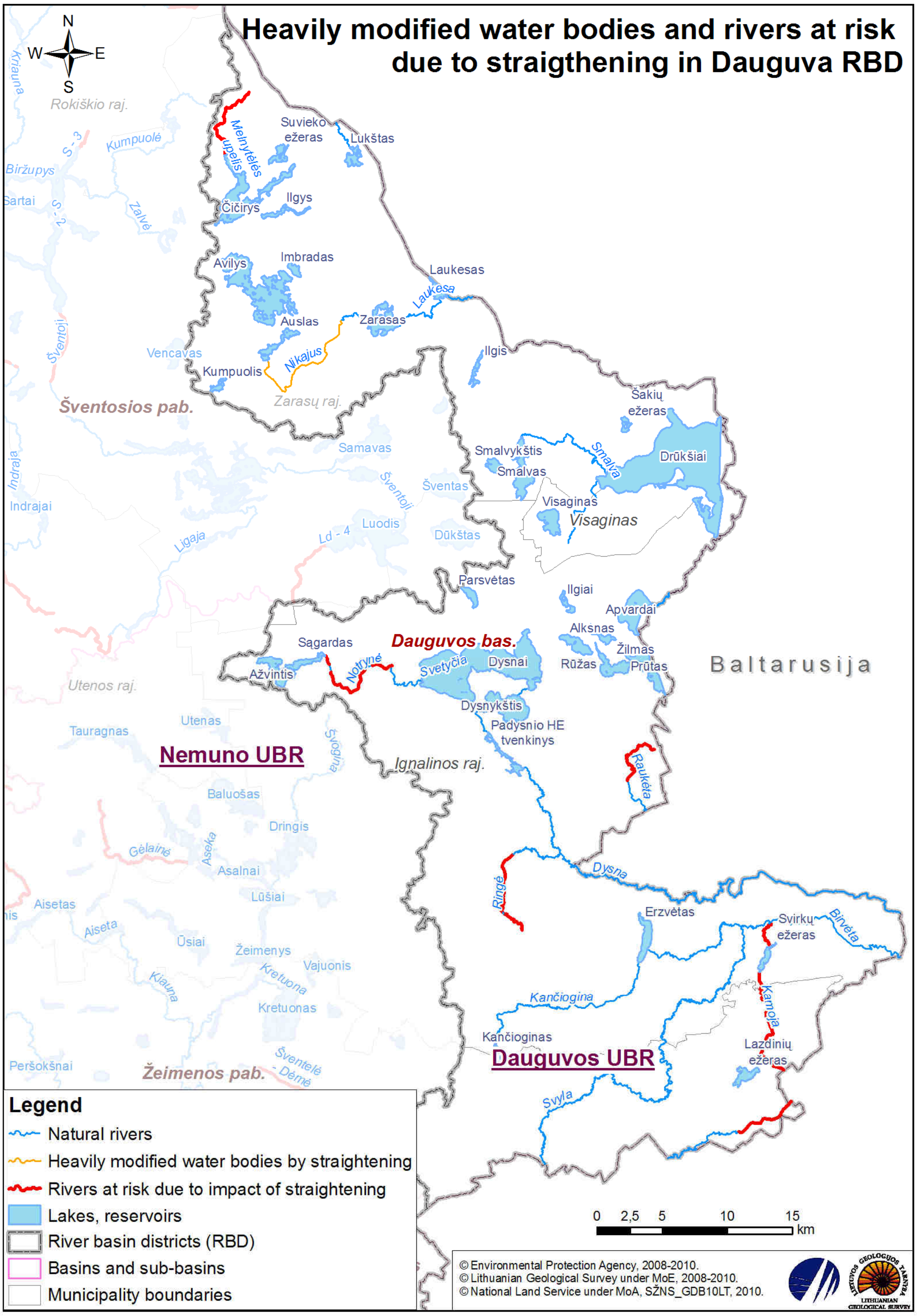



Figure 13. Straightened rivers at risk and heavily modified water bodies

## Impacts of hydropower plants

40. There is only one small operating hydropower plant in the Dauguva RBD – Padysnis HPP (P=120 kW), with a low head (4.3 m) and relatively low drainage (K = 29). This is explained by the fact that the HPP stands on the river which flows out of a lake. In addition, the installed discharge of Padysnis HPP is more than twice higher than the natural discharge of the river, which determines rather significant fluctuations of the discharge downstream of the HPP. As a result, Padysnis HPP has a significant impact on the ecological status of one water body – the Dysna River, with a length of 11.7 km.

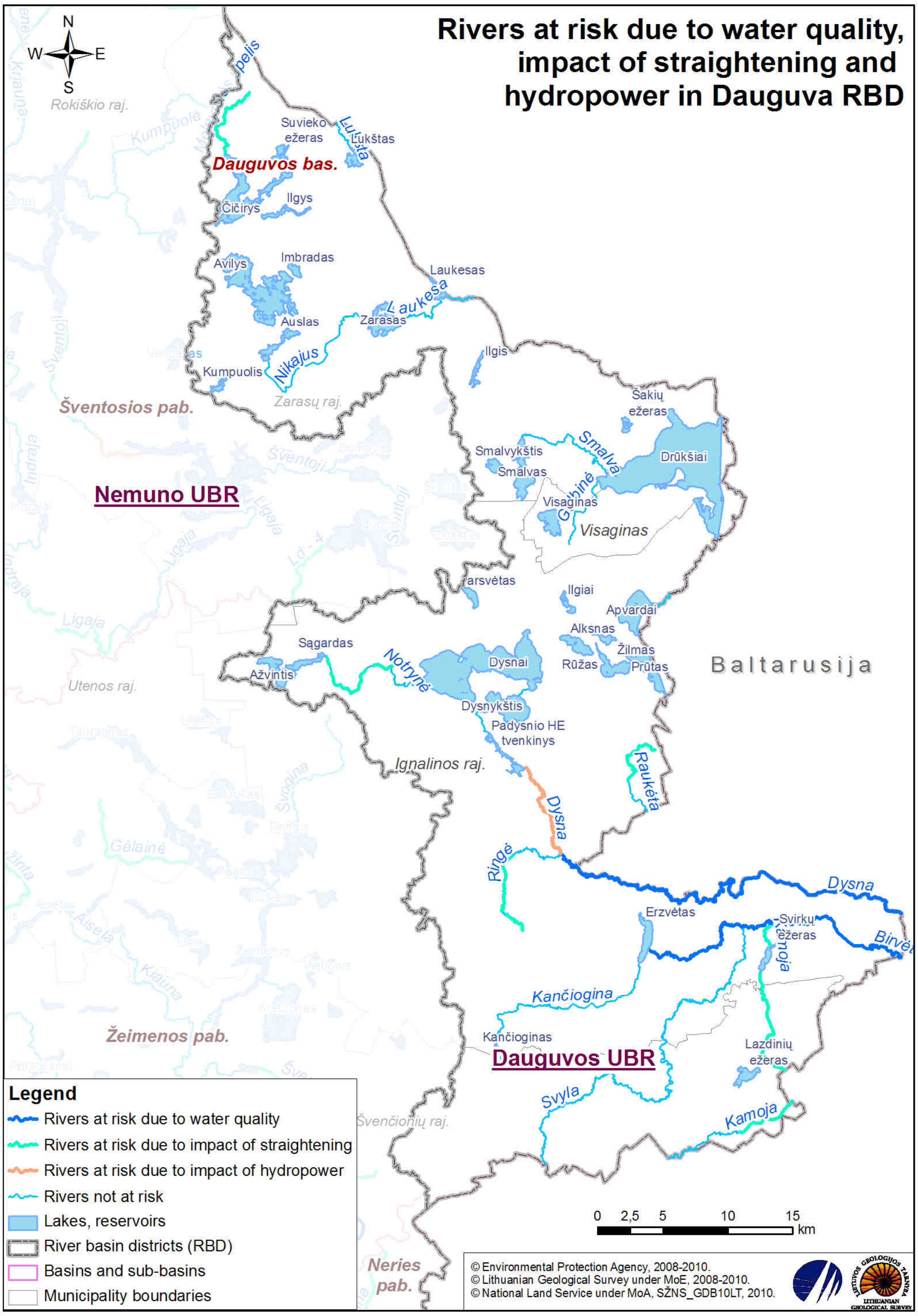



Figure 14. HPP exerting a significant impact in the Dauguva RBD

## Drainage reclamation

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

Table 42. Reclaimed area in the Dauguva RBD

| Basin | Total reclaimed area, ha | Drained area, ha | Share of the total reclaimed area in the basin area, % |
|---|---|---|---|
| Dauguva | 60 772.64 | 59 915.10 | 32.5 |

Source: GIS database of land reclamation status Mel_DB10LT

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

The impact of drainage reclamation on the hydrological regime of rivers and streams is more significant in small basin. The larger is the basin, the lower is the impact of drainage reclamation. The hydrological regime of rivers in large river basins is mainly determined by groundwater in deeper aquifers and not by drainage water. The total reclaimed area and drained area in the Dauguva RBD is provided in Table 42.

Taking into account the present nitrogen and phosphorus loads, it can be concluded that drainage reclamation will not prevent achieving the established water protection objectives. A more detailed description of drainage reclamation on water bodies is given in Part 1 of the project activity outputs.

## Abstraction of surface water and its impact on rivers and lakes

42. The average annual abstraction of surface water within the Dauguva RBD totals to 2 527 126.94 thousand $m^3$. Abstraction of surface water is conditioned by the concentration of economic entities within the RBD. The main users of surface water are industrial, energy and fisheries companies. The water users and volumes of water abstracted thereby within the Dauguva RBD are given in Table 43.

Table 43. Users of surface water in the Dauguva RBD

| User | Place | Average annual abstraction, thou. $m^3$ | Source of abstraction |
|---|---|---|---|
| Gardeners' community Pavasaris | Visaginas | 134.2 | Lake Drūkšiai |
| Company UAB Ignalinos statyba | Ignalina distr. | 7.0 | Lake Dysnai |
| State enterprise Ignalinos atominė elektrinė (Ignalina Nuclear Power Plant) | Visaginas | 2 295 281.3 | Lake Drūkšiai |
| Company UAB SPG2 | Zarasai distr. | 1.64 | Petrūniškės pond |
| Company UAB Birvėtos tvenkiniai | Ignalina distr. | 5 863.0 | Birvėta River |

Source: EPA data for 1997-2008 (data for 2009 has not been prepared yet)

Potentially, the largest user of surface water in agriculture is irrigation. However, according to data of the Ministry of Agriculture of the Republic of Lithuania and the State Land Planning Institute, there were no areas irrigated with surface water in the Dauguva RBD in 2001-2008. The areas suitable for irrigation are provided in Table 44 below. Taking into account the forecasted climate changes, the demand of irrigation may increase in future. However, a poor technical state of the irrigation systems as well as the economic conditions allow maintaining that there will be no surface water abstraction for agricultural purposes during the coming 5-10 years.

Table 44. Irrigated land (ha) in the Dauguva RBD

| Municipality | Area of irrigated land in the land reclamation cadastre | Area suitable for use | Irrigated with water in 2001-2008 |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| Ignalina distr. | 0.00 | 0.00 | 0.00 |
| Švenčionys distr. | 198.60 | 198.60 | 0.00 |
| Zarasai distr. | 0.00 | 0.00 | 0.00 |

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

Rivers were identified for which water abstraction during low water can result in negative hydrological changes (Table 45). The section of the Birvėta downstream of the fish farming ponds was identified as a water body at risk due to a significant impact of water abstraction.

Table 45. Problematic rivers due to surface water abstraction at low water

| Basin | River | User | Potential impact | |
|---|---|---|---|---|
| | | | Summer time | Winter time |
| Dysna | Birvėta | UAB Birvėtos tvenkiniai | Very high | Very high |

Source: experts' analysis results

The impact of water abstraction on the hydrological regime of lakes is assessed with the help of a comprehensive analysis of the following characteristics and changes therein: the average annual lake water level (AAL) (m), average annual water level fluctuation amplitude (ALA) (the difference between the highest and the lowest water level, m) and the ratio between the average annual summer and winter levels (SWL). Such methodology is widely applied in EU Member States as well as in the USA. The said characteristics should be assessed separately for shallow (<10 m) and deep (>10 m) lakes. The assessment results serve as the basis for identifying the demand of water abstraction. The indicators for the assessment of hydrological changes due to water abstraction in lakes are provided in Table 46.

Table 46. Assessment of hydrological changes due to water abstraction in lakes

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

Source: experts' analysis results

Such assessment requires a lot of comprehensive information about bathymetric measurements and seasonal water level fluctuation and water abstraction characteristics in lakes Dysnai and Drūkšiai. However, no detailed information is available at the moment. The assessment of the average annual water abstraction and the average water level characteristics in the lake identified minor hydrological changes in Lake Dysnai (changes in the water level <10%), whereas changes in Lake Drūkšiai are very high.

## SECTION II. SURFACE WATER BODIES AT RISK

### Water bodies at risk in the category of rivers

43. 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 due to one or more of the following factors significantly affecting the status of rivers: water abstraction, straightening of the river bed, HPP, anthropogenic (diffuse and/or point) pollution. Supplementary measures are required for achieving good ecological status/potential in water bodies at risk.

43.1. Water bodies at risk due to water abstraction are rivers which can undergo significant changes in their hydrological regime during low water.

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

43.3. Water bodies at risk also include river stretches downstream of the HPP to the place where the river catchment area becomes 10% larger as compared to the catchment area at the head.

43.4. No river affected by the straightening or HPP is regarded a water body at risk when monitoring data indicates that parameters for biological quality elements meet the good ecological status criteria.

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

44. Parameters for good ecological status and their threshold values are as follows:

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

44.2. average annual concentration of $NH_4$-N ≤0.2 mg/l;

44.3. average annual concentration of $NO_3$-N ≤2.3 mg/l;

44.4. average annual concentration of $N_{total}$ ≤3.0 mg/l;

44.5. average annual concentration of $PO_4$-P ≤0.09 mg/l;

44.6. average annual concentration of $P_{total}$ ≤0.14 mg/l;

45. There are 20 water bodies with the total length of 282 km in the category of rivers within the Dauguva RBD. Of these, five water bodies were assigned to a risk group to the straightening of their river beds. The length of these water bodies is 46.8 km. One water body was identified as a water body at risk due to an impact of HPP; its length is 12 km. One water body with a length of 32 km fails to meet the good ecological status requirements according to parameters for biological quality elements and therefore was also assigned to water bodies at risk. A significant impact on the ecological status of the water body is exerted by water abstraction in Birvėta fish farming ponds. The results of assessment of the impact of point and diffuse pollution sources and the status of surface water bodies show that there are no river water bodies at risk due to the impact of diffuse and/or point pollution sources within the Dauguva RBD. Though concentrations of di(2-ethylhexyl)phthalate (DEHP) were found to be exceeding the maximum allowable concentration (MAC) in the Dysna at the border during the study “Identification of substances hazardous for the aquatic environment” conducted in 2006, no source of pollution with hazardous substances was identified. Consequently, the Dysna with a length of 43.4 was assigned to water bodies at risk and the risk causes were identified as not known.

In total, there are eight water bodies at risk within the Dauguva RBD accounting for 40% of the total number of water bodies. The risk factors which determine the assignment of water bodies to the risk group are given in Table 47 below.

Table 47. Water bodies at risk in the category of rivers in the Dauguva RBD and risk factors; “1” indicates a risk

| Basin | HMWB | Risk factors | | | | | | Number of WB | Length, km |
|---|---|---|---|---|---|---|---|---|---|
| | | Water abstraction | HPP | Straightening | Water quality problems | | | | |
| | | | | | Point pollution | Diffuse pollution | Causes are not known | | |
| Dauguva | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 5 | 46.8 |
| | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 12.0 |
| | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 32.0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 43.4 |

Source: experts’ analysis results

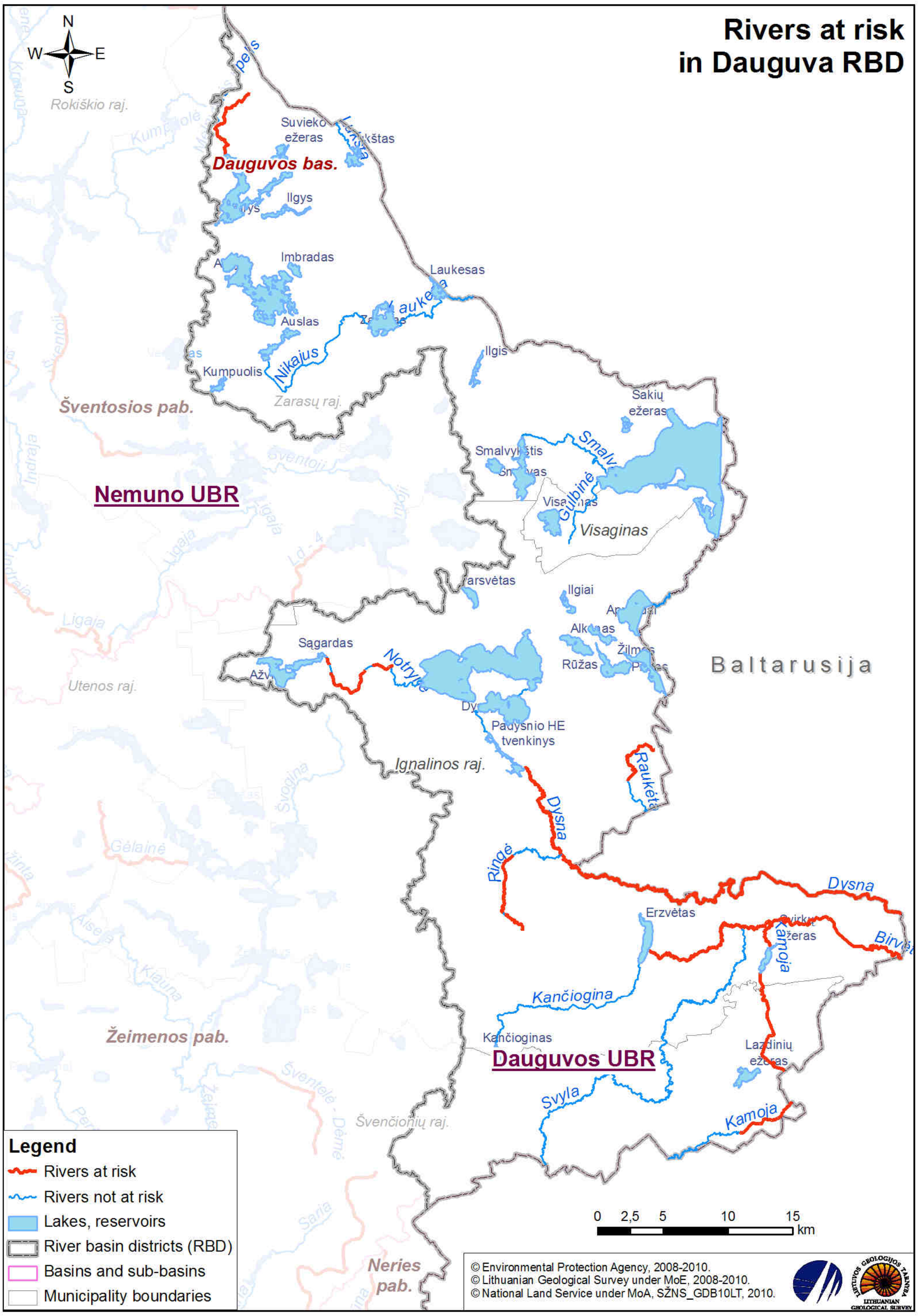



Figure 15. Rivers at risk in the Dauguva RBD

**Water bodies at risk in the category of lakes and ponds**

44. Water bodies in the category of lakes and ponds have been identified as water bodies at risk when the critical values of total nitrogen, total phosphorus and chlorophyll *a* were exceeded: Type-1 and Type-2 lakes – $N_{total}$ > 1.80 mg/l, $P_{total}$ > 0.060 mg/l, EQR of chlorophyll *a* > 0.33; in Type-3 lakes – $N_{total}$ > 1.20 mg/l, $P_{total}$ > 0.050 mg/l, EQR of chlorophyll *a* > 0.33;

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

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

45.1. When there was national monitoring data available on the indicators of the ecological status of a lake, the lake 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.

45.2. 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.

45.3. 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.

45.4. 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.

45.5. 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.

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

The water bodies at risk in the category of lakes in the Dauguva RBD and their risk factors are listed in Table 48.

Table 48. Water bodies at risk in the category of lakes; “1” indicates risk factors

| **River** | **Lake / pond** | **Area, km$^2$** | **Risk factors** | | |
|---|---|---|---|---|---|
| | | | **Diffuse pollution** | **Potential impact of historic pollution** | **Historic thermal pollution** |
| Dysna | Drūkšiai | 36.226 | 1 | | 1 |
| Laukesa | Imbradas | 0.6 | | 1 | |

Source: experts’ analysis results

46. Following the modelling results for pollution loads from diffuse and point pollution sources, the main factor which determines lower than good ecological status of Lake Drūkšiai is historic and present point pollution from Visaginas town. Pollutants enter the lake by the Gulbinėlė River from Lake Skrytas (Skripkų ežeras) where the outlet of Visaginas wastewater plant (WWTP) is located. The deterioration of the ecological status of the lake was also affected by an unnaturally high water temperature (the water of the lake used to be used for the cooling of Ignalina Nuclear Power Plant (hereinafter –Ignalina NPP). Today, Visaginas WWTP has already been rehabilitated; besides, Visaginas municipality has planned cleaning up Lake Skripkų ežeras (which determines secondary pollution of Lake Drūkšiai), hence pollution loads are expected to go down significantly in the nearest future.

47. Causes which condition lower than good ecological status of Lake Imbradas are not known. Mathematical pollution load modelling results indicate that the status of the lake should be high. The lake study suggests that the lake can be (could have been) suffering from pollution with wastewater from Imbradas settlement.

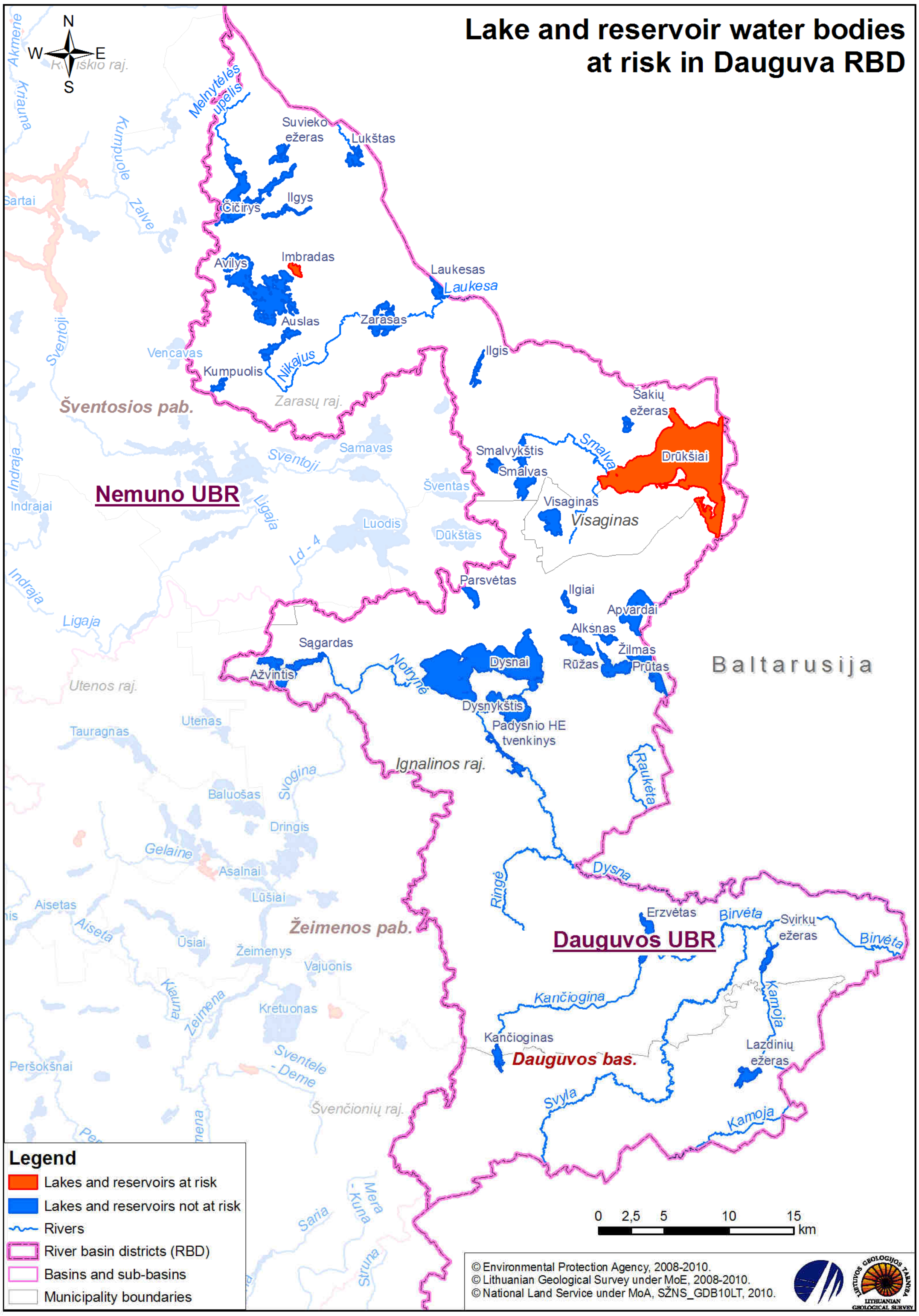



Figure 16. Lakes and ponds at risk in the Dauguva RBD

## SECTION III. IMPACT OF ECONOMIC ACTIVITIES ON GROUNDWATER WELLFIELDS

48. Anthropogenic activities – pollution of the environment and abstraction of groundwater – can have a negative impact on groundwater bodies.

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

### General description

49. A quantitative impact of diffuse pollution on shallow groundwater is demonstrated in maps of increased concentrations of individual analytes of its hydro-chemical composition in shallow groundwater as compared to their background (natural) values, which illustrate the extent of contamination of shallow groundwater with a specific polluting substance in a certain place. The maps were prepared using maps of technogenic loads and average concentrations of analytes in different types of land use. Such maps, which demonstrate increased concentrations of nitrates and ammonium in shallow groundwater of the Dauguva and neighbouring RBD due to impacts of diffuse pollution, are given in Figures 17 and 18. The maps show that the concentrations of the said nitrogen compounds do not exceed the standards of drinking water at the regional level. The nitrate concentration in shallow groundwater is close to the MAC, which is 50 mg/l, and the ammonium concentration totals to 2.44 mg/l exceeding the MAC a few times (0.5 mg/l) only in certain localities (mainly in wells in urbanised areas). However, this is usually a pollution problem of dug wells constructed in an inadmissible place from the point of view of hygienic requirements.

50. The average increase of nitrate concentrations in shallow groundwater in Dauguva RBD as a result of the impact of diffuse pollution is 7.6 mg/l, and of ammonium – 0.33 mg/l. In this RBD, natural territories with background concentrations of nitrates and ammonium ($NO_3$ – 1.55 mg/l, $NH_4$ – 0.21 mg/l) take the area of 675 $km^2$, i.e. more than one third (36%) of the RBD area. More than half of the area (55%) has been subject to diffuse pollution from grassland, pastures and agricultural fields situated in clayey soils, where the average concentration of nitrates is higher by 1.3-8.12 mg/l and that of ammonium – by 0.22-0.3 mg/l as compared to the background values (see Figures 17, 18). 6% of the area is taken by agricultural fields situated in sandy soils, where the average concentration of nitrates in shallow groundwater is 16.68 mg/l and of ammonium – 0.53 mg/l (the increase due to the impact of diffuse pollution is respectively 15.13 mg/l and 0.32 mg/l) (see Figures 17 and 18). Urbanised areas where the most significant impact of diffuse pollution on shallow groundwater is observed occupy as little as 2% of the total RBD area. Here the average concentration of nitrates exceeds the background values by 43.59 mg/l and totals to 45.14 mg/l, the concentration of ammonium exceeds the background values by 2.21 mg/l and totals to 2.44 mg/l (see Figures 17 and 18).

