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Summary

The prime task of the water management is to manage the hydrological cycle of water for the benefit of all users. The **Directive 2000/60/EC** of the European Parliament and of the Council **establishing a framework for the Community action in the field of water policy** (Water Framework Directive or WFD) sets the structure and requirements for water management in the European Union (EU). The innovative approach established by the WFD is based on the number of main aspects:

- natural river basins are the primary units for water management instead of national, political or administrative boundaries;
- WFD covers inland surface and groundwater as well as sea coastal water and transitional water (water in the mixing zone or freshwater and marine water);
- ecological quality based on assessment of biological quality elements (groups of organisms living in the water) is the key for assessment of surface water quality;
- general public and all stakeholders operating in the basin shall be involved in the water management.

WFD sets the goal to be achieved with respect to water quality – at least “good” ecological quality in all surface water bodies and “good” qualitative and quantitative status of groundwater water bodies by 2015. River basin management plans and programmes of measures are the main instruments for achieving of these goals.

Both Latvia and Lithuania have **4** river basin districts (RBD) being a larger assemblages of single river basins. **3** of them are common RBD for both countries including Venta RBD.

Venta river basin cross border management plan is the first attempt to develop common Latvian – Lithuanian Venta RBD draft management plan to be served as outline for the elaboration of international Venta RBD management plan by the competent state institutions in the future as elaboration of such plans is envisaged by the WFD and both countries have agreed to develop it during the next planning period (2015 – 2021).

The Venta river basin cross border management plan was drafted in the framework of the project “Cross border cooperation in management of Venta river basin area nature values (Live Venta)” (project index LLIII-164**)** supervised by Kurzeme Planning Region in Latvia and Venta Regional Park in Lithuania. The project is financed by the European Regional Development Fund and self-financing from Latvia and Lithuania

Venta river basin cross border management plan is based on related national management plans already approved in both countries in 2010 as well as on updated information on essential aspects in relation to implementation of these plans. The plan consists of three main parts: **Analysis of the situation**, **Public participation** and **Recommendations**.

In the **part of situation analysis** a number of key issues with respect to general characterization of Venta RBD and institutions at different level taking part in the management of river basins are described. Besides, the way of implementation of WFD in both countries up to now is assessed. Common feature both for Latvia and Lithuania is that large amount of inland surface water bodies within the Venta RBD is designated (**91** in Latvia and even more in Lithuania (**124**), however only ~1/3 of the Venta RBD is located in Lithuania). Analysis has revealed that ecological typology of surface water and related criteria for water quality classification are quite different in both countries. The same statement applies to organization of water monitoring in Latvia and Lithuania. In Lithuania it is theoretically more sophisticated than in Latvia

covering a bit more chemical and biological quality elements introduced in the monitoring program. Nevertheless, it should be stressed that during the last years monitoring is reduced in both countries due to financial reasons hindering actualization of water quality assessment. According to the **water quality assessment** provided in the national management plans, **49 %** of Lithuanian river water bodies and **33 %** of Latvian ones are lacking at least the good quality status. With regard to lakes there are **50 %** of water bodies in Lithuania and **~57 %** in Latvia with the quality "less than good". As regards groundwater, the quality and quantity status is assessed as good within the whole RBD.

The water quality status assessment is followed by **detection of pressures** shaping the actual quality situation in the RBD. Main pressures causing the potential surface water quality problems are associated both to **point source** and **diffuse pollution**. Precise data is impossible to obtain at the moment as different approaches concerning estimation of diffuse pollution is used in Latvia and Lithuania. Even rough estimates are showing that diffuse pollution can play the greatest role in forming of the actual quality of surface water, especially with respect to nitrogen compounds (giving contribution to the total pollution load more than **90 %**). Sources of diffuse pollution are associated to agriculture, forestry and runoff from urban territories. Point source pollution is considered as essential in a number of locations within the basin, and reduction of related pressures is already carried out by implementation of both basic and supplementary measures. Besides, **hydromorphological pressures** (river straightening, regulation and power generation by small hydropower plants in both countries as well as harbours in some water bodies in Latvia) are significant. On the contrary, water abstraction, particularly - groundwater abstraction is not a problem in the basin as only up to **25 %** of the groundwater resources available are used at the moment.

Analysis of measures planned and implemented, or measures to be implemented within the RBD shows that a large number of projects are dedicated to improvement of "water infrastructure" foreseen under the Urban Wastewater Treatment and Drinking Water Directives. In addition, a number of so called supplementary measures are envisaged in order to construct or reconstruct wastewater treatment plants in smaller settlements with amount of inhabitants less than 2000. Furthermore, remediation of contaminated places is implemented, started or planned. With respect to reduction measures of diffuse pollution, in Lithuanian part of the RBD they are connected to special measures anticipated for nitrate vulnerable zones as all the territory of Lithuania is designated as such. On the contrary, Latvia has only small part of the Venta basin approved as nitrate vulnerable zone. In this case voluntary measures shall be promoted like "good agricultural practise", maintenance of buffer zones along the water bodies and "good cutting practice" in forestry. Good general measures could be provided by information and education campaigns to the general public as well as to specific stakeholders like farmers in both countries.

Similar to diffuse pollution, measures in relation to improvement of hydromorphological conditions are foreseen in the national management plans but implemented or started to a very limited extent yet (for example, cleaning of some rivers and lakes from macrophytes, recovery of rivers` continuity, diminishing of impact from small hydropower plants). National guidance on renaturalization of straightened rivers shall be still elaborated.

Special emphasis in the project was placed on the **cross border river water bodies** in Lithuania (**10**) and Latvia (**7**). According to the assessment done in the national management plans, the quality of Lithuanian cross border water bodies are slightly better than in the Latvian ones. It can be explained to some extent by general, probably diffuse pollution load coming from Lithuania (the Lithuanian part of the basin occupies more agricultural lands) as well as by different assessment methods and principles, and differing execution of monitoring. Irrespective of these considerations, the priority measures should apply to the whole part of the basin in order to mitigate the diffuse pollution and not so much to the places located in the territory close to the border.

With respect to **public informing** and **involvement**, a special working group of the project was established consisting of participants from the Ministries of Environment in both countries, Lithuanian Environmental Protection Agency and Latvian Environmental, Geology and Meteorology Centre (competent authorities for river basin management in both countries), Kurzeme Planning Region, Venta Regional Park, Liepāja Regional Environmental Board, Siauliai Regional Environmental Protection Department, Kuldīga and Saldus municipalities and Skuodo County municipality. Totally, four meetings of the working group were organized. Two of them were enlarged working group meetings dedicated to broader audience separately in Lithuania and Latvia with involvement of additional participants from municipalities, regional state environmental authorities and NGOs. Ideas resulted from discussions of participants taking part in these meetings are included in the section of recommendations, as well. The Venta river basin cross border management plan is published at the internet homepage of Venta Regional Park and Kurzeme Planning Region. Besides, press releases on the project are prepared by the Kurzeme Planning Region and disseminated both in Latvia and Lithuania.

The **part of recommendations** provides proposals for further cooperation of Lithuania and Latvia in the field of river basin management as such and particularly within the Venta RBD. These recommendations cover a wide scope of issues starting with formal arrangement of cooperation at the level of Ministries of Environment, information exchange at regular basis and public involvement. It is concluded that the initiative in relation to driving of the general cooperation within the Venta RBD should be taken by regional institutions but it can be delegated to third parties, as well. Municipalities along the border shall cooperate on local issues. Special suggestions are provided with respect to harmonization of water ecological typology and quality classification system in the common water bodies of Venta RBD. It could be done by some simplification of existing ecological typologies.

WFD requires introduction of all biological quality elements listed in the directive. For small countries like Latvia and Lithuania it is difficult to ensure the all necessary experts dealing with specific biological elements because exchange of experts is proposed as crucial component of cooperation in the future. With regard to methodologies of assessment the local Latvian – Lithuania intercalibration should be organized. Latvia shall try the Danish Stream Fauna Index for assessment of river quality by macrozoobenthos implemented in Lithuania since this method is successfully intercalibrated at the EU level.

Kopsavilkums

Ūdens apsaimniekošanas pamatuzdevums ir vadīt ūdens hidroloģisko jeb aprites ciklu tā, lai tiktu saskaņotas un apmierinātas visu lietotāju vajadzības. Eiropas Savienībā (ES) prasības un pārvaldības struktūru ūdens apsaimniekošanas jomā nosaka Eiropas Parlamenta un Padomes **Direktīva 2000/60/EK**, **ar ko izveido sistēmu Kopienas rīcībai ūdens resursu politikas jomā** (Ūdens struktūrdirektīva vai ŪSD). Inovatīvā pieeja, kuru izvirza ŪSD, balstās uz vairākiem galvenajiem aspektiem:

- upju sateces baseini ir tās dabiskās vienības, kurās jāveic ūdens pārvaldība, pretstatā agrākajai praksei, kad to ierobežoja nacionālās, politiskās vai administratīvās robežas;
- ŪSD aptver gan virszemes iekšzemes un pazemes ūdeņus, kā arī jūras piekrastes un pārejas ūdeņus (ūdeni saldūdeņu un jūras ūdeņu sajaukšanās zonā);
- virszemes ūdeņu kvalitātes novērtēšana balstās uz to ekoloģisko kvalitāti, kuru vērtē pēc bioloģiskās kvalitātes elementiem – ūdenī dzīvojošo organismu grupām;
- sateces baseina iedzīvotājus kopumā un mērķgrupas – dažādus ūdens izmantotājus un lietotājus sateces baseinā ir jāiesaista ūdens apsaimniekošanā.

ŪSD paredz, ka līdz 2015.gadam visos virszemes ūdensobjektos, jāsasniedz vismaz „laba" ekoloģiskā kvalitāte, bet pazemes ūdensobjektos – „labs" kvalitatīvais un kvantitatīvais stāvoklis. Upju sateces baseinu apsaimniekošanas plāni un pasākumu programmas ir galvenais instruments šo mērķu sasniegšanā.

Gan Latvijā, gan Lietuvā ir noteikti **4** upju baseinu apgabali (UBA). **3** no tiem ir kopīgi abām valstīm, tai skaitā arī Ventas UBA.

Šī Ventas upju baseina pārrobežu apsaimniekošanas plāna izstrāde ir pirmais mēģinājums izstrādāt kopīgu Latvijas – Lietuvas Ventas UBA pārvaldības plāna projektu, kurš atbildīgajām institūcijām kalpotu kā uzmetums starptautiskā Ventas UBA pārvaldības plāna izstrādei nākotnē, jo par šādu plānu izstrādi nākošajā plānošanas periodā (2015. – 2021.gads) ir vienojušās abas valstis un tā nepieciešamību paredz arī ŪSD.

Ventas upju baseina pārrobežu apsaimniekošanas plāns izstrādāts projekta „Pārrobežu sadarbība Ventas upju baseina dabas vērtību apsaimniekošanā (Live Venta)" ietvaros (projekta identifikācijas numurs LLIII-164). Projektu koordinē Kurzemes plānošanas reģions (Latvija) un Ventas reģionālais parks (Lietuva), to finansē no Eiropas Reģionālās attīstības fonda līdzekļiem, kā arī no abu valstu budžeta līdzekļiem.

Šī Ventas upju baseina pārrobežu apsaimniekošanas plāna izstrādē izmantota informācija no 2010.gadā apstiprinātajiem nacionālajiem apsaimniekošanas plāniem, kā arī aktuāla informācija par būtiskākajiem plāna ieviešanas aspektiem. To veido trīs galvenās daļas: **Situācijas analīze**, **Sabiedrības iesaistīšana** un **Rekomendācijas**.

Situācijas analīzes daļā ir dots Ventas UBA vispārīgs raksturojums, kā arī dažāda līmeņa institūciju apraksts, kas ir atbildīgas un piedalās upju baseina pārvaldībā. Bez tam ir novērtēts, kā līdz šim abas valstis ir ieviesušas ŪSD galvenās prasības.

Kopīgais Latvijas un Lietuvas plānos ir tas, ka abās valstīs Ventas UBA ir noteikts liels skaits iekšzemes virszemes ūdensobjektu (Latvijā **91**, bet Lietuvā pat

124, lai gan tikai 1/3 no Ventas UBA atrodas Lietuvas teritorijā). Abās valstīs ir atšķirīga pieeja virszemes ūdeņu ekoloģiskajai tipoloģijai, tāpat atšķiras ūdens kvalitātes klasifikācijas kritēriji. Tas pats attiecas uz ūdens kvalitātes monitoringa organizāciju Latvijā un Lietuvā. Lietuvā monitoringa programma ir labāk izstrādāta, un tajā ir ietverts nedaudz vairāk ķīmiskās un bioloģiskās kvalitātes rādītāju nekā Latvijā. Taču ir jāuzsver, ka abās valstīs pēdējos gados monitoringa apjoms ir ievērojami samazināts finansiālu iemeslu dēļ, tādējādi kavējot ūdens kvalitātes novērtējuma aktualizēšanu. Atbilstoši **ūdens kvalitātes novērtējumam**, kas veikts nacionālajos upju baseinu apsaimniekošanas plānos, **49 %** Lietuvas un **33 %** Latvijas upju ūdensobjektu Ventas UBA neatbilst vismaz labam kvalitātes stāvoklim. Attiecībā uz ezeriem, Lietuvā šādu ūdensobjektu ir **50 %**, bet Latvijā - **~57 %**. Pazemes ūdeņu kvalitatīvais un kvantitatīvais stāvoklis ir vērtējams kā labs visā Ventas UBA.

Pēc ūdens kvalitātes novērtējuma seko **slodžu izvērtējums**, kas nosaka baseina esošo ūdens kvalitāti. Galvenās slodzes, kas rada virszemes ūdeņu kvalitātes problēmas, ir saistītas gan ar punktveida, gan izkliedētā (difūzā) piesārņojuma avotiem. Tā kā abās valstīs ir atšķirīgas pieejas izkliedētā piesārņojuma aplēsēm, tad šobrīd nav iespējams iegūt precīzus datus. Tomēr arī aptuvens novērtējums parāda, ka izkliedētajam piesārņojumam ir būtiskāka ietekme, jo īpaši attiecībā uz slāpekļa savienojumiem (izkliedētā piesārņojuma ieguldījums kopējā slodzē atsevišķās teritorijās sasniedz vairāk par **90 %**). Izkliedētā piesārņojuma avoti ir gan lauksaimniecība, gan mežsaimniecība, gan urbāno teritoriju notece. Punktveida slodze uzskatāma par būtisku atsevišķās upju baseina vietās un tās samazināšana tiek risināta, jau šobrīd realizējot paredzētos pamata un papildu pasākumus. Bez tam nozīmīga ietekme ir arī hidromorfoloģiskajām slodzēm – upju taisnošanai, regulēšanai, mazajām hidroelektrostacijām (HES) abās valstīs un ostām dažos Latvijas ūdensobjektos. Turpretī ūdens ņemšana baseinā, jo īpaši pazemes ūdens ieguve, nerada problēmas, jo tiek izmantoti tikai aptuveni **25 %** no kopējiem pazemes ūdens resursiem Ventas UBA.

Plānoto un ieviesto **pasākumu analīze** atklāj, ka liela daļa projektu tiek realizēta ūdens infrastruktūras uzlabošanai Pilsētu notekūdeņu attīrīšanas direktīvas un Dzeramā ūdens direktīvas prasību ietvaros. Bez tam ir paredzēta virkne tā saucamo papildu pasākumu, lai būvētu vai rekonstruētu notekūdeņu attīrīšanas iekārtas (NAI) apdzīvotās vietās ar iedzīvotāju skaitu zem 2000. Bez tam ir ieviesti, sākti vai plānoti piesārņoto vietu sanācijas un rekultivācijas pasākumi. Attiecībā uz izkliedētā piesārņojuma novēršanas pasākumiem, Lietuvā tie ir saistīti ar speciāliem pasākumiem, kuru ieviešana paredzēta teritorijās, kas ir jutīgas pret nitrātu piesārņojumu. Visa Lietuvas teritorija ir noteikta par šādu jutīgu zonu. Savukārt, Latvijā tikai neliela daļa no Ventas UBA ir noteikta kā nitrātu jutīgā teritorija. Līdz ar to būtu jāveicina brīvprātīgie pasākumi, piemēram, „labas lauksaimniecības prakses" ieviešana, buferzonu uzturēšana gar ūdensobjektiem un „labas ciršanas prakses" ieviešana mežsaimniecībā tajos ūdensobjektos, kuri nav nitrātu jutīgajā teritorijā, bet kuros izkliedētā piesārņojuma slodze būtiski ietekmē virszemes un seklo pazemes ūdeņu kvalitāti. Abās valstīs nepieciešami arī informēšanas un izglītošanas pasākumi gan sabiedrībai kopumā, gan specifiskajām mērķgrupām, piemēram, zemniekiem.

Līdzīgi izkliedētajam piesārņojumam, pasākumi hidromorfoloģisko apstākļu uzlabošanai ir paredzēti nacionālajos apsaimniekošanas plānos, bet tikai neliels to skaits ir jau realizēti vai vismaz uzsākti (piemēram, dažu upju un ezeru attīrīšana no makrofītiem, upju nepārtrauktības atjaunošana un mazo HES ietekmes samazināšana). Vēl aizvien dienas kārtībā ir nacionālo vadlīniju izstrādāšana iztaisnoto upju renaturalizācijai.

Projekta īpašs fokuss ir uz **upju pārrobežu ūdensobjektiem**, kuru skaits Lietuvā ir **10**, bet Latvijā – **7**. Atbilstoši novērtējumam, kas veikts nacionālajos upju baseinu apsaimniekošanas plānos, pārrobežu ūdensobjektu kvalitāte Lietuvas pusē ir nedaudz labāka nekā Latvijā. To var izskaidrot gan ar vispārīgā, iespējams, izkliedētā piesārņojuma slodzi no Lietuvas (Lietuvas Ventas UBA teritorijā ir salīdzinoši vairāk lauksaimniecības zemju), gan ar atšķirīgām novērtējuma metodēm un principiem, kā arī atšķirībām monitoringa izpildē. Neraugoties uz to, prioritāri veicamie pasākumi izkliedētā piesārņojuma slodzes mazināšanai būtu jāattiecina ne vien uz pašu pierobežas zonu, bet arī uz visu baseina daļu Lietuvā.

Saistībā ar sabiedrības informēšanu un iesaisti tika izveidota speciāla projekta darba grupa, kuru veidoja pārstāvji no abu valstu Vides ministrijām, Lietuvas Vides aizsardzības aģentūras un Latvijas Vides, ģeoloģijas un meteoroloģijas centra (abas institūcijas ir kompetentās iestādes upju baseinu pārvaldībā savās valstīs), Kurzemes plānošanas reģiona, Ventas reģionālā parka, Liepājas Reģionālās vides pārvaldes, Šauļu Reģionālā vides aizsardzības departamenta, Kuldīgas un Saldus pašvaldībām, kā arī Skodas rajona pašvaldības. Kopumā tika organizētas četras darba grupas sanāksmes, no kurām divas bija paplašinātas darba grupas sanāksmes atsevišķi Lietuvā un Latvijā, kas tika veltītas plašākas auditorijas iesaistīšanai abās valstīs – tajās papildus tika aicināti piedalīties pārstāvji no pašvaldībām, reģionālajām valsts vides institūcijām un sabiedriskajām organizācijām. Sanāksmju diskusiju laikā radušās idejas ir iekļautas plāna rekomendāciju daļā. Ventas upju baseina pārrobežu apsaimniekošanas plāns ir publicēts Ventas reģionālā parka un Kurzemes plānošanas reģiona interneta mājas lapās. Bez tam Kurzemes plānošanas reģions sagatavoja preses relīzes par projektu, kas tika izplatītas gan Latvijā, gan Lietuvā.

Plāna **rekomendāciju daļa** sniedz ieteikumus Lietuvas un Latvijas tālākajai sadarbībai upju baseinu pārvaldības jomā vispār un konkrēti Ventas UBA. Šīs rekomendācijas aptver plašas jomas, sākot ar sadarbības formālo organizāciju un sakārtošanu atbildīgo ministriju līmenī, regulāru informācijas apmaiņu un sabiedrības iesaistīšanu. Ir izdarīts secinājums, ka iniciatoriem vispārīgās sadarbības organizēšanā Ventas UBA jābūt reģionālajām institūcijām, bet šo uzdevumu var deleģēt arī trešajām pusēm. Savukārt, pierobežas pašvaldībām jāsadarbojas lokālo jautājumu risināšanā. Īpaši ieteikumi ir doti ūdens ekoloģiskās tipoloģijas un kvalitātes klasifikācijas sistēmas saskaņošanai kopējos Ventas UBA ūdensobjektos. To var veikt, vienkāršojot esošo ūdens ekoloģisko tipoloģiju.

ŪSD prasa novērtējuma sistēmā ieviest visus bioloģiskās kvalitātes elementus, kas ir uzskaitīti direktīvā. Mazajām valstīm, kādas ir arī Latvija un Lietuva, ir problemātiski nodrošināt visus nepieciešamos ekspertus specifiskajiem bioloģiskajiem elementiem. Tāpēc ekspertu apmaiņa ir piedāvāta kā svarīga sadarbības komponente nākotnē. Attiecībā uz ūdens kvalitātes novērtēšanas metodēm ir ierosināta lokālās Latvijas – Lietuvas interkalibrācijas organizēšana. Latvijas upju kvalitātes novērtēšanai pēc makrozoobentosa būtu jāizmēģina Dānijas upju faunas indekss, kas ir ieviests Lietuvā, jo šī metode ir sekmīgi interkalibrēta ES līmenī.