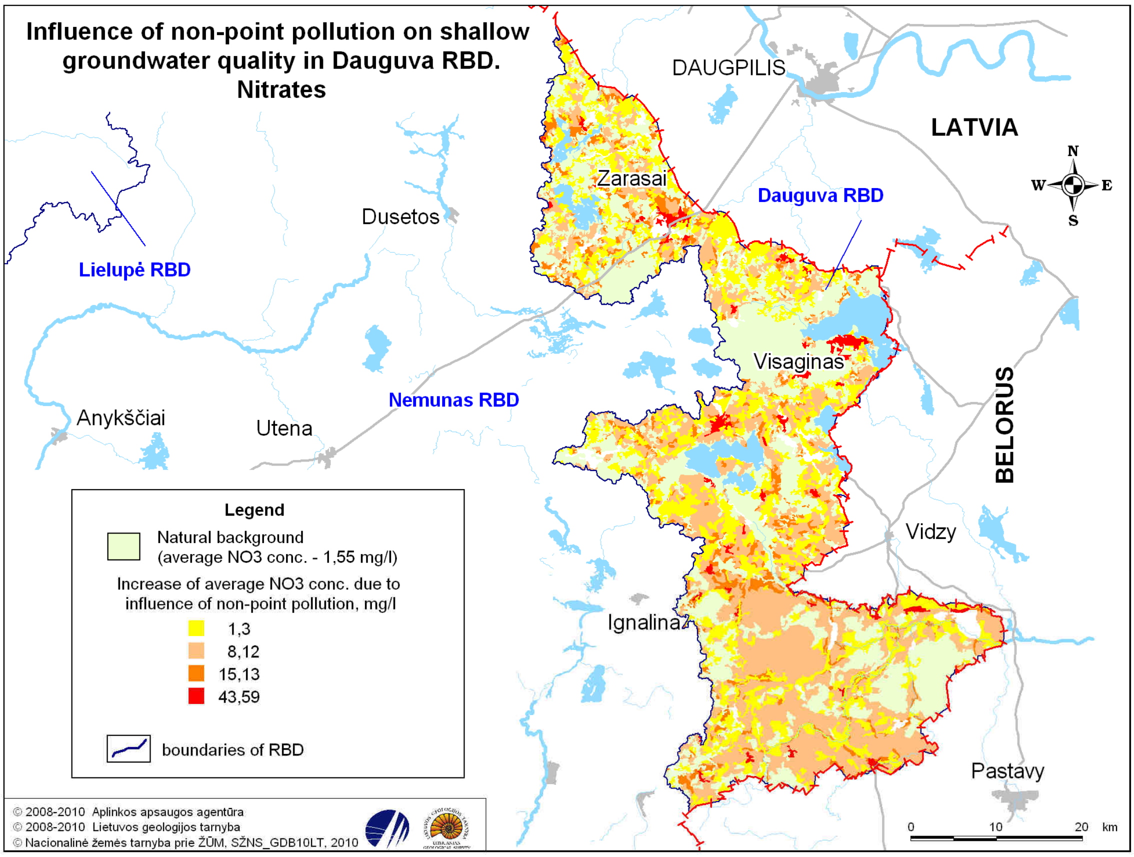



Figure 17. Impact of diffuse pollution on shallow groundwater quality. Nitrates.

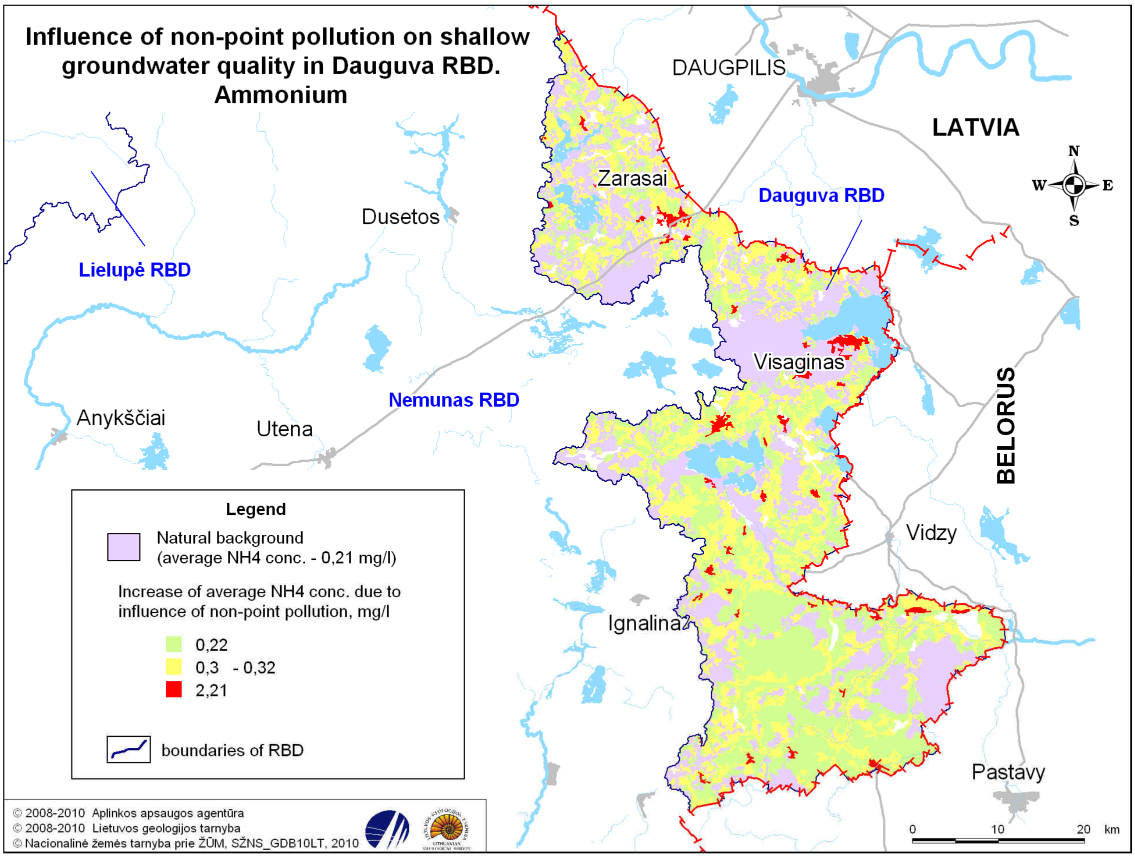



Figure 18. Impact of diffuse pollution on shallow groundwater quality. Ammonium.

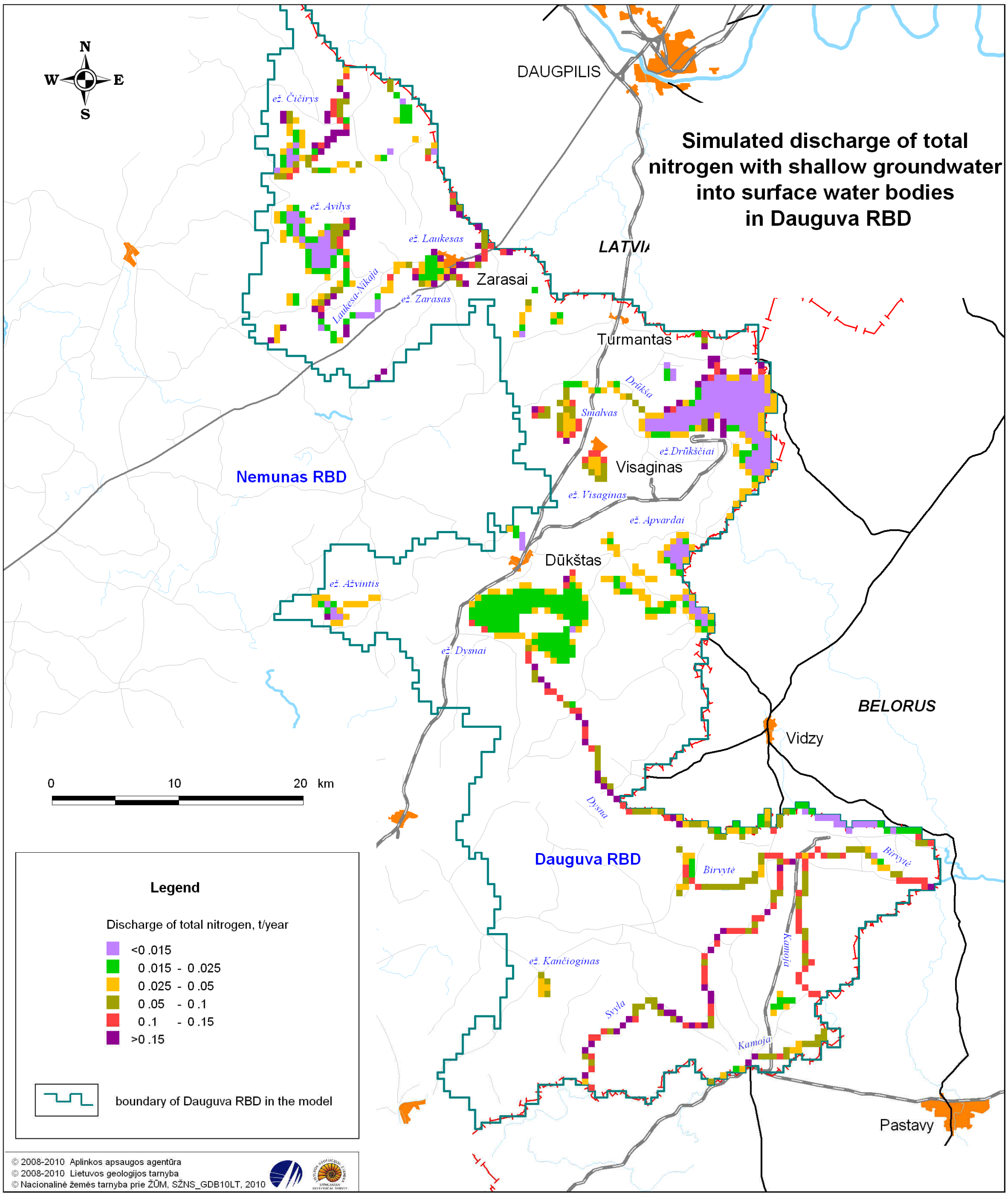



Figure 19. Simulated total leaching of nitrogen with shallow groundwater to surface water bodies in the Dauguva RBD

51. A quantitative impact of shallow groundwater affected by diffuse pollution on surface water within the Dauguva RBD was assessed using mathematical models of groundwater filtration, where values of discharge of groundwater outflow into individual rivers in each calculated block of the model were established. Leaching of nitrates, ammonium, phosphates, total nitrogen, nitrate nitrogen, ammonium nitrogen, and phosphate phosphorus with groundwater to surface water bodies was estimated having entered additional values of the parameters of groundwater pollution in the models. The results of this assessment for the Dauguva RBD are provided in Table 49.

Table 49. Simulated leaching of pollution with shallow groundwater to surface water bodies in the Dauguva RBD

| River basin | Area, $km^2$ | Simulated shallow groundwater flow module, $l/s/km^2$ | Parameter | Simulated leaching with groundwater, t/year |
|---|---|---|---|---|
| Dauguva | 1 874.96 | 2.12 | $NO_3$ | 193.84 |
| | | | $NH_4$ | 26.26 |
| | | | $PO_4$ | 10.0 |
| | | | $N_{total.}$ | 63.78 (22.1) |
| | | | $N\_NO_3$ | 43.77 |
| | | | $N\_NH_4$ | 20.01 |
| | | | $P\_PO_4$ | 3.25 (14.4) |

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

Source: Modelling results of 2010.

The amounts of pollutants leaching to surface water bodies with groundwater given in Table 49 above show how much of these compounds enter surface waters as a result of groundwater – river interaction. The entry of the said compounds from groundwater to surface waters, i.e. to different oxidation-reduction conditions, results in rapid destruction, transformation, decay, dilution and other processes of these pollutants, hence their concentrations significantly go down. However, even without taking into account the said destruction and other processes, it can be maintained that the share of diffuse pollution which enters rivers of Dauguva RBD with groundwater flow in the aggregate amount of pollutants in rivers is of a minor significance. For instance, the amount of total nitrogen leaching to surface water bodies with groundwater accounts for 22.1%, the amount of phosphate phosphorus – for 14.4% of the total amounts of these pollutants in rivers (see Table 49). Hence, even without considering the said destruction and other processes, which reduce concentrations of pollutants which leach from shallow groundwater into surface water, it can be maintained that there are no groundwater wellfields which would pose risk to surface water bodies in the shallow aquifer within the Dauguva RBD (the amounts of pollution leaching with shallow groundwater does not exceed 50% of the total amount of pollution of surface water indicated in the EC guidelines). Having in mind that concentrations of nitrogen compounds leaching from groundwater to surface waters go down at least 2.5 times as a result of their destruction, transformation, dilution and other processes (the background concentration of total nitrogen in shallow groundwater is 0.51 mg/l, its concentration in a river during minimum low flow is 0.2 mg/l), the actual impact of diffuse pollution of shallow groundwater on surface water would be even lower.

Figure 16 demonstrates distribution of the outflow of total nitrogen with shallow groundwater in each simulated river along the entire bed depending on filtration properties of the shallow aquifer, concentration of pollutants in shallow groundwater, and the flow gradient. The size of the calculated blocks in the model is 0.5x0.5 km, which means that the figures given in the map show the magnitude of the outflow of this diffuse pollution component with shallow groundwater in a river stretch of 500 m. Following the modelling results, the highest leaching of nitrogen compounds is found in individual stretches of the rivers Dysna, Svyla, Drūkša, where agricultural or urbanised areas are located in the neighbourhood of the river slope. In many of these areas, the annual leaching of the said pollutants in a river stretch of 500 m totals to 0.05-0.1 and more tonnes (see Figure 16).

It should be mentioned that estimations carried out for the Nemunas RBD showed that the share of diffuse pollution which enters the rivers with groundwater flow is of a minor significance and constitutes not more than a few per cent in the aggregate pollution amount. The same is indicated by the results of the simulation of groundwater leaching to rivers – the discharge of outflowing groundwater is calculated in litres per seconds meanwhile the discharge of any larger river is calculated in cubic meters per second. Hence, it can be preliminary concluded that the impact of diffuse pollution of groundwater on the quality of surface water within the Dauguva RBD is not significant at the regional level and that there are no groundwater wellfields which would pose risk to surface water bodies in the shallow aquifer (the amounts of pollution flowing out with shallow groundwater does not exceed 50% of the total amount of pollution of surface water indicated in the EC guidelines).

### Impacts of point pollution

52. The most important and potentially most dangerous objects of point pollution in the Dauguva RBD, as in other districts, are animal husbandry complexes. In addition, the Dauguva RBD also contains another potential specific polluter – Ignalina NPP.

According to the analysis data of the LGS, there is only one complex within the Dauguva RBD studied in 2004–2007 – a pig breeding complex in Rupinskai village owned by the company UAB Saerimner in Ignalina district. A monitoring programme was prepared for this complex for 2003-2007. The amounts of nitrates detected in samples taken in two monitoring wells were very low – 5.34–10.4 mg/l. However, the data obtained in other animal husbandry complexes operated by UAB Saerimner which are situated outside the Dauguva RBD show even lower concentrations of nitrates (0.086–0.49 mg/l) and thus do not seem to be reliable, because at least a few milligrams of nitrogen compounds, including nitrates, are usually found in groundwater of even completely clean areas. Consequently, such data should be revised on the basis of programme monitoring data, which should reveal whether any negative impact is made on shallow groundwater. Such monitoring is obligatory in this complex, as in all other ones, because the impact of the said pollutants on shallow groundwater and/or surface water can be assessed only on the basis of multi-annual data.

A comprehensive assessment of the impact of Ignalina NPP on bodies of groundwater and surface water is provided in a special monograph. In addition, there is data available of other, specific research as well as monitoring data on the radiological status of shallow groundwater in the territories of Ignalina HPP and its individual objects. Concentrations of the most hazardous (caesium $^{137}Cs$, strontium $^{90}Sr$) and most mobile (tritium $^{3}H$) radionuclides in groundwater have been analysed and controlled. All this data confirms the long-known fact that the most hazardous radionuclides of heavy metals practically do not migrate under the ground because they are sorbed and detained by the smallest soil particles. Analyses show that only a minor mobile share of these radionuclides finds its way to shallow groundwater, and its migration path under the ground usually does not exceed a dozen to some tens meters, meanwhile here the concentration of radionuclides is very small, although cumulative amounts of radionuclides in the soil may be large and varying. Dispersion of the most mobile radionuclide tritium ($^{3}H$) under the ground is much more likely; however, its concentrations in the surroundings of Ignalina HPP, as everywhere else, are very low and, consequently, concentrations observed in shallow groundwater are even lower. Hence, the objects of Ignalina HPP do not pose any risk of radiological pollution of shallow groundwater and, as a result, on surface water.

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

53. There are 43 groundwater wellfields where groundwater is abstracted from the groundwater body of Quaternary deposits and groundwater body of Upper-Middle Devonian deposits Šventoji-Upninkai (Table 50).

Table 50. Groundwater wellfields in the Dauguva RBD

| RBD | GWB | Geological index of the aquifer | Number of groundwater wellfields |
|---|---|---|---|
| Dauguva | GWB of Upper-Middle Devonian deposits (Dauguva) | Q | 12 |
| | | $D_{3-2}$šv-up | 9 |
| | | **Total in GWB:** | **21** |
| | GWB of Quaternary deposits of South-Eastern Lithuania (Dauguva) | Q | 20 |
| | | $D_{3-2}$šv-up | 2 |
| | | **Total in GWB:** | **22** |
| | | **Total in RBD:** | **43** |

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

The main productive aquifer within the Dauguva RBD, Šventoji-Upninkai aquifer complex, occurs deep and is sufficiently well isolated from surface water. Quaternary intermoraine aquifers occur locally and produce only small volumes of water. Hence the impact of deeper confined aquifers on surface water bodies is only minor. A quantitative assessment can be made by comparing the modules of groundwater resources in the groundwater bodies situated in the Dauguva RBD which are abstracted today and which are planned for the future (Table 51).

Table 51. Modules of present and prospective groundwater resources in the Dauguva RBD

| GWB | Area, $km^2$ | Volume of current groundwater abstraction ($m^3/d$)* / module ($l/s·km^2$) | Volume of groundwater resources planned for abstraction in 2015 ($m^3/d$)** / module ($l/s·km^2$) |
|---|---|---|---|
| GWB of Upper-Middle Devonian deposits (Dauguva) | 752.82 | 8 393/0.13 | 9 526/0.15 |
| GWB of Quaternary deposits of South-Eastern Lithuania (Dauguva) | 1 122.13 | 798/0.08 | 425/0.004 |

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

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

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

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

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

54. The modelling results show that the use of wellfields within the Dauguva RBD at the prospective discharge level of 2015 practically does not have any impact on the groundwater table – the simulated decrease of the groundwater table within the entire territory of the RBD is not lower than 1 cm. The same is true for bogs, marshes and wetlands included in the NATURA 2000 network within this RBD. This means that there are no groundwater wellfields within the Dauguva RBD which would have an adverse impact on the status of surface water bodies and/or terrestrial systems dependent on groundwater.

## CHAPTER IV. PROTECTED AREAS

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

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

Particularly protected areas lying within Dauguva RBD take up 21 280 ha, or 11.5% of the total area of the basin (Table 52, Figure 20) and are significantly below the national average. Dauguva RBD contains relatively more reserves and biosphere polygons.

Table 52. Categories and areas of protected areas in the Dauguva RBD

| Categories and types of protected areas | Number | Area (ha) | Percentage of protected areas in the RBD | Ratio with the country's average |
|---|---|---|---|---|
| Strict nature reserves and small strict reserves | - | - | - | < |
| Natural and complex reserves | 13 | 6 348 | 3.42 | > |
| Recuperational plots | - | - | - | < |
| National parks | 1 | 358 | 0.19 | < |
| Regional parks | 2 | 8 288 | 4.46 | < |
| Biosphere reserves | - | - | - | < |
| Biosphere polygons | 3 | 7 267 | 3.91 | > |
| **Total:** | 19 | 21 280* | 11.46 | < |

* The area of reserves situated within biosphere reserves was subtracted from the total area.
Source: Data provided by the State Service for Protected Areas for 2010 and distributed in the RBD by experts.

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

**Strict reserves**

56. Strict reserves are protected areas established for preservation and research of natural and cultural territorial complexes, which are especially valuable from the scientific point of view, for ensuring maintenance of natural processes or authenticity of cultural values, as well as in order to propagate the protection of territorial complexes of natural and cultural heritage. There are no state nature strict reserves in the Dauguva Basin.

**Reserves**

57. Reserves – both state ones (Table 53) and those situated in Gražutė and Sirvėta regional parks – play an important role in preserving the landscape and biological diversity within the Dauguva RBD.

Table 53. State reserves in the Dauguva RBD

| | Reserve | Reserve type | Area, ha | Municipality |
|---|---|---|---|---|
| 1 | Ažušilė* | landscape | 103 | Ignalina distr. |
| 2 | Smalva | landscape | 2 225 | Ignalina distr., Zarasai distr. |
| 3 | Pratkūnai* | geomorphological | 24 | Zarasai distr. |
| 4 | Tilžė | geomorphological | 44 | Zarasai distr. |
| 5 | Dysna | hydrographical | 587 | Ignalina distr. |
| 6 | Smalva | hydrographical | 547 | Zarasai distr. |
| 7 | Antanai | pedological | 135 | Švenčionys distr. |
| 8 | Adutiškis | telmological | 846 | Ignalina distr., Švenčionys distr. |
| 9 | Milašius | telmological | 656 | Ignalina distr. |
| 10 | Pušnis | telmological | 779 | Ignalina distr. |
| 11 | Samaniai* | telmological | 16 | Zarasai distr. |
| 12 | Velniabalė | telmological | 119 | Zarasai distr. |
| 13 | Vytėnai | telmological | 267 | Ignalina distr. |
| | Total | | 6 348 | |

* Only the share of the protected area situated within the boundaries of the RBD.
Source: Data provided by the State Service for Protected Areas for 2010 and distributed in the RBD by experts.

There are no reserves established by municipalities within the Dauguva RBD. Expansion of such reserves should be facilitated by the Procedure for the Establishment of Municipal Reserves and Announcement of Municipal Objects of Nature Heritage approved by Resolution No. 56 of the Government of the Republic of Lithuania of 19 January 2006 (Žin., 2006, No. 9-335), which should be observed when establishing municipal reserves.

Regulations of Nature and Complex Reserves approved by Resolution No. 318 of the Government of the Republic of Lithuania of 2 August 2008 (Žin., 2008, No. 44-1642), lay down general and special rules for the protection and management of reserves as well as principles of management and organisation of activity. The provisions of the Regulations are applicable for state and municipal reserves as well as reserves situated in state parks and in biosphere monitoring territories.

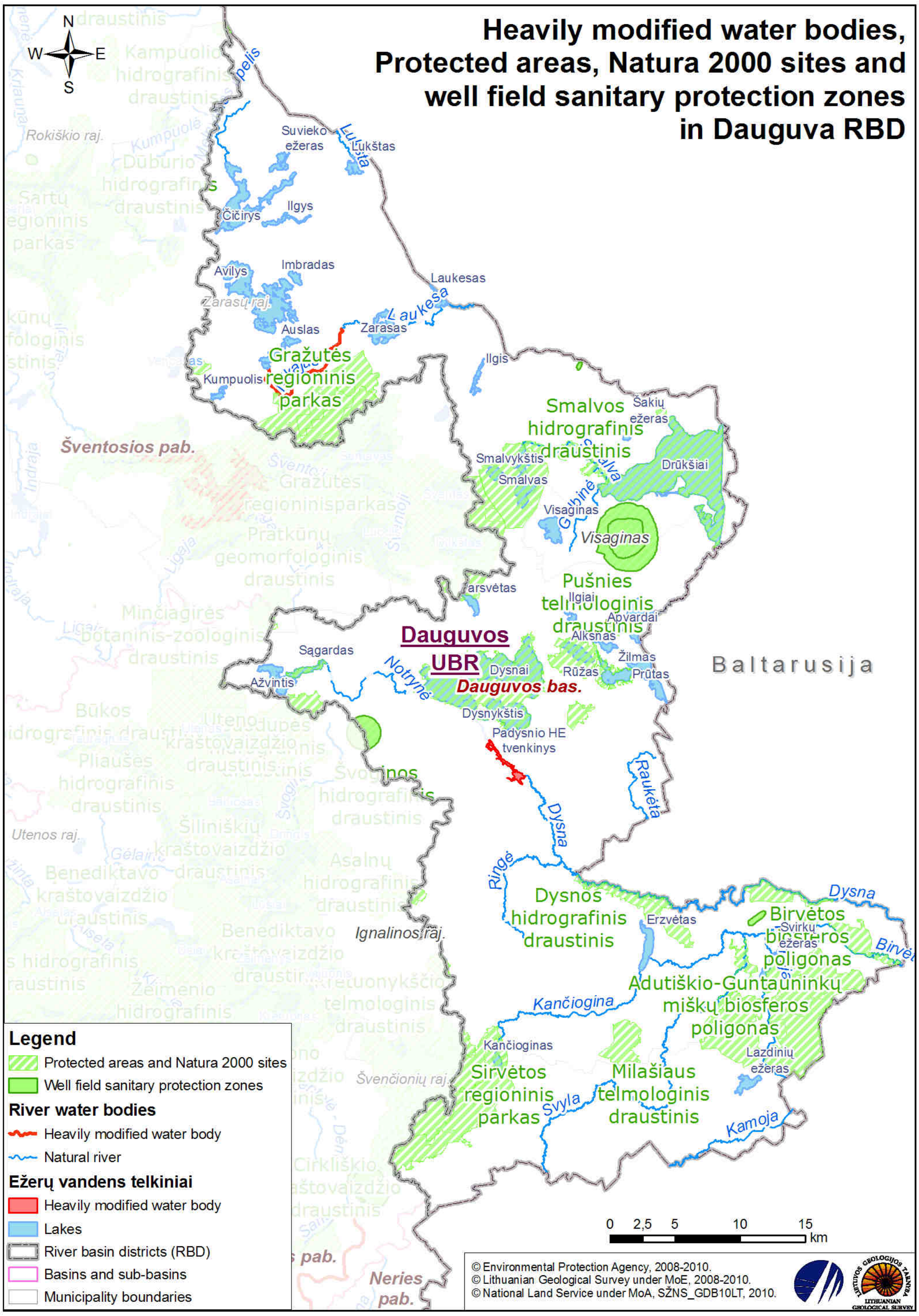



Figure 20. Protected areas in the Dauguva RBD

## State parks

58. State parks make up the largest share of the protected areas system in Lithuania. The Dauguva RBD situates only parts Aukštaitija National Park and Gražutė and Sirvėta regional parks (Table 54).

Table 54. State parks in the Dauguva RBD

| | State park | Area, ha | Municipality |
|---|---|---|---|
| 1 | Aukštaitija National Park | *358 | Ignalina distr. |
| 2 | Gražutė Regional Park | *4 176 | Ignalina distr., Zarasai distr. |
| 3 | Sirvėta Regional Park | *4 068 | Ignalina distr., Švenčionys distr. |
| | Total | 8 602 | |

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

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

## Biosphere monitoring territories

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

Biosphere polygons are created to facilitate the monitoring of national and regional environments in territories of particular geo-ecological importance. 28 biosphere polygons were established by orders of the Minister of Environment in 2004, 2005 and 2009, including three ones within the Dauguva RBD (Table 55 below), which also approved their individual regulations and boundaries.

Table 55. Biosphere monitoring territories in the Dauguva RBD

| | State park | Area, ha | Municipality |
|---|---|---|---|
| 1 | Biosphere polygons of Adutiškio-Guntauninkų forests | 5 670 | Ignalina distr., Švenčionys distr. |
| 2 | Birvėta biosphere polygon | 1 240 | Ignalina distr. |
| 3 | Svyla biosphere polygon | 357 | Ignalina distr. |
| | Total | 7 267 | |

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

## Network of NATURA 2000 sites

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

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

With a view to develop the NATURA 2000 network in Lithuania, as on 1 June 2010, there were 82 areas of importance for the conservation of birds, including 9 ones situated within the Dauguva RBD (Table 56) and 406 areas of importance for the conservation of habitats, including 20 ones within the Dauguva RBD (Table 57).