Santrauka

Vandens ūkio tvarkybos pagrindiniu uždaviniu yra vandens hidrologinio ar apyvartos ciklo valdymas tokiu būdu, kad suderintų ir užtikrintų visų vartotojų poreikių patenkinimą. Europos Sąjungos (ES) reikalavimus bei valdymo struktūrą vandens ūkio tvarkybos srityje nustato Europos Parlamento ir Tarybos **Direktyva 2000/60/EK,** remiantis kuria formuojama Bendrijos veiksmų sistema vandens resursų politikos srityje (Vandens struktūrinė direktyva arba VSD). VSD taikomas novatoriškas požiūris grindžiamas keliais pagrindiniais aspektais:

• upių nuotekų baseinai ir jų natūralūs vienetai, kuriuose būtina taikyti vandens valdymą palyginti su ankstesne praktika, kai ši sritis buvo apribota nacionalinėmis, politinėmis ar administracinėmis ribomis;

• VSD apima tiek paviršinius vidinius ir požeminius vandenius, tiek jūrų pakrančių ir kituos vandenius (vandenys saldžiuose vandeniuose bei jūrų vandenų sujungimo zonoje);

• paviršinių vandenų kokybės nustatymas grindžiamas jų ekologine kokybe, vertinama pagal biologinės kokybės elementus – vandenyje gyvenančių organizmų grupes;

• nuotekų baseinų zonų gyventojus ir tikslines grupes – įvairius vandens naudotojus ir vartotojus - reikia įtraukti į vandens ūkio tvarkybos procesą.

VSD numato, jog iki 2015 m. visiems paviršiniams vandens objektams turi būti užtikrinta bent "gera’’ ekologinė kokybė, bet požeminiams vandens objektams - "gera’’ kokybinė ir kiekybinė būklė. Upių nuotekų baseino tvarkybos planai ir priemonių programos yra pagrindinis įrankis šiems tikslams pasiekti.

Tiek Latvijoje, tiek Lietuvoje yra nustatyti 4 upių baseinų rajonai (UBR). **3** iš jų yra bendrieji abiejoms šalims (įskaitant ir Ventos UBR).

Šio Ventos upės baseino pasienio zonos tvarkybos plano paruošimas yra pirmasis bandymas sukurti bendrąjį Latvijos-Lietuvos Ventos UBR valdymo plano projektą, kuris tam tikroms institucijoms tarnautų, kaip ‘’eskizas’’ tarptautiniam Ventos UBR valdymo planui parengti ateityje, nes dėl šių planų paruošimo sekančiu planavimo periodu (2015-2021 m.) susitarė abi šalysm ir jo reikalingumą numato taip pat ir VSD.

Ventos upės baseino pasienio zonos tvarkybos planas paruoštas projekto "Pasienio bendradarbiavimas tvarkant Ventos upės baseino gamtines vertybes (Live Venta)" rėmuose (projekto identifikacinis numeris LLIII-164). Projektą koordinuoja Kuržemės planavimo regionas (Latvijoje) ir Ventos regioninis parkas (Lietuvoje), projektas finansuojamas Europos regioninės plėtros fondo lėšomis bei panaudojant abiejų valstybių biudžeto lėšas.

Rengiant šio Ventos upės baseino pasienio zonos tvarkybos planą buvo panaudota informacija iš 2010 metais patvirtintų nacionalinių tvarkybos planų bei aktuali informaciją apie pagrindinius šio plano įgyvendinimo aspektus. Jis susideda iš trijų pagrindinių dalių: **Situacijos analizė, Visuomenės įsitraukimas ir Rekomendacijos.**

Situacijos analizė dalyje pateiktas bendras Ventos UBA apibūdinimas bei įvairių lygių institucijų aprašymas, kurios neša atsakomybę ir dalyvauja upės baseino tvarkybos procese. Be to, įvertinama, kad iki šiol abi šalys įdiegė pagrindinius VSD reikalavimus.

Latvijos ir Lietuvos planų bendrasis bruožas yra tai, kad abiejose šalyse Ventos UBR buvo nustatytas didelis vidinių paviršinių vandens objektų skaičius (Latvijoje

91, o Lietuvoje **124**, nors tik 1/3 nuo Ventos UBR yra Lietuvos teritorijoje). Abi šalys naudoja skirtingą prieigą prie ekologinės paviršinių vandenų tipologijos, taip pat skiriasi ir vandens klasifikavimo kokybės kriterijai. Tas pats pasakytina ir apie vandens kokybės stebėjimo organizavimą Latvijoje ir Lietuvoje. Lietuvoje minėta stebėjimo programa yra geriau sukurta, ir į ją yra įtraukti šiek tiek daugiau cheminių ir biologinių kokybės rodiklių, nei Latvijoje. Tačiau reikėtų pažymėti, kad pastaraisiais metais abiejosešalyse dėl finansinių priežasčių žymiai sumažėjo tokios stebėsenos apimtis, tokiu būdu užkertant kelią vandens kokybės įvertinimo aktualizavimui. Pagal **vandens kokybės vertinimą**, taikomą nacionaliniuose upių baseinų tvarkybos planuose, **49%** Lietuvos ir **33%** Latvijos upių vandens objektų Ventos UBR neatitinka bent ‘’gerą’’ kokybės būklę. Kalbant apie ežerus, Lietuvoje tokių vandens objektų yra **50%**, bet Latvijoje - ~ **57%**. Požeminių vandenų kokybinė ir kiekybinė būklė vertinama kaip gera ištisame Ventos UBR.

Po vandens kokybės vertinimo vyksta **apkrovų įvertinimas**, nustatantis baseine esančio vandens kokybę. Pagrindinės apkrovos, sukeliančios paviršinio vandens kokybės problemas, yra susijusios su tiek ‘’fiksuotos'', tiek pasklidosios (difuzinės) taršos šaltiniais. Kadangi abiejose šalyse yra taikomos skirtingos prieigos prie pasklidosios taršos prognozių, dabartiniu metu neįmanoma gauti tikslių duomenų. Tačiau, apytikslis įvertinimas rodo, kad pasklidosi tarša turi didesnį poveikį ypač atsižvelgiant į azoto junginius (pasklidosios taršos dalis bendroje apkrovoje atskirose teritorijose pasiekia daugiau nei **90%**). Pasklidosios taršos šaltiniai randami tiek žemės ūkyje, tiek miškininkystėje, tiek miestų teritorijose. Fiksuota apkrova laikoma esminga atskirose upių baseinų vietose ir jos mažinimo problema sprendžiama jau dabartiniu metu įgyvendinant numatytas pagrindines ir papildomas priemones. Be to reikšmingas poveikis skiriamas ir hidromorfologinėms apkrovoms – upių ištiesinimui, reguliavimui, mažosioms hidroelektrinėms (HES) abiejose šalyse bei uostams kai kuriuose Latvijos vandens objektuose. Priešingai, vandens ėmimas iš baseino (ypač kalbant apie požeminių vandenų gavyba) nesukelia problemų, nes naudojama tik apie **25%** nuo visų požeminio vandens resursų Ventos UBR.

Suplanuotų ir įgyvendintų **priemonių analizė** rodo, kad didelis projektų dalis įgyvendinama siekiant pagerinti vandens infrastruktūrą Miestų nutekamųjų vandenų valymo direktyvos ir Geriamojo vandens direktyvos reikalavimų ribose. Be to, numatyta grandinė taip vadinamų papildomų priemonių, skirtų pastatyti ar rekonstruoti nutekamųjų vandenų valymo įrenginius (NVĮ) gyvenamosiose vietose, kuriose gyventojų skaičius yra mažesnis kaip 2000. Be to, yra įdiegtos, pradėtos arba suplanuotos užterštų teritorijų sanavimo ir rekultivavimo priemonės. Kalbant apie pasklidosios taršos prevencijos priemones, Lietuvoje jos yra susijusios su konkrečiomis priemonėmis, kurių įdiegimas numatytas teritorijose, pasižyminčiose savo jautrumu nitratų užteršimui. Visa Lietuvos teritorija identifikuojama kaip toki jautri zona. Savo ruožtu, Latvijoje tik maža dalis Ventos UBR buvo identifikuota kaip nitratams jautri teritorija. Be to, reikėtų skatinti savanoriškų priemonių programą, pavyzdžiui, "geros žemės ūkio praktikos’’ įgyvendinimą, buferinių zonų palaikymą palei vandens objektus bei "geros kirtimo praktikos" įdiegimą miškininkystėje vandens objektuose, kurių nėra nitratams jautrioje teritorijoje, bet kuriose pasklidosios taršos apkrova žymiai įtakoja paviršinių ir negilių požeminių vandenų kokybę. Abiejose šalyse būtinos taip pat ir informavimo bei švietimo priemonės, skirtos tiek plačiajai visuomenei, tiek konkrečioms tikslinėms grupėms, pavyzdžiui, ūkininkams.

Panašiai kaip pasklidosios taršos priemonių atžvilgiu, hidromorfologinių aplinkybių pagerinimui skirtos priemonės numatytos nacionaliniuose tvarkybos planuose, tačiau tik nedidelė jų dalis jau įgyvendinta arba bent pradėta (pavyzdžiui, makrofitų pašalinimas iš kai kurių upių ir ežerų, upių nepertraukimo atkūrimas ir mažųjų HES poveikio mažinimas). Vis tiek į darbotvarkę dar yra įtraukta nacionalinių gairių paruošimas ištiesintų upių renaturalizavimui.

Projekto ypatingas dėmesys yra skiriamas pasienio upių vandens objektams, kurių Lietuvoje yra 10, bet Latvijoje - 7. Pagal nacionalinių upių baseinų tvarkybos planų rėmuose atliktą įvertinimą, pasienio vandens objektų kokybė Lietuvoje yra šiek tiek geresnė negu Latvijoje. Tai galima paaiškinti tiek bendrosios, galbūt, pasklidosios taršos apkrova iš Lietuvos (Lietuvos Ventos UBR teritorijoje yra santykinai daugiau žemės ūkio žemių), tiek skirtingais vertinimo metodais ir principais bei stebėsenos atlikimo skirtumais. Nepaisant to, pasklidosios taršos apkrovos mažinimui skirtos prioritetinės priemonės turi būti taikomos ne tik jų pačių ribojamų zonų atžvilgiu, bet ir visai baseinų daliai Lietuvoje.

Ryšium su visuomenės informavimu ir įsitraukimu buvo sukurta speciali darbo grupė, susidedanti iš abiejų šalių Aplinkos ministerijų, Lietuvos Aplinkosaugos agentūros ir Latvijos aplinkos, geologijos ir meteorologijos centro (abi institūcijos yra kompetentingos įstaigos, užsiimančios upių baseinų tvarkybos klausimais šiose šalyse), Kuržemės planavimo regiono, Ventos regioninio parko, Liepajos Regioninės aplinkos valdybos, Šiaulių regioninio aplinkos apsaugos departamento, Kuldigos ir Saldaus savivaldybių bei Skuodos rajono savivaldybių atstovų. Apskritai buvo organizuotas keturi darbo grupių susitikimai, iš kurių du išplėstiniai darbo grupių susitikimai atskirai Lietuvoje ir Latvijioje, ir jie buvo skirti platesnės auditorijos įtraukimui abiejose šalyse – dalyvauti buvo papildomai pakviesti atstovai iš savivaldybių, regioninių valstybės aplinkos institūcijų ir visuomeninių organizacijų. Susitikimų diskusijų metu atsiradusios idėjos buvo įtrauktos į plano rekomendacijų dalį. Ventos upės baseino pasienio tvarkybos planas buvo paskelbtas Ventos regioninio parko ir Kuržemės planavimo regiono interneto svetainėse. Be to, Kuržemės planavimo regionas parengė tiek Latvijoje, tiek Lietuvoje išplatintą pranešimą spaudai apie projektą.

Plano **rekomendacijų dalyje** yra pateiktos rekomendacijos Lietuvos ir Latvijos tolesniam bendradarbiavimui upių baseinų tvarkybos srityje apskritai bei Ventos UBR konkrečiai patobulinti. Šios rekomendacijos apima platesnes sritis, pradedant nuo bendradarbiavimo formalaus organizavimo ir sutvarkymo atsakingų ministerijų lygyje, reguliarų informacijos apsikeitimą ir visuomenės dalyvavimą. Darytina išvada, kad organizuodami bendrąjį bendradarbiavimą Ventos UBR, iniciatoriai turi užtikrinti tam tikrų regioninių institucijų veikimą, tačiau šias užduotis galima deleguoti ir trečiosioms šalims. Savo ruožtu, pasienio valdžios institucijos turi bendradarbiauti siekdamos spręsti vietinės reikšmės klausimus. Konkrečios rekomendacijos suteikiamos vandens ekologinės tipologijos ir kokybės klasifikacijos sistemos suderinimui bendruosiuose Ventos UBR vandens objektuose. Tai gali padaryti, supaprastinant esančią vandens ekologinę tipologiją.

VSD reikalauja įvesti į vertinimo sistemą visus Direktyvoje išvardytus biologinės kokybės elementus. Mažosiose šalyse, kurioms prikiriama Latvija ir Lietuva, sunku užtikrinti visus reikalingus ekspertus konkretiems biologiniams elementams. Todėl, apsikeitimas ekspertais siūlomas kaip svarbus bendradarbiavimo komponentas ateityje. Ryšium su vandens kokybės vertinimo metodais buvo pradėtas vietinio Latvijos – Lietuvos interkalibravimo organizavimas. Latvijos upių kokybės vertinimui pagal makrozoobentosą reikėtų pabandyti Lietuvoje įvestą Danijos upių faunos indeksą, nes šis metodas buvo sėkmingai interkalibruotas ES lygyje.

Abbreviations used

AWB	Artificial water body
ASPT	Average Score per Taxon
BOD_5	Biological oxygen demand during 5 days
BOD_7	Biological oxygen demand during 7 days
BS	Baltic System
COD	Chemical oxygen demand
CIS	Common Implementation Strategy
CB	Consultative Board
DRBMP	Danube River Basin Management Plan
DSFI	Danish Stream Fauna Index
EU	European Union
EC	European Commission
ERDF	European Regional Development Fund
EQR	Ecological quality ratio
GIS	Geographical information systems
GWB	Groundwater body
HPP	Hydropower plant
HMWB	Heavily modified water body
ICPDR	International Convention on Protection of Danube River
ICPR	International Commission for the Protection of the Rhine
ICPE	International Commission for the Protection of the Elbe
IWRM	Integrated water resources management
LEGMC	Latvian Environmental, Geology and

	Meteorology Centre
LFI	Lithuanian Fish Index
LSU	Livestock units
LMCM	Latvian Macroinvertebrate Common Metrix
MEPRD	Ministry of Environmental Protection and Regional Development
NGO	Non-governmental organization
NO_3-N	Nitrate nitrogen
NO_2-N	Nitrite nitrogen
NH_4-N	Ammonium nitrogen
Ntot	Total nitrogen
O_2	Oxygen
PO_4-P	Phosphate phosphorous
Ptot	Total phosphorous
p.e.	Population equivalent
RBD	River basin district
RBMP	River basin management plan
RBMG	River Basin Management Group
RDEP	Regional Department of Environmental Protection
REB	Regional Environmental Board
SWOT	Strengths-Weaknesess-Opportunities-Threats
SPZ	Sanitary protection zone
TOC	Total organic carbon
UWTP	Urban wastewater treatment plants
WFD	Water Framework Directive
WB	Water body

WWTP	Wastewater treatment plant
WP	Work package

INTRODUCTION:

The EU Water Framework Directive and the modern paradigm of water resources management

Water is the key to life: a crucial resource for humanity and the rest of the living world. Everyone needs it – and not just for drinking. Our rivers, lakes, coastal and marine waters as well as our ground waters are valuable resources to protect. Society uses water to generate and sustain economic growth and prosperity, through activities such as farming, commercial fishing, energy production, manufacturing, transport and tourism. Water is important in deciding where we settle and how we use land. Water can also be a source of geo-political conflicts – in particular where water shortages occur. For our own well-being, not only clean drinking water but also clean water for hygiene and sanitation is crucial. Water is also used for recreational activities such as bathing, fishing or just for enjoying the beauty of coasts, rivers and lakes in nature. We expect clean rivers and coastal waters when we go on holiday, and we expect an unlimited supply on tap for showers and baths, washing machines and dishwashers. Water is at the core of natural ecosystems, and climate regulation. The hydrological cycle is the name for the continuous movement of water on, above and below the surface of the Earth, without beginning or end, changing through liquid, vapour and ice (Fig. 1).

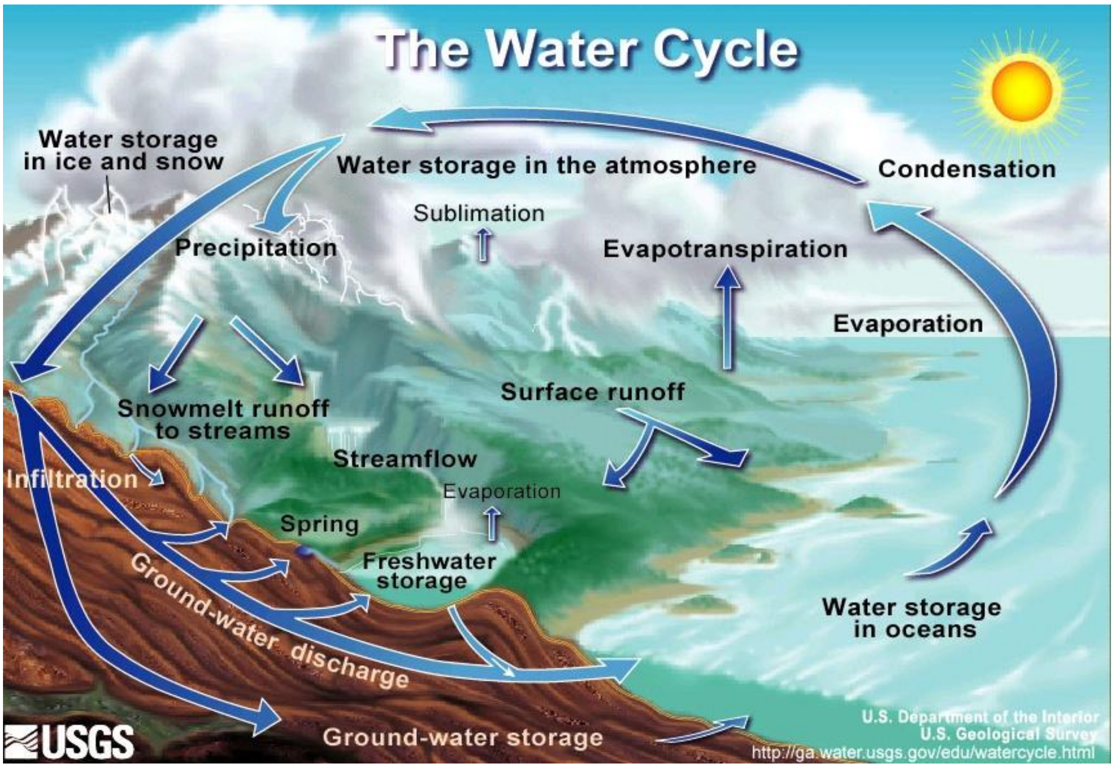

Figure1. Representation of water cycle (Source: US Geological Survey).

The prime task of the water management is to manage the hydrological cycle for the benefit of all users – to supply water in the quantities and quality required by domestic, industrial and agricultural users, to ensure the maintenance of quality of water resources for the future.

In 2000 the European Union (EU) adopted the **Directive 2000/60/EC** of the European Parliament and of the Council **establishing a framework for the Community action in the field of water policy** (Water Framework Directive – WFD). It is considered as a groundbreaking step in the water management establishing an innovative approach to water management and setting a legal obligation to protect and restore the quality of waters across Europe taking into account natural geographical and hydrological formations, namely, the river basins instead of national, political or administrative boundaries. Besides, it has laid down a concrete goal and timetable for action getting all EU waters at least into good condition by 2015. Furthermore, the accent is placed upon ecological quality of surface water including both inland (rivers, streams, lakes, water reservoirs, ponds) and sea coastal water as well as transitional water, such as estuaries that connect fresh water and saltwater.

Ecological quality of water combines three main descriptors or quality elements – biological quality as a key element as well as chemical quality and hydromorphological quality. Biological quality is referred to as the status of communities or ecosystems of water organisms living in the water mass, on the bottom of water objects or in shoreline.

Additionally, groundwater is considered as an inevitable element of the whole water system, too. Following, Water Framework Directive encompasses both surface water and groundwater. It shall be stressed that chemical quality and quantitative status with respect to groundwater is looked upon.

WFD is regarded as one of the most ambitious and comprehensive pieces of EU legislation ever. Summarizing, the main objectives or main pillars of the WFD are:

1. Coordinated action to achieve ‘good status’ for all EU waters, including surface and groundwater, by 2015.
2. Setting up a water-management system based on natural river basin districts, crossing regional and national boundaries.
3. Integrated water management, bringing different water management issues into one framework.
4. Active involvement of interested parties and consultation of the public[1].