Table 56. Areas of importance for the conservation of birds in the Dauguva RBD

| | Area of importance for the conservation of birds | Area, ha | Municipality |
|---|---|---|---|
| 1 | Adutiškio-Guntauninkų forests** | 5 670 | Ignalina distr., Švenčionys distr. |
| 2 | Birvėta wetlands | 1 240 | Ignalina distr. |
| 3 | Wetland complex of Dysnai and Dysnykštis lake sides | 4 017 | Ignalina distr. |
| 4 | Lake Drūkšiai | 3 654 | Ignalina distr., Zarasai distr. |
| 5 | Pušnies, Ružo and Apvardų wetland complex** | 838 | Ignalina distr. |
| 6 | Smalvos wetland complex** | 547 | Zarasų distr. |
| 7 | Svyla River valley | 357 | Ignalina distr., Švenčionys distr. |
| 8 | North-eastern part of Gražutė Regional Park** | *10 | Ignalina distr., Zarasai distr. |
| 9 | Western part of Aukštaitija National Park | *358 | Ignalina distr. |
| | Total | 16 691 | |

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

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

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

Table 57. Areas of importance for the conservation of habitats in the Dauguva RBD

| | Area of importance for the conservation of habitat | Area, ha | Municipality |
|---|---|---|---|
| 1 | Adutiškio bog** | 4 076 | Švenčionys distr. |
| 2 | Aukštaitija National Park** | *358 | Ignalina distr. |
| 3 | Birvėta River valley at Rimaldiškė | 113 | Ignalina distr. |
| 4 | Meadows of Dietkauščizna | 147 | Ignalina distr. |
| 5 | Dysna River valleys | 460 | Ignalina distr. |
| 6 | Lake Drūkšiai | 3 612 | Ignalina distr., Zarasai distr. |
| 7 | Gervelės bog | 335 | Ignalina distr. |
| 8 | Gražutė Regional Park** | *4 176 | Zarasai distr. |
| 9 | Guntauninkų forest** | 1 594 | Ignalina distr., Švenčionys distr. |
| 10 | Neverščių forest | 11 | Švenčionys distr. |
| 11 | Puščios bog | 88 | Zarasai distr. |
| 12 | Pušnies bog** | 779 | Ignalina distr. |
| 13 | Lake Rūžas** | 59 | Ignalina distr. |
| 14 | Samanių bog | 112 | Zarasai distr. |
| 15 | Sėtikė River and its valley | 49 | Švenčionys distr. |
| 16 | Smalvelė River and wetlands** | 547 | Zarasai distr. |
| 17 | Lakes Smalvas and Smalvykštis | 2 225 | Zarasai distr. |
| 18 | Lake Sungardas | 117 | Ignalina distr. |
| 19 | Meadows of Šakeliškė | 115 | Ignalina distr. |
| 20 | Velniabalė bog | 119 | Zarasai distr. |
| | Total | 19 092 | |

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

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

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

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

**Sanitary protection zones of wellfields**

62. Pursuant to the Procedure for the Approval of Explored Solid Minerals approved by Order No. 1-146 of the Director of the Lithuanian Geological Survey under the Ministry of Environment of 14 July 2010 (Žin., 2010, No. 86-4576), exploitable resources of groundwater must be assessed and approved for all operating and newly designed public water supply and mineral water wellfields. In addition, all wellfields must have the established sanitary protection zones (SPZ) which are designed to protect sources of drinking groundwater and natural mineral water against pollution, as well as to ensure the safety and quality of drinking water supplied to customers. SPZ are established, installed and maintained observing the provisions of the Lithuanian Hygiene Norm HN 44:2006 "Delineation and maintenance of sanitary protection zones of wellfields" approved by Order No. V-613 of the Minister of Health of the Republic of Lithuania of 17 July 2006 (Žin., 2006, No. 81-3217). Sizes and restrictions of SPZ (different from HN 44:2006) are provided in Chapter XX "Sanitary protection zones of groundwater wellfields" of the Special Conditions of Land and Forest Use approved by Resolution No. 343 of the Government of the Republic of Lithuania of 12 May 1992 (Žin., 1992, Nr. 22-652).

SPZ for wellfields abstracting more than 100 $m^3$/day on average must be defined or established using a simulation technique. There are no sanitary protection zones established and validated pursuant to the requirements of the Lithuanian Hygiene Norm HN 44:2006 within the Dauguva RBD.

After the approval of a special plan for the SPZ of a wellfield, the special land use conditions are entered in the Real Property Cadastre and Real Property Register pursuant to the procedure laid down in Article 22 of the Law of the Republic of Lithuania on Land (Žin., 1994, No. 34-620; 2004, No. 28-868) and the Regulations of the Real Property Cadastres of the Republic of Lithuania approved by Resolution No. 534 of the Government of the Republic of Lithuania of 15 April 2002 (Žin., 2002, No. 41-1539; 2005, No. 80-2899). This is an important requirement because it ensures application of restrictions on economic activity within the SPZ.

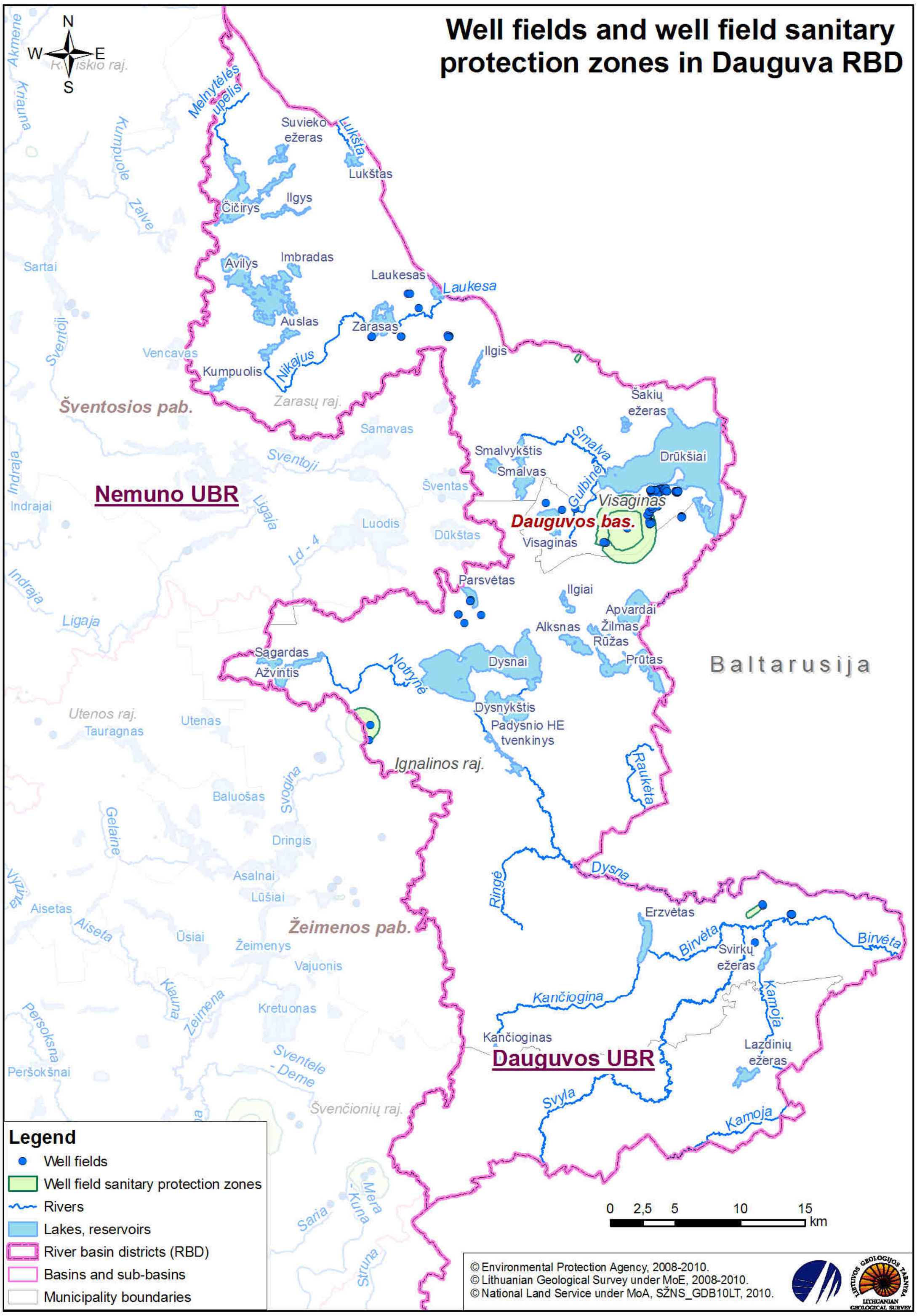



Figure 21. Groundwater wellfields and their SPZ in the Dauguva RBD

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

## SECTION I. SURFACE WATER BODIES

### Monitoring programme for surface water bodies

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

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

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

64. 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.

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

Surveillance intensive monitoring sites were selected:

65.1. in the major rivers of the basin;

65.2. in transboundary water bodies situated at the border;

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

65.4. in other water bodies of national significance.

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

67. 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.

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

69. 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, 20 water bodies in the category of rivers, 32 water bodies in the category of lakes and ponds have been identified within the Dauguva RBD. Consequently, the task of the monitoring programme is to reflect the status of all 52 water bodies in the Dauguva RBD. To this end, monitoring of all required quality elements has been provided for and has been carried out in accordance with the General Requirements for the Monitoring of Water Bodies approved by Order No. 726 of the Minister of Environment of the Republic of Lithuania of 31 December 2003 (Žin., 2004, No. 10-290), which specify only the minimum monitoring frequency. An exception is provided only for the minimum frequency of the monitoring of parameters indicative of biological elements: macrophytes (in all water bodies, except for reference condition sites), fish fauna and zoobenthos (in water bodies in the category of lakes and heavily modified lakes, except for reference condition sites). Macrophyte communities are one of the most inert ones among biological elements, their reaction to qualitative changes in their living environment is exceptionally slow. The water exchanger rate is much lower in lakes than in rivers, hence communities of fish fauna and zoobenthos also change very slowly. Consequently, parameters indicative of biological elements are sufficient to be monitored once in six years in such specific cases, and not once in three years as provided for in the General Requirements for the Monitoring of Water Bodies (Žin., 2004, No. 10-290). Such monitoring frequency is deemed to be sufficient to be able to assess changes in the status of biological quality elements.

**Network of monitoring sites for water bodies in the category of rivers, heavily modified and artificial water bodies**

70. 20 water bodies were identified in the category of rivers within the Dauguva RBD. A number of these water bodies are similar by their typology, status and factors conditioning the status. In order to streamline the monitoring network, water bodies were grouped on the basis of their typology, status and factors determining the status. At least one monitoring site was selected for each group of water bodies assuming that such one monitoring site represents the status of all water bodies within the group.

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 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 Dauguva RBD covers 9 sites. Surveillance intensive monitoring should be carried out in 2 sites, surveillance extensive monitoring – in 4 sites and operational monitoring – in 3 sites. The surveillance intensive monitoring programme includes observations in 2 transboundary rivers which are also the main tributaries.

The number of monitoring sites for rivers in the Dauguva RBD is provided in Table 58 below.

Table 58. Type and number of monitoring sites for rivers within the Dauguva RBD

| Basin | Number of surveillance intensive monitoring sites | Number of surveillance extensive monitoring sites | Number of operational monitoring sites |
|---|---|---|---|
| Dauguva | 2 | 4 | 3 |

Source: experts' data

### Network of monitoring sites for lakes and ponds

71. The status of lakes and ponds can be affected and determined by different factors; thus, due to the unique conditions in each lake or pond, monitoring should be carried out in respect of all water bodies falling within the category of lakes and ponds. The programme of monitoring of lakes and ponds for the Dauguva RBD covers the total of 32 water bodies. Surveillance extensive monitoring should be carried out in 30 water bodies: 29 lakes and 1 pond. Operational monitoring is required for Lake Drūkšiai, investigative monitoring – for Lake Imbradas.

The number of monitoring sites for lakes and ponds within the Dauguva RBD is provided in Table 59 below.

Table 59. Type and number of monitoring sites for lakes and ponds within the Dauguva RBD

| Basin | Monitoring of lakes | | | Monitoring of ponds |
|---|---|---|---|---|
| | Surveillance extensive | Operational | Investigative | Surveillance extensive |
| Dauguva | 29 | 1 | 1 | 1 |

Source: experts' data

### Monitoring programme for rivers and heavily modified water bodies

### Surveillance intensive monitoring

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

The Dysna River has been assigned to water bodies at risk due to the concentrations of di(2-ethylhexyl)phthalate therein found to be exceeding the environmental quality standards. Thus, with a view to identify the pollution level more precisely, the concentrations of this pollutant shall be measured 12 times a year in the Dysna at Kačergiškė. If the concentrations of the hazardous substance do not exceed the relevant environmental quality standard during the first year of measurement, repeat samples may be taken after three years. Once a year, concentrations of di(2-ethylhexyl)phthalate shall also be measured in sediments.

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

Parameters indicative of morphological conditions in rivers, which change the most slowly, and river continuity are sufficient to be monitored once during a six-year monitoring cycle.

Table 60. Surveillance intensive monitoring programme for rivers

| **Monitoring elements and parameters** | | | **Surveillance intensive monitoring sites in rivers** | | |
|---|---|---|---|---|---|
| | | | **Transboundary rivers / main tributaries** | | |
| | | 1 | | 3 | 4 |
| Physico-chemical quality elements | General parameters | AP 1 | 2 | 12 | 6 |
| | Main ions | AP 2 | 2 | 12 | 6 |
| | Specific pollutants in water | AP 4 | 1 | 12 | 6 |
| | Specific pollutants in bottom sediments | AP 5 | 1 | 1 | 6 |
| Biological quality elements | Macrophytes | AP 6 | 2 | 1 | 1 |
| | Zoobenthos | AP 7 | 2 | 1 | 6 |
| | Fish fauna | AP 8 | 2 | 1 | 2 |
| | Phytobenthos | AP 9 | 2 | 3 | 6 |
| Hydromorphological quality elements | Hydrological regime | AP 10 | 2 | 12 | 6 |
| | Morphological conditions | AP 11 | 2 | 1 | 1 |
| | River continuity | AP 12 | 2 | 1 | 1 |

Explanation of the column numeration:

1 – analytical package, lists of parameters for each analytical package are provided in Table 63
2 – number of monitoring sites
3 – annual number of samples in sites
4 – frequency during a six-year monitoring cycle

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

Source: experts' data

## Surveillance extensive monitoring

73. Surveillance extensive monitoring aims at observing general status in water bodies (natural rivers, heavily modified rivers and artificial canals) which meet the requirements for good ecological status or good ecological potential. There are 13 such water bodies within the Dauguva RBD, 4 surveillance extensive monitoring site have been envisaged for their monitoring. These monitoring sites shall ensure the assessment

of the ecological status and ecological potential of all water bodies outside the category of water bodies at risk with a medium level of confidence.

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

Four surveillance extensive monitoring have been envisaged for the Dauguva RBD (Table 61).

Table 61. Surveillance extensive monitoring programme for rivers (natural and heavily modified rivers and artificial canals)

| **Monitoring elements and parameters** | | **Surveillance extensive monitoring sites in rivers** | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| Physico-chemical quality elements | General parameters | AP 1 | 4 | 4 | 2 |
| | Main ions | AP 2 | 4 | 4 | 2 |
| Biological quality elements | Macrophytes | AP 6 | 2 | 1 | 1 |
| | Zoobenthos | AP 7 | 4 | 1 | 2 |
| | Fish fauna | AP 8 | 4 | 1 | 2 |
| | Phytobenthos | AP 9 | 4 | 1 | 2 |
| Hydromorphological quality elements | Hydrological regime | AP 10 | 4 | 4 | 2 |
| | Morphological conditions | AP 11 | 4 | 1 | 1 |
| | River continuity | AP 12 | 4 | 1 | 1 |

Explanation of the column numeration:

1 – analytical package, lists of parameters for each analytical package are provided in Table 63
2 – number of monitoring sites
3 – annual number of samples in sites
4 – frequency during a six-year monitoring cycle

Source: experts' data

## Operational monitoring

74. Operational monitoring is intended for the monitoring of the ecological status/potential in river stretches where the established water protection objectives are not likely to be achieved. This monitoring allows assessing changes in ecological status/potential which occur while implementing programmes of measures for the achievement of water protection objectives. The operational monitoring network in the Dauguva RBD covers three river sites (Table 62).

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

In the monitoring sites, parameters indicative of all elements which might prevent the achievement of water protection objectives and parameters indicative of biological elements shall be monitored measuring their values every three years. Less frequent measurements, once every six years, shall be carried out only in respect of elements which change the most slowly, i.e. river morphology, continuity and macrophytes (the latter shall be monitored only in river stretches which are not Type-1 rivers). Though the monitoring frequency (once every six years) for macrophytes is lower than indicated in the General Requirements for the Monitoring of Water Bodies (Žin., 2004, No. 10-290), it is deemed to be sufficient because macrophyte communities are one of the most inert ones (changing the most slowly) of biological elements. General physico-chemical parameters shall be measured in all river sites subject to operational monitoring, taking measurements every three months (four times a year) during the monitoring year. Hydrological parameters (quantity of flow which partially determines concentrations of certain chemical elements in water) shall be monitored at the same frequency, except for the stretch of the Dysna River affected by a HPP where the hydrological regime should be measured on an annual basis 12 times a year (i.e. every month). These measurements will allow making a more accurate assessment of the impact of the HPP on the hydrological regime of river.

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

Table 62. Operational monitoring programme for rivers. Analyses to be performed in each analytical package (AP) are provided in Table 63.

| **Monitoring elements and parameters** | | **Operational monitoring sites in rivers** | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| Physico-chemical quality elements | General parameters | AP 1 | 3 | 4 | 2 |
| Biological quality elements | Macrophytes | AP 6 | 1 | 1 | 1 |
| | Zoobenthos | AP 7 | 3 | 1 | 2 |
| | Fish fauna | AP 8 | 3 | 1 | 2 |
| | Phytobenthos | AP 9 | 3 | 3 | 2 |
| Hydromorphological quality elements | Hydrological regime | AP 10 | 3 | 4 | 2 |
| | Morphological conditions | AP 11 | 3 | 1 | 1 |
| | River continuity | AP 12 | 3 | 1 | 1 |

Explanation of the column numeration:

1 – analytical package, lists of parameters for each analytical package are provided in Table 63
2 – number of monitoring sites
3 – annual number of samples in sites
4 – frequency during a six-year monitoring cycle

Source: experts' data

Table 63. Parameters for river water quality elements in each analytical package

| **Analytical package** | **List of parameters** |
| --- | --- |
| AP 1 | General physico-chemical parameters:<br>temperature, colour (Pt mg/l), pH, oxygen concentration, $BOD_7$, suspended matter, P total, $PO_4$-P, N mineral, N total, $NO_3$-N, $NH_4$-N, $NO_2$-N, TOC, COD, Cr, Ca, electric conductivity, alkalinity |
| AP 2 | Main ions: Cl, $SO_4$, Na, K, Mg, Si |
| AP 3 | Specific pollutants in water:<br>In surveillance intensive monitoring site No. 325:<br>di(2-ethylhexyl)phthalate |
| AP 4 | Specific pollutants in bottom sediments:<br>In surveillance intensive monitoring site No. 325:<br>di(2-ethylhexyl)phthalate |
| AP 6 | Macrophytes:<br>species composition, abundance and bottom coverage with each species (SI or other adequate indices) |
| AP 7 | Zoobenthos:<br>species composition, abundance of individuals of each species (DSFI or other adequate indices) |
| AP 8 | Fish fauna:<br>species composition, abundance of individuals of each species (DSFI or other adequate indices) |
| AP 9 | Phytobenthos:<br>species composition, abundance |
| AP 10 | Hydrological regime:<br>quantity of water flow |
| AP 11 | Morphological conditions:<br>type of river bed, length and width of the natural riparian vegetation zone |
| AP 12 | River continuity:<br>artificial barriers for fish migration and transportation of outwash material |

Source: experts' data

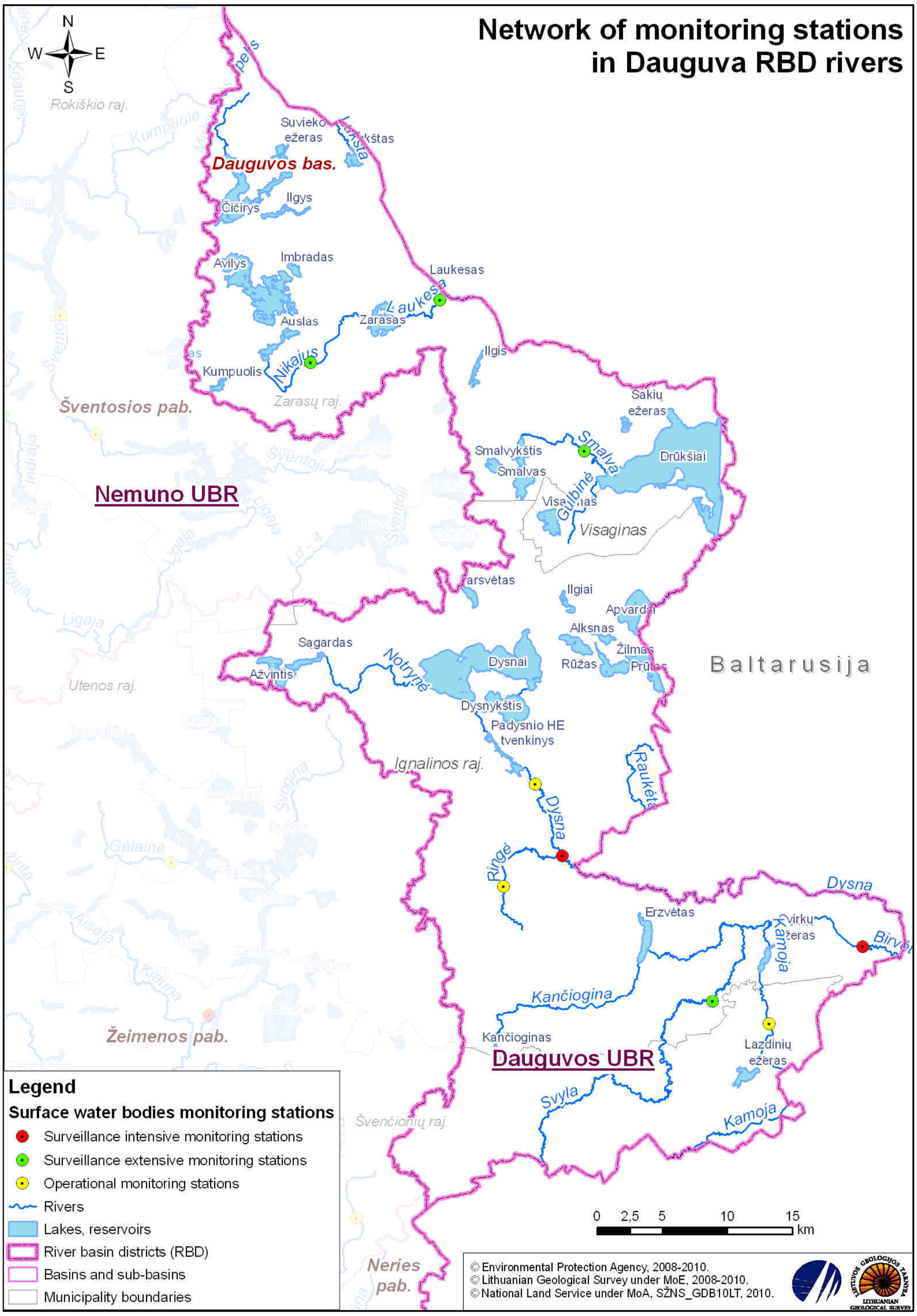



Figure 22. Monitoring network for rivers in the Dauguva RBD

## Monitoring programme for lakes and ponds

### Surveillance extensive monitoring

75. Surveillance extensive monitoring is intended for the monitoring of the ecological status in lakes and ponds outside the category of water bodies at risk. The surveillance extensive monitoring network in the Dauguva RBD covers 29 lakes and the pond of Padysnis HPP (Table 64). Lake ecosystems change very slowly therefore it is sufficient

to monitor the relevant parameters once every six years. Though such monitoring frequency is lower than indicated in the General Requirements for the Monitoring of Water Bodies (Žin., 2004, No. 10-290), it is deemed to be sufficient for the monitoring of general ecological status of water bodies and ensuring medium confidence and precision level of the data.

General physico-chemical parameters and parameters for phytoplankton shall be measured at least four time a year (at the end of April – beginning of May, in the second half of July, second half of August, at the end of September – beginning of October). The remaining monitoring elements shall be measured once during a monitoring cycle.

Table 64. Surveillance extensive monitoring programme for lakes and ponds

| **Monitoring elements and parameters** | | **Surveillance extensive monitoring sites in lakes and ponds** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Lakes | | | Ponds | | |
| | | 1 | 2 | 3 | 4 | 2 | 3 | 4 |
| Physico-chemical quality elements | General parameters | AP 13 | 29 | 4 | 1 | 1 | 4 | 1 |
| Biological quality elements | Phytoplankton | AP 16 | 29 | 4 | 1 | 1 | 4 | 1 |
| | Macrophytes | AP 17 | 29 | 1 | 1 | 1 | 1 | 1 |
| | Fish fauna | AP 18 | 29 | 1 | 1 | 1 | 1 | 1 |
| | Zoobenthos | AP 19 | 29 | 1 | 1 | 1 | 1 | 1 |
| Hydromorphological quality elements | Water exchange rate | AP 20 | 29 | 1 | 1 | 1 | 1 | 1 |
| | Morphological conditions | AP 21 | 29 | 1 | 1 | 1 | 1 | 1 |

Explanation of the column numeration:

1 – analytical package, lists of parameters for each analytical package are provided in Table 67
2 – number of monitoring sites
3 – annual number of samples in sites
4 – frequency during a six-year monitoring

Source: experts' data

## Operational monitoring

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

Such monitoring within the Dauguva RBD is required for Lake Drūkšiai (Table 65). With a view to monitor changes in the ecological status of the lake in the operational monitoring network, measurements of parameters indicative of general physico-chemical elements and phytoplankton as well as chlorophyll *a* should be performed at least every three years four times a year. Parameters for other elements which change slower may be measured once during a six-year monitoring cycle. Taking into account the fact that measures for the reduction of impacts of anthropogenic activities take effect with some delay (after a certain time period), such regularity is sufficient to be able to assess changes in the status of parameters for quality elements. The absolute majority of biological elements (except for phytoplankton) react to improvements of their living environment in lakes after a very long time, hence it is believed that such monitoring frequency ensures sufficient data confidence and precision.

Table 65. Operational monitoring programme for Lake Drūkšiai

| Monitoring elements and parameters | | Operational monitoring sites in Lake Drūkšiai | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| Physico-chemical quality elements | General parameters | AP 13 | 1 | 4 | 2 |
| Biological quality elements | Phytoplankton | AP 16 | 1 | 4 | 2 |
| | Macrophytes | AP 17 | 1 | 1 | 1 |
| | Fish fauna | AP 18 | 1 | 1 | 1 |
| | Zoobenthos | AP 19 | 1 | 1 | 1 |
| Hydromorphological quality elements | Water exchange rate | AP 20 | 1 | 1 | 1 |
| | Morphological conditions | AP 21 | 1 | 1 | 1 |

Explanation of the column numeration:

1 – analytical package, lists of parameters for each analytical package are provided in Table 67
2 – number of monitoring sites
3 – annual number of samples in sites
4 – frequency during a six-year monitoring cycle

Source: experts' data

A new nuclear power plant is planned to be constructed on Lake Drūkšiai. Before the start-up of the power plant, the basic values of quality elements should be analysed in more detail (the basic status of the lake should be identified), i.e. investigative monitoring is required. If the NPP is constructed and put into operation at the end of the current or at the beginning of the next monitoring cycle, more intensive analyses of the general parameters indicative of physico-chemical quality elements and of phytoplankton to be conducted nine instead of four times a year would be required.

## Investigative monitoring

77. Causes which condition poorer than good ecological status of Lake Imbradas are not clear enough (the lake may be potentially affected by historic pollution). Hence more intensive – investigative monitoring is recommended for Lake Imbradas in order to obtain more precise data on seasonal variation of general physico-chemical parameters and, at the same time, to find out whether there are any phosphorus compounds released from bottom sediments during thermal stagnation (secondary pollution conditioned by historical pollution). Values of general physico-chemical parameters should be measured 12 times a year (every month) instead of four and values of phytoplankton – six times a year (during the period of intensive vegetation).

Table 66. Investigative monitoring programme for Lake Imbradas

| Monitoring elements and parameters | | Investigative monitoring programme for Lake Imbradas | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 |
| Physico-chemical quality elements | General parameters | AP 13 | 1 | 12 | 2 |
| Biological quality elements | Phytoplankton | AP 16 | 1 | 6 | 2 |
| | Macrophytes | AP 17 | 1 | 1 | 1 |
| | Fish fauna | AP 18 | 1 | 1 | 1 |
| | Zoobenthos | AP 19 | 1 | 1 | 1 |
| Hydromorphological quality elements | Water exchange rate | AP 20 | 1 | 1 | 1 |
| | Morphological conditions | AP 21 | 1 | 1 | 1 |

Explanation of the column numeration:

1 – analytical package, lists of parameters for each analytical package are provided in Table 67
2 – number of monitoring sites
3 – annual number of samples in sites
4 – frequency during a six-year monitoring cycle

Source: experts' data

Table 67. Parameters for water quality elements for lakes and ponds in each analytical package

| **Analytical package** | **List of parameters** |
|---|---|
| AP 13 | General physico-chemical parameters:<br>transparency, oxygen concentration, temperature, pH, suspended matter, P total, N total, colour (Pt mg/l), electric conductivity, alkalinity, Ca, Fe, Si, $NO_3$-N, $NO_2$-N, $PO_4$-P, $NH_4$-N |
| AP 16 | Phytoplankton:<br>species composition, abundance, biomass, parameters for indicative groups, chlorophyll *a* |
| AP 17 | Macrophytes:<br>species composition, abundance and bottom coverage with each species (SI index) |
| AP 18 | Fish fauna:<br>species composition, abundance of individuals of each species and biomass |
| AP 19 | Zoobenthos:<br>species composition, abundance of individuals of each species |
| AP 20 | Water exchange rate |
| AP 21 | Morphological conditions:<br>changes in the shore line, length of the natural riparian vegetation zone |

Source: experts’ data

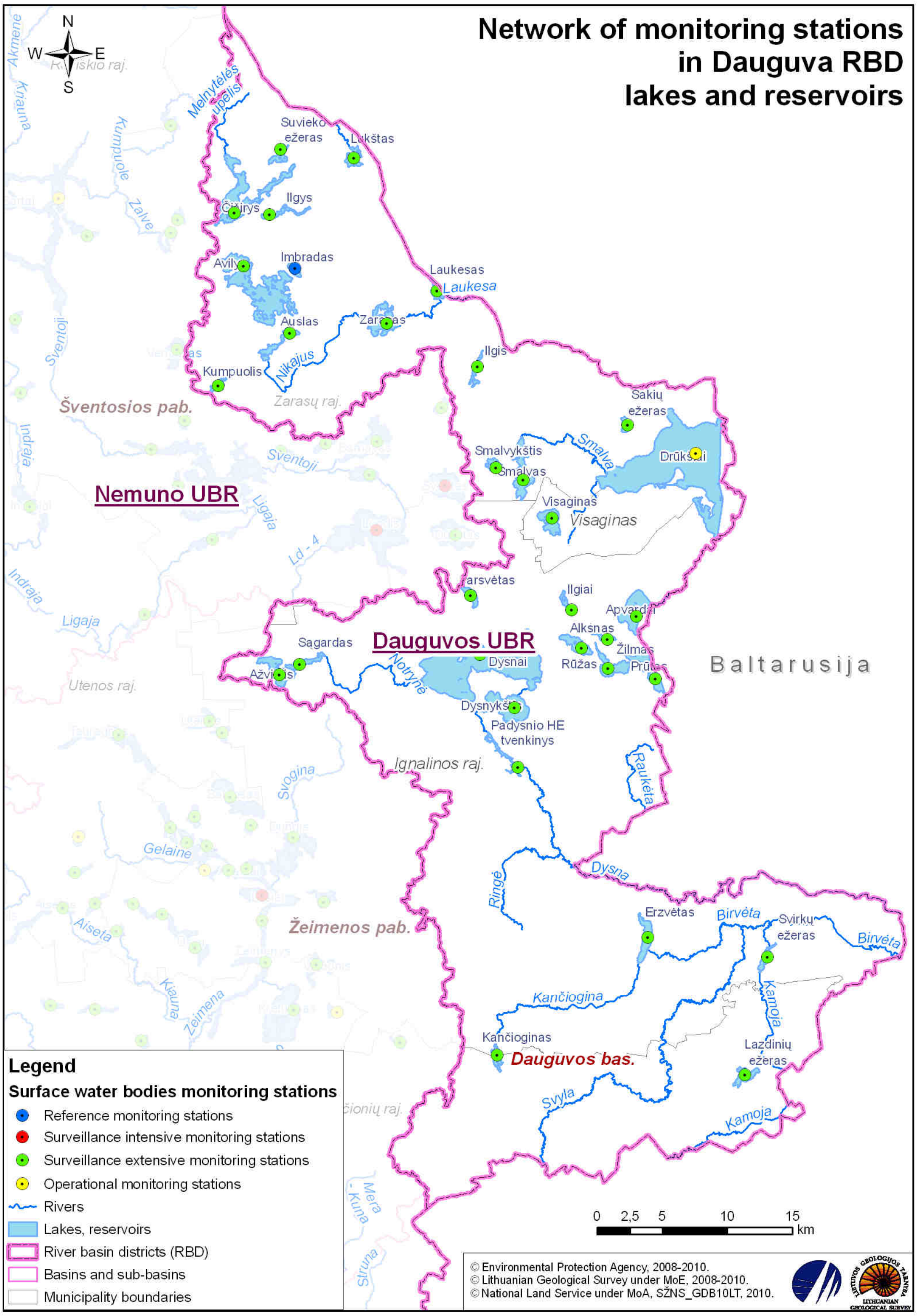



Figure 23. Monitoring network for lakes and ponds in the Dauguva RBD

## Status assessment results for surface water bodies

## Ecological status and ecological potential of rivers

78. Taking into account river typology and anthropogenic pressures on ecological status, 20 water bodies in the category of rivers were identified within the Dauguva RBD. The most important source of information for the assessment of the ecological

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

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

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

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

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

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

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

The assessment of the ecological status of water bodies in the category of rivers within the Dauguva RBD demonstrated that the requirements for high ecological status are met by 11 water bodies with the total length of 135.8 km, which accounts for about 55% of all water bodies within the Dauguva RBD. One water body with the length of 43.4 km is at good ecological status. Six water bodies with the total length of 78.7 km are at moderate ecological status and constitute 30% of the total number of the water bodies in the category of rivers within the Dauguva RBD. One water body with the length of 11.7 km is at poor ecological status. In addition, there is one heavily modified water body (12 km) within the Dauguva RBD. Its ecological potential was assessed to be good.

In total, seven water bodies in the category of rivers within the Dauguva RBD were identified as failing the good ecological status requirements: five of these water bodies were at ecological status poorer than good because of the straightening of river beds, the ecological status of one water body falls short of the requirements for good ecological status due to the impact of a hydropower plant, and another one suffers from water quality problems.

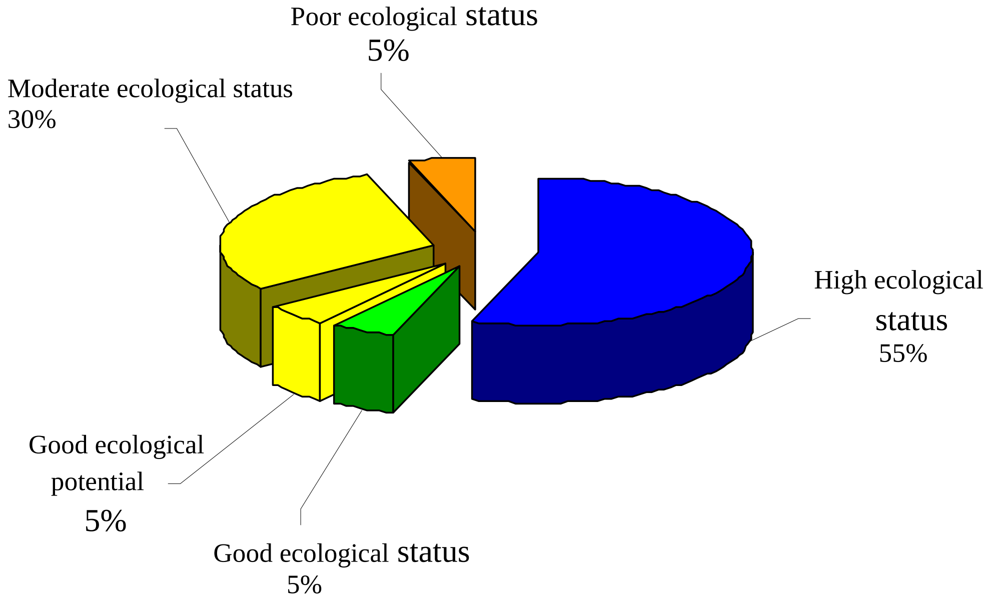



Figure 24. Ecological status and ecological potential of water bodies in the category of rivers in the Dauguva RBD
Source: experts' analysis results

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

High confidence was granted in respect of the identification of the ecological status in one water body within the Dauguva RBD. Medium confidence in the status assessment was granted in respect of 12 water bodies, and low confidence – in respect of the assessment of the ecological status of six water bodies and the ecological potential of one heavily modified water body.

## Chemical status of rivers

79. The assessment of the chemical status of rivers was carried out on the basis of the river water quality monitoring data of 2005–2009. The analysis of the data demonstrated that none of hazardous or priority hazardous substances in rivers within the Dauguva RBD exceeded the MAC during the said period. The analysis also took into account the findings of the study “Screening of substances dangerous for the aquatic environment in Lithuania” conducted in 2006. During this study, concentrations of di(2-ethylhexyl)phthalate (DEHP) were found to be exceeding the MAC in the Dysna at the border. The measured concentration of DEHP totalled to 3.85 μg/l meanwhile the MAC of DEHP in the receiving water body is 0.1 μg/l. Following these results, the Dysna River with the length of 43.4 km is currently identified as failing good chemical status.

## Status of lakes and ponds

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

80.1. national monitoring data;

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

80.3. mathematical modelling results.

When classifying the ecological status of lakes, priority was given to the national monitoring data, i.e. in case of availability of the national monitoring data on indicators of the ecological status of a lake, the lake in question was attributed to the status class indicated by the monitoring data, meanwhile the modelling results and the findings of the study were not taken into consideration.

The ecological potential of the pond of Padysnis HPP was assessed on the basis of the mathematical modelling results because no monitoring data has been available.

The assessment results for the ecological status of lakes within the Dauguva RBD and the ecological potential of Padysnis HPP pond according to parameters indicative of physico-chemical and biological quality elements are provided in Table 68 below.

Table 68. Ecological status/potential of lakes and one pond in the Dauguva RBD

| **Lakes and pond** | **Ecological status/potential** | **Level of confidence in the assessment** |
|---|---|---|
| lksnas | high | low |
| Apvardai | good | low |
| Auslas | good | low |
| Avilys | high | low |
| Ažvintis | high | low |
| Čičirys | high | low |
| Drūkšiai | moderate | high |
| Dysnai | high | medium |
| Dysnykštis | good | low |
| Erzvėtas | good | low |
| Ilgiai | good | low |

| Lakes and pond | Ecological status/potential | Level of confidence in the assessment |
|---|---|---|
| Ilgis | high | low |
| Ilgys | high | low |
| Imbradas | moderate | low |
| Kančioginas | good | low |
| Kumpuolis | good | low |
| Laukesas | high | low |
| Lazdinių ežeras | high | low |
| Lukštas | high | low |
| Padysnis HPP pond | high | low |
| Parsvėtas | high | low |
| Prūtas | high | low |
| Rūžas | good | low |
| Sągardas | high | low |
| Šakių ežeras | high | low |
| Smalvas | high | high |
| Smalvykštis | high | low |
| Suvieko | high | low |
| Svirkų ežeras | good | low |
| Visaginas | good | low |
| Zarasas | good | low |
| Žilmas | high | low |

Source: experts' analysis result

The ecological status of 18 lakes included in the Dauguva RBD monitoring network is high, the ecological status of 11 lakes is good, and the status of 2 lakes is moderate. The pond of Padysnis HPP conforms to maximum ecological potential requirements.

High level of confidence was granted to the assessment of the ecological status/potential in one water body (3%), medium confidence in the status assessment was granted in respect of one water body (3%) as well, and low confidence – in respect of 30 water bodies (94%).

Monitoring of specific pollutants (priority and other regulated substances) in lakes within the Dauguva RBD was conducted only in Lake Drūkšiai. The chemical status of this lake is deemed to be good. Since no data is available on the remaining water bodies in the category of lakes, it is assumed that all of them are at good chemical status.

Summing up, at present 30 water bodies are at good ecological status or good ecological potential and 2 water bodies are failing the good ecological status/potential requirements.

The ecological status assessment results for lakes and ponds within the Dauguva RBD are illustrated in Figure 25 and the level of confidence in the assessment – in Figure 26 below.

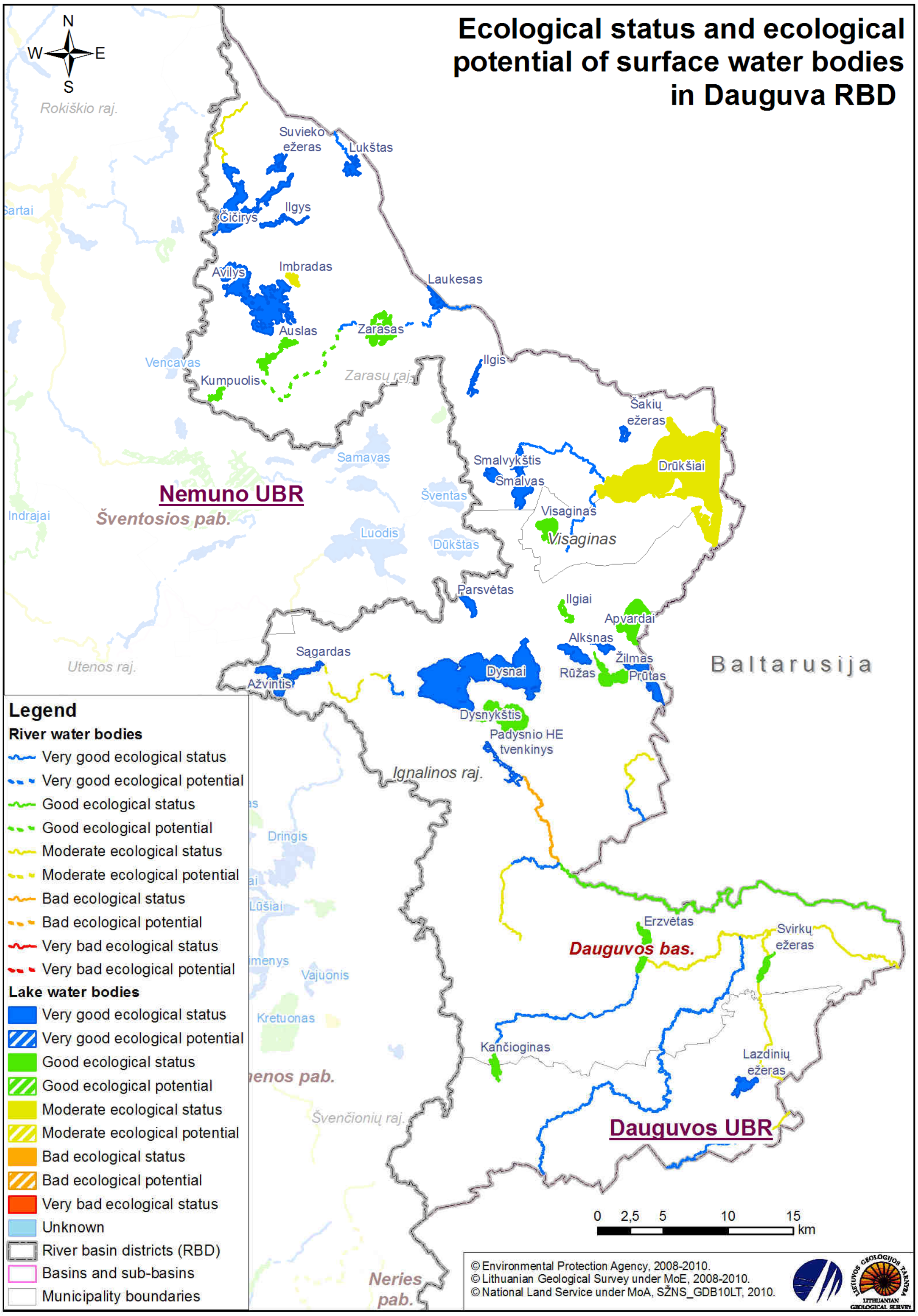



Figure 25. Ecological status and ecological potential of surface water bodies in the Dauguva RBD

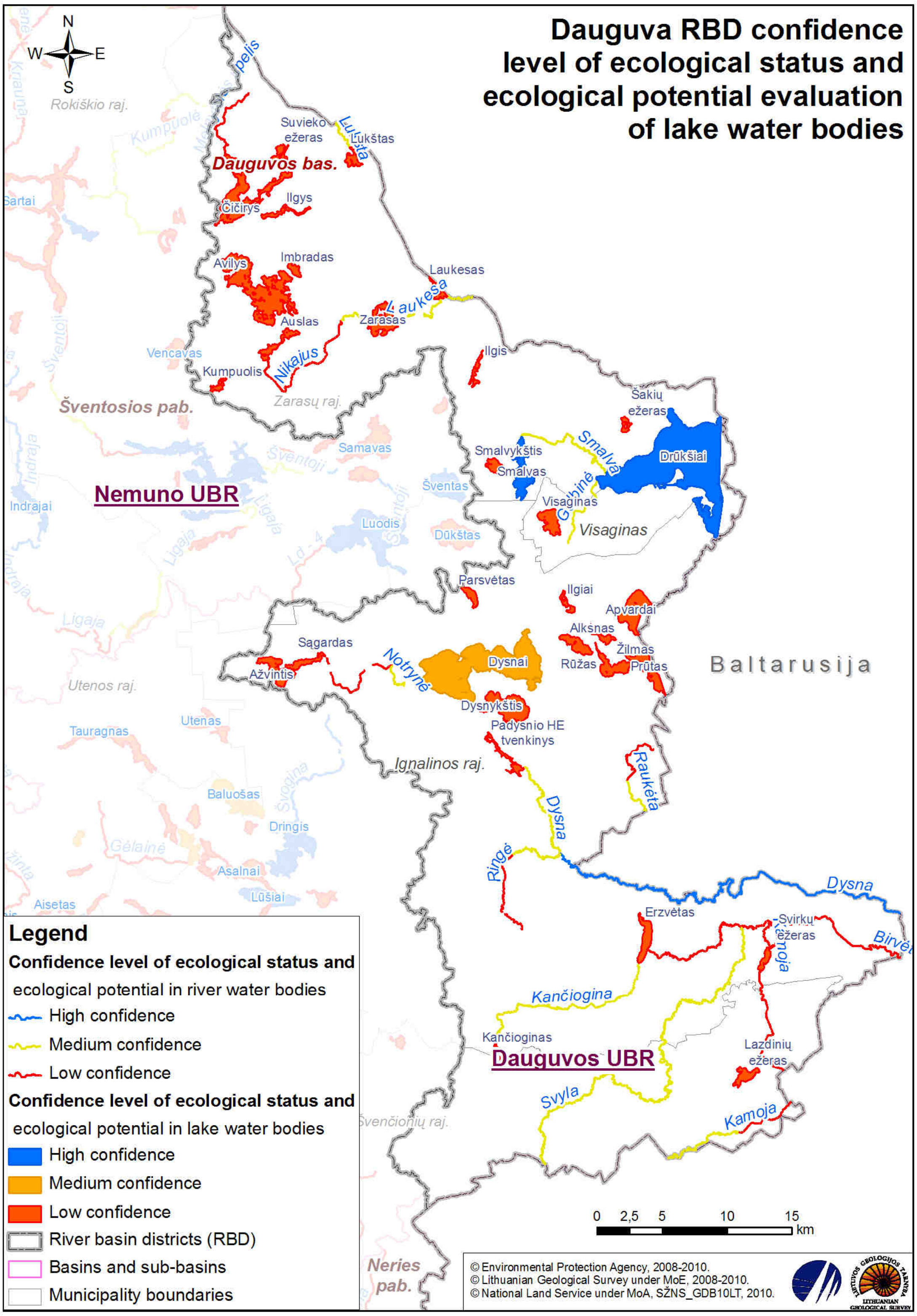



Figure 26. Level of confidence in the assessment of ecological status and ecological potential of surface water bodies in the Dauguva RBD

81. The chemical status of surface water bodies within the Dauguva is demonstrated in Figure 27 and the overall status – in Figure 28.

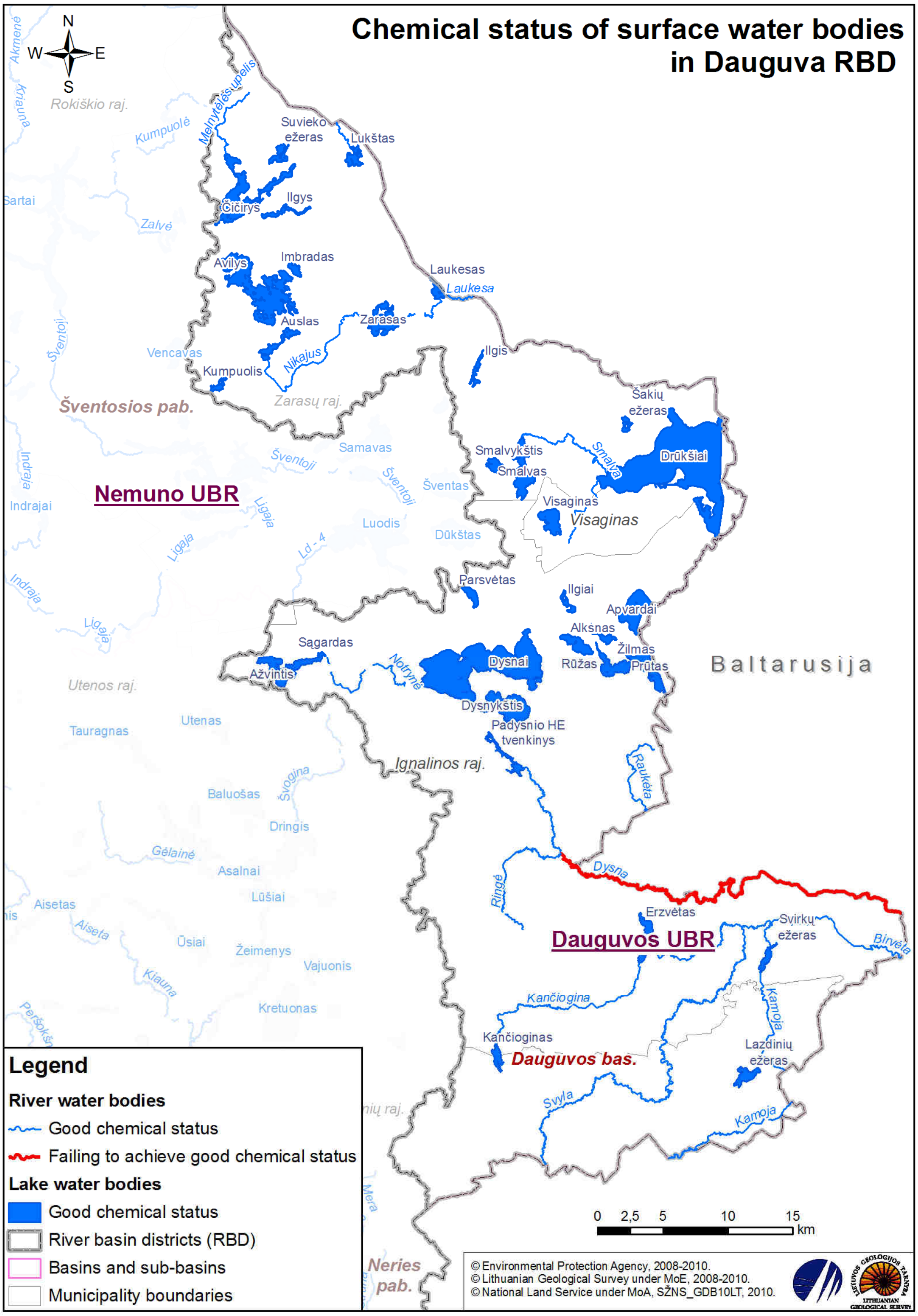



Figure 27. Chemical status of surface water bodies in the Dauguva RBD

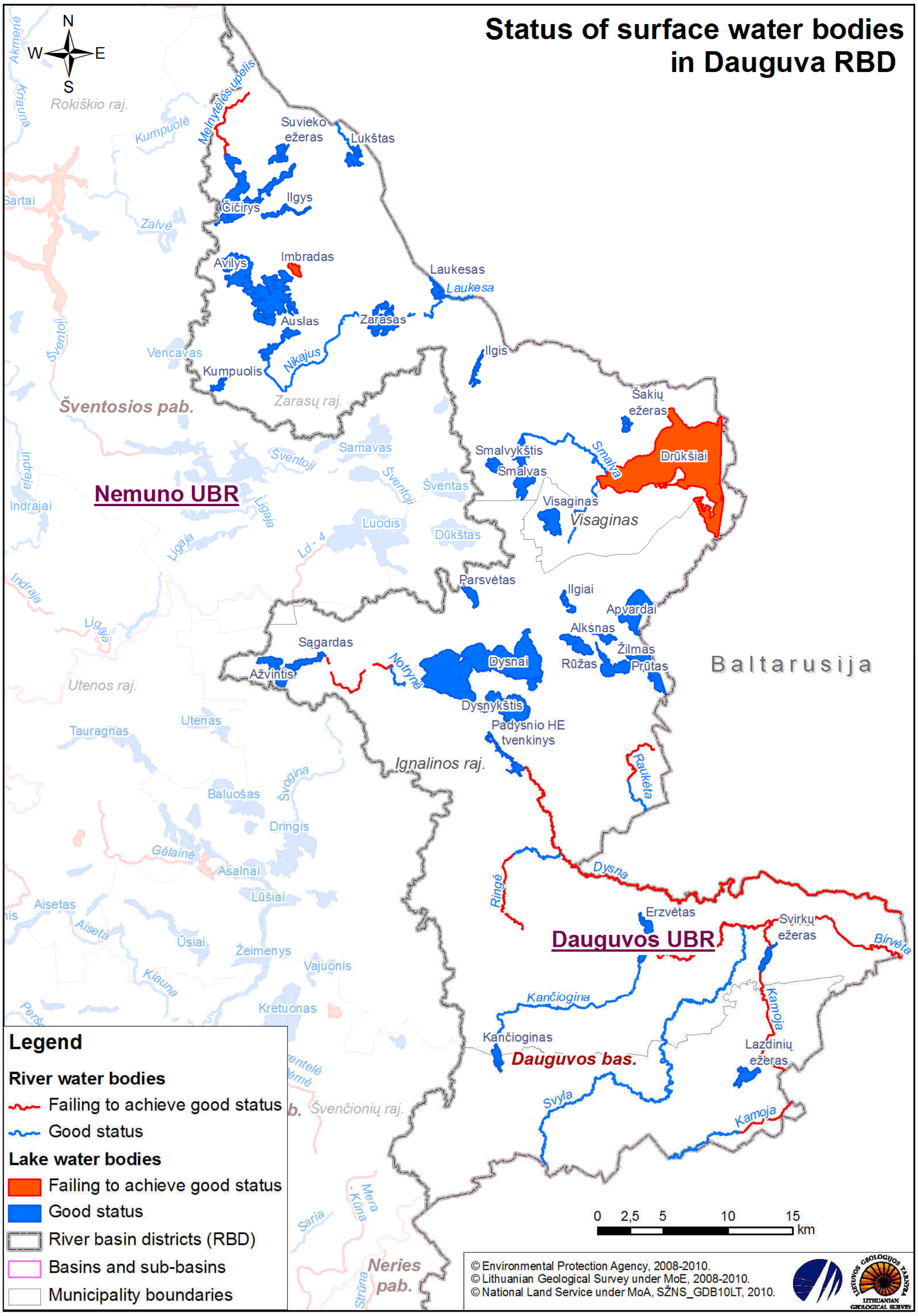



Figure 28. Overall status of surface water bodies in the Dauguva RBD

## SECTION II. GROUNDWATER MONITORING

82. The objective set in the National Environmental Monitoring Programme for 2005-2010 approved by Resolution No. 130 of the Government of the Republic of Lithuania of 7 February 2005 (Žin., 2005, No. 19-608; 2008, No. 104-3973) is to assess sources of recovery of groundwater resources, trends of changes in the groundwater quality and

respective factors, and to assess chemical composition of water in drinking water abstraction sites. To this end, general chemical composition of water as well as micro components, pesticides and organic compounds, biogenic elements therein are analysed/have to be analysed in selected 280 sites; the monitoring frequency – from once a year to once every two to six years.