The WFD shall to be implemented through a six-year recurring cycles, the first of which covers the period 2009-2015. After the WFD came into force, Member States had to define their river basin districts geographically, and identify the authorities responsible for water management (2003). The next task was to undertake a joint economic and environmental analysis of these areas’ characteristics (2004), and to identify water bodies at risk of not achieving the 2015 target. By 2006, countries had to launch water monitoring networks. Very important milestone concerning implementation of WFD was end of 2009 – the deadline for approval of the first river basin management plans (RBMPs). RBMP is the main tool for safeguarding and sustainable usage of all water resources as management of water resources is very complex process, which involves many different players, such as

[1] European Commission. Water is for life: How the Water Framework Directive helps safeguard Europe’s resources. Luxembourg: Publications Office of the European Union. 2010. 25 pp.

different administrative levels from state to local municipalities, different economic actors as well as the public. All types of potentially polluting and damaging activities as well as all uses of water shall be addressed in the RBMP.

There are about **110** river basin districts (RBD) accross the EU. RBD are larger management units embracing a number of single river basins. Both Latvia and Lithuania have **4** RBD in total, **3** of them are common RBD for both countries – Venta, Lielupe and Daugava. Besides, the Gauja RBD belongs to Latvia and Nemunas RBD – to Lithuania. Latvia approved its RBMPs in relation to all RBD by the Decree Nr.143 of the Minister for Environment of 6 May 2010. As regards Lithuania, the Nemunas RBMP was approved by Resolution Nr. 1098 of the Government of the Republic of Lithuania of 21 July 2010, but the Daugava, Venta and Lielupe RBMPs were endorsed by the Resolutions Nr. 1616, 1617 and 1618 of the Government of the Republic of Lithuania of 17 November 2010.

WFD envisages that for the international RBDs the common, cross border RBMPs shall be elaborated. The outcomes of the sub-project "Elaboration of the Venta river basin cross border management plan" being a part of the larger project "Cross border cooperation in management of Venta river basin area nature values (Live Venta)" supervised by Kurzeme Planning Region in Latvia and Venta Regional Park in Lithuania should serve as the draft for elaboration of such international cross-border management plan regarding Latvian – Lithuanian common Venta RBD.

The Venta river basin cross border management plan is prepared by the project expert group: **Normunds Kadiķis**, M.Sc. in environ. sc. (leader and expert of the project, general edition), **Sigita Šulca**, M.Sc. in environ. sc. (expert of the project) and **Anete Šturma**, M.Sc. in environ. sc. (GIS expert, maps` preparation).

The project expert group thanks **Audrius Šepikas** and **Martynas Pankauskas** from the Environmental Protection Agency of Lithuania and **Linda Fībiga** from the Latvian Environmental, Geology and Meteorology Centre for support provided during the project.

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ANALYSIS OF THE SITUATION

2. Characterization of Venta River Basin District

1.1. Physiographic characteristics and specially protected areas

1.1.1. General description

Venta River Basin District (Venta RBD) consists of *Venta*, *Bartuva* and *Šventoji* subbasins in Lithuania and of *Venta* as well as of *small rivers*` subbasins entering both the Baltic Sea and Gulf of Rīga including subbasins of *Bārta* and *Irbe* rivers in Latvia (Fig. 1.1.1). The total area of Venta RBD in Lithuanian part is **6277.3 km^2** (**9.6 %** of the total area of the country), but in Latvian part – **15625.24 km^2** (**24.2%** of the total territory).

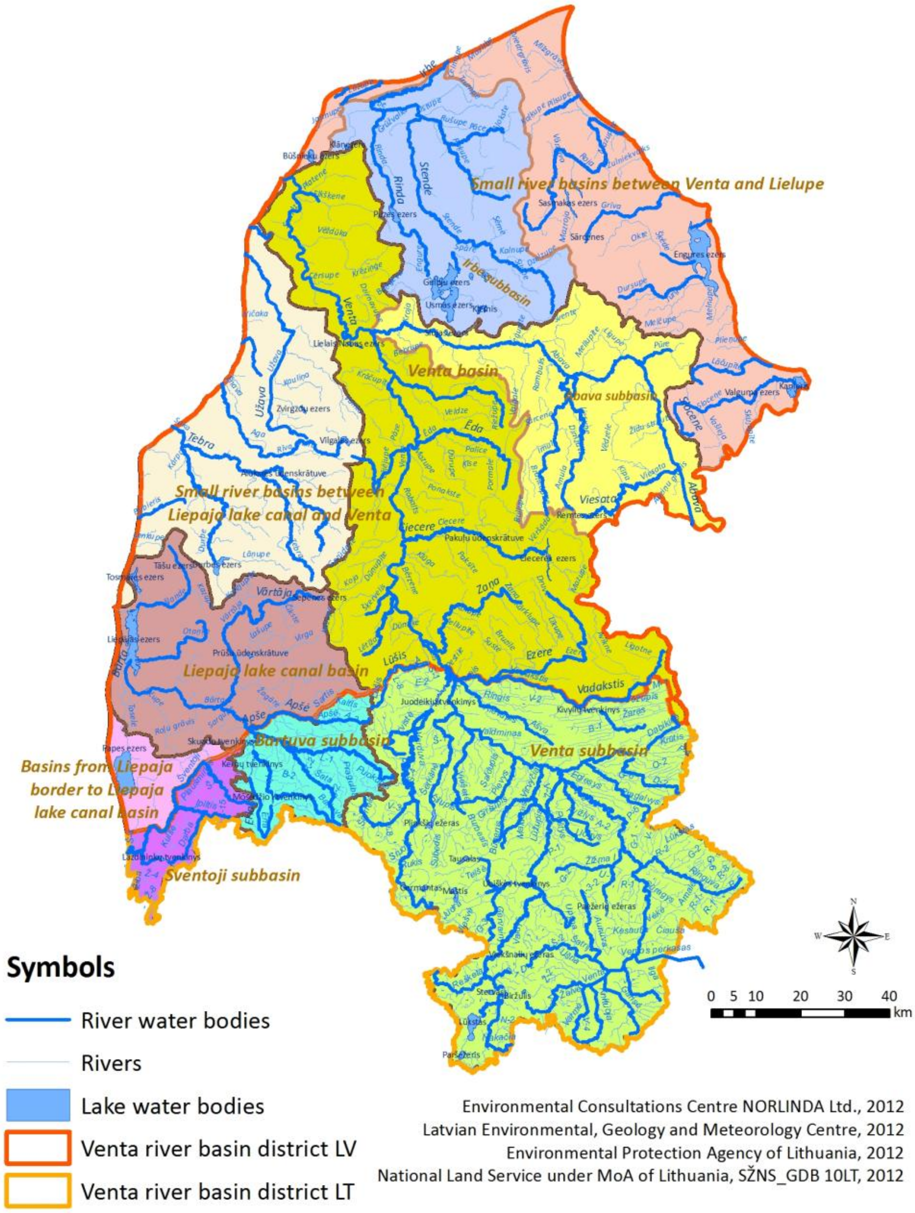

Figure 1.1.1. Subbasins of the Venta RBD.

The territories occupied by respective subbasins are characterized in the Table 1.1.1.

Table 1.1.1

Characterization of subbasins of Venta RBD

Country	Subbasin	Area, km^2
Lithuania	Venta	**5138.1**
	Bartuva	**749.2**
	Šventoji	**390**
Latvia	Venta	**6588.9**
	✓ Int.al. Abava	2042.5
	Small rivers of the Baltic Sea	**4528**
	✓ Int.al. Liepāja lake channel basin with Bārta	1761.7
	Small rivers of the Gulf of Rīga	**4514**
	✓ Int.al. Irbe	1940.2

Venta River - the main river of the RBD is situated in north-western part of Lithuania and western part of Latvia. The whole length of the river is from **318** to **346 km** according to different literature sources, within Latvia – **176 km**. The total area of the Venta basin is **11726.1 km^2**, within Latvia – **6588 km^2**. The mean slope of Venta River is **0.5** ‰ (0.5 m per 1000 m of river length). Venta River source is near Kuršėnai in the Lithuanian Šiauliai County and it flows into the Baltic Sea at Ventspils in Latvia. Venta River rises in Lake Medainis situated at the altitude of 180 m of the Baltic System (BS) in Žvirgždžiai village, Telšiai district.

Lakes cover less than **1 %** of the Venta RGD area, bogs, marshes and swamps- **1.8%**, artificial areas - **1.7 %,** agricultural lands - **45.9 %** but forests and semi natural areas – **49.2%** (Tab. 1.1.2). The Venta RBD is dominated by low-permeable soils; more than **50 %** of its surface is taken by wetlands. Conditions for regulating the natural runoff are better in uplands and at the foot thereof where gravely and sandy formations are much more common than in the lowland of the middle reaches of the Venta River.

Table 1.1.2

Land use division in the Venta RBD

Basin	**Artificial zones,** km^2	**Agricultural land,** km^2	**Forests and semi-natural areas,** km^2	**Wetlands,** km^2	**Water,** km^2
Venta (LT)	155.39	3277.21	1594.25	33.84	56.26
Šventoji	13.13	218.77	152.31	0	1.48
Bartuva	27.40	595.52	107.74	0.72	3.55

Small rivers of the Gulf of Rīga incl. Irbe	62.09	1612.97	4424.51	200.38	153.14

Table 1.1.2 (continued)

Basin	Artificial zones, km^2	Agricultural land, km^2	Forests and semi-natural areas, km^2	Wetlands, km^2	Water, km^2
Venta (LV)	4.18	1010.38	1004.34	16.87	6.72
Small rivers of the Baltic Sea incl. Bārta	61.68	2121.02	2197.26	90.42	56.77
Total	**323.87**	**8835.87**	**9480.41**	**342.23**	**277.92**
	19260.93				

Lake Medainis and a stretch of the upper Venta are part of the hydrographical reserve of the Venta sources. The upper reaches of the Venta and its left tributaries drain the north-eastern slopes of the Samogitian Upland (*Žemaičių aukštuma*) so the bed slopes of these stretches are rather high going up to 0.1 ‰ in some places. Further, the river arrives at the lowland of the middle reaches of the Venta with lower bed slopes and flow rate and enters Latvia at the mouth of the Varduva River. From its springhead, the Venta River flows from **142** to **170 km** (again, according to different data sources) to the Lithuanian-Latvian border, the average bed slope of the river within Lithuanian part is **0.085 ‰**.

The total annual water runoff of Venta River is approximately **3 km³**. The average annual runoff rate in the Venta River Basin varies between **5.21** and **12.3 l/s/km²**. The most aqueous rivers are those draining the slopes of the uplands and the least aqueous ones are the rivers that flow over the plains of the basin. In the territory of Latvia Venta River stretches across Kurzeme – through the Kursa Lowland (Pieventa plain) between the uplands of Eastern Kursa (*Austrumkursa)* and Western Kursa (*Rietumkursa)* (Bandava hilly, Embūte hilly, Saldus hilly, Kurmāle hilly, Vārme sloping, Pieventa plain, Vadakste plain) and the Coastal Lowland (Ugāle plain, Ventava plain). Largest part of the basin of Venta River`s right tributary - Abava River occupies the northern part of Eastern Kursa upland (Vārme sloping, northern part of Saldus hilly and Spārnene rippling flat) as well as eastern part of Northern Kursa upland - Vanema hilly. Watershed between two mentioned uplands composes Abava River Valley. At the west, Venta River basin stretches in Kursa lowland - northern part of Pieventa plain, including Abava River and Lake Usma. Physiographic map with hydrological network of the Venta RBD is shown in the Figure 1.1.2.

The average density of river network in the Venta RBD is **380 m/km**. There are **3** rivers longer than **100 km** and **1** lake - Usmas Lake larger than **10 km^2**. The Venta River has many tributaries but only one of them, the Abava River, exceeds 100 km in length. The tributary Virvyčia with 99.7 km is just a bit from 100 km mark. Another tributary Varduva is 90.3 km long and flows into Venta at the Lithuanian–

Latvian border. Summary of main tributaries of Venta, Bartuva and Šventoji Rivers in Lithuania is given in the Table 1.1.3. In its turn, main tributaries of Venta River in Latvia are listed in the Table 1.1.4.

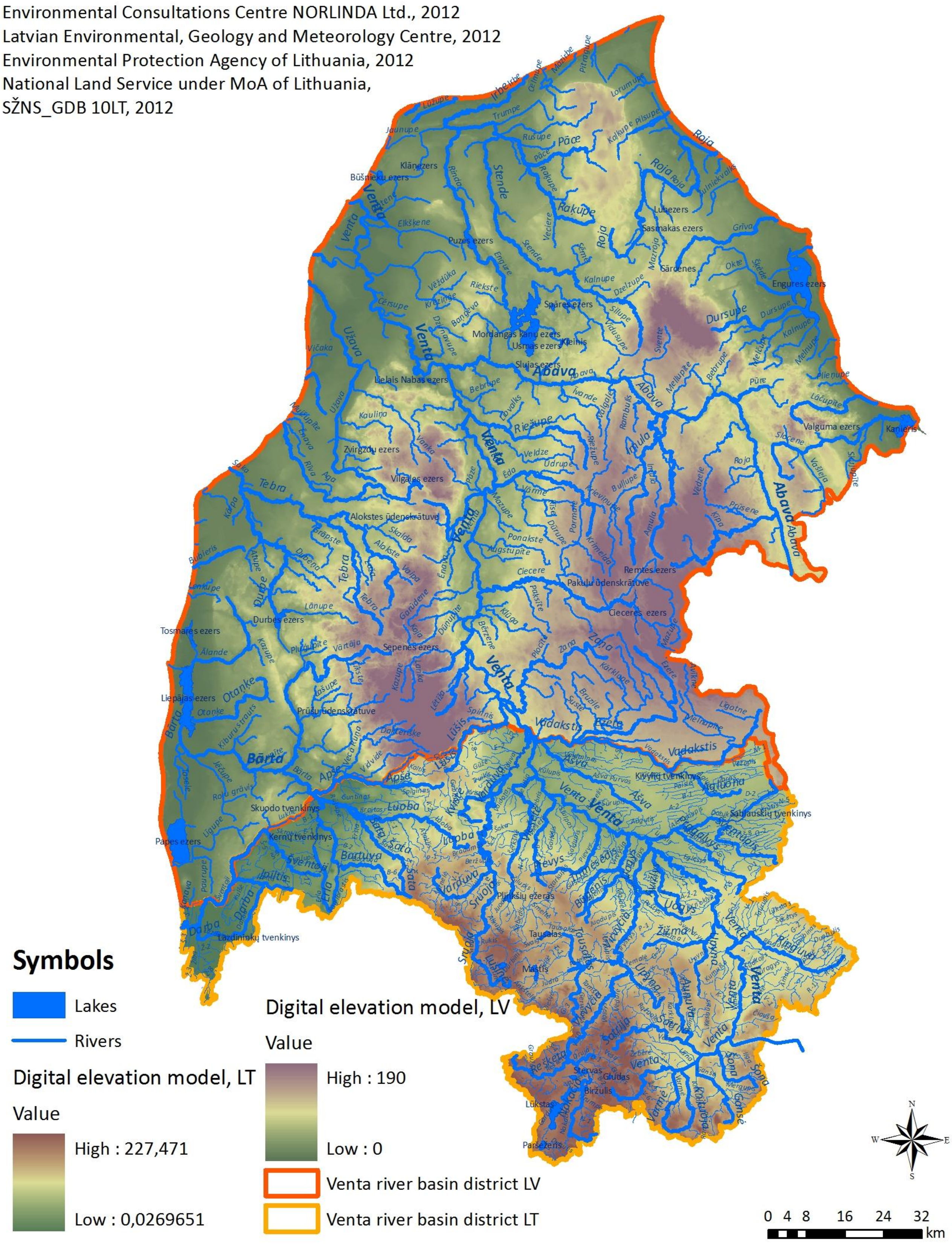

Figure 1.1.2. Physiographic characterization and hydrological network of the Venta RBD.

Table 1.1.3

Main tributaries of the Venta, Bartuva and Šventoji Rivers in Lithuania

River	Bank of inflow	**Length,** km		**Catchment size,** km^2	
		Total	**In Lithuania**	**Total**	**In Lithuania**
Venta River					
Varmé	R	17.0	17.0	81.2	81.2
Knituoja	R	16.8	16.8	61.1	61.1
Gansé	R	19.3	19.3	116.2	116.2
Aunuva	L	25.5	25.5	186.0	186.0
Šona	R	16.5	16.5	68.1	68.1
Ringuva	R	33.6	33.6	322.2	322.2
Žižma	L	20.6	20.6	166.1	166.1
Avižlys	L	20.1	20.1	78.3	78.3
Uogys	L	27.6	27.6	68.2	68.2
Dabikine	R	37.2	34.2	387.6	374.2
Virvyté	L	99.7	99.7	1134.2	1134.2
Pievys	L	26.9	26.9	69.0	69.0
Viešeté	L	23.6	23.6	92.2	92.2
Šerkšné	L	38.1	38.1	285.2	285.2
Vadakstis	R	82.2	7.8	1239.6	467.6
Varduva	L	90.3	90.3	586.7	586.7
Lūšis	L	31.5	6.4	113.6	60.6
Bartuva River					
Eiškūnas	L	16.5	16.5	36.9	36.9
Erla	L	27.6	27.6	111.4	111.4
Luoba	R	52.2	52.2	353.9	353.9
Apšé	R	40.3	16.3	357.1	122.4
Šventoji River					
Įpiltis	L	16.2	16.2	42.8	42.8
Kulšé	L	18.2	18.2	43.5	43.5
Darba	L	26.2	26.2	118.7	118.7

R – right bank; L – left bank

The total length of the **Bartuva River** (Bārta in Latvia) is **101.3 km** with the catchment size of **2020 km^2**. A section of **55.3 km** of the Bartuva River flows in Lithuania; the catchment size of the river in Lithuania totals to **749.2 km^2**. The total length of the **Šventoji River** (Sventāja in Latvia) is **68.4 km**, of which **31.8 km** (48.5–16.7 km from the mouth) coincide with the Lithuanian-Latvian border. The total area of the Šventoji River catchment is **471.9 km²**, of which **390 km²** are situated in Lithuania and the remaining part – in Latvia.

Hydrological regime is characterized by high spring floods, autumn and winter rainfall floods and a summer drought. Water feeding consists of snow melt

(**55%**), ground water (< **10 %**) and rainfall (**35 %**). In lower part of the river basin mean annual water runoff is about 280 mm, in upper part 240-260 mm on the right bank and 280-300 mm on the left bank of Venta River.

Table 1.1.4

Main tributaries of the Venta River in Latvia

Name	**Length,** km	**Catchment,** km^2	**Bank of inflow**	**Country**
Virvīča	99.7		L	Lithuania/Latvia
Šerkšne	38.1		L	Lithuania/Latvia
Varduva	90.3		L	Lithuania/Latvia
Losis	31.5	183/58.7*	L	Lithuania/Latvia
Lētīža	32		L	Latvia
Šķērvelis	34	104.1	L	Latvia
Koja	25		L	Latvia
Garūdene	15		L	Latvia
Ēnava	19		L	Latvia
Lējējupe	19		L	Latvia
Padure	19		L	Latvia
Naba	7		L	Latvia
Vadakste	82.2	1250/775*	R	Lithuania/Latvia
Zaņa	53	256.9	R	Latvia
Bērzene	12		R	Latvia
Sumata	11		R	Latvia
Klūga	17		R	Latvia
Ciecere	51	542.6	R	Latvia
Ponakste	27		R	Latvia
Mazupe	14		R	Latvia
Ēda	38		R	Latvia
Riežupe	42	259.7	R	Latvia
Rudupe	18		R	Latvia
Abava	129	2042	R	Latvia
Dzirnavupe	18		R	Latvia
Vēždūka (Varžupe)	33		R	Latvia
Kamārce	22		R	Latvia
Packule	10		R	Latvia
Standze	9		R	Latvia
Vecventa	8		R	Latvia

*Total/in Latvia
R – right bank; L – left bank

Climate of Venta RBD is highly influenced by the Polar Maritime air masses of the North Atlantic origin. Air temperature in summer is lower, but during winters - higher than in eastern areas of both countries. Monthly average air temperature in the basin`s downstream area is -2.7 °C (Feb.) and 16.7 °C (Jul.) but in the upstream area – 4.3 °C (Feb.) and 16.6 °C (Jul.). In particular, differences are observed in the winter thaw periods as well as during transition periods - spring and autumn. Uplands of Venta RBD (Western Kursa, Eastern Kursa, Northen Kursa and Samogitian) are directed against the west winds, which bring high humidity. Air masses over highlands are "forced" up causing the water vapour condensation and enhanced precipitation (more than 700 mm per year). The maximum precipitation falls in August (more than 80 mm), the minimum - in February (~ 30 mm). Snow cover duration in the basin is 65-75 days. Ice cover on the lower part of the catchment area is usually formed in the beginning of January, and in ~30 % of the observation period rivers don't freeze.

Along the Venta River a lot of famous geological heritage objects are located; some of them are included into the most representative geological sites of Northern Europe.

Geological structure of Venta RBD is shaped of two main parts - crystalline bedrock and the sedimentary cover dominated by Devonian age sedimentary rocks - dolomite, limestone, sandstone, clay and gypsum. In Latvia a big number of geological monuments are located in the Venta River valley and nearby. They belong to different geological periods and formations: Upper Devonian, Lower Carboniferous, Jurassic, and Quaternary. Venta River in Lithuania lies on the pre Devonian age rocks - Carbon, Permian, Triassic and Jurassic sediments. Quartz clay, fluvio-glacial and Aeolian sand deposits as well as the marina and fluvio-glacial sand and gravel deposits are located in Venta RBD. Besides, there are a limestone and quartz sand deposits, too. A number of valuable features of present landscapes are situated in the basin such as ravines, boulders, waterfalls, caves and springs.