**National monitoring network**

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

The depth of occurrence of shallow groundwater is measured once a day with a help of electronic sensors. The groundwater table in confined aquifers is measured only prior to the sampling. The monitoring posts within the Dauguva RBD are demonstrated in Figure 29 and Table 69.


Figure 29. National groundwater monitoring network in the Dauguva RBD

Table 69. National groundwater monitoring network in the Dauguva RBD

| **River basin/**sub-basin | Type of aquifer | | |
|---|---|---|---|
| | **Shallow** | **Confined** | |
| | | Number of wells/posts | Geological index |
| **Dauguva** / Dauguva Tributaries | 3 | 4 | agIII, lgIII, $D_3$šv-$D_2$up |
| **Total:** | **3** | **4** | |

Source: LGS, 2009

Tables 70 and 71 list monitoring wells from which water samples are taken for the analysis of chemical status and quality of shallow and confined aquifers.

Table 70. National monitoring posts for the monitoring of shallow groundwater quality

| **GWB code** | **Monitoring post** | **Gr. No.** | **Basin/sub-basin** | **Coordinates** | | **Geological index** |
|---|---|---|---|---|---|---|
| | | | | x | y | |
| LT001 | Dūkštas | 25398 | Dauguva Tributaries | 6157828 | 646667 | agIII |
| LT001 | Dūkštas | 25399 | Dauguva Tributaries | 6157828 | 646667 | gIII |
| LT001 | Dūkštas | 25400 | Dauguva Tributaries | 6157828 | 646667 | gIII |
| LT001 | Marionava | 35955 | Dauguva Tributaries | 6164258 | 662937 | gtIII |
| LT005 | Bobėnai | 25367 | Dauguva Tributaries | 6131578 | 668603 | lgIII |
| **Total:** | | | **5 wells** | | | |

Source: LGS, 2009

Table 71. National monitoring posts for the monitoring of confined groundwater quality

| **GWB code** | **Monitoring post** | **Gr. No.** | **Sub-basin** | **Coordinates** | | **Index** | **Type of aquifer** |
|---|---|---|---|---|---|---|---|
| | | | | x | y | | |
| LT001 | Zarasai (Dimitriškės) | 15294 | Dauguva Tributaries | 6181486 | 641867 | $D_3$šv-$D_2$up | pre-Quaternary confined |
| LT001 | Dūkštas | 13235 | Dauguva Tributaries | 6156791 | 645797 | agIII | Quaternary confined |
| LT001 | Dūkštas | 25389 | Dauguva Tributaries | 6157828 | 646667 | agIII | Quaternary confined |
| LT001 | Dūkštas | 20618 | Dauguva Tributaries | 6157904 | 646708 | agII | Quaternary confined |
| LT005 | Didžiasalis | 10679 | Dauguva Tributaries | 6134387 | 669219 | agIII | Quaternary confined |
| **Total:** | | | **5 wells** | | | | |

Source: LGS, 2009

The groundwater water table is measured in posts listed in Table 72 below.

Table 72. National groundwater monitoring posts for the measuring of groundwater tables

| **GWB code** | **Monitoring post** | **Gr. No.** | **Sub-basin** | **Coordinates** | | **Index** |
|---|---|---|---|---|---|---|
| | | | | **x** | **y** | |
| LT001 | Dūkštas monitoring station | 35954 | Dauguva Tributaries | 646236 | 6156108 | gtIII |
| LT001 | Bobėnai | 25367 | Dauguva Tributaries | 668583 | 6131527 | lgIII |
| LT001 | Marionava | 35955 | Dauguva Tributaries | 662937.2 | 6164258 | gtIII |
| **Total:** | | | **17 wells** | | | |

Source: LGS, 2009

The density of the groundwater monitoring network in shallow and confined aquifers is provided in Tables 73 and 74.

Table 73. Shallow groundwater monitoring network in river basins in the Dauguva RBD

| Sub-basin | Sub-basin area, km | 100 $km^2$ | Number of monitoring wells | | | Number of wells per 100 $km^2$ | |
|---|---|---|---|---|---|---|---|
| | | | national | of economic entities | total number | national | total number |
| Dauguva Tributaries | 1 870.80 | 18.7 | 7 | 137 | 144 | 0.4 | 7.7 |
| Ignalina NPP | | | | 104 | | | |
| excl. Ignalina NPP | 1 870.80 | 18.7 | | 33 | 40 | | **2.1** |

Source: LGS, 2009

Table 74. Confined aquifer monitoring network in GWB in the Dauguva RBD

| GWB | Area, $km^2$ | 100 $km^2$ | Number of monitoring wells | | | Number of wells per 100 $km^2$ | |
|---|---|---|---|---|---|---|---|
| | | | national | of wellfields | total number | national | total number |
| Dauguva GWB of Upper-Middle Devonian deposits | 674 | 6.74 | 2 | 2 | 4 | 0.30 | 0.59 |
| Dauguva GWB of Quaternary deposits of South-Eastern Lithuania | 1 192 | 11.92 | 4 | 2 | 6 | 0.34 | 0.50 |

Source: LGS, 2009

When developing the national monitoring network, the most important thing was to ensure that the monitoring posts more or less evenly reflect the natural shallow groundwater formation conditions and anthropogenic pressures on the area, and include all major aquifers utilised for public water supply. The interconnection of groundwater with surface water and other ecosystems was practically not taken into account at that time. This has resulted in uneven distribution of the national groundwater monitoring posts in individual river sub-basins.

## Status of groundwater

84. A set of groundwater status maps demonstrating the chemical status of the major aquifers (groundwater bodies) and wellfields which are currently utilised has been compiled. Analysis showed that both quantitative and chemical status of groundwater within the Dauguva RBD is good (Figures 30 and 31).

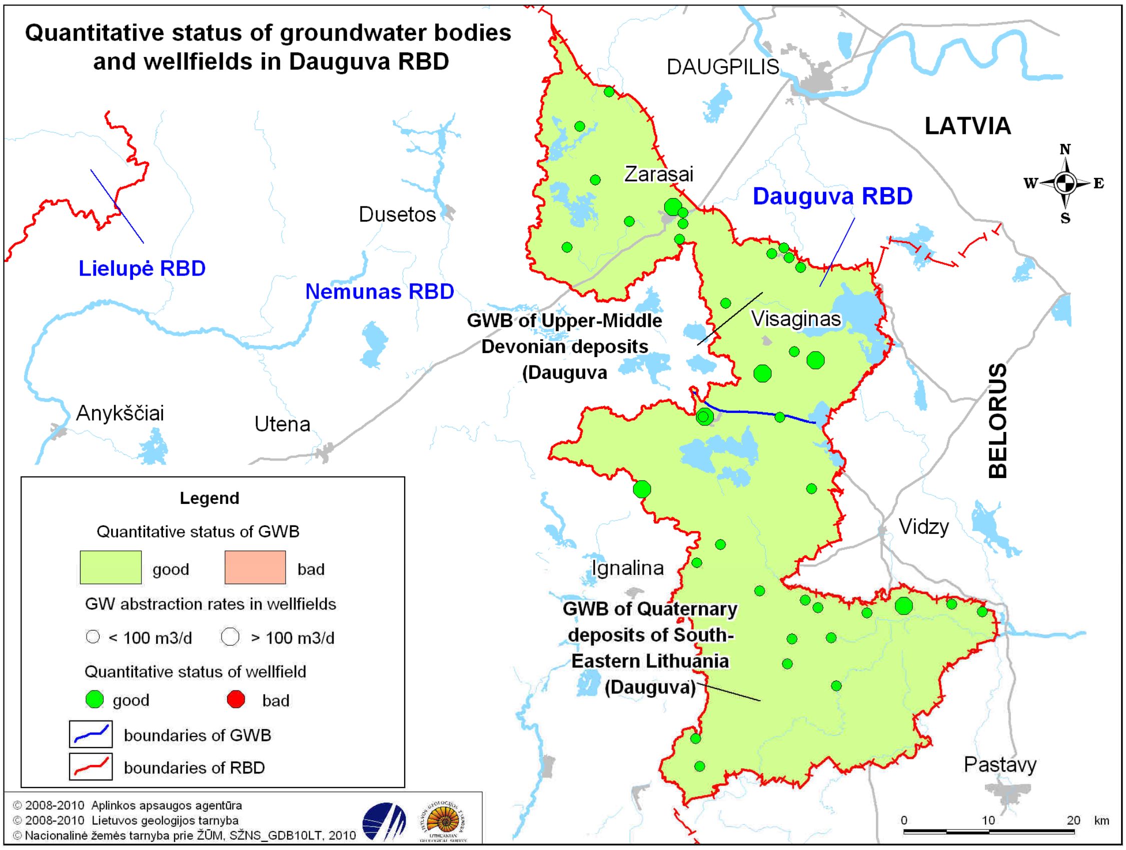



Figure 30. Quantitative status of groundwater bodies and wellfields in the Dauguva RBD

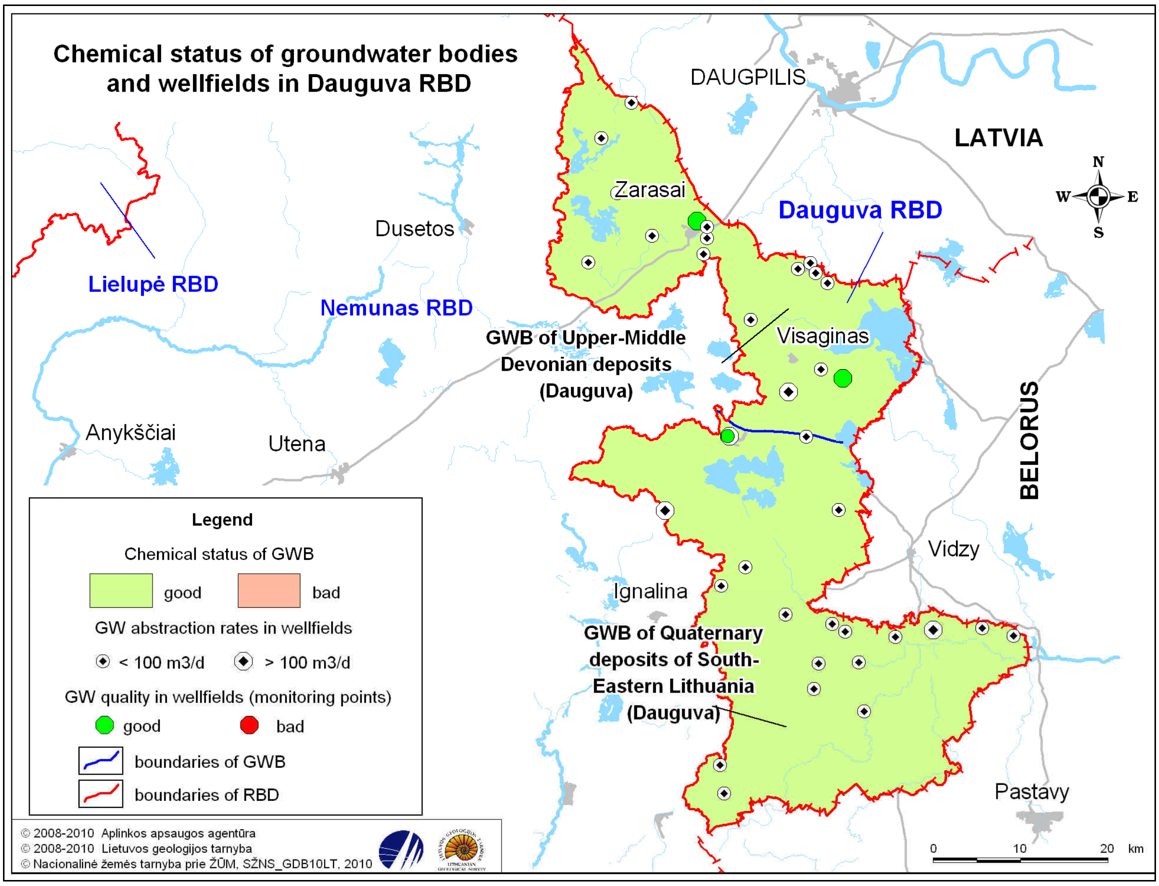



Figure 31. Chemical status of groundwater bodies and wellfields in the Dauguva RBD

## SECTION III. MONITORING OF PROTECTED AREAS

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

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

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

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

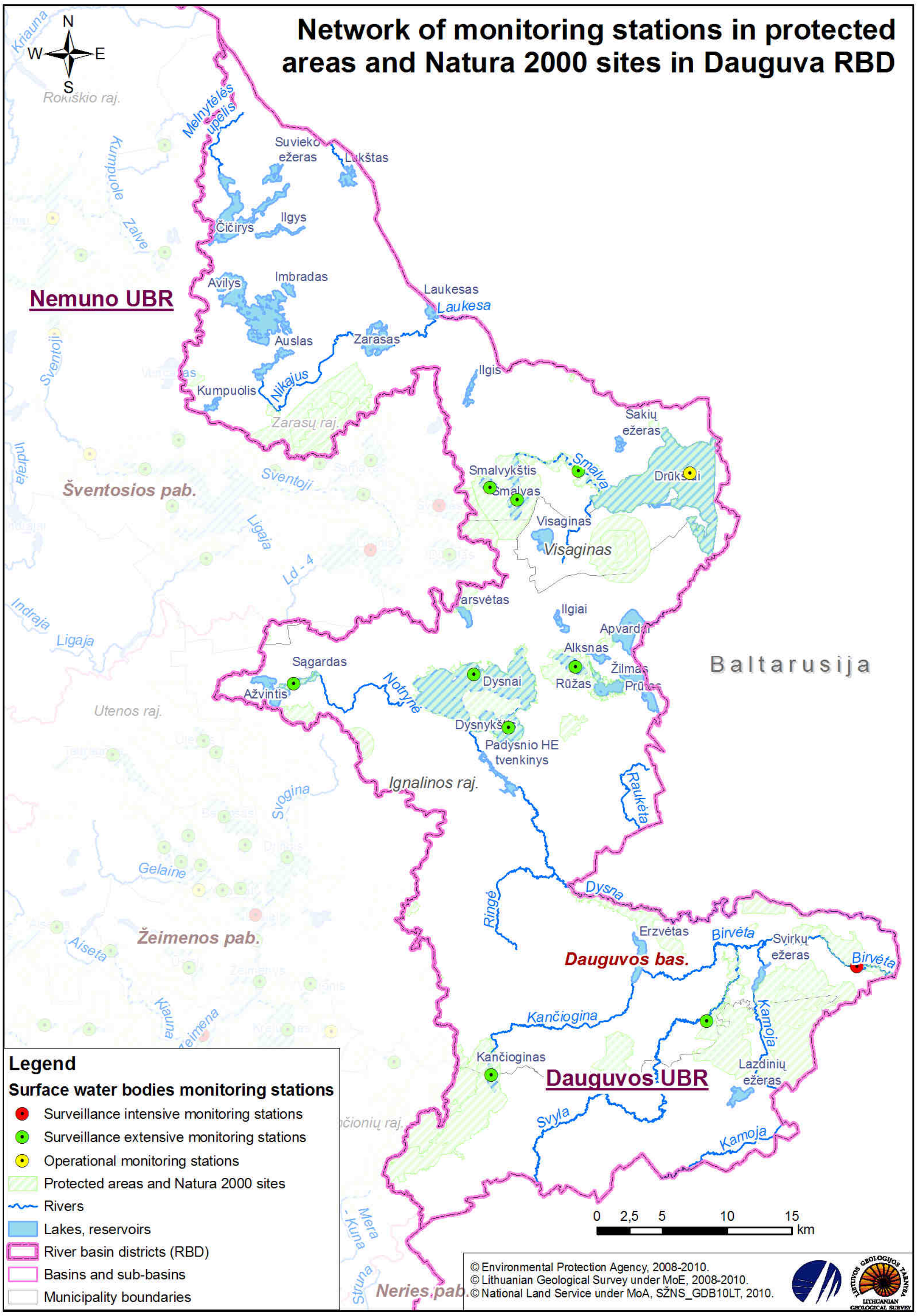



Figure 32. Monitoring network for protected areas and NATURA 2000 sites in the Dauguva RBD

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

## SECTION I. OVERALL WATER PROTECTION OBJECTIVES FOR SURFACE WATER BODIES

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

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

## SECTION II. GOOD STATUS REQUIREMENTS FOR SURFACE WATER BODIES

### Rivers

### Biological elements

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

### Physico-chemical elements

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

Table 75. 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 | ≥6.5 (in Type-2 rivers) ≥7.5 (in rivers of other types) |

Source: experts' analysis results

## Hydromorphological elements

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

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

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

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

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

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

89.3. It is rather difficult to describe the aspired criteria for river continuity which would serve as a ground for concluding on conformity or failure to conform to the good status requirements for the biological elements, without taking into account hydromorphological changes conditioned by artificial barriers (impoundments).

Artificial barriers are most damaging for populations of migratory fish (migrating from the sea to rivers or within river catchments). Every artificial barrier and resulting altered hydromorphological characteristics of the river above the barrier lead to either complete disappearance of migratory fish upstream of the barrier (fish which migrate from the sea to rivers), or significant reduction of resources of certain fish type (fish which migrate within river catchments). Even fish bypass channels (passes) do not prevent reduction of migratory fish resources, or complete disappearance thereof, due to disturbed reproduction (loss of spawning grounds and selective passing capacities of fish passes: not all fish manage to pass both towards the upper and lower reaches of the river). Taking into account the above-said, the objective is to improve the conditions for fish migration in places with current artificial barriers in rivers where migratory fish are living today or are known to have lived earlier.

### Chemical status

90. Concentrations of hazardous substances in water may not exceed the maximum allowable concentrations set in Annexes 1 and 2 to the Wastewater Management Regulation. So far, no MAC have been established for hazardous and priority hazardous as well as other regulated substances in bottom sediments.

## Lakes

### Biological elements

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

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

### Physico-chemical elements

92. The general physico-chemical elements which have the most significant impact on the status of the biological quality elements in lakes are total nitrogen and total phosphorus. The values for the physico-chemical quality elements characterising good ecological status of lakes which should be attained in lakes by 2015 are provided in Table 76 below.

Table 76. General physico-chemical quality elements which affect ecological status in lakes by biological parameters

| | Type-1 and Type-2 lakes: | Type-3 lakes: |
|---|---|---|
| $P_{total}$ | 0.06 mg/l | 0.05 mg/l |
| $N_{total}$ | 1.8 mg/l | 1.2 mg/l |

Source: experts' analysis results

### Hydromorphological elements

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

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

**Chemical status**

94. Concentrations of hazardous substances in water may not exceed the maximum allowable concentrations set in the Wastewater Management Regulation. So far, no MAC have been established for hazardous and priority hazardous as well as other regulated substances in bottom sediments.

**Specific case of Lake Drūkšiai**

95. The main factor which has determined poorer than good ecological status in Lake Drūkšiai is historic and present pollution from Visaginas town. Deterioration in the ecological status of the lake (eutrophication process) was significantly speeded up by unnaturally high water temperature – the lake water used to be used for the cooling of Ignalina NPP, which is no longer in operation. It is likely that the decommissioning of Ignalina NPP and reduction of pollution might bring about certain reversible processes (investigative monitoring has been proposed for observing these processes). However, a new nuclear power plant, which is highly important for the social-economic welfare of the country, is planned to be constructed at Lake Drūkšiai. In such case the lake water will be inevitably heated again (used for the cooling of the reactors), hence the reversible processes might significantly slow down or even stop. The structure of fish communities indicates that the lake has turned from mesotrophic to eutrophic. Certain stenothermal fish species (which require a sufficient volume of cold oxygen-rich water) are already extinct (Lake Smelt), abundance of other fish species has noticeably gone down (Vendace) and species less sensitive to water temperature have also undergone major changes. If the water is “heated up” once again (even observing the valid normative standards of thermal pollution), the former fish population will not be restored. Changes are also likely to remain in communities of macrophytes and phytoplankton. In such case good ecological status of the lake according to the parameters for fish and other biological elements will hardly be attained. Consequently, if a new nuclear power plant is constructed, a lower objective will have to be set due to reasons of technical feasibility, i.e. to ensure at least moderate ecological status in Lake Drūkšiai instead of good one.

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

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

The classification of good ecological potential of HMWB 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

97. There are no artificial water bodies within the Dauguva RBD.

### Heavily modified water bodies

98. 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 77. The parameter value for good ecological potential of HMWB according to biological elements

| Parameter | Parameter value |
|---|---|
| Chlorophyll *a* (mean of the EQR of the average annual value and the EQR of the maximum value) | ≤0.33 |

Source: experts' analysis results

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

## SECTION III. WATER PROTECTION OBJECTIVES FOR GROUNDWATER WELLFIELDS

100. Pursuant to the National Environmental Monitoring Programme for 2005–2010, the most important water protection objective is good quantitative and qualitative (chemical) status of groundwater wellfields:

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

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

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

Since there is no apparent threat of diffuse or point pollution of groundwater wellfields within the Dauguva RBD, groundwater wellfields are considered to be meeting the water protection objectives.

## SECTION IV. ENVIRONMENTAL OBJECTIVES FOR PROTECTED AREAS

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

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

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

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

## SECTION V. EXTENSION OF THE DEADLINE FOR ACHIEVING ENVIRONMENTAL OBJECTIVES

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

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

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

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

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

104. An additional analysis was carried out upon the identification of the water bodies at risk within the Dauguva RBD (8 rivers, 2 lakes and ponds) in order to identify possibilities of achieving good ecological status or good ecological potential in these water bodies during the first cycle of the implementation of the Programme of Measures (2010-2015).

It is forecasted that good status or good potential during the first cycle will not be achieved in any water body at risk. Hence extension of the deadline for achieving environmental objectives is proposed for reasons of technical feasibility, disproportionate costs or natural conditions.

**Technical feasibility**

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

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

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

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

106. The required extension for achieving good ecological status in water bodies within the Dauguva RBD is mainly related to the second and third reasons: more time is required or there is insufficient information on the problem and/or its cause and hence no solution can be proposed.

107. An analysis in the Dauguva RBD established the following uncertainties:

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

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

107.3. uncertainty about the causes of poor status.

108. 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 was established in respect of one of water body in the category of rivers.

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

110. It is commonly agreed that river straightening deteriorates the ecological status of rivers and so such rivers are designated either as water bodies at risk or heavily modified water bodies. However, impacts of the straightening on the ecological status of water bodies have not been analysed in detail yet, therefore it is recommended to postpone the achievement of the objectives due to uncertainty about such impact. In addition, even if the cause was clear, the acceptability by the society and inability to

afford renaturalisation of rivers would be a sufficient reason for the extension of the deadline for achieving good ecological status. There are five such water bodies within the Dauguva RBD.

111. Sources of pollution are not clear in one lake (Lake Imbradas). Since there is no monitoring data on the parameters indicative of physico-chemical and biological quality elements of this lake, investigative monitoring has been envisaged for the lake. The monitoring data will confirm (or deny) the validity of the assignment of the lake to water bodies at risk.

112. Operational or investigative monitoring has been envisaged for all risk factors the impact of which is not known yet or raises doubts. It is proposed to extend the deadline for achieving water protection objectives in these water bodies until more data proving a significant impact of the risk factors on the status/potential of the water bodies is obtained. It should be noted that there is no economic entity with an IPPC permit which would have an adverse impact on the status of water bodies within the Dauguva RBD, therefore there is no need to review the conditions specified in the IPPC permits.

**Disproportionate costs of status improvement within the established timescale**

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

The principle of disproportionate costs, i.e. a cost-benefit comparison was not required in any case of extension of the deadline for the attainment of environmental objectives within the Dauguva 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.

114. Out of the total number of eight water bodies at risk in the category of rivers within the Dauguva RBD, five water bodies were designated as such either due to straightening or because of both straightening and other risk factors. According to expert judgement, stretches situated in the upper reaches of the rivers should be left for natural renaturalisation. Renaturalisation is recommended for the straightened river stretches which are located in areas with a clear public demand (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, i.e. attainment of good ecological status in water bodies at risk, would require LTL 2.4 million by 2015.

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

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

**Natural conditions which prevent attainment of water protection objectives**

115. One lake at risk (Drūkšiai) will not be able to achieve good ecological status during the first cycle of the implementation of the Programme of Measures due to secondary pollution from Lake Skripkų ežeras. The municipality of Visaginas town has planned cleaning up Lake Skripkų ežeras so it is likely that pollution loads in Lake Drūkšiai will significantly go down in the nearest future. However, self-cleaning processes in standing waters and low-drainage water bodies are much slower than in the ecosystems of flowing water bodies. Self-restoration of more inert biological quality elements, such as macrophytes and fish, is an especially slow process. Accordingly, it is proposed to postpone the achievement of environmental objectives under the Law of the Republic of Lithuania on Water, which provides for a possibility to extend the deadline for achieving the objectives when the achievement is prevented by natural conditions. Operational monitoring has been envisaged for this lake allowing for monitoring changes in the water body after the implementation of pollution reduction measures.

The scheme for assessing the degree of achievement of good ecological status in all ten water bodies at risk is demonstrated in Figure 33. The achievement of water protection objectives in rivers and lakes at risk within the Dauguva RBD is provided in Tables 78 and 79 and in Figure 34.