As regards the **soils** in Venta RBD, they are mainly characterized by soils on sandy bedrock, the area in the southern part – by soils on clay, sandy loam and sandy clay bedrock, as well. In the northern part of Venta RBD podzolic and peaty podzolic soils are typical, but in the middle part of the basin - sod podzolic soil and pseudo-gley soils as well as eroded podzolic soils at terrains and turf gley peaty soils in mires and low lying areas are occurring. At the coastal parts of Venta RBD in uplands a typical podzol on sandy bedrock is formed, but at the terrain depressions - peaty podzolic gley soils on the sand bedrock and sod gley soils are encountered.

1.1.2. Protected areas

All waters should be protected, but some of them require a particular attention according to WFD in order to ensure protection against adverse effects and to guarantee the sustainable exploitation of water resources for all human needs as well as to maintain suitable living conditions for rare and endangered species and habitats depending on water. Therefore, so-called protected areas should be specially marked in the river basin management plans. Information on protected areas of Latvian part of Venta RBD including related legislation and main aspects of developed conservation plans with respect to protected natural areas is compiled in the special Register of Protected Areas available at internet site http://www.meteo.lv/public/30328.html.

A. Sanitary protection zones of well fields

On 1 April 2010 there were **170** well fields located in the Lithuanian part of Venta RBD and registered in the Register of the Earth Entrails of the State Geological Survey of Lithuania (Fig. 1.1.3). The coloured dots in the map correspond to water aquifers in different geological structures. The largest ones are well fields located in towns of Telšiai, Mažeikiai, Kuršėnai, Skuodas and Naujoji Akmenė.

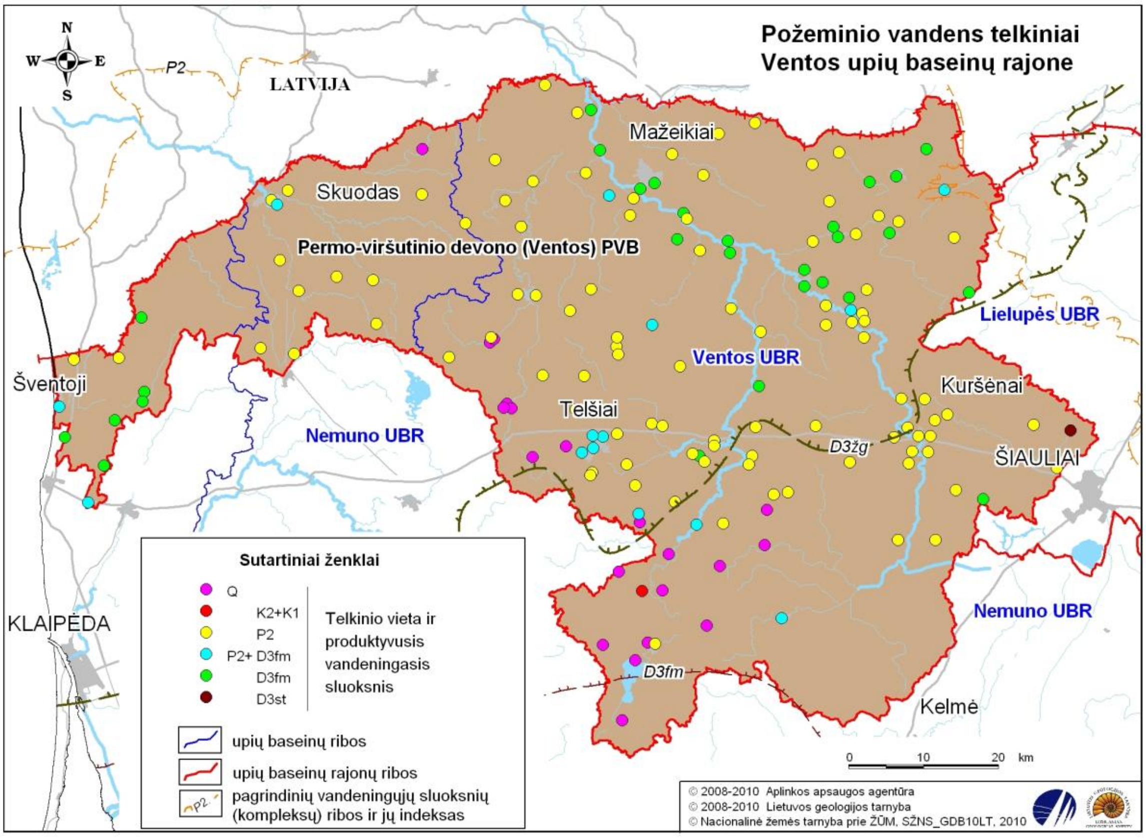

Figure 1.1.3. Drinking water well fields in the Venta RBD of Lithuania.

Pursuant to the *Procedure for the Approval of Explored Solid Minerals* approved by Order No. 1-146 of the Director of the Lithuanian State Geological Survey under the Ministry of Environment of 14 July 2010, exploitable resources of groundwater must be assessed and approved for all operating and newly designed public water supplies. Mineral water well fields are covered by the same procedure. In addition, all well fields 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 respecting the provisions of the Lithuanian hygiene norms. After the approval of a special plan for the SPZ of a well field, the special land use conditions are entered into force. According to the Law of the Republic of Lithuania on Land, restrictions on economic activities within the SPZ are ensured.

During the period 2003-2009 the total number of SPZ of well fields in relation to public water supply reached 89. SPZ for well fields abstracting more than 100 m^3 per day on average have been defined and established pursuant to the provisions of the Lithuanian Hygiene Norm HN 44:2006. In their turn, for well fields abstracting less than 100 m^3 per day on average pollution restriction belts have been established within 50 m from the well pursuant to same Hygiene Norm.

Similarly to Lithuania, *Latvian Law on Protection zones* states that all well fields must have the established protection zones (severe regime, bacteriological and chemical protection zones) 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. There are **629** drinking water well fields in the Latvian part of Venta RBD (Fig. 1.1.4). Boreholes, wells or springs which are used by individual water users (physical persons) have no mandatory obligations for special protection zones but wastewater infiltration and water pollution shall be prevented.

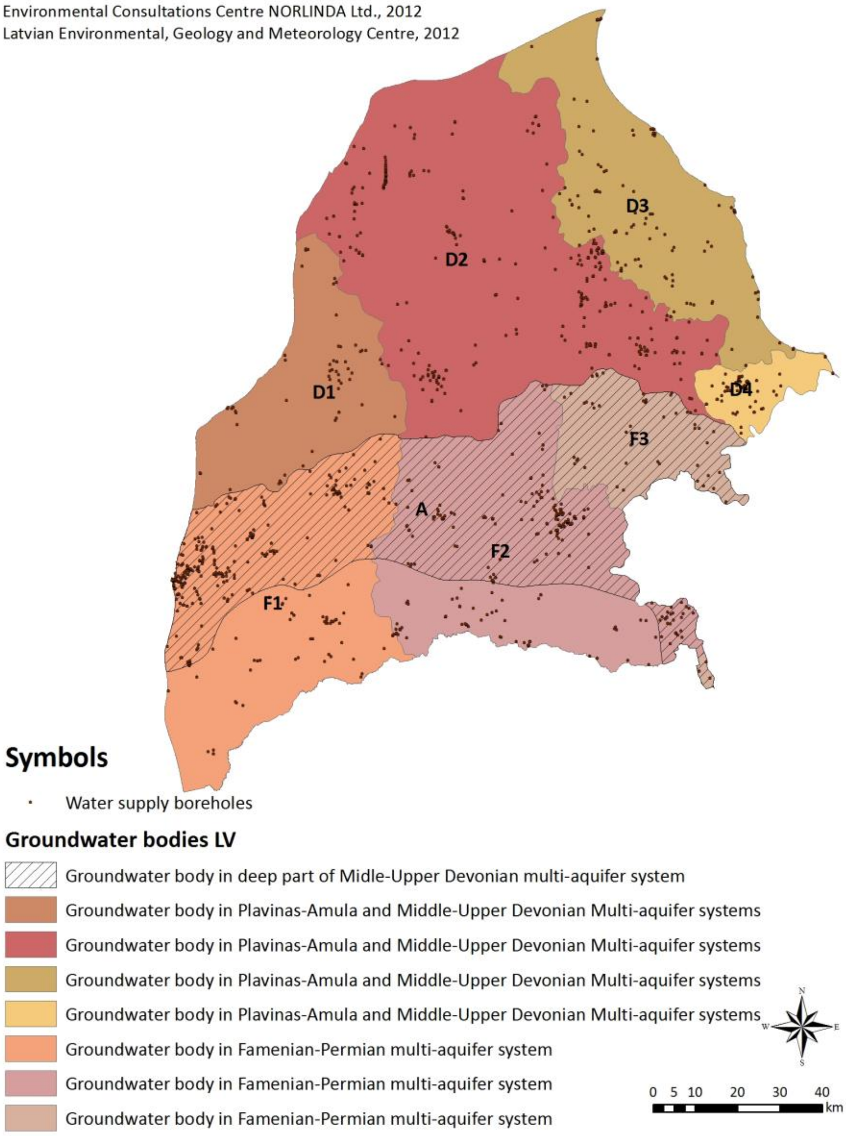

Figure 1.1.4. Drinking water well fields in the Venta RBD of Latvia.

B. Priority fish waters

In Latvia according to the *Regulations of the Cabinet of Ministers Nr. 118 on quality of surface water and groundwater* priority fish waters are freshwater water objects that need water protection or water quality improvement measures in order to ensure good living conditions for fish populations. Priority fish waters are divided into:

- Salmonid waters which support or can provide good conditions for salmon (Salmo salar), sea trout and brook trout (Salmo trutta), grayling (Thymallus thymallus) as well as for whitefish (Coregonus) existence;

- Cyprinid waters which support or can provide good conditions for the carp family (Cyprinidae) as well as for existence of pike (Esox lucius), perch (Perca fluviatilis) and eel (Anguilla anguilla).

As priority fish waters in Latvian part of Venta RBD **38** rivers (or their stretches) and **7** lakes have been identified forming **28** Salmonid waters and **19** Cyprinid waters (in some minor cases these stretches can be of both types) (Fig. 1.1.5). In the Lithuanian part Venta River and Šventoji River are identified as Salmonid waters. In their turn, Bartuva River, Virvyčia River and Lūkstas Lake are designated as Cyprinid waters.

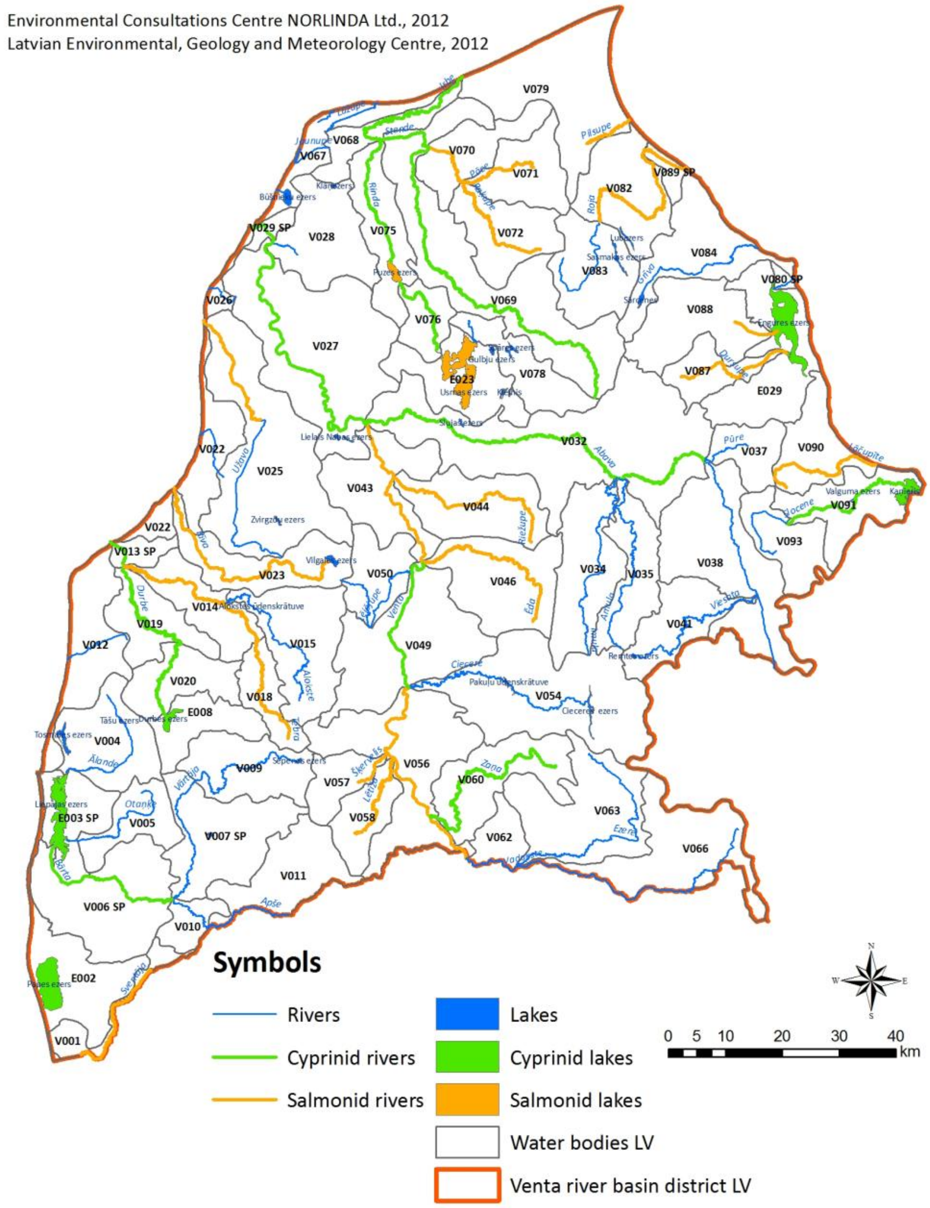

Figure 1.1.5. Priority fish waters in the Venta RBD of Latvia.

C. Bathing places

There are 6 lakes and ponds larger than 0.5 km^2 in the Lithuanian part of Venta RBD. Most of them are used for fishing and/or bathing. Totally, according to data of 2011, there are **11** bathing waters (sites) officially designated pursuant to *Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC* (Bathing Waters Directive): Lake Germantas in Telšiai district, Lake Lukstas in Varniai (Telšiai district) Lake Paršežerisin in Laukuva (Šilalė district), Lake Plinkšių ežeras in Seda (Mažeikiai distr.), Pragalvys River in Akmenė district, Sablauskių pond (Dabikinė area, Akmenė district), Skuodo pond in Skuodas, Venta River in Akmenė, Venta River in Mažeikiai, Lake Saukenas in Saukenas and Uzvencio River in Uzvencio.

As regards Latvia, according to *Regulations of the Cabinet of Ministers Nr. 38 on establishment and maintenance of bathing sites* (2012) there are **17** bathing sites within the Venta RBD – **12** places in the coastal part of Baltic Sea and the Gulf of Riga (beaches in Liepāja (2), Ventspils (2), Abragciems, Klapkalnciems, Ķesterciems, Ragaciems, Mērsrags, Upesgrīva, Kolka and Roja) as well as **5** places in inland waters – pond Beberliņi, lakes Būšnieku, Saldus and Ciecere, and bathing site of Venta River named "Mārtiņsala" in town Kuldīga.

All bathing sites in the common Venta RBD are displayed in the Figure 1.1.6.

D. Vulnerable areas

Latvian part of Venta River basin includes **3** river water bodies which are part of the territories defined as nitrate vulnerable areas according to *Regulations of the Cabinet of Ministers Nr. 33 on protection of water and soil from pollution of nitrates caused by agriculture* (2011). These water bodies include *Vadakste* (V066), *Abava* (V038) and *Ezere* (V063). Additionally, all Latvian part of Venta RBD is recognized as a particularly sensitive area subject to increased requirements for urban waste water treatment plants according to *Regulations of the Cabinet of Ministers Nr. 34 on emission of polluting substances into the water*.

As regards Lithuania, all territory of the country is defined as nitrate vulnerable area and particularly sensitive area subject to increased requirements for urban wastewater treatment.

E. Nature protection areas

Venta RBD has **111** specially protected natural areas (**37** in Lithuania and **74** in Latvia) that have been created to preserve the species or habitats demanding the protection of existing water status, its maintenance or improvement as an essential provision for survival of these species and habitats (Fig. 1.1.7). Nature protection areas have various management forms - Strict Nature Reserves, Natural reserves, National Parks, Regional Parks, Biosphere reserves, etc.

Particularly nature protected areas lying within the whole Venta RBD take up **~2324 km^2** or approximately **11 %** of the Venta RBD. In Lithuania the area covered by protected natural territories occupies about **13.5 %** of the total area of the Lithuanian part of the basin **(~881 km^2).** In Lithuania the Venta RBD contains relatively less amount of reserves and biosphere polygons. The percentage of State parks corresponds to the national average but the area of strict reserves (mainly because of Kamanos strict nature reserve) is more than twice larger than the national average. In its turn, in the Latvian part approximately **9 %** of the Venta RBD is occupied by protected natural territories **(~1443 km^2)**. This more or less corresponds to the national average.

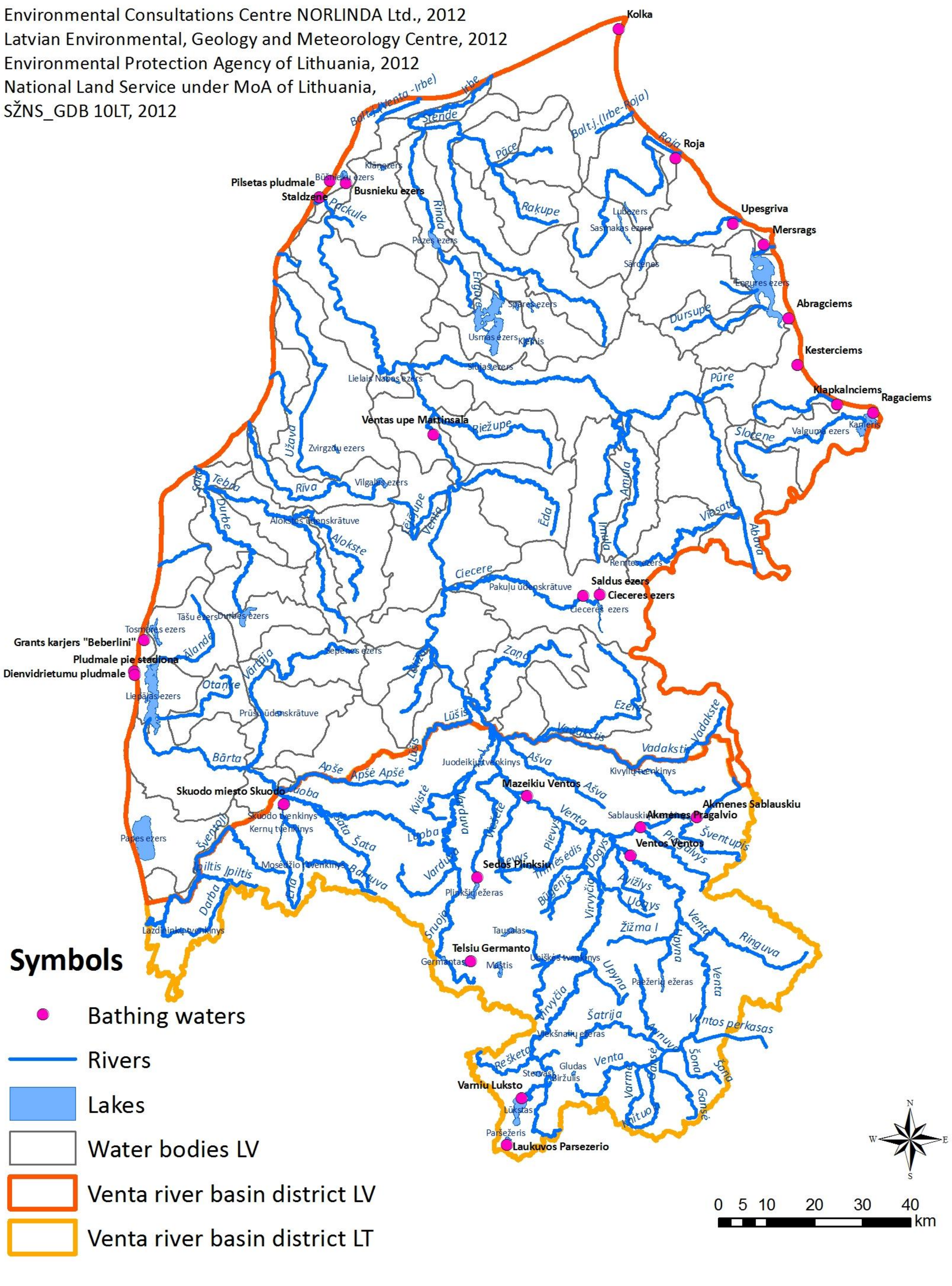

Figure 1.1.6. Bathing sites in the Venta RBD.