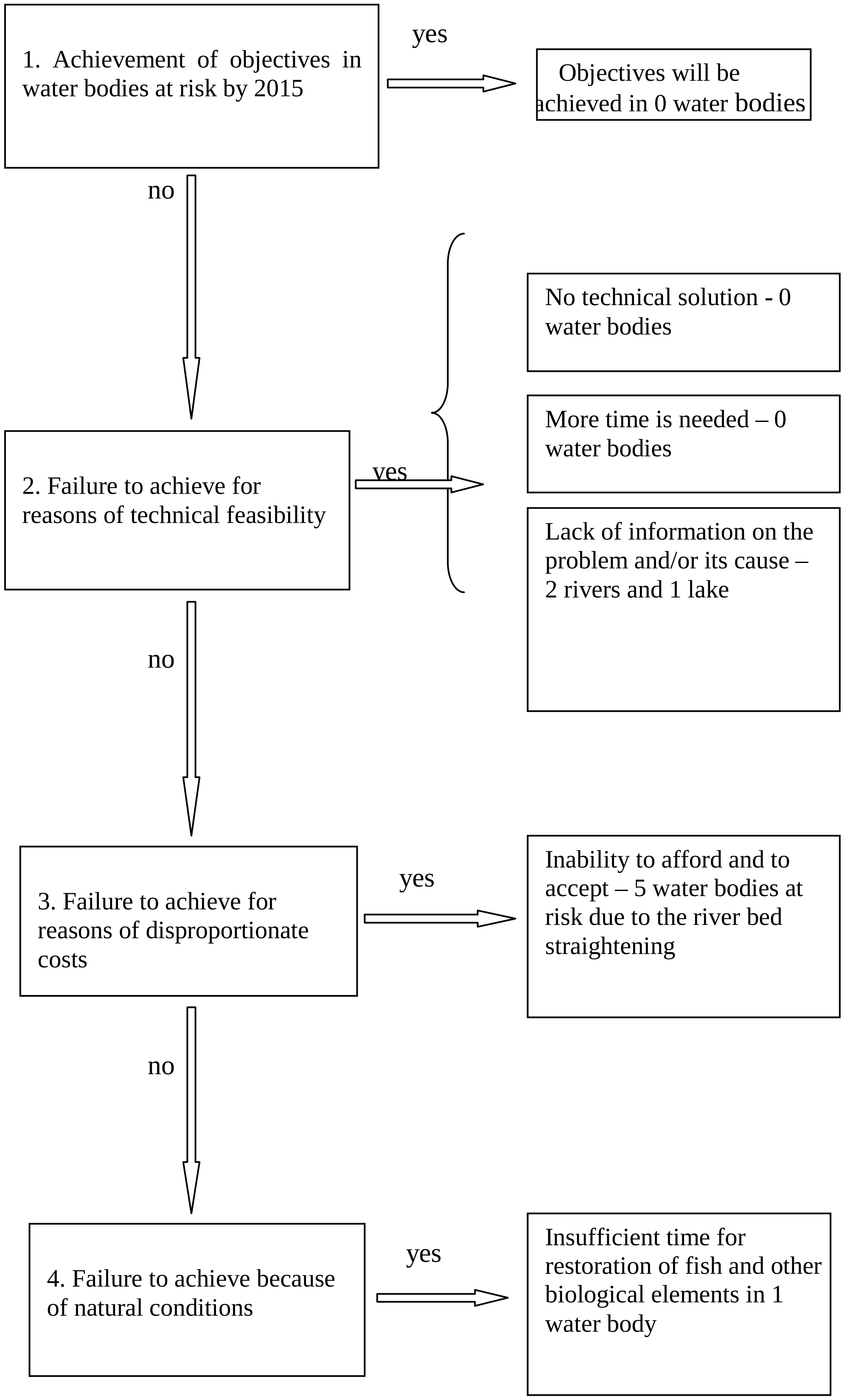



Figure 33. Steps of the deadline extension for achieving good ecological status in water bodies at risk

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

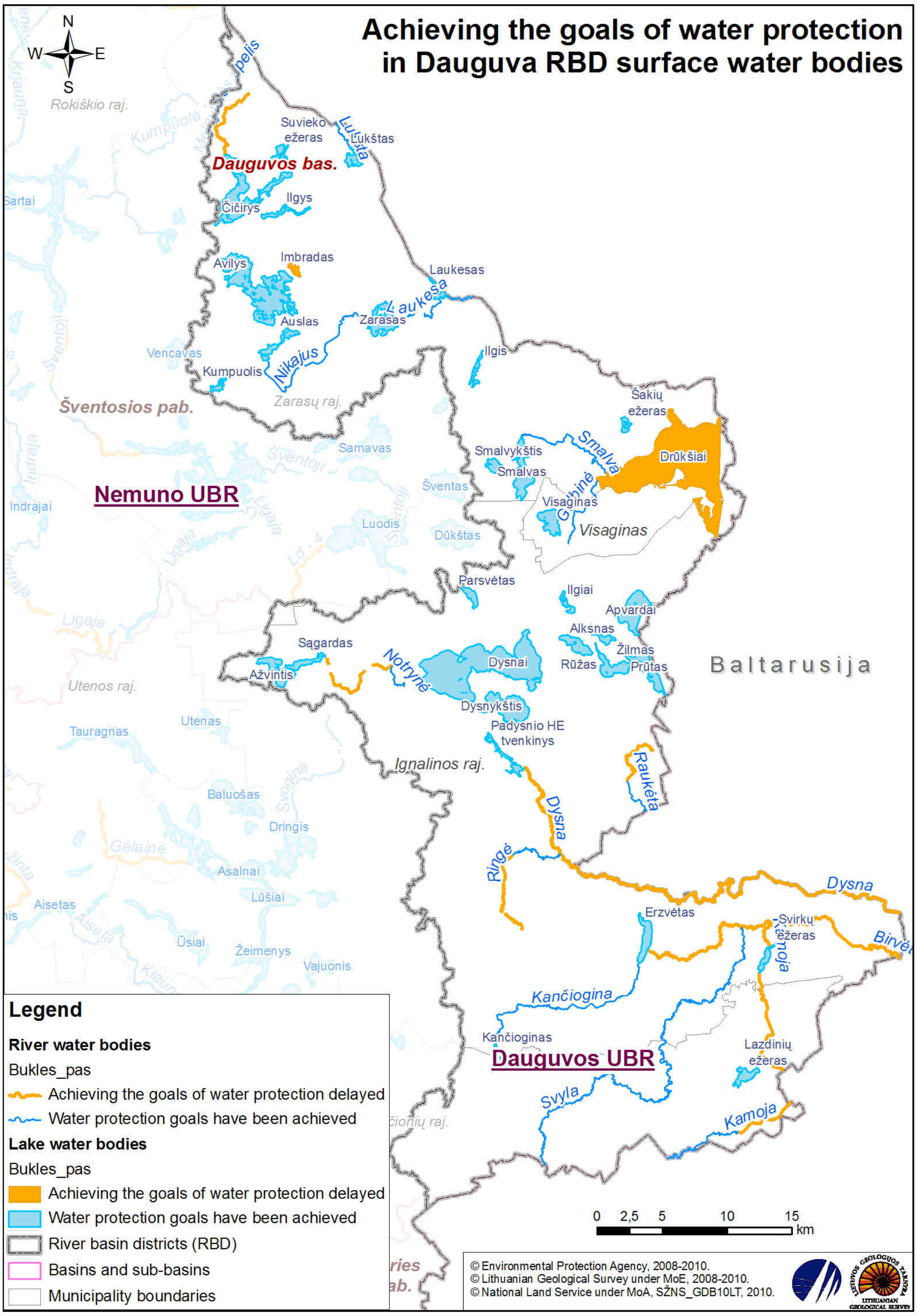



Figure 34. Achievement of water protection objectives in surface water bodies in the Dauguva RBD

Table 79. Achievement of water protection objectives in water bodies at risk in the category of rivers in the Dauguva RBD

| ***WB code*** | ***Basin*** | ***River*** | ***Length of WB, km*** | ***Type*** | ***HMWB*** | ***Achievement of water protection objectives*** | ***Reasons of deadline extension*** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ***Uncertainty about status*** | ***Uncertainty about the impact of the river bed straightening and lack of affordability*** | ***Uncertainty about the impact*** | | | ***Uncertainty about technical feasibility to reduce diffuse pollution*** |
| | | | | | | | | | ***HPP*** | ***Water abstraction*** | ***Point pollution*** | |
| 500100011 | Dauguva | Dysna | 11.7 | 2 | 0 | Deadline extended | | | 1 | | | |
| 500100012 | Dauguva | Dysna | 43.4 | 2 | 0 | Deadline extended | 1 | | | | | |
| 500100071 | Dauguva | Notrynė | 7.4 | 1 | 0 | Deadline extended | | 1 | | | | |
| 500100801 | Dauguva | Ringė | 8.0 | 1 | 0 | Deadline extended | | 1 | | | | |
| 500101501 | Dauguva | Raukėta | 5.8 | 1 | 0 | Deadline extended | | 1 | | | | |
| 500104101 | Dauguva | Birvėta | 32.0 | 2 | 0 | Deadline extended | | | | 1 | | |
| 500104562 | Dauguva | Kamoja | 18.0 | 1 | 0 | Deadline extended | | 1 | | | | |
| 500108461 | Dauguva | Melnytėlė Stream | 7.6 | 1 | 0 | Deadline extended | | 1 | | | | |

Table 80. Achievement of water protection objectives in water bodies at risk in the category of lakes in the Dauguva RBD

| ***WB code*** | ***Basin*** | ***Lake/pond*** | ***Area of WB, km$^2$*** | ***Type*** | ***HMWB*** | ***Achievement of water protection objectives*** | ***Reasons of deadline extension*** | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | ***Uncertainty about pollution sources*** | ***Uncertainty about achievement of good status after the removal of the impact*** |
| 550030316 | Dauguva | Imbradas | 0.6 | 1 | 0 | Deadline extended | 1 | |
| 550040100 | Dauguva | Drūkšiai | 36.226 | 2 | 0 | Deadline extended | | 1 |

# CHAPTER VII. SUMMARY ECONOMIC ANALYSIS OF WATER USE

## SECTION I. GENERAL OVERVIEW OF THE SITUATION

116. With the area of 1 857 km$^2$, the Dauguva RBD is the smallest river basin district constituting only 2.9% of the total area of the country. Only one river basin is situated within the Dauguva RBD – the Dauguva Basin with a population of 57.5 thousand, or 1.7% of the total population in the country. The density of the population is 31 inhabitants per km$^2$.

The Dauguva Basin situates 100% of Visaginas town municipality, 66% of Ignalina district municipality, 44% of Zarasai district municipality, and 17% of Švenčionys district municipality population. The largest municipality is Ignalina district municipality which occupies around 53% of the RBD area and the smallest one is Zarasai district municipality occupying about 32% of the area.

Table 80. Comparison of the general indicators in the Dauguva RBD with the national figures, 2008

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

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

The data in Table 80 demonstrates that GDP in the Dauguva RBD in 2008 totalled to LTL 1 629 million, which accounted for 1.7% of the national GDP. The GDP share per capita was LTL 28 314 – like in the rest of Lithuania, apart from the largest cities (which are situated in the Nemunas RBD).

The average monthly disposable income per household member in the Dauguva RBD in 2008 was lower than the national average and totalled to LTL 869, meanwhile the national average in 2008 was LTL 987 per household member. Registered unemployed population in the Dauguva RBD in 2008 accounted for 14.8%, which is more than the average national figure.

The annual water consumption in the Dauguva RBD in 2008 totalled to 19 167 58 thousand m$^3$, which is 36% of the total water consumption in Lithuania. However, the largest share of this amount was water for the purposes of the energy sector, i.e. Ignalina Nuclear Power Plant. Accordingly, the water consumption indicators should significantly go down in 2010.

Apart from the water volume consumed for energy purposes, the water consumption in the Dauguva RBD in 2009 accounted for 4.8% of the total consumption in Lithuania.

The distribution of water consumption by sectors (excluding the energy sector) is provided in Figure 35 below.

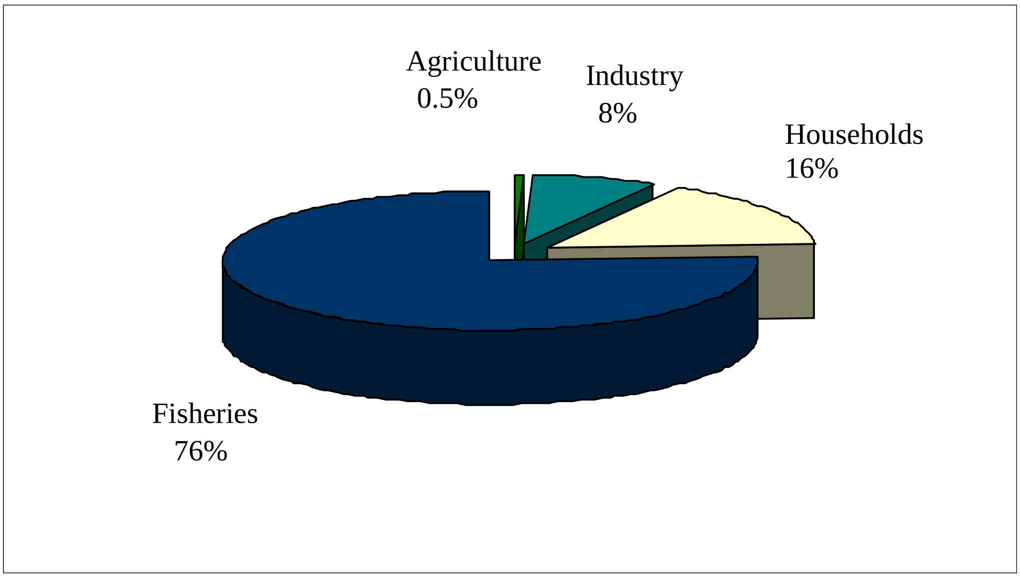



Figure 35. Water consumption in the Dauguva RBD in 2009, thousand m$^3$
Source: Statistics Lithuania. Data distributed in basins following distribution of the population.

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

There is no untreated wastewater discharged in two major municipalities within the Dauguva RBD (Visaginas and Ignalina) (the respective national figure is 0.3%); however, the treatment quality is insufficient: 82% of wastewater is treated below the established standards meanwhile in Lithuania this figure is 27% (excluding wastewater which is generally not subject to treatment).

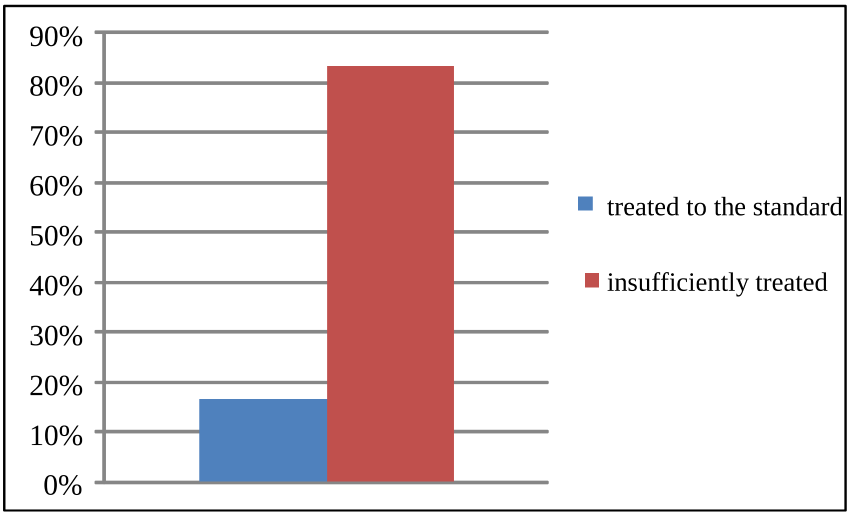



Figure 36. Level of treatment in two municipalities in the Dauguva RBD in 2008
Source: Statistics Lithuania. The chart was drawn by the Expert.

There is a project going on in Visaginas (until May 2010), "Investment Programme for the Neris River Basin. Stage I", which involves rehabilitation of the infrastructure of the water economy: construction of wastewater treatment facilities, pump-house of second elevation, six wastewater pump-houses and renovation of 3.83 km of the wastewater force main. The amount of LTL 16.4 million was allocated for the project from the EU Cohesion Fund, LTL 6.1 million from the state budget, and LTL 8.9 million were allocated by the state enterprise Visagino energija.

Modern biological treatment technologies will be used in the new wastewater treatment facilities, which will significantly improve the treatment quality. Consequently, the treatment percentage given in Figure 35 will be much higher.

## SECTION II. ANALYSIS OF ECONOMIC SECTORS

117. An analysis of sectors related to and affecting the use of water resources demonstrated that the main drivers of the major pressures on surface water bodies include households, industry, energy, agriculture and fisheries. However, none of the said sectors poses any major problems to water quality. There is one hydropower plant in the Dauguva RBD – Padysnis HPP, with the installed capacity of 120 kW. The area of its pond is 1.09 $km^2$. In addition, there are four small dams constructed on rivers within this RBD.

Differently from countries with insufficient water resources, Lithuania little depends on water resources, which do not have any significant influence on the selection of an economic activity (except for activities directly connected with water resources, such as hydropower and navigation) or place of residence. The analysis of pressures given above, economic activities and supplementary measures required in the Dauguva RBD as described further in the text demonstrated that the input of the major activities into GDP is more or less proportionate to pollution generated by these activities, i.e. sectors which produce a higher value added also exert a larger impact on water resources.

### Households

118. The household sector is one of the most important users of water resources. In 2008, the average consumption of water by one member of a household connected to a

centralised network in Lithuania was 63 litres per day[3]. The consumption in Ignalina district was 47 litres per day, in Visaginas – 86 litres per day per household member. The average daily consumption by one inhabitant serviced by these two water supply companies totalled to 76 litres.

Implementation of the LGS project "Assessment of groundwater resources in Lithuania" included development of forecasts for groundwater abstraction and demand of water supply for public purposes in Lithuanian regions in 2015 and 2025 (Source: Report on the development of forecasts for groundwater abstraction and demand of water supply for public purposes in Lithuanian regions in 2015 and 2025. The implementer of the project – UAB SWECO-Lietuva. Vilnius, Lithuanian Geological Fund, 2007). Today, the daily abstraction within the Dauguva RBD is 9 191 $m^3$, which constitutes 14.4% of the amount of approved groundwater resources. Daily abstraction in 2015 is forecasted to total to 9 951 $m^3$ accounting for 15.5% of the volume of the approved groundwater resources. Accordingly, groundwater consumption in 2015 as compared with the present consumption will go up by about 1%.

The precise figure on wastewater discharges by households and by industries cannot be provided because the majority of industries emit their wastewater to the same wastewater treatment facilities. The analysis was conducted on the assumption that wastewater volumes discharged by households and industries are proportionate to the amounts consumed by these sectors. Comparison of households and industry shows that consumption by households within the Dauguva RBD is twice higher than the industry sector. The annual consumption for industrial purposes in Ignalina district totalled only to 500 $m^3$, which accounts for 8% of the total consumption, excluding the water used for Ignalina NPP.

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

The number of people in households connected to water supply networks by the main water supply companies within the Dauguva RBD is provided in Table 81.

Table 81. Percentage of population connected to water supply and sewerage networks in the Dauguva RBD, 2008

| Water supply company | Percentage share of population connected to water supply networks in the areas serviced by water supply companies | Percentage share of population connected to sewerage networks in the areas serviced by water supply companies |
|---|---|---|
| Ignalinos vanduo | 60 | 39 |
| Visagino energija | 100 | 100 |
| **In Dauguva RBD on average** | **99** | **91** |

Source: Water Suppliers' Association

For the purpose of implementing the strategic goal to achieve that 95% of the population becomes able to use water supply and wastewater management services, it has been planned to allocate funds for Ignalina district from the Financial Perspective 2007-2013. Since wastewater discharged from Ignalina finds its way to the Žeimena

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

Sub-basin and, accordingly, to the Nemunas RBD, the costs for the construction of sewerage and water supply networks are included in the costs of supplementary measures for the Nemunas RBD. Table 82 provides data on the planned investment projects including the required costs. In addition, a sewage sludge composting/drying facility is planned to be constructed in Visaginas. The costs of the latter facility are included in the costs of supplementary measures for the Dauguva RBD.

Table 82. National projects in the Dauguva RBD in 2007-2013

| Water supply company | Settlement | Planned works | | | | | | | | Project value, LTL million, excl. VAT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 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 | Sewage sludge composting/drying facility | |
| Ignalinos vanduo | Ignalina | | | 2.3 | | 1.0 | | | | 2.31 |
| Visagino energija | Visaginas | | | | | | | | 1 | 9.8 |
| **Total in Dauguva RBD** | | | | **2.3** | | **1.0** | | | | **12.11** |

Source: List No. 01 under Measure No. VP3-3.1-AM-01-V "Renovation and development of water supply and wastewater treatment systems"

Note: The minimum length of networks to be constructed or reconstructed is provided pursuant to an order of the Minister of Environment. The scope of works might become different if construction prices change.

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

The prices of water supply and wastewater management of the two main water suppliers in the Dauguva RBD are given in Table 83 below.

Table 83. Prices of water supply and wastewater management in the Dauguva RBD, 2010, LTL/m$^3$

| Water supply company | Price of water supply | | | | Price of sewerage management | | | | Total price | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | for customers | | for subscribers | | for customers | | for subscribers | | for customers | | for subscribers | |
| | excl. VAT | incl. VAT | excl. VAT | incl. VAT | excl. VAT | incl. VAT | excl. VAT | incl. VAT | excl. VAT | incl. VAT | excl. VAT | incl. VAT |
| Ignalinos vanduo | 2.31 | 2.80 | 2.28 | 2.76 | 4.35 | 5.26 | 3.45 | 4.17 | 5.82 | 7.05 | 5.73 | 6.93 |
| Visagino energija | 1.72 | 2.08 | 1.7 | 2.06 | 3.05 | 3.69 | 4.63 | 5.6 | 4.77 | 5.77 | 4.71 | 5.7 |

Source: Water supply companies

## Industry

119. Industries in the Dauguva RBD consume abut 8% of the total volume consumed in this river basin district. If the fisheries sector were assigned to that of industry, water consumption by industries would go up significantly and constitute the major share of water consumed in the RBD because fisheries consume 73% of the total water volume in the Dauguva RBD.

The highest percentage of companies (excluding public institutions, trade companies, companies providing other services, or similar companies) is operating in manufacturing – 9% (Figure 37). According to the data provided by Statistics Lithuania by counties and adjusted for municipalities, about 1 250 companies were operating in Visaginas and Ignalina district in 2008.

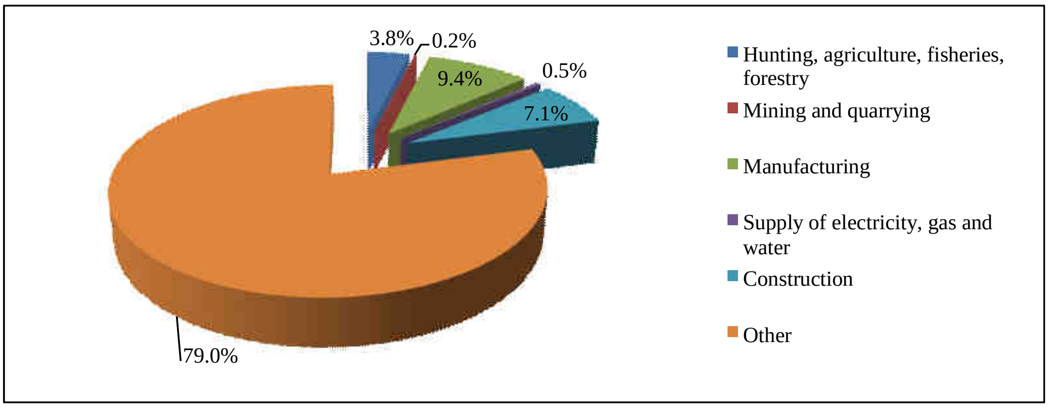



Figure 37. Distribution of companies by industries in the Dauguva RBD, 2008

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

During the project "Identification of substances dangerous for the aquatic environment in Lithuania" carried out in 2006, examination of hazardous substances discharged with wastewater was performed in various wastewater treatment facilities. The findings revealed that a few hazardous substances of concern, namely, phenols and their ethoxylates, polycyclic aromatic hydrocarbon, organotin compounds and phtalates were detected in wastewater treatment plants of a few towns in addition to those which are monitored under the National Monitoring Programme. In the Dauguva RBD, hazardous substances in wastewater were examined in the Dysna River at the border. Here, concentration of nickel exceeded the EU environmental quality standards and the amount of di-(2-ethylhexyl)phthalate was higher than the Lithuanian norms set for this substance. No source of pollution has been identified so far, hence monitoring in the Dysna River has been provided for.

There are four companies in the Dauguva Basin which have been issued integrated pollution prevention and control (IPPC) permits. Table 84 below specifies the number of installations subject to the IPPC requirements by individual types specified in the IPPC legislation.

Table 84. Number of companies with IPPC permits by types of installations in the Dauguva RBD, 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 | 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 | 1 |

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

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

The number of payers of charges for water pollution and the payable amounts are given in Table 85 below. Both the number of payers and the amounts paid in 2008 went down as compared to the figures of 2007.

Table 85. Payments of the water pollution charge in the Dauguva RBD

| District | Number of payers | | Payable amounts, LTL (rounded up) | |
|---|---|---|---|---|
| | 2007 | 2008 | 2007 | 2008 |
| Ignalina | 8 | 3 | 8 950 | 4 500 |
| Visaginas | 5 | 4 | 76 600 | 69 000 |
| **Total** | **13** | **7** | **86 000** | **74 000** |

Source: Database of pollution charges of the Ministry of Environment

## Energy

120. This sector is the main driver of alterations of the hydrological regime due to dams and similar embankments. Until 2010, approximately 99% of all water abstracted in the Dauguva RBD was used for energy generation. Today, there is only one HPP (Padysnis HPP) with installed total capacity of 120 kW. The area of its pond is 1.09 km$^2$.

## Agriculture[4]

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

The amount of water consumed for agricultural purposes in the Dauguva RBD totals to about 48 thousand m$^3$, which is less than 0.01% of the total consumption in the RBD. Excluding water consumption for energy purposes from the total water consumption, the share for agriculture would still be as low as 0.5%. One hectare of agricultural land consumes almost one cubic meter of water which is more than the national average (0.54 m$^3$/ha).

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

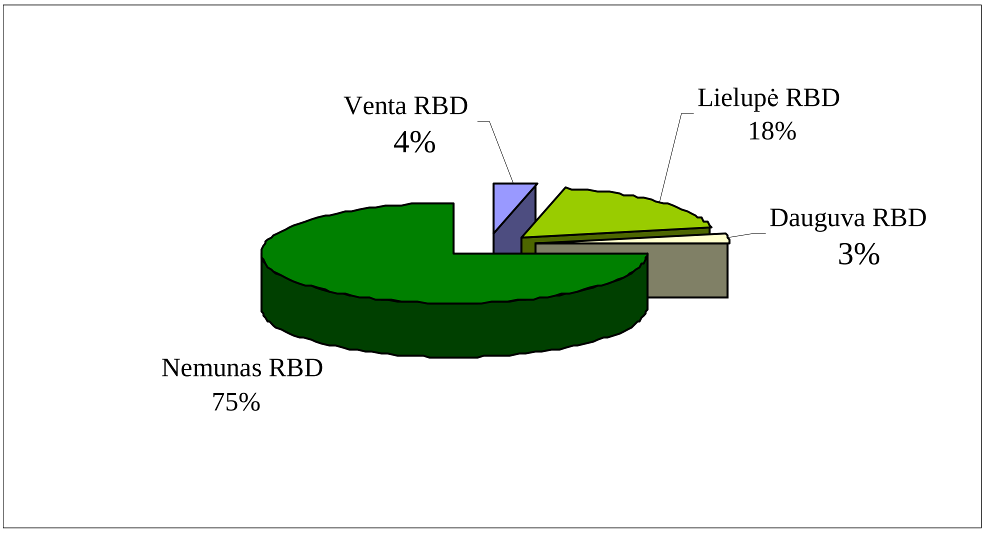



Figure 38. Water consumption for agricultural purposes in different RBD, 2009

Source: Environmental Protection Agency, experts' calculations by individual RBD

Due to very low water consumption, the sector of agriculture does not have any significant impact on the amount of water resources in the Dauguva RBD. The largest volume of surface water in agriculture is usually consumed for irrigation; however, no significant abstraction of surface water for agricultural purposes is forecasted for the coming 5-10 years in Lithuania due to poor technical state of irrigation systems and natural and economic conditions. According to the Land Reclamation Cadastre, areas potentially subject to irrigation in the Dauguva RBD totalled to 200 ha. Not all of these are suitable for use. Practically there were no irrigated areas in 2001-2008.

Diffuse pollution and hydromorphological changes (for purposes of land reclamation) constitute indirect use of water resources for agricultural needs. The major share of diffuse pollution loads generated in agriculture is pollution entering the soil with animal manure and mineral fertilisers. An estimated demand of mineral nitrogen and phosphorus fertilisers per hectare in the Dauguva RBD is much lower as compared to other river basin districts. The loads of animal pollution are proportionate to the animal density, which is lower in the Dauguva RBD as compared to the national average (0.5 LSU/ha) and totals to 0.24 LSU/ha. Morphological changes in the Dauguva RBD, as in all other RBD, are significant. The total drained area within the Dauguva RBD is 60 772 ha, i.e. larger than the total agricultural area. It was calculated that straightened rivers in the Dauguva Basin total to 59 km. Of these, about 4.4 km are situated in protected areas.

**Fisheries**

122. The fisheries (aquaculture) sector covers special ponds which are considered to be merely industrial objects and not bodies of water that must achieve good water status. 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 10 000 ha. The number of live marketable fish grown in these ponds in 2008 totalled to about 3.76 thousand tonnes. It is forecasted that the number of ponds will not be increasing because they need land and other large investments, and in future this number is likely to go down a little. Such assumption was made taking into account the current tendency of decrease of fish farms in Lithuania. At present, there is no reliable data on any negative impact of fisheries on bodies of surface water, thus this sector is not included among significant pressures.

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

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

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

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

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

There is one commercial pond fish farming company in the Dauguva RBD – Birvėtos tvenkiniai. The area of its ponds totals to 793.6 ha. This company has been issued ecological fish breeding certificate.

According to the data of the EPA, the quality parameters ($BOD_7$, $N_{total}$ and $P_{total}$) of water released from fishery ponds seldom exceed the permitted norms.

## Recreation

123. There are no official bathing waters in the municipality of Zarasai district the beaches of which are situated within the Dauguva RBD, although there are 45 beaches of various size, 3 of which are maintained observing the relevant hygiene norms. Another one is located in Visaginas. Other sites contain at least minimum infrastructure, though no study has been conducted. The report presented to the European Commission indicates 4 bathing waters within the Dauguva RBD.

Studies conducted 2008 in three beaches in Zarasai cost about LTL 6 000 and in the previous year – around LTL 2 000. It is expected that the price of studies will go down in 2000.

The Environmental Support Programme (ESP) allocates around LTL 25 000/year for the maintenance of beaches.

Zarasai municipality was planning to fund establishment of a beach on an island in Lake Zarasas from its budget; however, it is believed that the funds may be reallocated.

Also, there are plans to renovate three beaches for LTL 443 000 (from Interreg Programme).


Figure 39. Beaches and bathing sites in the Dauguva RBD

## Economic and social importance of sectors

124. A brief description of the main sector which can exert a negative impact on water resources in Lithuania, those in the Dauguva RBD included, demonstrates that there are no problems related to point pollution generated by households and that fish farming ponds are one of the main users of water and dischargers of wastewater which, however,

need not to be treated. A specific object in the Dauguva RBD is Ignalina NPP which used to consume very large volumes of water for its cooling. However, after the decommissioning of the plant in 2010, this pressure has been fading away.

Economic importance of the said sectors is in a way characterised by such indicators as the number of employees in the sector and value added. Indicators characterising the importance of each sector are provided in Tables 86 and 87.

Table 86. Employed population in the Dauguva RBD, 2008

| Municipality | Employed population, thousand | | | | |
|---|---|---|---|---|---|
| | Total | Hunting, agriculture, fisheries, forestry | Industry | Construction | Services |
| Visaginas | 12.54 | 1.26 | 2.93 | 1.72 | 6.64 |
| Ignalina | 8.84 | 0.89 | 2.07 | 1.21 | 4.68 |
| Total | 21.37 | 2.15 | 5.00 | 2.94 | 11.32 |
| | 100% | 10.0% | 23.4% | 13.7% | 53.0% |

Source: Statistics Lithuania and experts' calculations adjusting county data for municipalities according to the population number

Table 87. Value added in the Dauguva RBD by industries, 2008

| Municipality | GDP and value added, LTL million | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Per capita, LTL thousand | Hunting, agriculture, fisheries, forestry | % | Industry | % | Construction | % | Services, etc. | % |
| Visaginas | 692.3 | | 29.8 | | 275.7 | | 68.6 | | 318.3 | |
| Ignalina | 488.0 | | 21.0 | | 194.3 | | 48.3 | | 224.3 | |
| On average / total | 1 180.3 | 27.2 | 50.8 | 4.3 | 470.0 | 39.8 | 116.9 | 9.9 | 542.6 | 46.0 |

Source: Statistics Lithuania and experts' calculations adjusting county data for municipalities according to the population number

The values of the indicators given above were recalculated using the data on former counties. The figures in the tables demonstrate that the most important sector by employment, excluding the sector of services, is industry. In 2008, the sectors of agriculture, forestry, hunting and fisheries in the Dauguva RBD created only 4.3% of the value added created in this RBD though the number of population working in the sector of agriculture alone makes up 8-10% of all working-age population[5]. The national figure is 8.1%.

The value added created in 2008 in the sector of industry, which employs over 23% of all labour force, totalled to 36%. As demonstrated above, the input of industry, agriculture and fisheries into the total pollution load corresponds to the proportions of the input into the overall economy in Visaginas and Ignalina district.

The importance of agriculture in Lithuania by the value added created therein significantly lags behind other major economic activities. Only about 4% of the gross domestic product is created in the sectors of forestry, hunting and fisheries (2008 m). The value of gross agricultural production produced in one hectare of agricultural land

[5] The share of relative employees from all working-age population.

within the Dauguva RBD is around LTL 1 600 per hectare, meanwhile this indicator is much higher in Lithuania – LTL 2 865 per hectare of utilised agricultural land. The value of agricultural production in the Dauguva RBD totals to LTL 79.7 million, which is less than 1% of the value of gross agricultural production produced in Lithuania. Agricultural land in the Dauguva RBD makes up 2.9% of the total area of the land, and smaller farms dominate in this river basin district.

# CHAPTER VII. SUMMARY PROGRAMME OF MEASURES

## SECTION I. INTRODUCTION

125. The programme of measures for improving the status of water bodies in a river basin district is one of the pillars of the river basin management planning. Having summed up the available information on the scope of planned pollution reduction measures, water quality monitoring data and mathematical modelling results, water bodies have been identified which will fail to conform to the good water status criteria after the implementation of the main (basic) measures (i.e. the requirements laid down in the key water directives). With a view to improve, where possible, the status of such surface water bodies, packages of supplementary measures which are most effective from both environmental and economic point of view have been proposed. An integrated programme of measures consists of specific measures or studies suggested for the selection of supplementary measures during later stages.

## SECTION II. BASIC MEASURES

126. Following Part A of Annex VI to the WFD, the basic measures are the ones which must be implemented in order to meet the requirements of the following directives:

126.1. Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC (OJ 2006 L 64, p. 37-51) (Bathing Waters Directive);

126.2. Birds Directive;

126.3. Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption (OJ 2004 special edition, Chapter 15, Volume 4, p. 90) (Drinking Water Directive);

126.4. Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances (OJ 2004 special edition, Chapter 5, Volume 2, p. 410) (Major Accidents Directive);

126.5. Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment (OJ 2004 special edition, Chapter 15, Volume 1, p. 248) as amended by Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No. 1013/2006 (OJ 2009 L 140, p. 114-135) (Environmental Impact Assessment Directive);

126.6. Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture (OJ 2004 special edition, Chapter 15, Volume 1, p. 265) (Sewage Sludge Directive);

126.7. Urban Wastewater Treatment Directive;

126.8. Council Directive 91/414/EEC concerning the placing of plant protection products on the market (OJ 2004 special edition, Chapter 3, Volume 11, p. 332) as amended by the Commission Directive 2010/42/EU of 28 June 2010 amending Council Directive 91/414/EEC to include FEN 560 (fenugreek seed powder) as active substance (OJ 2006 L 161, p. 6-8) (Plant Protection Products Directive);

126.9. Nitrates Directive;

126.10. Habitats Directive;

126.11. Directive 2008/1/EC of the European Parliament and of the Council concerning integrated pollution prevention and control (OJ 2008 L 24, p. 8-29), as last amended by Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No. 1013/2006 (OJ 2009 140, p. 114-135) (IPPC Directive).

Seven directives out of the eleven ones the implementation of which also means introduction of the basic measures are related to high costs. The implementation of the remaining directives – the Birds Directive, Environmental Impact Assessment Directive, Plant Protection Products Directive, and Habitats Directive – means establishment of relevant legal, institutional, procedure, and other measures which do not require any investments.

### Measures required for implementing the transposed Community legislation for protection of water

127. Measures required for implementing the Community legislation for protection of water transposed into the Lithuanian acquis are provided in Table 88 below.

Table 88**.** Measures required for implementing the Community legislation for protection of water

| | **Key legislation of the Republic of Lithuania transposing the EU directive** | **Measure** | **Implementation costs at the national level** |
|---|---|---|---|
| **Environmental Impact Assessment Directive** | Law on Environmental Impact Assessment of the Proposed Economic Activity (Žin., 1996, No. 82-1965; 2005, No. 84-3105). | Environmental impact assessment in all relevant cases | No need of supplementary investments; annual costs estimated according to the number of potential EIA total to LTL 100 thousand |
| **IPPC Directive** | Rules for the Issuing, Renewal and Revocation of Integrated Pollution Prevention and Control Permits approved by Order No. 80 of the Minister of Environment of the Republic of Lithuania of 27 February 2002 (Žin., 2002, No. 85-3684; 2005, No. 103-3829) | Application of IPPC permits in all relevant cases; implementation of BAT | Acc. to preliminary estimates in 2000, implementation costs of the IPPC Directive in Lithuania must have ranged from LTL 1 200 to 2 000 million. The demand of one-time costs in the Dauguva RBD until 2015 is estimated to be LTL 10 thousand according to the number of potential IPPC permits. |

| | Key legislation of the Republic of Lithuania transposing the EU directive | Measure | Implementation costs at the national level |
|---|---|---|---|
| **Major Accidents Directive** | Regulations of the Prevention, Response to and Investigation of Industrial Accidents approved by Resolution No. 966 of the Government of the Republic of Lithuania of 17 August 2004 (Žin., 2004, No. 130-4649; 2008, No. 109-4159);<br><br>Programme on the Inspection of Dangerous Installations of the Republic of Lithuania approved by Order No. 1-528 of the Director of the State Fire and Rescue Department of 29 December 2006 (Žin., 2007, No. 3-143)<br><br>List of Potentially Dangerous Installations approved by Order No. 539 of the Minister of Environment of the Republic of Lithuania of 11 October 2002 (Žin., 2002, No. 111-4929; 2005, No. 58-2025) | Development of safety reports and emergency plans; measures for accident prevention | No need of supplementary investments. One-time expenditure until 2015 estimated on the basis on the potential number of relevant documents to be prepared total to LTL 50 thousand |
| **Plant Protection Products Directive** | Law of the Republic of Lithuania on Plant Protection (Žin., 1995, No. 90-2013; 2010, No. 13-620).<br><br>List of Active Substances which May Be Contained in Plant Protection Products approved by Order No. 3D-187 of the Minister of Agriculture of the Republic of Lithuania of 19 April 2004 (Žin., 2004, No. 60-2145). | Control of the use of plant protection products; application of the Code of Good Practice for Plant Protection; studies and analyses of impacts of plant protection products; withdrawal/banning of harmful substances | Investment costs until 2015 estimated on the basis on the number of the existing plant protection products and their potential demand total to LTL 544 thousand. Annual operating costs total to LTL 90 thousand. |
| **Bathing Water Directive** | Lithuanian Hygiene Norm HN 92:2007 “Beaches and Bathing Water Quality” approved by Order No. V-1055 of the Minister of Health of the Republic of Lithuania of 21 December 2007 (Žin., 2007, No. 139-5716);<br><br>Bathing Water Quality Monitoring Programme for 2009-2011 approved by Resolution No. 668 of the Government of the Republic of Lithuania of 25 June 2009 (Žin., 2009, No. 80-3344) | Monitoring of bathing water quality; provision of information to the public on bathing water quality.<br><br>Official designation 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). Maintenance of bathing sites in the Dauguva RBD in 2010-2015 will annually require around LTL 8 thousand. |
| **Birds Directive** | Law of the Republic of Lithuania on Protected Areas (Žin., 1993, No. 63-1188; 2001, No. 108-3902)<br><br>General Regulations of Areas of | Establishment of sites important for the conservation of birds, development and implementation of | Required investment costs for the management of bird habitats until 2015 total to ca. LTL 1.9 million |

| | Key legislation of the Republic of Lithuania transposing the EU directive | Measure | Implementation costs at the national level |
|---|---|---|---|
| | Importance for the Conservation of Habitats or Birds approved by Resolution No. 276 of the Government of the Republic of Lithuania of 15 March 2004 (Žin., 2004, No. 41-1335).<br><br>Criteria for the Screening of Areas of Importance for the Conservation of Birds approved by Order No. D1-358 of the Minister of Environment of the Republic of Lithuania of 2 July 2008 (Žin., 2008, No. 77-3048) | management plans for protected areas | and operating costs – ca. LTL 350 thousand. |
| **Habitats Directive** | Law of the Republic of Lithuania on Protected Areas<br><br>Regulations of Areas of Importance for the Conservation of Habitats or Birds<br><br>Criteria for the Screening of Areas of Importance for the Conservation of Habitats approved by Order No. 219 of the Minister of Environment of the Republic of Lithuania of 20 April 2001 (Žin., 2001, No. 37-1271; 2008, No. 87-3495) | Establishment of sites important for the conservation of habitats; development of protected area management plans | Required investment costs for the establishment and management of habitats until 2015 total to ca. LTL 102 thousand, operating costs – ca. LTL 300 thousand. |
| **Sewage Sludge Directive** | Regulatory document LAND 20-2005 "Requirements for the use of sewage sludge for fertilisation and recultivation" approved by Order No. 349 of the Minister of Environment of the Republic of Lithuania of 28 June 2001 (Žin., 2001, No. 61-2196; 2005, No. 142-5135) (LAND 20-2005) | Development of fertilisation plans; analysis and accounting of sewage sludge; withdrawal/banning of dangerous substances | According to the Study on Development of an Investment Programme for Sludge Management in Lithuania prepared by SWECO BKG, the required total costs are estimated at about LTL 300 million. The amount planned to be invested in the Dauguva RBD until 2013 totals to about LTL 9.8 million. Annual operating costs – LTL 300 thousand. |
| **Urban Wastewater Treatment Directive** | The Directive has to be implemented in 2010,<br>Law of the Republic of Lithuania on Water (Žin., 2001, No. 64-2327);<br><br>Law of the Republic of Lithuania on Drinking Water Supply and Wastewater Management (Žin., 2006, No. 82-3260)<br><br>Wastewater Management Regulation | Assurance of centralised wastewater treatment in agglomerations larger than 2 000 p.e. | Investment costs for 2003-2009 are estimated at about LTL 1 billion. In 2007-2013, about LTL 2.1 billion are planned to be allocated for the development and rehabilitation of water supply, wastewater collection and sludge management infrastructures in |

| | Key legislation of the Republic of Lithuania transposing the EU directive | Measure | Implementation costs at the national level |
|---|---|---|---|
| | | | settlements larger than 2000 p.e. in Lithuania. No such measures will be required in the Dauguva RBD. |
| **Nitrates Directive** | National Programme on the Reduction of Water Pollution from Agricultural Sources approved by Resolution No. 1076 of the Government of the Republic of Lithuania of 26 August 2003 (Žin., 2003, No. 83-3792) | Construction of manure and slurry storages on farms having more than 10 LSU; regulation of crop rotation and fertilisation, promotion of ecological farming, establishment and control of water protection belts, restoration and establishment of wetlands. Continuously. | Investment costs at 2002 prices were estimated at ~ LTL 320 million for Lithuania. The amount needed for the implementation of these requirements in the Dauguva RBD until 2015 totals to ca. LTL 5.3 million of investment costs and ca. LTL 53 thousand of annual operating costs |
| **Drinking Water Directive** | Law of the Republic of Lithuania on Water<br><br>Law of the Republic of Lithuania on Drinking Water Supply and Wastewater Management<br><br>Wastewater Management Regulation<br><br>State Procedure for Drinking Water Control approved by Order No. 643 of the Director of the State Food and Veterinary Service of the Republic of Lithuania of 10 December 2002 (Žin., 2002, No. 3-99);<br><br>Lithuanian Hygiene Norm HN 24:2003 "Drinking water safety and quality requirements" approved by Order No. V-455 of the Minister of Health of the Republic of Lithuania of 23 July 2003 (Žin., 2003, No. 79-3606);<br><br>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) | Drinking water quality surveillance and control; expansion of fields with multi-annual crops; monitoring of agricultural activities; application of the Code of Good Agricultural Practice | According to estimates in 2001, costs of addressing problems of fluoride and iron totalled to ca. LTL 100 million. However, removal of iron, as of an indicative parameter, is not obligatory under the Drinking Water Directive. No costs for the expansion and rehabilitation of drinking water supply systems have been planned for the Dauguva RBD. |

**Practical steps and measures for application of the principle of water costs recovery as laid down in Article 9 of the WFD**

128. Practical steps and measures for application of the principle of water costs recovery as laid down in Article 9 of the WFD and in the Law of the Republic of Lithuania on Water are given in Table 89.

Table 89. 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).<br><br>Law of the Republic of Lithuania on Water<br><br>Law of the Republic of Lithuania on Drinking Water Supply and Wastewater Management<br><br>Law of the Republic of Lithuania on Charges for State Natural Resources (Žin., 1991, No. 11-274; 2006, No. 65-2382);<br><br>Law of the Republic of Lithuania on Environmental Pollution Charge (Žin., 1999, No. 47-1469; 2002, No. 13-474). | The key measure for implementing Article 9 of the WFD is introduction of the cost recovery principle for all consumers.<br><br>Such principle has already been enacted in the Law of the Republic of Lithuania on Water and the Methodology for the Pricing of Drinking Water Supply and Wastewater Management Services approved by the National Control Commission for Prices and Energy.<br><br>In addition, an informal working group for coordinating development of the water management system, consisting of representative of the Ministry of Environment, Association of Local Authorities in Lithuania, Lithuanian Water Suppliers Association and the National Control Commission for Prices and Energy, was established in March 2010 on the initiative of the Ministry of Environment. It is proposed to discuss issues regarding accounting of depreciation of donated assets related to cost recovery in this group.<br><br>According to 2009 data, the cost recovery level in the sector of public water supply and wastewater management in the Dauguva RBD totals to ca. 78%. |

129. The estimated cost recovery level in the sector of public water supply and wastewater management demonstrates that the water supply companies operating within the Dauguva RBD in 2009 recovered 78% of their costs on average

Table 90. Recovery of water supply and wastewater management costs of two major water supply companies in the Dauguva RBD in 2008 and 2009, %

| | 1 | 2 | **Dauguva RBD** |
|---|---|---|---|
| Total costs, 2008 | 62 | 81 | 77 |
| Total costs, 2009 | 84 | 77 | 78 |

Source: experts' estimations on the basis of prices and cost prices of water supply companies

130. The main reason of the failure to fully implement the cost recovery principle in many water supply companies in 2008 was delay by municipalities to approve tariffs covering the costs. New water supply and wastewater management tariffs were approved in 2009 – at the beginning of 2010, thus, following the opinion of municipalities and the National Control Commission for Prices and Energy, it is likely that the cost recovery principle has been implemented by now. Also, municipalities are currently preparing Water Supply and Wastewater Management Infrastructure Development Plans. 25 such plans were prepared until 2010, 26 were being prepared

and the remaining 9 municipalities were only planning the development of such plans. One of the components of the plans is assessment of the forthcoming tariffs and affordability, hence these plans are believed to contribute to the effective implementation of the cost recovery principle. Environmental costs are included in the cost recovery mechanisms through charges for state natural resources and for pollution of the environment.

131. The two main reasons of the failure to fully implement the cost recovery principle in the sector of industry are subsidies and failure to reflect the actual industrial pollution of water resources in the tariffs of charges for state natural resources and for pollution of the environment. Companies usually finance investments to the water sector with their own funds and bank credits. The amount of subsidies to the water sector in Lithuania is rather small. There are two main potential sources of funding:

131.1. EU support granted through mechanisms under the control of the Ministry of Economy, and

131.2. subsidies granted by the Lithuanian Environmental Investments Fund (LEIF).

Until 2007, EU structural support was granted to business (industry included) under the Single Programming Document 2004–2006 (SPD). More than LTL 1.13 billion of the support administered by the Ministry of Economy was allocated for the implementation of 333 projects during that period. None of these, however, was related to the water sector. Accordingly, the only source of importance for the assessment of cost recovery is subsidies granted by the LEIF.

Only about LTL 1 million of the annual amount of LTL 13 million received from the LEIF was granted to industrial and construction companies  for the water sector in 2008 and about LTL 1.7 million – in 2007. As a result of the poor financial situation, only one application of an industrial enterprise was approved for the funding of the water sector in 2009.

Having in mind that industry creates more than LTL 20 billion of the value added, internalisation of LTL 1-2 million (which is the amount of subsidies granted during a more favourable period 2007-2008), i.e. inclusion of such amount into the polluter’s costs, does not have any effect on the cost recovery level in the sector of industry.

Today, no reliable data is available on which companies are responsible for discharge of certain hazardous substances to rivers, and to what extent. For this reason, the costs of supplementary measures (if any) for the sector of industry cannot be compared to the “external” pollution costs at the moment[6].

Following the afore-said assumption that charges for state natural resources and for pollution of the environment reflect the external environmental costs, it can be maintained that the cost recovery level in the sector of industry is 100%.

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[6] Deterioration of the environmental status is treated as “external costs” in our economic system. External costs appear when action or failure to act one individual or a group of individuals has a damaging effect on other individuals or groups. Pollution means negative “external costs”. For example, when a factory pollutes a river with untreated wastewater, the downstream water users incur expenses related to health or water treatment. The English equivalent “externality” is sometimes used in other economic areas. It means an external impact, i.e. a benefit or cost caused by an action or process and incurred by a party not related to that action or process.

132. The cost recovery estimation method used for the public sector cannot be applied to agriculture. The sector of agriculture is not an important direct user of water in Lithuania, the Dauguva RBD included. A significant component for estimations is diffuse agricultural pollution which is not included in water or any other costs.

It is very difficult to assess costs of the environment, resources and other expenditure incurred due to agricultural pressures (there are no studies and data available on how much the “value” of water bodies is reduced due to agricultural pollution). In such case it should be assumed that such “external” costs are approximately equal to the agricultural pollution removal costs. This amount in the Dauguva RBD during the first stage of the Programme of Measures will total to about LTL 534 thousand every year until 2015. LTL 8 thousand will have to be borne by the state for measures of control. Farmers will have to fund the major part of the costs – LTL 526 thousand. Such agricultural pollution reduction measures would cut agricultural pollution in areas where it exerts a significant impact. Since there are no water bodies which require supplementary measures to be financed with state funds within this RBD, it is believed that the polluter pays principle will be implemented and the cost recovery level will reach 100% by 2015, on condition that the established measures will be introduced.

However, this is only an a priori assessment meanwhile the actual cost recovery level in agriculture will be identified only in 2015 upon evaluation of farmers’ contribution to the implementation of the measures.

### Measures to meet the requirements of Article 7 of the WFD

133. Measures required to meet the requirements of Article 7 of the WFD are given in Table 91.

Table 91. Measures to meet the requirements of Article 7

| **Relevant legislation** | **Measure** |
|---|---|
| Regulations of the Register of the Earth Entrails approved by Resolution No. 584 of the Government of the Republic of Lithuania of 26 April 2002 (Žin., 2002, No. 44-1676; 2006, No. 54-1961);<br><br>Procedure for Groundwater Monitoring by Economic Entities approved by Order No. 1-190 of the Director of the State Geological Survey of 24 December 2009 (Žin., 2009, No. 157-7130) | Monitoring of water bodies where abstraction exceeds 100 m3 per day<br><br>Relevant protection of water bodies |

### Controls over abstraction and impoundment of water and measures aimed at economical and sustainable use of water

134. Controls over abstraction and impoundment of water and measures aimed at economical and sustainable use of water are provided in Table 92.

Table 92. Controls over abstraction and impoundment of water and measures aimed at economical and sustainable use of water

| Relevant legislation | Measure |
|---|---|
| **Water abstraction**<br>Building Technical Regulation STR 2.02.04:2004 “Water Abstraction, water preparation. Basic provisions” approved by Order No. D1-156 of the Minister of | Water abstracting entities report information on the abstraction volume. The EPA stores information received in its data bases.<br><br>Companies which abstract, use or supply |

| Relevant legislation | Measure |
|---|---|
| Environment of the Republic of Lithuania of 31 March 2004 (Žin., 2004, No. 104-3848)<br><br>Rules of the Issuing, Renewal and Revocation of Integrated Pollution Prevention and Control Permits | groundwater or surface water are subject to relevant permits. Permits shall specify the water source, yielding capacity of the water abstraction facilities $m^3/s$, the volume of water abstracted, presence of water accounting facilities, etc. and provide for measures for rational water use and protection. |
| Regulations of the Register of the Earth Entrails Resources<br><br>Order No. 1-10 of the Director of the State Geological Survey of 19 February 2003 on the approval of Form 1-PV for quarterly reports on groundwater abstraction (Žin., 2003, No. 19-849) | All economic entities which abstract more than 10 $m^3$ of groundwater per day for the purposes of drinking water supply or industrial needs shall provide quarterly water abstraction reports to the State Geological Survey. |
| **Water impoundment:**<br>Law of the Republic of Lithuania on Water | The Law on Water defines both preventive and hard control measures for impoundment. The Minister of Environment lays down a procedure for use and maintenance of ponds by issuing relevant legislation. |
| Standard Rules for the Use and Maintenance of Ponds (LAND 2-95) approved by Order No. 33 of the Minister of Environment of the Republic of Lithuania of 7 March 1995 (Žin., 1997, No. 70-1790; 2004, No. 96-3563; 2006, No. 101-3915); | A separate part of the Rules is devoted HPP ponds. The latest amendment of the Rules sets a deadline for the introduction of automatic devices measuring and registering the water level in HPP and requires performing measurements of discharges and water levels. |
| Resolution No. 1144 of the Government of the Republic of Lithuania of 8 September 2004 on the approval of the List of Ecologically or Culturally Valuable Rivers or River Stretches (Žin., 2004, No. 137-4995) | The Resolution prohibits impoundments for any purposes in 169 rivers and their stretches. |

### Measures intended to prevent or control potential discharge of pollutants from diffuse pollution sources

135. 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

136. The Lithuanian Geological Survey issues permits for discharging pollutants directly into groundwater bodies. The permitting procedure is regulated observing the Procedure for the Inventory of Discharges of Hazardous Substances into Groundwater and Collection of Information Thereon approved by Order No. 1-06 of the Director of the Lithuanian Geological Survey under the Ministry of Environment of 3 February 2003 (Žin., 2003 No.17-770). There are no such discharges directly into groundwater in the Dauguva RBD.

### Summary of controls over point source discharges and other activities with an impact on the status of water

137. Pollution from point sources is regulated by the Wastewater Management Regulation, Rules of the Issuing, Renewal and Revocation of Integrated Pollution

Prevention and Control Permits, and the Surface Runoff Management Regulation approved by Order No. D1-193 of the Minister of Environment of the Republic of Lithuania of 2 April 2007 (Žin., 2007, No. 42-1594).

## Flood control measures

138. Activities of preparation for floods and elimination of consequences thereof are carried out observing the Civil Protection Law of the Republic of Lithuania (Žin., 1998, No. 115-3230) and the Procedure for Flood Risk Assessment and Management approved by Resolution No. 1558 of the Government of the Republic of Lithuania of 25 November 2009 (Žin., 2009 No.144-6376).

Pursuant to the said Resolution, the Ministry of Environment has to:

138.1. draw up and approve preliminary flood risk assessment reports not later than by 22 December 2011;

138.2. discuss and approve, if required, preliminary flood risk assessment reports and amendments thereof not later than by 22 December 2018, and afterwards – every six years;

138.3. draw flood threat maps  and flood risk maps and submit these to the Government of the Republic of Lithuania for approval not later than by 22 June 2013;

138.4. prepare flood risk management plans and submit these to the Government of the Republic of Lithuania for approval not later than by 22 June 2015.