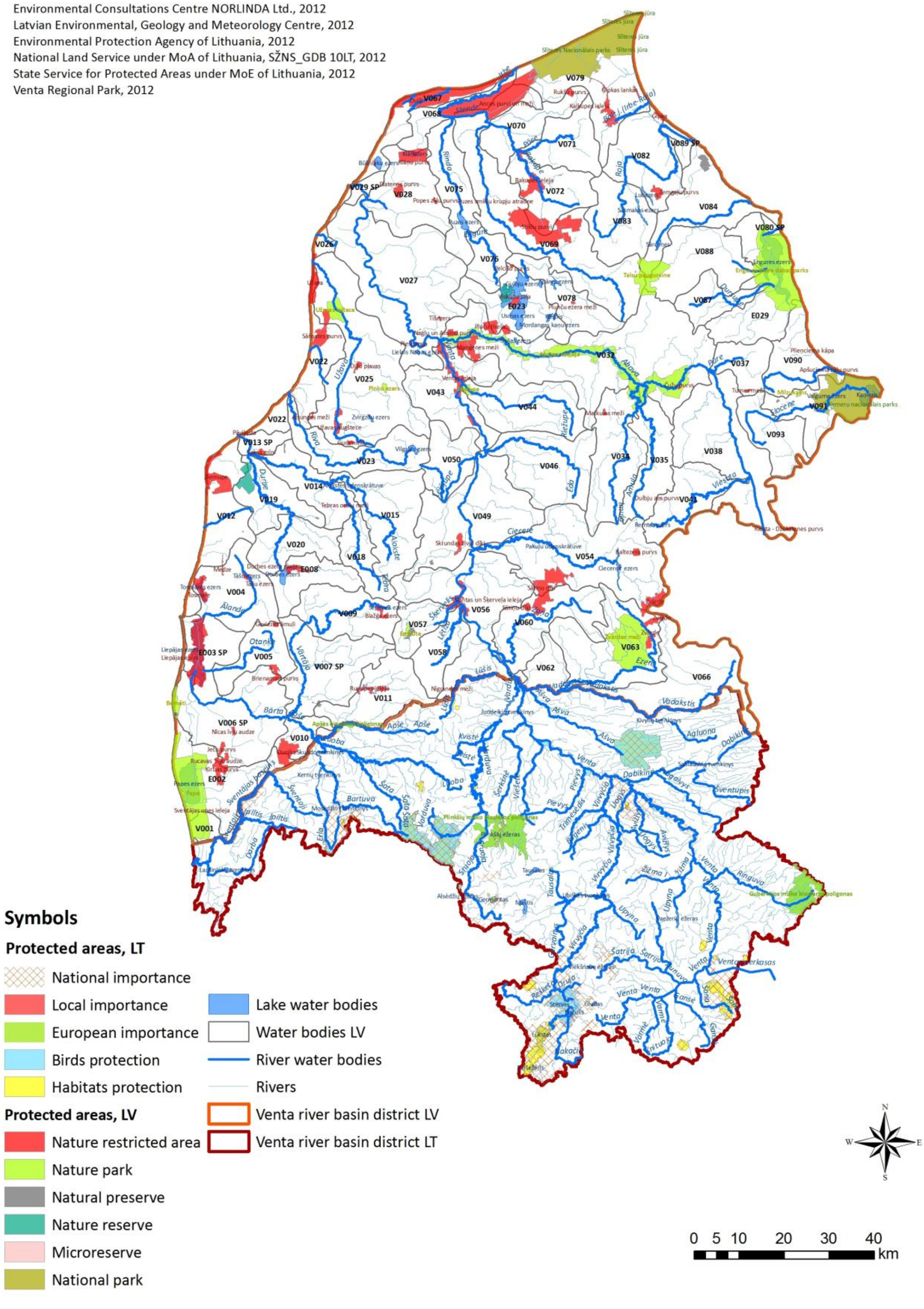

Figure 1.1.7. Specially protected natural areas in the Venta RBD.

Note: LT "European importance" protected areas with exception to birds` and habitats` protected areas

1.2. Administrative characteristics

With the area of **6277** km^2 the Venta RBD constitutes **9.6 %** of the total area of the Lithuania and is the third largest river basin district in the country. The following municipalities and proportions of their territories are located in the Venta RBD: **99 %** of Mažeikiai district, **98 %** of Akmenė district, **90 %** of Telšiai district, **49 %** of Šiauliai district and **35 %** of Kelmė district. Besides, a minor part of some other municipalities is situated in the Venta RBD.

The largest area of the Venta River basin is occupied by Telšiai district and Mažeikiai district (**25.3 %** and **23.5 %**, respectively). The Šventoji River basin encompasses **50 %** of Palanga town municipality as well as **22.8 %** of Kretinga district municipality and **13.7 %** of Skuodas district municipality. The Kretinga district municipality constitutes almost **58 %** of the total area of the Šventoji basin. In its turn, the largest share of Bartuva Basin is taken by Skuodas district – **76 %** of the Skuodas district municipality is situated in this basin (Fig. 1.2.1).

The largest towns situated in the Venta RBD of Lithuania are Mažeikiai (~**40800** inhabitants), Telšiai (~**30200** inhabitants), Skuodas (~**7400** inhabitants) and Akmené (~**2800** inhabitants) (Fig. 1.2.1).

Latvian part of Venta RBD consists of **24** territories or regions ("novadi" in Latvian) and the largest towns are Liepāja (~**81900** inhabitants), Ventspils (~**41900** inhabitants), Tukums (~**19700** inhabitants), Kuldīga **(~13000** inhabitants), Saldus (~**12700** inhabitants) and Talsi (~**11000** inhabitants) 20 administrative territories are fully situated within the Venta RBD (Fig. 1.2.1). With regard to areas occupied by the territories located in the Venta RBD the largest ones are Ventspils, Talsi and Saldus territory.

1.3. Socio-economic characteristics

1.3.1. Population

More than **550 thousands** of inhabitants of both countries are living in the common Venta RBD. In Lithuanian part of Venta RBD most of the population (**188 thousands**) are living in the Venta River basin (**6.5 %** of the state population). The density of the population varies from **37** inhabitants per km^2 in the Venta River basin to **29** inhabitants per km^2 in the Šventoji River basin and **28** inhabitants per km^2 in Bartuva River basin.

In relation to Latvia, about **16 %** of the total state population are living in the Venta RBD. The settlement pattern within the area is very uneven. **61 %** of the total population in the Venta RBD are living in urban areas but in rural areas - around **39 %** of population. The average population density in Latvian part is relatively low - about **23** people per one km^2 (Fig. 1.3.1).

Figure 1.2.1. Administrative division of the Venta RBD.

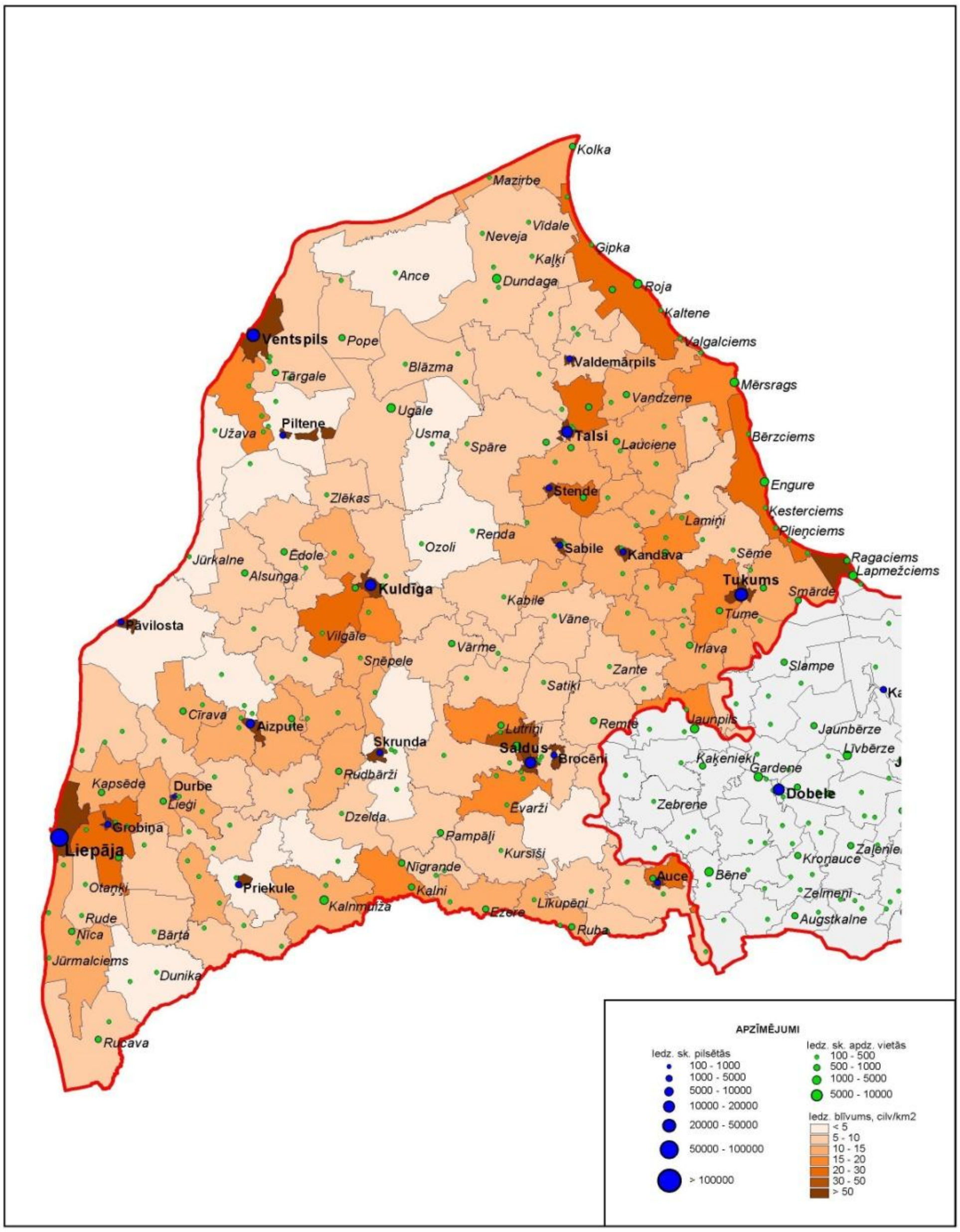

Figure 1.3.1. The settlement pattern and population density of the Venta RBD within Latvia.

1.3.2. Gross domestic product and sectorial value added

According to Venta RBD management plan, the RBD area provides a relatively small contribution to the Latvian gross domestic production (GDP) - about **12 %**. However, this situation is caused by the fact that City of Riga covers one third of Latvian population and produces around 57 % of national GDP. After the production of GDP per capita two towns - Ventspils and Liepāja must be mentioned while the figures for the rest of the area in relation to GDP per capita are lower.

Most important is service sector (trade, transport and communications) which is characteristic of the whole Latvia. Besides, processing industry is important, too.

In Latvian part of Venta RBD are located **2** large (Ventspils and Liepāja) and **4** small (Mērsrags, Roja, Engure, Pāvilosta) ports. Ventspils Free Port is largest

Latvian cargo turnover port mainly handling oil and its derivatives, potassium salt, liquid chemical products, metals, wood and other goods. Besides, some years ago Ventspils port was served by a regular ferry lines: Ventspils - Nynäshamn (Sweden), Ventspils - Travemünde (Germany) and Lübeck (Germany) - Ventspils – St.Petersburg (Russia).

Liepājas Free Port is smallest of the Latvian large cargo turnover ports. Of all through the Port of Liepāja handled cargo types around of **48 %** consists of general cargo - mainly timber, ferrous metals and roro type container load, **37 %** - bulk cargo, mainly cereals and grain products, wood chips and peat, and **15 %** - liquid bulk cargo of which about **65 %** comprises oil.

Main activities of small ports are sea freight transport in the Baltic (Mērsrags), base for fishing outside the scope (Roja, Engure and Pāvilosta) and yacht tourism (Roja, Engure and Pāvilosta). Besides, through small ports logs, chips, lumber and turf are exported.

The greatest added value of the Latvian part of Venta RBD is provided by the service sector (**68 %**). The basic service sectors are transport and communications, trade, public administration and business. Significant contribution to the added value in the area of Venta RBD is also provided by the manufacturing industry – **18 %**. In their turn, agriculture and fishing, mining and energy provides about **10 %** of the total added value of the RBD in question.

1.3.3. Employment and wages

The average monthly disposable income per household member in the Lithuanian part of Venta River basin in 2008 was the lowest in the RBD and totalled to **LTL 874** (~250 EUR), meanwhile in the Šventoji and Bartuva basins it was **LTL 942** (~265 EUR). The national average income per household member in 2008 was **LTL 987** (~280 EUR).

Registered unemployed population in the Venta RBD of Lithuania in 2008 accounted for **17.5 %** of the total working-age population within RBD; the corresponding national figure was **13.9 %**.

The level of economic activity of Latvian part of Venta RBD is similar to the whole country - around 63 %. The average unemployment rate in 2009 and 2010 was **11.8 %**[2]. This proportion is similar to the whole state, however, the territory is characterized by slightly lower income levels comparing to the national average value. Average monthly gross wage in the Venta RBD of Latvia in 2010 was **383 LVL** (~540 EUR). It could be mentioned that average salary in the private sector is a bit lower than in the public sector – **381 LVL**.

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2. Institutions

2.1. National and regional authorities involved in the basin management

Three institutional levels of environmental management, including water management also, can be distinguished in both countries – state, regional and local (municipal). The state level comprises the Parliament (*Saeima* in Latvia, *Seimas* in Lithuania), Government (*Cabinet of Ministers* both in Latvia and Lithuania) and ministries with subordinated institutions, including regional authorities. The Parliament is in charge of legislation with respect to approval of basic laws. The Government issues more specific regulations (on propositions of ministries) dedicated to implementation of laws. The ministry can provide its own regulations on specific issues under the scope of the certain ministry.

In Latvia the main institution in the field of environmental protection and water management is the Ministry of Environmental Protection and Regional Development (MEPRD), but in Lithuania – the Ministry of Environment.

In the Latvian Ministry of Environmental Protection and Regional development Department of Environmental Protection with its Water Resources Division is responsible for elaboration of regulations on water management. The Department is subordinated to State Secretary of the Ministry. The Investment Department, Projects` Supervision Department and Projects` Implementation Department which are subordinated to Deputy State Secretary are responsible for administration of investments in the water management sector (Fig. 2.1.1).

Structure of the Ministry of Environmental Protection and Regional Development

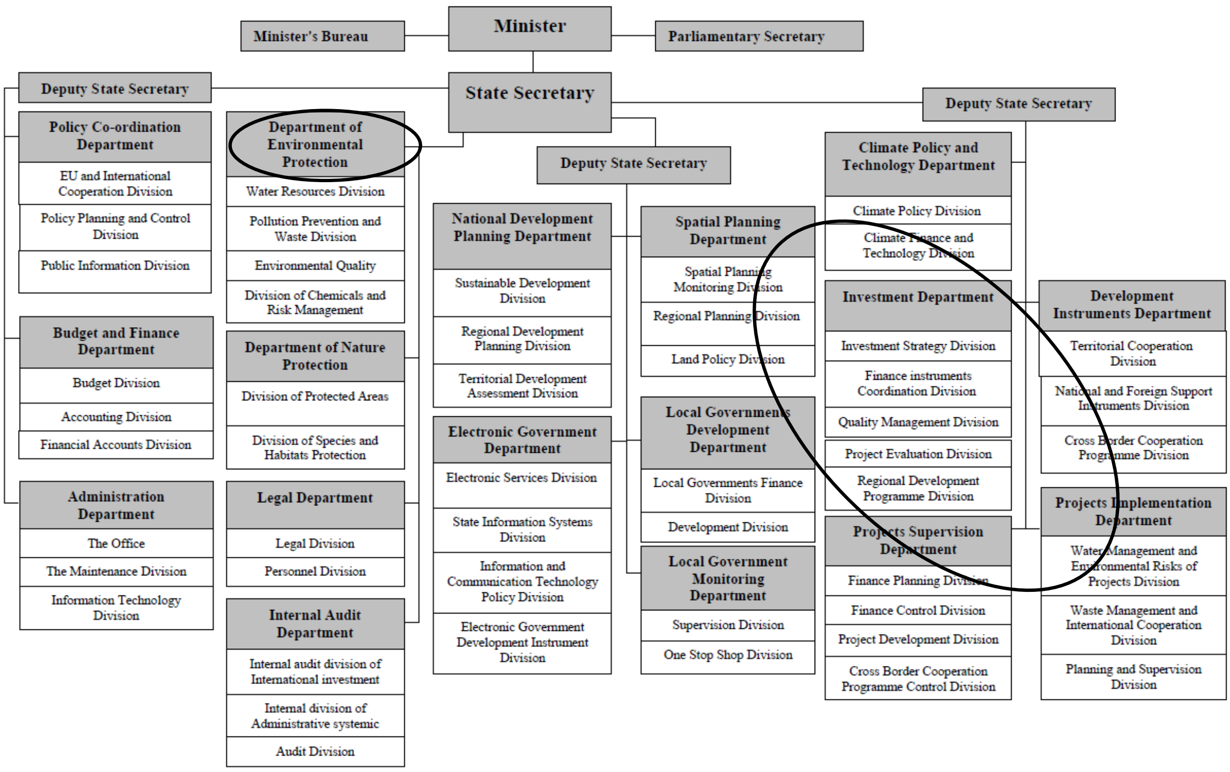

Figure 2.1.1. Structure of the Ministry of Environmental Protection and Regional Development of Latvia.

It shall be mentioned that the structural reorganization of the ministry was announced in the beginning of 2012 but still not carried out by the end of April, 2012.

Responsible institution for preparation of River Basin Management Plans and Programmes of Measures in Latvia is the State company with limited liability "Latvian Environment, Geology and Meteorology Centre" which is subordinated company of MEPRD. The Water Division of the Centre coordinated and lead elaboration of Latvian RBD management plans approved by the Order No 143 of the Minister of Environment on 6 June 2010.

In Lithuanian Ministry of Environment the responsible department for elaboration of regulations on water management is the Water Department which is subordinated to Deputy Minister. The same State Secretary supervises the European Union Support Administrative Department which is responsible for administration of investments as well as the Environmental Protection Agency which is responsible for preparation of River Basin Management Plans and Programmes of Measures (Fig. 2.1.2). Besides, the role of the Agency 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 and reporting to the European Commission (EC). Environmental Status Assessment Department of the Agency is directly involved in the performance of these tasks. River Basin Management Division under the department mentioned takes main responsibility for basin management issues.

In addition, the Lithuanian State 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.

It shall be mentioned that the same general tasks with respect to provision of environmental information, organization of exploration and maintenance of groundwater resources and entrails of the Earth, administration of state geological information, reporting to EC etc., are placed upon the Latvian Environment, Geology and Meteorology Centre by related contracts from the MEPRD.

Apart from the Ministries of Environment of both countries, several other ministries are involved in water management:

- The *Ministry of Health* in Lithuania with its subordinated institutions is responsible for the sanitary control and elaboration of standards for drinking water and for recreational water bodies (bathing water); the *Ministry of Health* in Latvia with its subordinated institutions is responsible for the sanitary control of drinking and bathing water, issuance of more relieved, so called special drinking water quality norms as well as for elaboration of standards for bathing water;
- The *Ministries of Agriculture* in both countries is not directly involved in water management but can have a very important impact on the quality of water by promoting environmentally friendly agricultural practices (A Code of Good Agricultural Practice is prepared in each country) and preventing pollution from diffuse sources; besides, the *Ministry of Agriculture* in Latvia is responsible for the elaboration of standards for drinking water;
- The *Ministries of Economy* in both countries is indirectly involved in water management by preparation of long-term and short-term state investment programmes on development of the infrastructure in water sector. The

ministries co-ordinate foreign technical aid and priorities, etc. Besides, the functions of state regulations on electricity production is carried out by the *Ministry of Economy* of Latvia;

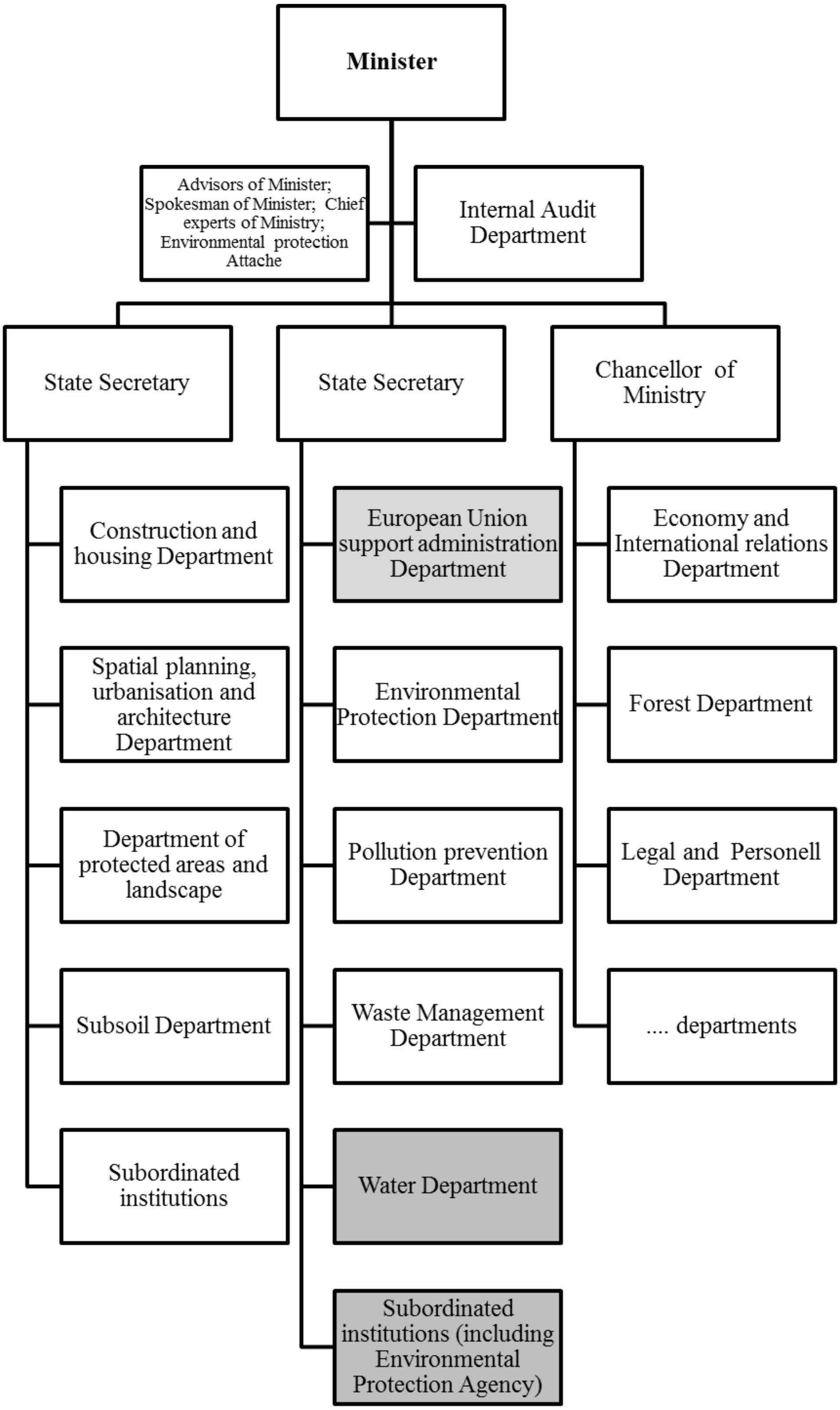

Figure 2.1.2. Structure of the Ministry of Environment of Lithuania.

- The *Ministry of Energy* in Lithuania is responsible for the elaboration of regulations on energy resources management (incl. electricity production and all renewable energy resources);
- The functions of state regulation of navigation are carried out by the *Ministry of Transport and Communications* in Lithuania and by the *Ministry of Transport* in Latvia.

In both countries the most important institutions in water management at the regional level are Regional Departments of Environmental Protection in Lithuania (RDEP) and Regional Environmental Boards in Latvia (REB), which organization is based on administrative borders covering only part of respective RBD. RDEP and REB are responsible for water abstraction and emission control, identification of water management problems at regional and local level, control of implementation of management plans within RBD.

RDEP are situated in Vilnius, Kaunas, Klaipeda, Siauliai, Panevezys, Alytus, Utena and Marijampole. In the Venta RBD there are two regional departments – in Siauliai and Klaipeda. As regards Latvia, the REBs are located in Rīga, Daugavpils, Liepāja, Jelgava, Madona, Rēzekne, Valmiera and Ventspils. Venta RBD is located mainly in the territories of Liepāja and Ventspils REBs as well as partly of Jelgava REB jurisdiction.

There are no special regional RBD authorities established with respect to implementation of related management plans but Latvian Planning Regions established according to the *Law on Regional Development* by the end of 2006 are indirectly involved in the implementation of these plans. Development Councils of Planning Regions are decision maker institutions consisting from representatives of all related municipalities. The territory of Venta RBD is under the auspices of Kurzeme Planning Region. As regards Lithuania, there is no such kind of regional authorities similar to Latvian Planning Regions.

RBD Coordination Boards/Comities have been established as an advisory mechanism for the involvement of all institutions and organizations concerned, from national to regional level, in preparation of River Basin Management Plans as well as for their implementation.

2.2. The role of municipalities in the basin management

Generally, the municipalities are responsible for water management at local level taking into account relevant laws and regulations and cooperating with related state regional authorities. Municipalities are owners of the water supply and sewerage systems and are responsible for supply of drinking water and treatment of sewage, which is usually carried out by municipality-owned public companies (Water Service Companies). The municipalities are setting their own prices for water services.

Even though water management issues are dealt with in smaller administrative units – within local municipalities, nevertheless, in order to achieve the quality 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 area of the common river basin. The coordinating role can be executed by the regional authorities like Planning Regions as it is the case in Latvia to some extent.

So, the role of municipalities could be more fundamental:

- To move towards water demand management policies;
- To give stakeholders the instruments to understand and forecast the consequences of political choices;
- To reduce the asymmetry of knowledge among the stakeholders and the policy makers, contributing to a democratic knowledge-based society;
- To improve the management of our natural water environment locally;
- To foster integrated policies taking in consideration not only the environment but also social aspects and economy;
- To reduce the vulnerability of social, economic structures and ecosystems caused by the impacts of climate change;
- To allow future generations to satisfy their needs.

In order to assure that municipalities can guarantee a homogeneous approach to water management from local to the whole basin level, effective and clear directives on objectives and targets are necessary to be provided by regional and state governmental institutions. Some possible mechanisms and good experience is demonstrated by Lithuania. In Lithuania the state RDEPs are subdivided into agencies (total number – 56) which have their offices in the municipalities and are responsible for environmental protection at the local level. **5** agencies from Siauliai Regional Department fall into the Venta RBD as well as **4** agencies from Klaipeda Regional Department are situated within the Venta RBD.

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3. Implementation of basic requirements of Water Framework Directive

3.1. National legislation

The basic framework for environmental protection in Latvia and Lithuania is formed by general laws on environmental protection which are pertinent for protection of water resources, too:

- In Latvia – Law on Environmental Protection (2006, last amended in 2010);
- In Lithuania - Law of the Republic of Lithuania on Environmental Protection (1992, last amended in 1996).

Besides, a number of more general legal acts on environmental monitoring being the main tool for obtaining of environmental information inevitably significant for environmental management including management of water resources have been adopted in both countries:

In Latvia -

- Regulations of the Cabinet of Ministers Nr. 158 on requirements for environmental monitoring and its performance, establishment of register of polluting substances and availability of information for the public (2009, last amended in 2010);
- Order Nr. 187 of the Cabinet of Ministers dated 11 March 2009 on the guidelines on the environmental monitoring program for 2009-2012;
- Order Nr. 121 of the Minister of Environment dated 19 April 2010 on the environmental monitoring program[3].

In Lithuania-

- Law of the Republic of Lithuania on Environmental Monitoring (1997);
- Resolution Nr. 130 of the Government of the Republic of Lithuania dated 7 February 2005 on the approval of State Environmental Monitoring Programme for 2005-2010;
- Resolution Nr. 315 of the Government of the Republic of Lithuania dated 2 March 2011 on the State Environmental Monitoring Programme for 2011-2017

[3] Environmental Monitoring Program for 2009-2014

Protection of water resources, of fresh and salt water ecosystems, as well as of drinking and bathing water is defined by EU environmental policy as one of the cornerstones of environmental protection in Europe. On 23 October 2000 the Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy or, in short, the EU Water Framework Directive (WFD) was adopted. However, a number of other water directives were developed more or less independently, WFD serves as the basis for management of water resources incorporating relevant aspects of other directives. The member states were obliged to transpose the WFD in the national legislation by the end of 2003 and, following, the respective legal acts serving as "umbrella" laws on water protection and management have been adopted:

- In Latvia – Law on Water Management (2002, last amended in 2011);
- In Lithuania - Law of the Republic of Lithuania on Water (1992, last amended in 2003).

The "umbrella" laws are supplemented by a number of regulations, resolutions and orders, dedicated to different issues in relation to water protection and management (Tab. 3.1.1). All legal acts with a minor exception are given based on the situation on 1 January 2012.

Table 3.1.1

Key national legislation of implementation of WFD and related water directives in Latvia and Lithuania

EU legislation	Key legislation of Latvia transposing the EU directive	Key legislation of Lithuania transposing the EU directive
Water Framework Directive (2000/60/EC)	Law on Water Management (2002, last amended in 2011)	Law of the Republic of Lithuania on Water (1992, last amended in 2003)
	Regulations of the Cabinet of Ministers Nr. 418 on the water bodies at risk (2011)	Underground Law of the Republic of Lithuania (2001)
	Regulations of the Cabinet of Ministers Nr. 646 on the management plans and action programs in relation to river basin districts (2009)	Resolution Nr. 198 of the Government of the Republic of Lithuania dated 23 February 2004 on the approval of the procedure for the provision of information about river basin districts to the society, water consumers and other interested parties
	Regulations of the Cabinet of Ministers Nr. 42 on determination of groundwater resources and quality criteria (2009, last amended in 2010)	Order Nr. 457 of the Minister of Environment dated 15 September 2003 on the approval of the procedure for the establishment of objectives of water protection
	Regulations of the Cabinet of	Order Nr. 471 of the Minister

	Ministers Nr. 406 on methodology of establishment	of Environment dated 25 September 2003 on the

Table 3.1.1 (continued)

EU legislation	Key legislation of Latvia transposing the EU directive	Key legislation of Lithuania transposing the EU directive
	of protection strips in relation to surface water bodies (2008, last amended in 2010)	formation of river basin districts and the appointment of the authority for the administration of these districts to achieve water protection objectives
	Regulations of the Cabinet of Ministers Nr. 858 on type characterization, classification, quality criteria and determination of anthropogenic pressures in relation to surface water bodies (2004, last amended in 2009)	Order Nr. 707 of the Minister of Environment dated 24 December 2003 on the attribution of groundwater bodies to river basin districts
	Regulations of the Cabinet of Ministers Nr. 92 on requirements for monitoring and elaboration of monitoring programs in relation to surface water, groundwater and protected areas (2004, last amended in 2010)	Order Nr. 719 of the Minister of Environment dated 24 December 2003 on the approval of methodological provisions for the assessment of groundwater bodies and attribution thereof to river basin districts
	Regulations of the Cabinet of Ministers Nr. 179 on description of boundaries in relation to river basin districts (2003, last amended in 2009)	Order Nr. 472 of the Minister of Environment dated 25 September 2003 on the approval of the procedure for the description of river basin districts, assessment of impact of human activities on the condition of water bodies, economic analysis of the use of water and compilation of data on river basin districts
	Regulations of the Cabinet of Ministers Nr. 118 on quality of surface water and groundwater (2002, last amended in 2009)	Order Nr. 591 of the Minister of Environment dated 25 November 2003 on the approval of the procedure for the development of the plan for the management of river basin districts and the action

		programme to achieve water protection objectives, and co-ordination thereof with foreign

Table 3.1.1 (continued)

EU legislation	Key legislation of Latvia transposing the EU directive	Key legislation of Lithuania transposing the EU directive
		states
	Regulations of the Cabinet of Ministers Nr. 34 on emission of polluting substances into the water (2002, last amended in 2010)	Order Nr. 329 of the Minister of Environment dated 30 June 2003 on the approval of the procedure for the compilation and classification of data on protected areas in river basin districts
	Regulations of the Cabinet of Ministers Nr. 736 on permission for usage of water resources (2003, last amended in 2009)	Order Nr. 726 of the Minister of Environment dated 31 December 2003 on the approval of general provisions for the monitoring of water bodies
	Regulations of the Cabinet of Ministers Nr. 1354 on initial assessment of flood risks, flood maps and management plan in relation to flood risks (2009)	Order Nr. 685 of the Minister of Environment dated 24 December 2003 on the approval of the procedure for the collection of information about water protection and management from public and municipal authorities and other public legal entities, and reporting to the Commission of the European Communities
	Order Nr. 830 of the Cabinet of Ministers dated 20 December 2007 on the national program in relation to assessment and management of flood risks for 2008-2015	Resolution Nr. 1076 of the Government of the Republic of Lithuania dated 26 August 2003 on the programme for the reduction of state water pollution caused by agricultural sources
	Order Nr. 232 of the Cabinet of Ministers dated 13 April 2004 on the action program in relation to pollution reduction and quality assurance of priority fish water and bathing water	Order Nr. 623 of the Minister of Environment dated 21 December 2001 on the approval of rules for the reduction of water pollution with priority hazardous substances

	Order Nr. 181 of the Cabinet of Ministers dated 31 March 2004 on the action program in relation to pollution reduction	Order Nr. D1-71 of the Minister of Environment dated13 February 2004 on the approval of the programme for

Table 3.1.1 (continued)

EU legislation	Key legislation of Latvia transposing the EU directive	Key legislation of Lithuania transposing the EU directive
	of surface water caused by domestic wastewater and dangerous substances	the reduction of water pollution with hazardous substances
		Order Nr. 643 of the Minister of Environment dated 21 December 2001 on the approval of recommendations for the development of programmes for the reduction of water pollution with hazardous substances
		Order Nr. 171 of the Minister of Environment dated 30 March 2001 on procedure of primary accounting and control of pollutants contained in discharged wastewater and exploitation of water resources
		Order Nr. D1-98 of the Minister of Environment dated 14 February 2007 on the amendment of the Order Nr. 540 of the Minister of Environment dated 7 November 2001 on the approval of rules for establishing protection zones and shore protection strips of surface waters
Urban Wastewater Treatment Directive (91/271/EEC)	Regulations of the Cabinet of Ministers Nr. 912 on water supply, wastewater collection and procedure of construction of treatment plants (2007, last amended in 2009)	Law of the Republic of Lithuania on Drinking Water Supply and Wastewater Management (2006)
		Order D1-515 of the Minister of Environment dated 8 October 2007 on the approval of regulation on wastewater management
		Order Nr. 171 of the Minister of Environment dated 30

		March 2001 on procedure of primary accounting and control of pollutants contained

Table 3.1.1 (continued)

EU legislation	Key legislation of Latvia transposing the EU directive	Key legislation of Lithuania transposing the EU directive
		in discharged wastewater and exploitation of water resources
Sewage Sludge Directive (86/278/EEC)	Regulations of the Cabinet of Ministers Nr. 362 on usage, monitoring and control of sewage sludge and it`s compost (2006)	Regulatory document LAND 20-2005 "Requirements for the use of sewage sludge for fertilization and recultivation" approved by the Order Nr. 349 of the Minister of Environment on 28 June 2001
Drinking Water Directive (98/83/EC)	Regulations of the Cabinet of Ministers Nr. 235 on obligatory requirements for safety and quality of drinking water, procedure of monitoring and control (2003, last amended in 2010)	Law of the Republic of Lithuania on Drinking Water Supply and Wastewater Management (2006)
		State Procedure for Drinking Water Control approved by the Order Nr. 643 of the Director of the State Food and Veterinary Service on 10 December 2002
		Lithuanian Hygiene Norm HN 24:2003 "Drinking water safety and quality requirements" approved by the Order Nr. V-455 of the Minister of Health on 23 July 2003
Groundwater Directive (2006/118/EC)	Regulations of the Cabinet of Ministers Nr. 42 on determination of groundwater resources and quality criteria (2009, last amended in 2010)	Underground Law of the Republic of Lithuania (2001)
	Regulations of the Cabinet of Ministers Nr. 92 on requirements for monitoring and elaboration of monitoring programs in relation to surface water, groundwater and protected areas (2004, last amended in 2010)	Order Nr. 472 of the Minister of Environment dated 21 September 2001 on the approval of rules for groundwater protection from pollution with hazardous substances

	Regulations of the Cabinet of Ministers Nr. 118 on quality of surface water and groundwater	Order Nr. 1-59 of the Director of the Lithuanian Geological Survey under the Ministry of

Table 3.1.1 (continued)

EU legislation	Key legislation of Latvia transposing the EU directive	Key legislation of Lithuania transposing the EU directive
	(2002, last amended in 2009)	Environment dated 24 October 2003 on the approval of the procedure for the monitoring of groundwater of economic operators
	Regulations of the Cabinet of Ministers Nr. 34 on emission of polluting substances into the water (2002, last amended in 2010)	
Bathing Water Directive (2006/7/EC)	Regulations of the Cabinet of Ministers Nr. 608 on bathing water monitoring, quality assurance and requirements for public information (2010, last amended in 2011)	Lithuanian Hygiene Norm HN 92:2007 "Beaches and Bathing Water Quality" approved by the Order Nr. V-1055 of the Minister of Health on 21 December 2007
	Regulations of the Cabinet of Ministers Nr. 38 on establishment and maintenance of bathing sites (2012)	Bathing Water Quality Monitoring Program for 2009-2011 approved by Resolution Nr. 668 of the Government of the Republic of Lithuania on 25 June 2009
Nitrates Directive (91/676/EEC)	Regulations of the Cabinet of Ministers Nr. 33 on protection of water and soil from pollution of nitrates caused by agriculture (2011)	Resolution Nr. 1076 of the Government of the Republic of Lithuania dated 26 August 2003 on the programme for the reduction of state water pollution caused by agricultural sources
	Order Nr. 163 of the Cabinet of Ministers dated 18 March 2004 on the action program in relation to especially vulnerable areas subject to elevated requirements for water and soil protection from pollution of nitrates caused by agriculture (amended by the Order Nr. 647 of the Cabinet of Ministers dated 17 October 2007)	Order Nr. 452/607 of the Minister of Agriculture and the Minister of Environment dated 19 December 2001 on the approval of provisions for the protection of water from pollution caused by nitrogen compounds from agricultural sources
		Order Nr. D1-367/3D-342 of the Minister of Environment and the Minister of Agriculture dated 14 July 2005

		on the approval of environmental provisions for manure management

Table 3.1.1 (continued)

EU legislation	Key legislation of Latvia transposing the EU directive	Key legislation of Lithuania transposing the EU directive
		Order Nr. 475/3D-397 of the Minister of Environment and the Minister of Agriculture dated 29 September 2003 on the approval of the procedure of conveying information about water pollution caused by agricultural sources to the European Commission
Marine Strategy Framework Directive (2008/56/EC)	Law on Protection and Management of Marine Environment (2010)	
	Regulations of the Cabinet of Ministers Nr. 1071 on requirements for assessment of state of marine environment, determination of good status of marine environment and elaboration of goals for marine environment (2010)	

Following the Part A of Annex VI of the WFD the basic measures outlined in other “non-water” directives must be included and implemented in the programs of measures according to WFD:

- The Habitats Directive (92/43/EEC);
- The Birds Directive (79/409/EEC);
- The Environmental Impact Assessment Directive (85/337/EEC);
- The Major Accidents (Seveso) Directive (96/82/EC);
- The Plant Protection Products Directive (91/414/EEC);
- The Integrated Pollution Prevention Control (IPPC) Directive (96/61/EC).

Related additional legislative instruments of Latvia and Lithuania for implementation of WFD and associated EU legal acts are displayed in the Table 3.1.2.

Table 3.1.2

Key national legislation of implementation of WFD in relation to additional legislative instruments in Latvia and Lithuania

EU legislation	Key legislation of Latvia transposing the EU directive	Key legislation of Lithuania transposing the EU directive
Habitats Directive (92/43/EEC)	Law on Protection of Species and Biotopes (2000, last amended in 2010)	Law of the Republic of Lithuania on Protected Areas (1993, last amended in 2001)
Birds Directive (79/409/EEC)	Law on Protection of Species and Biotopes (2000, last amended in 2010)	Law of the Republic of Lithuania on Protected Areas (1993, last amended in 2001)
Environmental Impact Assessment Directive (85/337/EEC)	Law on Environmental Impact Assessment (1998, last amended in 2010) .	Law of the Republic of Lithuania on the Environmental Impact Assessment of Planned Economic Activities (1996, last amended in 2000)
Major Accidents Directive (96/82/EC)	Law on Pollution (2001, last amended in 2011)	Regulations of the prevention, response to and investigation of industrial accidents approved by the Resolution Nr. 966 of the Government of the Republic of Lithuania on 17 August 2004
Plant Protection Products Directive (91/414/EEC)	Law on Chemical Products (1998, last amended in 2010)	Law of the Republic of Lithuania on Plant Protection (1995, last amended in 2010)
IPPC Directive (96/61/EC)	Law on Pollution (2001, last amended in 2011) Regulations of the Cabinet of Ministers Nr. 1082 on procedure for applying of A, B, C category polluting activities and issuance of permits for performance of A and B category polluting activity (2010)	Order Nr. 80 of the Minister of Environment dated 27 February 2002 on the approval of the rules of the issuance, renewal and annulment of integrated pollution prevention and control approvals (last amended in 2007)

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4. Venta river basin district management plan. Approved by Resolution Nr. 1617 of the Government of the Republic of Lithuania of 17 November 2010. http://vanduo.gamta.lt/files/Venta%20river%20management%20plan.pdf (accessed on 16 January 2012).

3.2. Identification of water bodies and characterization of cross border water bodies

3.2.1. Designation of water bodies

Principles of delineation of water bodies both in Latvia and Lithuania are similar. In both countries the methodology according to principles of WFD using so called system "B" is selected for delineation of water bodies. It means that obligatory parameters from system "A" and some optional parameters are combined in order to establish the typology for water. They are listed in the Tables 3.2.1, 3.2.2 and 3.2.3.