## Summary of measures implemented under Article 16 on priority substances

139. Summary of measures implemented under Article 16 on priority substances is provided in Table 93.

Table 93. Summary of measures implemented under Article 16 on priority substances

| **Relevant legislation** | **Measure** |
|---|---|
| Wastewater Management Regulation<br><br>Programme on the Reduction of Pollution of Waters with Hazardous Substances approved by Order No. D1-71 of the Minister of Environment of 13 February 2004 (Žin., 2004, No. 46-1539) | Regulation of maximum allowable concentrations of dangerous and priority dangerous substances<br><br>Self-regulation of dangerous and priority dangerous substances in wastewater |

## Measures which prevent or reduce impacts of accidental pollution incidents

140. Measures which prevent or reduce impacts of accidental pollution incidents are provided in Table 94.

Table 94. Measures which prevent or reduce impacts of accidental pollution incidents

| **Relevant legislation** | **Measure** |
|---|---|
| Regulations on the Prevention, Response to and Investigation of Industrial Accidents<br><br>Programme on the Inspection of Dangerous Installations of the Republic of Lithuania approved by Order No. 1-528 of the Director of the State Fire and Rescue Department of 29 December 2006 (Žin., 2007, No. 3-143) | Development of industrial accidents prevention and liquidation plans and emergency reports |

141. 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**

142. So far, a potential impact of hydro technical constructions (dams) and other morphological alterations on river ecosystems and river bed processes has not been adequately studied in Lithuania. Measures for today which would ensure better ecological conditions in hydromorphologically altered water bodies include construction of fish by-passes, which are regulated by Order No. 3D-427 of the Minister of Agriculture of the Republic of Lithuania of 25 September 2007 on the approval of the List of Dams where Facilities for Fish Migration are Required and of the List of Former Dam Remains where Barriers for Fish Migration Have to Be Removed (Žin., 2007, No. 102-4180).

It should be noted that installation of fish by-passes only mitigates but does not fully eliminate the negative effect of breaches of river continuity.

**Controls over artificial recharge or augmentation of groundwater bodies**

143. 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**

144. Lithuanian legislation provides for certain derogations for water bodies where water protection objectives cannot be achieved or are disproportionally expensive:

144.1. postponing of an objective (maximum until 2027) if accomplishment thereof is prevented by technical possibilities, disproportionate costs or natural conditions;

144.2. in the procedure laid down by the Minister of Environment, water bodies heavily modified by anthropogenic activities may be subject to less stringent water protection objectives ensuring that less stringent objectives will not deteriorate the status of a water body in question.

Derogations may be applied only in rare cases, upon performance of an economic analysis and well-founded proof of the necessity of the derogation.

**Details of supplementary measures identified as necessary to meet the environmental objectives**

145. 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 diffuse pollution, improvement of hydromorphological status, research and public information.

## 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

146. Measures for the prevention and mitigation of pollution arising from unforeseen accidents (which are always unpredictable) have been provided for in the following legislation:

146.1. Regulations on the Prevention, Response to and Investigation of Industrial Accidents, and

146.2. Programme on the Inspection of Dangerous Installations.

Emergency plans envisage ensuring protection of people and the environment in the event of emergencies as well as mitigation of negative impacts of accidents on people and the environment.

## Other basic measures and programmes

147. The following available programmes which are currently implemented can be classified as basic measures:

147.1. Programme on the Reduction of Agricultural Pollution of Waters approved by Order No. 3D-686/D1-676 of the Minister of Agriculture and the Minister of Environment of the Republic of Lithuania of 9 December 2008 (Žin., 2008, No. 143-5741);

147.2. 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);

147.3. 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);

147.4. 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);

147.5. National Strategy for the Implementation of the United Nations Framework Convention on Climate Change by 2012 approved by Resolution No. 94 of the Government of the Republic of Lithuania of 23 January 2008 (Žin., 2008, No. 19-685);

147.6. Lithuanian Rural Development Programme for 2007-2013 (RDP) approved at the EU Rural Development Committee on 19 September 2007;

147.7. Cohesion Promotion Action Programme approved by the Commission Resolution of 30 July 2007.

## Effect of implementation of the basic measures

148. The implementation of the basic measures will have a minor but nevertheless a positive effect on the status of water bodies. The major beneficial measure is construction of manure storages on farms with more than 10 LSU. The implementation of the requirements of other directives will be less noticeable because many of them are only indirectly related to the improvement of the status of water bodies.

Table 95. Implementation costs of the key water legislation from 2010 through 2015 in the Dauguva RBD

| Directive | Costs, LTL | | |
|---|---|---|---|
| | **Investment until 2015** | **Annual operating** | **Total annual** |
| Bathing Water* | 0 | 18 160 | 18 160 |
| Birds* | 1 866 000 | 347 000 | 602 000 |
| Drinking Water | together with the costs of the Nitrates Directive | | |
| Major Accidents * | 50 000 | | 7 000 |
| Environmental Impact Assessment | | 70 000 | 70 000 |
| Sewage Sludge** | 9 800 000 | 294 000 | 1 148 000 |
| Urban Wastewater Treatment | 0 | 0 | 0 |
| Plant Protection Products* | 544 000 | 5 000 | 89 000 |
| Nitrates** | 5 325 000 | 53 250 | 517 250 |
| Habitats * | 126 000 | 306 000 | 323 000 |
| IPPC* | 10 000 | 0 | 1 000 |
| **Total** | **17 720 000** | **1 090 000** | **2 770 000** |

Notes:
* Estimations of annual (annualised) costs were based on a 10 years service life.
** Estimations of annual (annualised) costs were based on a 20 years service life.
Operating costs were estimated applying the following investment percentage: Sewage Sludge Directive – 3%, Nitrates Directive – 1%.

## SECTION III. SUPPLEMENTARY MEASURES

148. 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 for the Dauguva RBD during the first implementation stage cover only surveillance, operational and investigative monitoring and public information.

### Supplementary measures to reduce the impact of point pollution sources and their costs

150. There are no point pollution sources (WWTP) which would require supplementary measures in the Dauguva RBD.

A source of point pollution is secondary pollution of Lake Drūkšiai from Lake Skrytas (Skripkų ežeras) where a wastewater outlet of Visaginas town is located. Secondary pollution enters Lake Drūkšiai from Lake Skrytas by the Gulbinėlė River. Visaginas municipality has planned cleaning up Lake Skripkų ežeras, hence secondary pollution problem of Lake Drūkšiai will also be solved in the nearest future. This means that no supplementary measures to reduce secondary pollution will be required.

### Measures to reduce pollution with hazardous and priority hazardous substances

151. During the project “Identification of substances dangerous for the aquatic environment in Lithuania”, concentrations of di-(2-ethylhexyl)phthalate (DEHP) were found to be exceeding the established norms in the Dysna River.

Hazardous substances were detected in the Dysna during one-time measurements, therefore the concentrations of the substances detected will be analysed in an intensive monitoring site in the Dysna with a view to identify the actual pollution level. It is proposed to postpone the achievement of water protection objectives in the Dysna until sufficient data is collected proving significant level of pollution with hazardous substances and allowing planning pollution reduction measures.

**Measures to reduce diffuse pollution**

152. An assessment of the impact of diffuse pollution sources and the status of surface water bodies demonstrated that there are no water bodies at risk due to the impact diffuse pollution within the Dauguva RBD. However, this RBD will benefit from the diffuse pollution reduction measures to be applied throughout Lithuania irrespectively of the present status in water bodies. Such measures will play a preventive role in the Dauguva RBD protecting the soil and water bodies against excessive amounts of nutrients in future. In addition, they facilitate implementation of the polluter pays principle.

Measures to reduce diffuse pollution are as follows:

152.1. validated maximum allowable amounts of nitrogen and phosphorus fertilisers per hectare, irrespective of whether organic or mineral fertilisers are used;

152.2. a revised and validated mandatory methodology for the development of fertilisation plans;

152.3. an obligation to develop fertilisation plans for farms utilising 10 ha of land and more;

152.4. an obligation to manage manure in line with the recommendations set forth in the Good Farming Rules and Guidelines and in compliance with the Environmental Requirements for Manure Management for farms with less than 10 LSU (i.e. farms which are not subject to the requirements of the Nitrates Directive). The Good Farming Rules provide for that solid manure may be temporarily stored in field heaps in accordance with the said Guidelines;

152.5. revised Environmental Requirements for Manure and Slurry Management approved by Order No. D1-608/3D-651 of the Minister of Environment and the Minister of Agriculture of the Republic of Lithuania of 14 July 2010 to include the obligation to keep documents which prove legal use, handover or sales of manure and/or slurry at least two years for farms with 50 and more LSU;

152.6. controls over the afore-listed measures. It is recommended to carry out additional control of 5% of all small farms in Lithuania which have less than 10 LSU, 10% of farms with 10 ha of land and more (which will also have to develop fertilisation plans observing the present Management Plan) where supplementary measures are required to reduce agricultural pollution, and 2% of farms of the latter size in the remaining area of Lithuania;

152.7. information campaigns for the implementers of the programmes of measures on measures against diffuse pollution. The main areas of information and training are as follows:

152.7.1. information campaigns for farmers on the maximum allowable fertilisation norms, procedure of the development of fertilisation plans and benefits of the plans;

152.7.2. information campaigns and trainings for small farms on manure and slurry management;

152.7.3. trainings for developers of fertilisation plans.

153. The effect of measures for reducing diffuse pollution and their costs are provided in Table 96.

Table 96. Costs of measures required to reduce diffuse pollution in the Dauguva RBD

| Measures in the Dauguva RBD | Measure application scope, ha/LSU/unit | Effect of the measure on N reduction, kg/year | Annual costs, LTL |
|---|---|---|---|
| Manure management on small farms | 8 873 LSU | 0 | 88 730 |
| Fertilisation plans on farms ≥ 10 ha | 4 954 ha | 0 | 436 800 |
| Additional control | - | - | 7 860 |
| Total: | - | 0 | 533 400 |

Source: experts' estimations

The annual costs of the measures required to reduce diffuse pollution in the Dauguva RBD would total to around LTL 533.4 thousand. The major amount would have to be borne by farmers with more than 10 ha of land who will have to develop fertilisation plans (LTL 437 thousand) and farmers who keep up to 10 LSU (LTL 89 thousand). The burden to the state would total to LTL 8 for the control of the implementation of the measures.

**Measures to improve hydromorphological status**

154. The main reasons which determine hydromorphological changes in water bodies and thus prevent the achievement of good ecological status in some bodies of water are related to:

154.1. artificial barriers (disruption of river continuity),
154.2. hydropower plants,
154.3. straightened rivers.

To eliminate these causes or mitigate their impact, the following measures are proposed:

154.4. restoring/ensuring river continuity and flow;
154.5. reduction of the impact of hydropower plants;
154.6. remeandering of rivers.

**Construction of fish bypass facilities**

155. The most important measure which allows mitigating impacts of disruption (artificial barriers) of river continuity is construction of fish bypass facilities. 25 fish migration facilities were constructed in Lithuania until 2010: sluices, rock channels with weirs, and vertical-slot pool fish passes.

Fish bypass facilities should be first of all installed in rivers which are most important for fish migration. Priority measures for today are construction of fish bypass channels and removal of former dam remains as indicated in Order No. 3D-427 of the Minister of Agriculture of the Republic of Lithuania of 25 September 2007 on the approval of the List of Dams where Facilities for Fish Migration are Required and of the List of Former Dam Remains where Barriers for Fish Migration Have to Be Removed. There are no such places in the Dauguva RBD. Lithuanian experts who analysed the same issues some time later have not identified the said demand either.

### Replacement of HPP turbines

156. River stretches downstream of hydropower plants are proposed to be assigned to water bodies at risk due to unnatural fluctuation of their water level and runoff. Besides, turbines of certain types injure by-passing fish. Such impact can be mitigated by replacing old-type turbines with modern ones which are more environmentally friendly.

There is one HPP in the Dauguva RBD. It was reconstructed in 1995 and so far has not been identified as a priority HPP which requires any improvements for fish migration. Consequently, no costs have been envisaged for these measures.

However, the owners of hydropower plants must be obligated to introduce an environmentally friendly turbine when the need of replacement arises. A permit for construction of new HPP should require observance of the best available techniques, i.e. introduction of modern turbines.

### Renaturalisation of rivers

157. Straightening of rivers in the Dauguva RBD significantly affects the ecological status of six water bodies in the category of rivers with the total length of 59 km. One of these water bodies, a 12 km stretch of the Nikajus River, flows over an urbanised area and thus is assigned to HMWB. Other five water bodies (47 km) are designated as water bodies at risk to the straightening of their beds. Of these, 24 km flow in plains and should be remeandered.

The main principles of naturalisation of regulated river beds are as follows:

157.1. to restore the original cross-section of the bed,

157.2. to ensure its stability, and

157.3. to restore the original functions of the bed (biological productivity, transformation of substances, habitats for water and land life).

Remeandering is an expensive process and so far is not acceptable to the population. Hence, the following is proposed for the Dauguva RBD:

157.4. to leave the 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;

157.5. 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);

157.6. 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.

The study “Feasibility study and development of recommendations for establishment/ restoration of wetlands aiming to reduce the input of organic and biogenic substances into water bodies" analysed costs of remeandering. The average demand of investment costs for one kilometre is about LTL 100 thousand.

Remeandering of the straightened water bodies at risk flowing in plains to the maximum extent would cost approximately LTL 2.4 million. The operating costs can be equated to zero. The total annual costs would be LTL 150 thousand.

Table 97 below provides general measures for mitigating the impact of hydromorphological changes and their costs.

Table 97. Measures for mitigating the impact of hydromorphological changes in the Dauguva RBD

| **Measure** | **Amount** | **Investment costs, LTL** | **Operating costs, LTL/year** | **Total annual costs, LTL/year** |
|---|---|---|---|---|
| Fish passes and removal of dam remains | 0 | 0 | 0 | 0 |
| Construction of a modern HPP turbine | 0 | 0 | 0 | 0 |
| Renaturalisation | 24 km | 2 400 000 | 0 | 150 000 |
| **Total ~** | | 2 400 000 | 0 | 150 000 |

Source: experts' estimations

It should be emphasised, however, that the estimations above only demonstrate the costs of the supplementary measure but do not mean that the measure will be proposed for implementation.

Also, it is not clear where such additional funds could be obtained because it has been established that potential funding sources already have their respective investment objects planned. At present, the state would not be able to afford such measure. Besides, the impact of the remeandering on the status of a stream in question is not known yet. Hence it is recommended that actions until 2015 are limited to the implementation of a pilot project on renaturalisation in the Nemunas RBD – the Grūda River.

## Supplementary measures for recreation

158. Although recreation has not been included among the drivers of significant pressures on the ecological status of water bodies, it is suggested that part of funds allocated for the development of recreation and already provided for in respective governmental documents are put aside for measures intended for the enhancement of the ecological status. This means that creation of any new object of infrastructure related to recreation should be permitted only in the event that measures to counterbalance the ecological damage done by such objects have been provided for.

Such measures should also be envisaged for the implementation of the National Special Plan of Water Tourism Routes which has already been prepared and which aims at expanding knowledge-oriented and recreational water tourism as well as the infrastructure of tourism and recreation. No water body of the Dauguva RBD is included among water tourism routes.

Countryside tourism, as a separate load type, is not expected to have any negative impact on the environment. Countryside tourism farmsteads are subject to regulations on treatment of household wastewater. Farmsteads should be regarded as point pollution sources which have treatment facilities and which are supposed to treat effluents at least to the following standards: $BOD_{7\ p}$ – 29 mg/l, $P_{total}$ – 10 mg/l, and $N_{total}$ – 40 mg/l. When issuing permits to these objects, the status of a receiving water body in question should be taken into account.

### Investigative measures

159. There are water bodies in the Dauguva RBD where the available data on causes of poor status is not sufficient. Hence supplementary studies are required in these water bodies prior to proposing specific measures for their status improvement.

The ecological status of Lake Imbradas is poorer than good; however, causes which condition such status are not known. Mathematical pollution load modelling results indicate that the status of the lake should be high. A lake study suggests that the lake may be (could have been) suffering from pollution with wastewater from Imbradas settlement. Impacts of historic pollution are also likely. To be able to identify the origin of pollution of this lake at risk (to find out whether the lakes suffers from anthropogenic pressures due to historic or present pollution, investigative monitoring (including the monitoring in the near-bottom layer of the lake) and inventory of pollution sources is required.

Table 98. Costs of investigative monitoring

| **Study or investigative measure** | **Required costs** | | |
|---|---|---|---|
| | **Investment / one-time, LTL** | **Operating, LTL/year** | **Annual*, LTL/year** |
| Investigative monitoring of Lake Imbradas (including the near-bottom layer) and inventory of pollution sources | 23 000 | | 3 000 |
| **Total** | **23 000** | | **3 000** |

Source: experts' estimations
* Estimations of annual costs were based on the assumption that the “service life” of investigative monitoring is 10 years and the discount rate is 6%.

### Summary costs of supplementary measures

Table 99. Costs of supplementary measures for the Dauguva RBD

| **Group of measures** | **Investment costs, LTL** | **Operating costs, LTL/year** | **Annual costs, LTL/year** |
|---|---|---|---|
| Point pollution | 0 | 0 | 0 |
| Diffuse pollution | 0 | 533 400 | 533 400 |
| - costs to be borne by farmers | | 525 544 | 525 544 |
| - costs of state control | | 7 860 | 7 860 |
| Hydromorphological changes | 2 400 000 | 0 | 152 000 |
| Studies | 23 000 | 0 | 3 000 |
| **Total ~** | **2 420 000** | **533 000** | **688 000** |

Source: experts' estimations

The data in the table above demonstrates that renaturalisation of rivers will not be carried out during the first stage of the implementation of the WFD. Costs under the Programme for the first stage will be required only for agricultural measures, investigative monitoring and information campaigns for the Programme implementers and for the general public.

The total costs of the whole Programme of Measures, including both basic and supplementary measures, are provided in Table 100.

Table 100. Implementation costs of the entire Programme of Measures for the Dauguva RBD until 2015

| **Group of measures** | **Investment costs, LTL** | **Operating costs, LTL/year** | **Annual costs, LTL/year** |
|---|---|---|---|
| **Basic measures** | | | |
| Bathing Water Directive | 0 | 18 160 | 18 160 |
| Birds Directive | 1 866 000 | 347 540 | 601 540 |
| Drinking Water Directive | together with the costs of the Nitrates Directive | | |
| Major Accidents Directive | 50 000 | | 7 000 |
| Environmental Impact Assessment Directive | | 70 000 | 70 000 |
| Sewage Sludge Directive | 9 800 000 | 294 000 | 1 148 000 |
| Urban Wastewater Treatment Directive | 0 | 0 | 0 |
| Plant Protection Products Directive | 544 000 | 5 000 | 89 000 |
| Nitrates Directive | 5 325 000 | 53 250 | 517 250 |
| Habitats Directive | 126 200 | 305 500 | 322 500 |
| IPPC Directive | 10 000 | 0 | 1 000 |
| **Basic measures in total** | **17 720 000** | **1 090 000** | **2 770 000** |
| **Supplementary measures** | | | |
| Point pollution | 0 | 0 | 0 |
| Diffuse pollution | 0 | 533 400 | 533 400 |
| Hydromorphological alterations | 0 | 0 | 0 |
| Research | 23 000 | 0 | 3 000 |
| **Supplementary measures in total ~** | **23 000** | **533 000** | **540 000** |
| **Basic and supplementary measures** | | | |
| **GRAND TOTAL ~** | **17 743 000** | **1 623 000** | **3 310 000** |

Source: experts' estimations

## SECTION IV. BENEFITS OF ACHIEVING GOOD STATUS IN WATER BODIES

160. The benefit which will be obtained upon the implementation of the supplementary measures has been estimated on the basis of the "Study on willingness to pay for improvement of the Nevėžis River water quality to achieve good status" and the "Study on willingness to pay for improvement of the Neris River water quality to achieve good status and remeandering of the Neris". Such relative assessment studies are rather widely used in many countries for the estimating benefits of natural resources (i.e. the benefits which cannot be estimated using conventional economic-commercial methods).

The said two sub-basins are situated in the Nemunas RBD. It is believed that the benefits derived therein may be directly transferred into other sub-basins in Lithuania due to highly similar geographical and social conditions throughout the country.

It was estimated that a statistically reliable monthly amount which respondents agreed to pay in the Nevėžis Sub-basin is LTL 1.85 per household (including the households which agree to pay 0 litas). Such study was conducted in 2007.

The “Study on willingness to pay for improvement of the Neris River water quality to achieve good status” identified four scenarios.

160.1. Willingness to pay for improvement of all water bodies in the Neris Sub-basin to achieve good ecological status;

160.2. 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;

160.3. Willingness to pay for improvement of the water quality of Lake Riešės ežeras to achieve good ecological status;

160.4. Willingness to pay for improvement of the water quality of Lake Riešės ežeras and Lake Didžiulis to achieve good ecological status.

161. 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.

In the Neris Sub-basin, the amount agreed to be paid by one household was LTL 40.51 per year, or LTL 3.38 per month only for improvement of the water quality, and LTL 48.18 per year, or LTL 4.01 per month both for improvement of the water quality and remeandering of rivers. In the first case, the amount totals to about 0.29% and in the second case – to 0.36% of the income of the studied households.

In the case of willingness to pay (i.e. to pay more than 0 litas), the payment for improvement of the water quality and remeandering of rivers totals averagely to more than 30% of people’s water bills.

Having in mind that the number of population in the Dauguva RBD totals to about 49 thousand and that the size of one household is 2.4 persons, the benefit estimated on the basis of the said study would be around LTL 74 thousand per month, or LTL 900 thousand per year.

It should be pointed out that these figures are provided for the purposes of information on how people in the Dauguva RBD view good status in water bodies.

At the present stage of the development of the Programme of Measures, the measures selected pursuant to a cost-efficiency analysis are those which will be the most effective during the first cycle of the implementation of the Management Plan. The question of whether the costs of a measure intended for the achievement of good ecological status in a water body are disproportionate and whether such costs may serve as a basis for derogation is a political decision based on economic information. Such decision needs comparing relevant costs and benefits. The principle of disproportionate costs, i.e. cost-benefit comparison was not required in any case of extension of the deadline in the Dauguva RBD. All cases of extension are based either on technical uncertainties already discussed or on affordability and/or negative attitude (acceptability) of the public to implement such measures until 2015. The latter is in a way a component of the principle of disproportionate costs. Besides, only extension of the deadline for the attainment of environmental objectives is required and no lower objects are proposed. Consequently, a cost-benefit analysis and the figures illustrating the benefit which are given in this section were not required at this stage.

## CHAPTER IX. PUBLIC INFORMATION AND CONSULTATION

162. Public participation activities in the management of the Dauguva RBD commenced in 2005 observing Order No. D1-273 of the Minister of Environment of the Republic of Lithuania of 31 May 2005 on the approval of the Personal Composition of the Coordination Councils of the Nemunas, Lielupe, Venta and Dauguva RBD (Žin., 2005, No. 72-2613). The main task of the Dauguva Coordination Council is to coordinate interests of public authorities, water users, interested non-governmental organisations and the public in setting and pursuing water protection objectives.

The following public information events were held:

162.1. A general Schedule for the Development of the Management Plans for all RBD in Lithuania was approved pursuant to Order No. V-110 of the Director of the Environmental Protection Agency of 25 October 2006 on the approval of the Schedule for the Development of River Basin District Management Plans (not published).

162.2. A few information events were arranged in 2007 for representatives of municipalities, regional environmental protection departments (REPD), non-governmental organisations (NGO), all four Coordination Councils, including the Coordination Council of the Dauguva RBD. The participants were informed about the progress of the development of Lithuanian RBD management plans.

162.3. Reviews of water protection problems identified in water bodies within the Dauguva RBD were prepared and placed on the EPA website on 22 December 2007. The general public could provide their comments until 22 June 2008.

162.4. Water protection problems in Lithuanian RBD, including the Dauguva RBD, were discussed on 26 June 2008 at the EPA with representatives of the RBD Coordination Councils. Mainly general comments and proposals were put forward in relation to the identification and solution of water protection problems.

162.5. A meeting of the Coordination Councils of the Lielupė, Venta and Dauguva RBD was held on 25 November 2009 in Šilagalis village to discuss draft management plans and programmes of measures.

162.6. A meeting was held with representatives of the Water Problems Council under the Academy of Science of the Republic of Lithuania on 14 April 2010 at the EPA to discuss Lielupė RBD, Venta RBD and Dauguva RBD management plans and programmes of measures and relevant comments.

162.7. The progress of the development of the Dauguva RBD Management Plan was presented on a specially designed website (www.upiubaseinai.lt) in 2010.

162.8. In 2010, the general public was informed about the progress of the development of the Management Plan in email newsletters.

162.9. In 2010, information about the progress of the river basin management was announced in the media.

162.10. In 2010, a video film (175 copies) and an information publication (700 copies) about the Dauguva RBD Management Plan and Programme of Measures were prepared and distributed to the general public.

162.11. An information conference was held on 25 October 2010 at the municipality of Ignalina district where the final drafts of the Dauguva RBD Management Plan and Programme of Measures were presented.

**Comments of the general public on the Dauguva RBD Management Plan**

163. The general public was invited to provide comments on draft managements plans and programmes of measures. The following institutions provided their written comments and questions regarding the draft management plan:

163.1. National Control Commission for Prices and Energy;

163.2. Administration of Zarasai district municipality;

163.3. Ministry of Transport of the Republic of Lithuania (did not have any comments);

163.4. Ignalina district municipality;

163.5. State Service for Protected Areas.

Ignalina district municipality suggested deleting Lake Gavys from the list of water bodies at risk. Having analysed the proposal, the experts accepted it and deleted Lake Gavys from the list of water bodies at risk.

The Administration of Zarasai district municipality pointed out that new water supply and wastewater collection networks in Dusetos, Padustėlis and Užtiltė settlements will not have any effect on the reduction of pollution in towns and settlements because the said settlements are situated outside the Dauguva River Basin District.

The comment was not clear enough because Dusetos, Padustėlis and Užtiltė settlements are mentioned in the Management Plan for the Nemunas RBD and not the Dauguva RBD.

The National Control Commission for Prices and Energy recommended providing reviews on the preparedness of municipalities to implement the provisions of the Law on Drinking Water Supply and Wastewater Management and on the relevant measures available.

This comment was taken into account when assessing information on municipal plans on development of water supply and wastewater management infrastructure, which in a way reflect the preparedness of municipalities to implement the provisions of the Law on Drinking Water Supply and Wastewater Management.

All comments of the State Service for Protected Areas were taken into account in this Management Plan.

## CHAPTER X. COMPETENT AUTHORITIES

164. The role of the Environmental Protection Agency, as specified in its regulations, is to collect, analyse and provide reliable information on the status of the environment, chemical flows and pollution prevention measures as well as to ensure arrangement of water protection and management for the attainment of water protection objectives. The Agency is also responsible for the development and coordination of basin management plans in the entire territory of Lithuania as well as for the reporting to the European Commission.

165. 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.

166. Regional Environmental Protection Departments are responsible for controls over the implementation of environmental legislation in the respective regions. The Departments will also be in charge of the controls over the implementation of the WFD requirements in their regions.

Table 101. Competent authorities

| **Competent authority and its website** | **Area of responsibility in relation to the Dauguva RBD** | **Contact persons, duties, telephone** | **Details for correspondence** | | |
|---|---|---|---|---|---|
| | | | **by fax** | **by email** | **by mail** |
| Environmental Protection Agency www.gamta.lt | Development of the Management Plan and Programme of Measures | Mindaugas Gudas, Head of the Environment Status Assessment Department +370-5-662814 | (8~5) 266 2800 | M.Gudas@aaa.am.lt | Juozapavičiaus 9 LT-09311 Vilnius |
| Lithuanian Geological Survey under the Minister of Environment of the Republic of Lithuania www.lgt.lt | Research and maintenance of groundwater resources | Kęstutis Kadūnas, Head of the Hydrogeology Department<br><br>+370-5-136272 | (8 5) 233 6156 | Kestutis.Kadunas@lgt.lt | Konarskio 35 LT-03123 Vilnius |
| Environmental Protection Department of Vilnius Region | Check-up of information on part of Švenčionys district within the Dauguva RBD for purposes of analysis and problem identification as well as control over the implementation of the Management Plan | Rolandas Masilevičius<br><br>Director<br><br>+370-5-2728536 | (8-5) 272 8389 | R.Masilevicius@vrd.am.lt | Juozapavičiaus 9 LT-09311 Vilnius |
| Environmental Protection Department of Utena Region | Check-up of information on parts of Ignalina, Visaginas, Zarasai districts within the Dauguva RBD for purposes of analysis and problem identification as well as control over the implementation of the Management Plan | Ričardas Vygantas<br><br>Director<br><br>+370-389-69 106 | 8-389 69662 | utena@urd.am.lt | Metalo g.11, LT-2821 Utena |