Table 3.2.1

Parameters selected for typology of rivers in Latvia and Lithuania

Descriptor	Obligatory/ optional
Absolute altitude	Obligatory
Geographical latitude	Obligatory
Geographical longitude	Obligatory
Geology of river bed	Obligatory
Catchment size	Obligatory
Average slope	Optional

Table 3.2.2

Parameters selected for typology of lakes in Latvia and Lithuania

Descriptor	Obligatory/ optional
Absolute altitude	Obligatory
Geographical latitude	Obligatory
Geographical longitude	Obligatory
Depth	Obligatory
Geological structure of lake bed	Obligatory
Size	Obligatory
Concentration of organic substances*	Optional

* not applied in Lithuania

Table 3.2.3

Parameters selected for typology of coastal water in Latvia and Lithuania

Descriptor	Obligatory/ optional
Salinity	Obligatory
Depth	Optional
Stratification of water	Optional
Water exchange time	Optional
Tidal impact	Optional
Substrate of bed	Optional

WFD Common Implementation Strategy (CIS) Guidance Document No.2 "Identification of Water bodies" describes the basic obligatory parameters for delineation of water bodies, and those are:

- smallest size range for river water bodies is 10 – 100 km^2 of catchment area;
- smallest size range for lake water bodies is 0.5 – 1 km^2 of surface area;
- for all types of water bodies absolute altitude (elevation above sea level), geographical latitude and longitude as well as geology of riverbed must be taken into account;
- water bodies can be also smaller if this is necessary for achievement of good ecological quality as well as with respect to protected areas to ensure better protection of the territory in question.

Other aspects that should be taken into account in the process of delineation are:

- in one large water body water bodies of the same water category and of the same type can be included;
- water bodies should not overlap with other water bodies or cross the water bodies` boundaries;
- water quality within the one water body must be the same;
- separate and significant hydrological elements of water are the basis for delineation of water into water bodies.

According to WFD CIS Guidelines, no specific size for delineation of transitional and coastal water is given. The WFD gives no indication of the landward extent of transitional or coastal water bodies. One of the hydromorphological quality elements for both transitional and coastal water is the structure of the intertidal zone. It is recommended that transitional and coastal water bodies include the intertidal area from the highest to the lowest astronomical tide (according to CIS Guidelines No.5).

A body of groundwater must be within an aquifer or aquifers. However, not all groundwater is necessarily within an aquifer. The WFD's definition of the term "body of groundwater" does not provide explicit guidance on how such bodies should be delineated. The delineation of bodies of groundwater must ensure that the relevant objectives of WFD can be achieved – bodies should be delineated in a way that enables an appropriate description of the quantitative and chemical status of groundwater (WFD CIS Guidelines No.2).

Water bodies in the Venta RBD are assigned to the following categories: rivers, lakes, artificial water bodies (AWB), heavily modified water bodies (HMWB), coastal water bodies and groundwater bodies.

Water bodies differ in their natural characteristics, such as the size, bed slope of rivers or the depth of lakes. The variety of these natural characteristics affects aquatic communities also: the species composition of aquatic organisms as well as relative indicators of various species in communities largely depends on natural conditions.

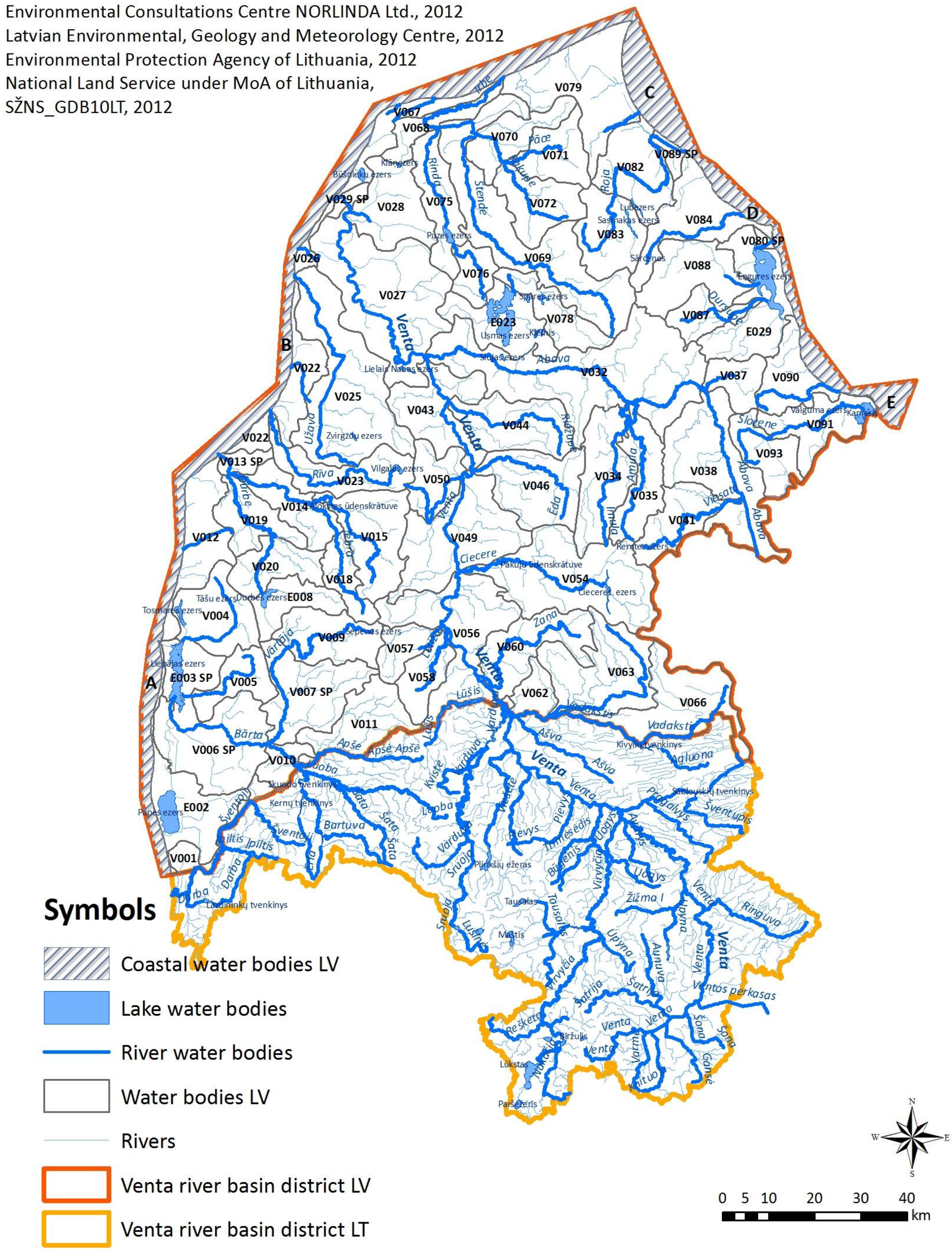
Therefore, rivers, lakes, coastal water bodies, AWB and HMWB are further differentiated according to type taking into account the variety of natural characteristics of surface water and the resulting differences in aquatic communities. A wholeness of certain characteristics typical for each separate ecological type of water when a water body is not affected by human activities is called reference conditions of such body of water. A degree of deviation of water bodies` characteristics from the reference conditions (magnitude of human impact) serves as a basis for identification of the actual ecological status of the water body, i.e., determining which differences exist between the communities due to natural factors and which have been caused by anthropogenic pressures. Thus, the differentiation of water bodies with different natural characteristics into ecological types is a mandatory requirement for correct identification of the ecological status of these water bodies.

Summary of all water bodies in the common Venta RBD is given in the Table 3.2.4 as well as is reflected in the Figure 3.2.1 and 3.2.3. More detailed information on key aspects related to designation of a particular type of water body is provided below. Complete list of all water bodies is presented in the Annex 1.

Table 3.2.4

Summary of water bodies within the Venta RBD

<table>
<tr><th colspan="2">Water body type</th><th>Latvia</th><th>Lithuania</th></tr>
<tr><td rowspan="3">River water bodies</td><td>Natural river WB</td><td>55</td><td>88</td></tr>
<tr><td>Heavily modified river WB</td><td>6</td><td>15</td></tr>
<tr><td>Artificial river WB</td><td>0</td><td>1</td></tr>
<tr><td rowspan="4">Lake water bodies</td><td>Natural lake WB</td><td>29</td><td>11</td></tr>
<tr><td>Heavily modified lake WB</td><td>1</td><td>1</td></tr>
<tr><td>Heavily modified (pond/water reservoir) WB</td><td>0</td><td>8</td></tr>
<tr><td>Artificial lake WB</td><td>0</td><td>0</td></tr>
<tr><td>Coastal water bodies</td><td></td><td>5</td><td>0</td></tr>
<tr><td>Transitional water bodies</td><td></td><td>1</td><td>0</td></tr>
<tr><td>Groundwater bodies</td><td></td><td>8</td><td>1</td></tr>
<tr><td colspan="2">TOTAL</td><td>105</td><td>125</td></tr>
</table>


Environmental Consultations Centre NORLINDA Ltd., 2012
Latvian Environmental, Geology and Meteorology Centre, 2012
Environmental Protection Agency of Lithuania, 2012
National Land Service under MoA of Lithuania,
SŽNS_GDB10LT, 2012
Symbols
Coastal water bodies LV
Lake water bodies
River water bodies
Water bodies LV
Rivers
Venta river basin district LV
Venta river basin district LT
0 5 10 20 30 40
km
N
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E
Venta
Abava
Ciecere
Venta
Vadakstis
Ašva
Agluona
Ringuva
Venta
Ventos perkasas

Figure 3.2.1. Surface water bodies within the Venta RBD.

A. River water bodies

Both in Lithuania and Latvia natural hydrological boundaries of rivers are shaping the basins within which water quality is managed and protected according to WFD instead of the administrative boundaries. Catchment areas of selected river water bodies in Latvia are larger than 100 km^2, but in Lithuania – larger than 50 km^2. Rivers with catchment area smaller than 50 km^2 (in Lithuania) or 100 km^2 (in Latvia) 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 for large water bodies but also the quality of smaller rivers situated within the respective basins. Totally, there are **88** natural river water bodies in the Lithuanian part and **55** water bodies in the Latvian part of Venta RBD.

Nevertheless, WFD states that "*body of surface water means a discrete and significant element of surface water such as a lake, a reservoir, a stream, river or canal, part of a stream, river or canal, a transitional water or a stretch of coastal water*". However the water quality of a stream, river or canal as well as of their parts depends on the status of the whole cathment area, the water body as the primary unit for water management in the light of WFD is a certain watercourse and not its drainage basin as such. Following, Latvia on the contrary to Lithuania has not properly identified its river water bodies as the entire territory of the country is divided into sub-basins attributed to water bodies` units.

B. Lake water bodies

All lakes are divided into one group of lakes larger than 0.5 km^2 (50 ha) in both countries. In Lithuania there are also ponds (more precisely to be called "water reservoirs" as usually are established on rivers) with an area larger than 0.5 km^2 delineated, in which the conditions typical of rivers have changed into the characteristics typical of lakes, hence such ponds are comparable to natural lakes and thus subject to the same depth criteria for the type identification. On Latvian side there are no such types of water bodies delineated since are considered to be of low importance.

Lakes with an area smaller than 0.5 km^2 within the Venta RBD are 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.

Totally, there are **11** natural lake and **8** pond or water reservoir water bodies in the Lithuanian part as well as **29** natural lake water bodies in the Latvian part of Venta RBD.

As lakes are natural "discrete elements of surface water", there are no discrepancies with definition laid down by WFD and Latvian approach for designation of lake water bodies which are certain individual lakes.

C. Heavily modified water bodies

The characteristics (hydrological, morphological) of certain natural bodies of water have been strongly modified due to impacts 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 communities 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. If the restoration of natural physical characteristics in such a water body has far-reaching negative socio-economic consequences or if the restoration of natural physical characteristics of water bodies cannot be achieved due to technical or economic reasons, such body of water is deemed to be a heavily modified water body (HMWB). The HMWB designation process and its steps are described in the Figure 3.2.2 below.

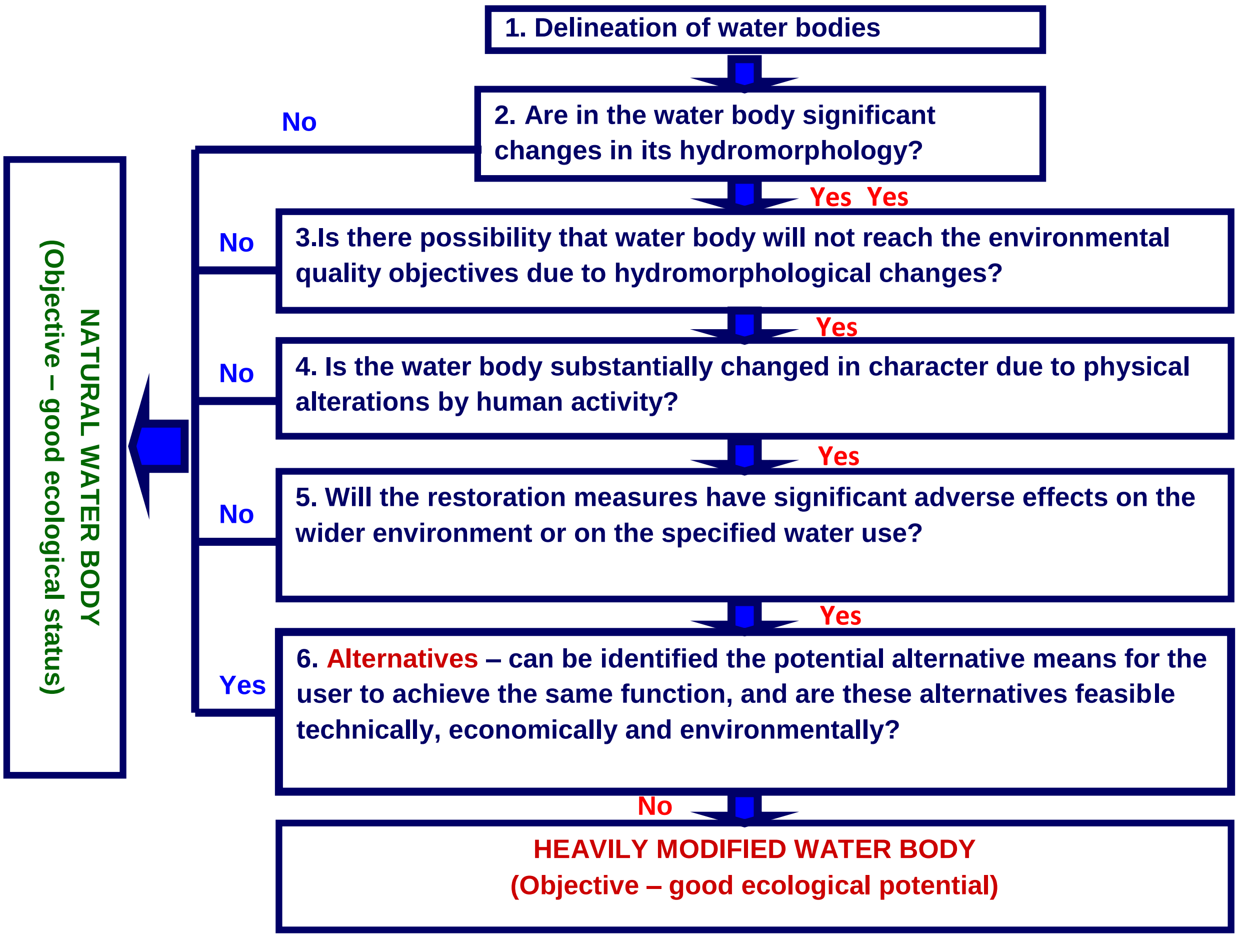

Figure 3.2.2. Steps of identification and designation process of HMWB and AWB (WFD CIS Guidelines on HMWB).

In Lithuania ponds (water reservoirs) with an area larger than 0.5 km^2 where the conditions typical for rivers have changed into the characteristics typical for lakes due to the impact of human activities as well as straightened rivers with low bed slopes flowing over urbanized territories are designated as HMWB. In addition, HMWB in Lithuania include stretches of rivers with cascades of hydropower plants where the status of biological elements in river stretches below the hydropower plants often fails to meet the criteria for good status. There are **15** HMWB with respect to rives and **1** lake HMWB.

As regards Latvian part of Venta RBD, regulated rivers and/or harbors` significantly impacted river and lake water bodies have been designated as HMWB. In those water bodies hydrological or morphological conditions have been significantly impacted by anthropogenic activities and, following, the natural quality of ecosystems cannot be ensured. There are **7** HMWB in the Latvian part of Venta RBD – **6** river water bodies (Bārta (V006SP) – polder, Vārtāja (V007SP) – river regulation, Saka (V013SP) – small harbor, Ventspils harbor territory (V029SP) – harbor, Mērsraga channel (V080SP) – small harbor, Roja with Mazupīte (V089SP) – small harbor) and **1** lake water body (Lake Liepājas (E003SP) – impact of harbor) in which related results of economical analysis, assessment of economical significance of these economical activities as well as possibilities and feasibility of other alternative measures in order to ensure the restoration to natural physical characteristics of these water bodies have been taken into account.

Generally speaking, main reasons for delineation of water bodies as HMWB within Venta RBD both in Latvian and Lithuanian part are melioration – polder systems, regulation of river stretches, established small hydropower plants and harbors.

D. Artificial water bodies

Artificial water bodies (AWB) are water bodies formed in places where they had not existed before without modifying the existing water bodies. The general scheme for designation of such water bodies is the same as for designation of HMWB (Fig. 3.1.1). There is only **1** water body in the Lithuanian part of Venta RBD classified as AWB – the Venta-Dubysa Canal, which connects the Nemunas and Venta river basins.

In relation to Latvian part of Venta RBD, there is no one water body designated as AWB.

E. Coastal water bodies

Coastal water bodies by definition are surface water 1 sea mile far from the coastal line to the sea (or they reach the external border of transitional water). The following main aspects are taken into account in order to delineate the sea coastal water bodies:

- belonging to the Baltic Sea or Gulf of Riga;
- openness of coast (moderate open or open);
- dominance of ground (rock or sand).

Following, **4** types of coastal water bodies have been designated in Latvia encountered in Venta RBD, too, and these are Baltic south eastern open stony or sandy coast as well as Riga Gulf sandy or stony coast. The Riga Gulf sandy coast is divided in two separated water bodies. With regard to Lithuania there are **2** types of coastal water bodies – open Baltic Sea sandy coast (southern coast, along Curonian Spit) and open Baltic Sea stony coast (northern coast). Both Lithuanian coastal water bodies belong to Nemunas RBD and none to Venta RBD.

F. Transitional water bodies

Transitional water bodies are parts of sea coastal water highly influenced by big rivers entering the sea – *"'transitional waters' are bodies of surface water in the vicinity of river mouths which are partly saline in character as a result of their proximity to coastal waters but which are substantially influenced by freshwater flows"* (according to Art.2(6) of WFD). It means that transitional waters are:

1) "... in the vicinity of a river mouth" meaning close to the end of a river where it mixes with coastal water;
2) "... partly saline in character" meaning that the salinity is generally lower than in the adjacent coastal water;
3) "... substantially influenced by freshwater flow" meaning that there is a change in salinity or flow (WFD CIS Guidelines No.5).

There is one transitional water body in the Gulf of Riga near river mouths Lielupe and Daugava belonging to Daugava RBD, but also small part of it belongs to Venta RBD. The water salinity in this coastal part is lower (4.7 ‰) than generally in the Gulf of Riga (6.26 ‰) (according to data on average water salinity 1993-2002).

G. Groundwater bodies

Groundwater bodies (GWB) in Lithuania have been identified assuming that:

- they are formed by hydrodynamic systems of closely related aquifers;
- they are separated by clearly identifiable impermeable strata;
- they are separated by horizontal or/and vertical lithological boundaries of low permeability hampering intrusion of saline water from related horizons;
- they are constituted of mostly used aquifers.

However any groundwater body can extend across several RBD, it is assumed in Lithuania that they can be artificially "split" for management purposes. On the contrary, in Latvia this approach is not applied.

Similar to Lithuania, GWB in Latvia are identified assuming that:

- they are distinct groundwater systems or parts of artesian basins which are hydraulically isolated from artesian basins nearby;
- they are separated by horizontal or/and vertical lithological boundaries of low permeability.

There is **1** GWB in the Lithuanian part of Venta RBD – the Venta GWB of Permian-Upper Devonian deposits. Its boundaries coincide with the boundaries of the Venta RBD in Lithuania (Fig. 3.2.3). 170 well fields were registered within the Venta RBD in the Register of the Earth Entrails of Lithuania.

In relation to Latvia, a number of freshwater horizons within Latvian part of Venta RBD are integrated in **8** GWB: A, D1, D2, D3, D4, F1, F2 and F3 (Fig. 3.2.3). It should be underlined that part of GWB A, F3 and D4 are situated behind the borders of Venta RBD. So, part of GWB A and F3 continues in Lielupe RBD but D4 even stretches within all other Latvian RBDs.

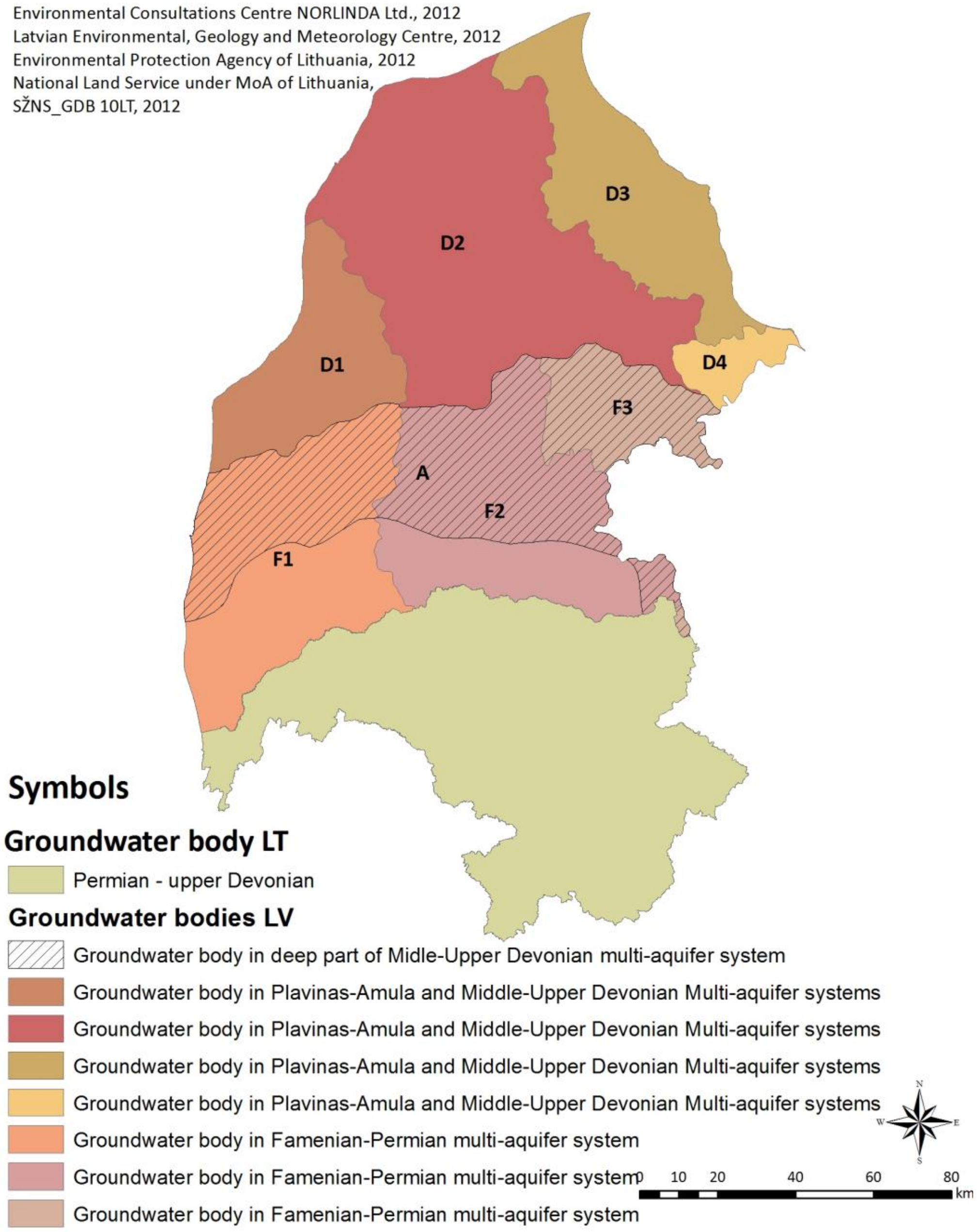

Figure 3.2.3. Groundwater bodies in Latvia and Lithuania.

3.2.2. Characterisation of cross border water bodies

Cross border water bodies are water bodies with transboundary impact or water bodies close to country border. Taking into account the natural hydrological flow in the Venta RBD, usually water from Lithuania flows to Latvia and then enters the Baltic Sea. However, there are a few water bodies with water flow from Latvia to Lithuania also. Besides, there are a few river water bodies located directly on the border between two countries.

Venta is a transboundary RBD hence a relevant issue here is the transboundary pollution. Pollution loads generated on the territory of Lithuania are transported to

Latvia by the main rivers of the RBD – Venta and Bārta (Bartuva). In its turn, Sventāja (Šventoji) is flowing on the border of both countries.

Cross border water bodies in Lithuanian part of Venta RBD are the following ones: *Šventoji* (LT700108102), *Bartuva* (LT800120103), *Apšė* (LT800121702), *Lūšis* (LT300114301 and LT300114302), *Varduva* (LT300113104), *Venta* (LT300100018), *Vadakstis* (LT300111701 and LT300111702) and *Dabikinė* (LT300106101). It must be mentioned that one of them, namely, Dabikinė is recognized as HMWB. This is the river in Naujoji Akmene region directed to south-west from Latvian border.

In their turn, cross border water bodies in Latvia with respect to the Venta RBD are the following river water bodies: *Sventāja basin* (V001), *Bārta* (V010), *Apše* (V011), *Venta* (V056), *Vadakste* (V062 and V066) and *Ezere* (V063). All water bodies are characterized as natural water bodies.

In addition, although the Lithuanian coastal water body "Open Baltic Sea stony coast (northern coast)" (LT100101200) does not belong to the Venta RBD, it has a common border with the Latvian coastal water body "Baltic south eastern open stony coast". It should be stressed that water quality of these water bodies is assessed as poor in both countries. Cross border water bodies with characterization of their ecological quality or potential are listed in the Table 3.2.5. Besides, all cross border water bodies within the Venta RBD are depicted in the Figure 3.2.4 but administrative division of the cross border part of the basin – in the Figure 3.2.5.

Table 3.2.5

Cross border water bodies in the Venta RBD and their relation to each other

Lithuania				**Latvia**			
Code of water body	**Name of water body**	**Type**	**Ecological quality/ potential**	**Code of water body**	**Name of water body**	**Type**	**Ecological quality/ potential**
LT700108102	Šventoji	2	2	V001	Sventāja basin	4	2
LT800120103	Bartuva	3	2	V010	Bārta	5	3
LT800121702	Apšė	3	1	V011	Apše	3	2
LT300114301	Lūšis	1	3	V056	Venta	6	3
LT300114302	Lūšis	1	1				
LT300113104	Varduva	3	3				
LT300100018	Venta	5	2				
LT300111702	Vadakstis	2	2	V062	Vadakste	5	2
				V063	Ezere	4	2
LT300111701	Vadakstis	1	2	V066	Vadakste	6	3
LT300106101	Dabikinė	1	3 (HMWB)				
LT100101200	Open Baltic Sea stony coast (northern coast)*		4	A	Baltic south eastern open stony coast		4

*does not belong to Venta RBD

The average length of natural river water bodies in the Venta RBD of Latvian side is 32.84 km but in Lithuania – 14.05 km. Cross border water bodies are longer - 33.77 km and 37.78 km, respectively. More precise information on length of water bodies is provided in the Annex 1.

The average annual amounts of polluting substances transported from Lithuania to Latvia by main rivers Venta and Bartuva are estimated at about **2313** t of **BOD_7**, **118** t of **ammonium nitrogen**, **2756** t of **nitrate nitrogen** and **93** t of **total phosphorus**. The loads transported by the Bartuva River alone are assessed at **370** t of **BOD_7**, **10** t of **ammonium nitrogen**, **385** t of **nitrate nitrogen** and **12** t of **total phosphorus**.

None of cross border water bodies has been identified as a water body at risk due to pollution of hazardous substances with exception to water body Venta on the Lithuanian side which is characterized as being at risk because of pollution with hazardous substances (assessment in Lithuania in 2006). This can significantly affect the chemical status of the Venta River on the Latvian territory. At the same time, according to results of the study “Survey of nitrates, priority and dangerous substances in surface and groundwater” (2010) no significant concentrations of hazardous substances were found in the Latvian part of Venta River including the territory near to border.

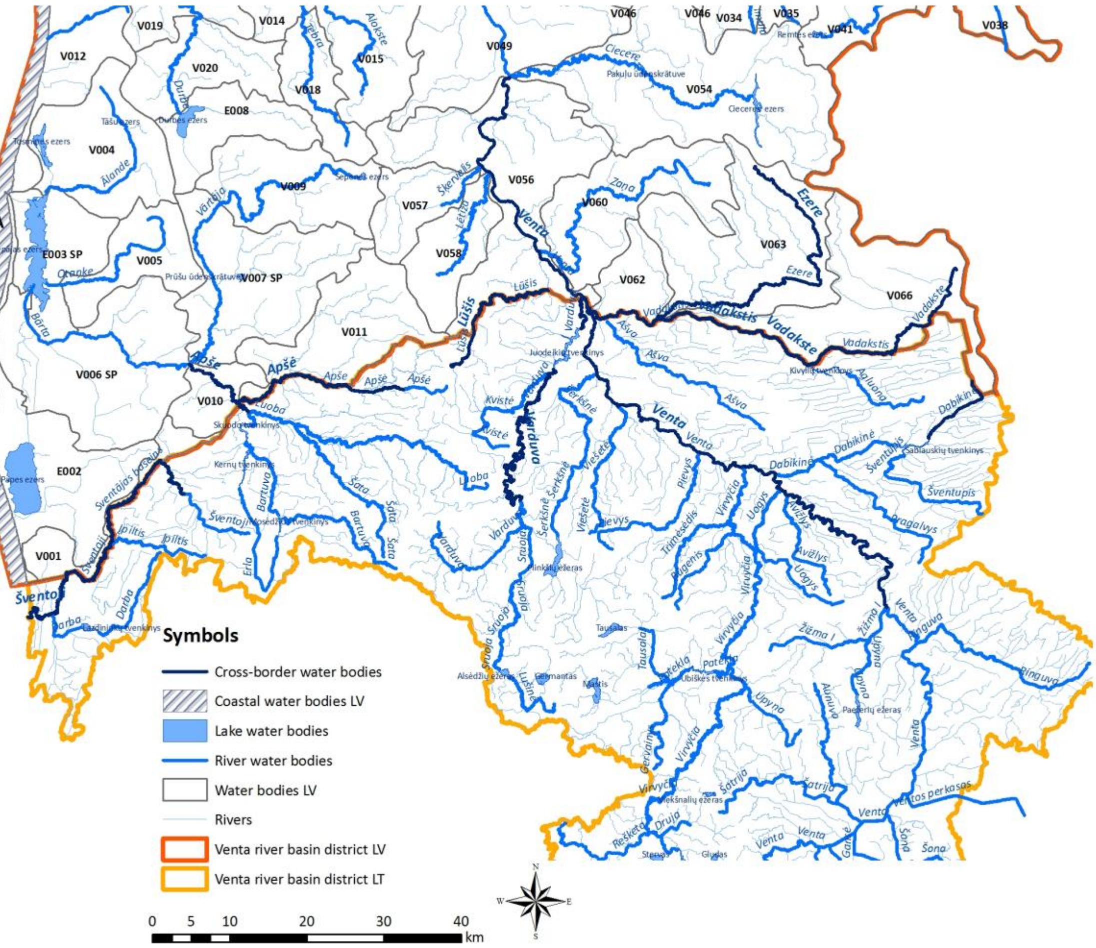

Figure 3.2.4. Cross border water bodies in the Venta RBD.

However, some heavy metals were found in fishes (Hg) and sediments (Ni, Cr) and episodically (October 2009) hexachlorobutadiene and small concentrations of pesticides have been detected in water of Venta[4]. According to previous monitoring results (2003-2007), no exceedances of mean concentrations of hazardous substances have been registered in the Latvian part of Venta RBD. Since the chemical quality of rivers is assessed as good. With respect to lakes the related data are missing.

Nevertheless, **2** cross border water bodies on the Latvian side (*Bārta* (V010), *Venta* (V056)) are characterized as being at risk due to possible transboundary pollution. In their turn, in Lithuania there are **4** cross border water bodies at risk (*Šventoji* (LT700108102), *Lūšis* (LT300114301), *Varduva* (LT300113104), *Dabikinė* (LT300106101)) due to hydromorphological modifications and pollution from diffuse sources or unknown sources. More information on related risk factors is provided in the chapter 3.4.

As regards the cross border groundwater bodies, there is not enough information on mutual interrelations. Besides, both countries have differing approaches for delineation of groundwater bodies.

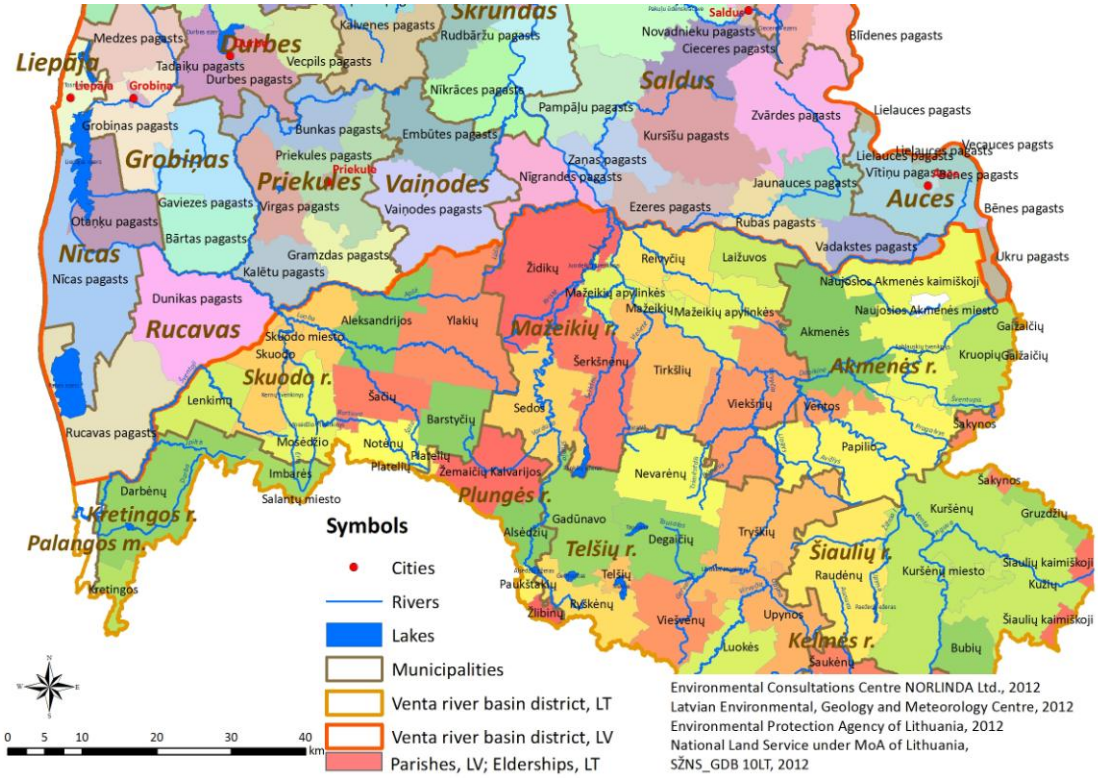

Figure 3.2.5. Administrative division of the cross border part of the Venta RBD.

[4] SIA Venteko noslēguma ziņojums "Nitrātu, prioritāro un bīstamo vielu apsekojums virszemes un pazemes ūdens objektos", 2010). 331 lpp.

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3.3. Quality objectives for water bodies

Environmental status objectives for each water body should be defined during each 6-year River Basin Planning Cycle. Objectives may be 'to achieve good status' or 'to maintain high status' within a specified time period. The key objectives are to prevent deterioration of status in all bodies of surface water and groundwater and to achieve at least good status for all natural water bodies and a good ecological potential for artificial (AWB) and heavily modified water bodies (HMWB).

The WFD recognizes that in some water bodies it may be impossible to get to near natural conditions because of useful changes, such as to protect people from floods, to allow navigation or to hold back water for abstraction or power generation. For these water bodies (HMWB or AWB) there is a target of good ecological potential set – this means that the biological parameters can be of lower quality than in natural water bodies but quality with regard to other parameters (chemical and physical) should still be the same as for natural water bodies.

For groundwater bodies the most important water protection objective is good quantitative and qualitative (chemical) status. If the status is good, the objective is to maintain this good status, if status is lower than good, then measures shall be introduced in order to improve the status and if the status is critically going down, such process must be stopped.

For the purpose of reaching a balance between the needs of human economic activities and water protection objectives, a derogations can be provided, including postponement of the objective set 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.

According to elaborated methodologies in Latvia and Lithuania, in both countries an objective for each water body is set. This assessment is based on present water quality as well as taking into account the balance between the needs of human economic activities and water protection objectives.

For **3**[5] river water bodies in Latvian part of Venta RBD there is a target set to maintain high ecological quality, for **57** river water bodies and **27** lake water bodies (including **6** river HMWB and **1** lake HMWB) the target is to achieve good ecological quality or good ecological potential. In addition, a common target is to maintain a good chemical quality in all surface water bodies as well as to maintain a good quantitative status and a good chemical quality in all groundwater bodies. A supplementary water quality objective is to ensure appropriate water quality for bathing in **2** river water bodies.

In their turn, for **1** river water body (**2 %**), **3** lake water bodies (**10 %**) and **5** coastal water bodies (**100 %**) within the Venta RBD of Latvia extensions for achievement of good ecological quality/potential are set. Besides, prolongation for **1** groundwater body (**12 %**) in relation to achievement of good quantitative and chemical status is set (part of water body F1). For **7** water bodies the extension is till 2021 and for **3** water bodies – till 2027.

Only for **60** river water bodies (**58 %**) and **10** lake water bodies (**50 %**) including HMWB and AWB in Lithuanian part of Venta RBD it is expected to achieve a good ecological quality till 2015, for other **44** river water bodies and **10**

[5] Užava (V025), Abava (V032), Raķupe (V072)

lake/ pond water bodies the deadline for achievement of good ecological quality is extended for reasons of technical feasibility, disproportionate costs or natural conditions. It means that in Lithuania a number of derogations are provided, as well.

All environmental objectives for surface water bodies are presented in the Figure 3.3.1.

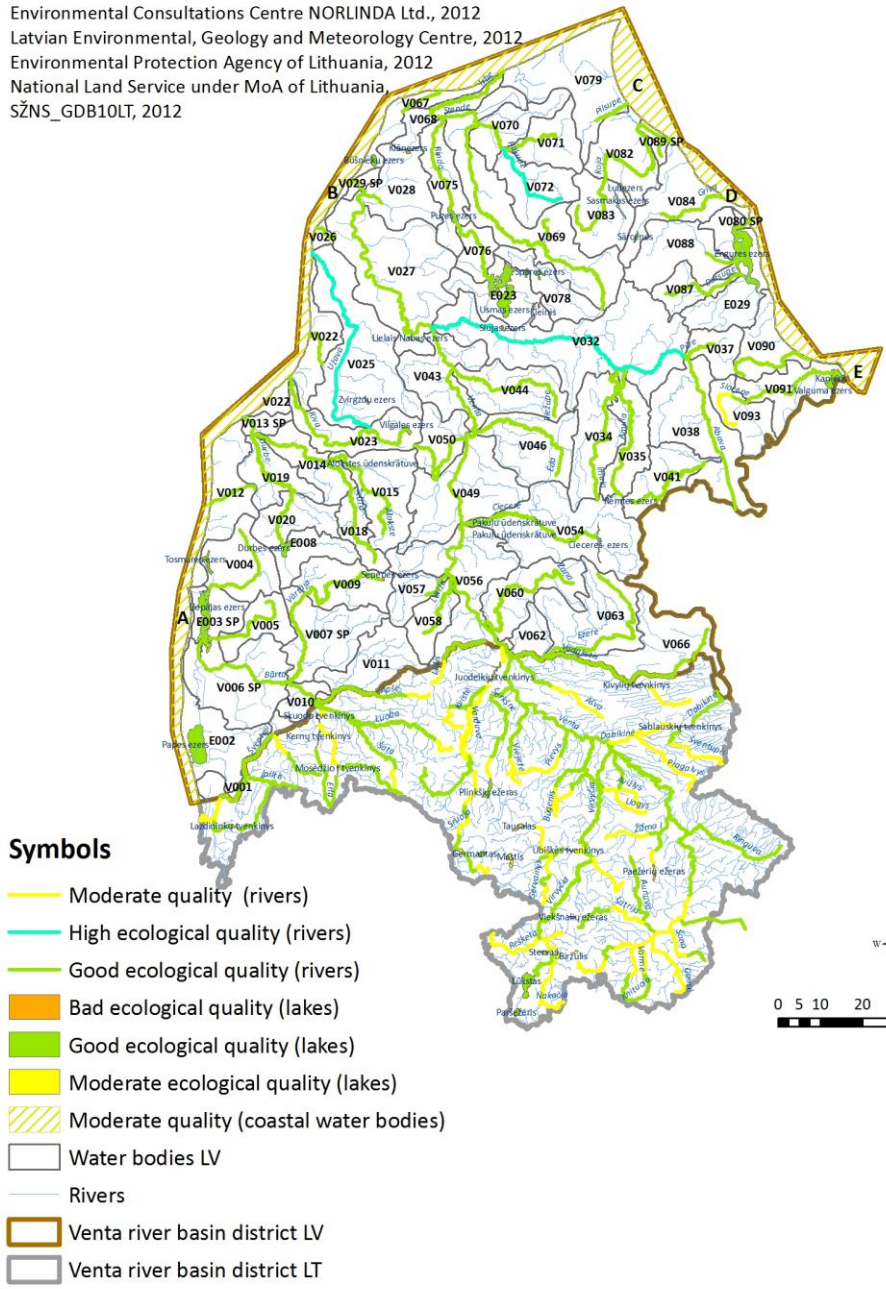

Figure 3.3.1. Environmental objectives for surface water bodies in the Venta RBD.

For the single groundwater body designated in the Lithuanian part of Venta RBD no changes in groundwater quality caused by pollution or water abstraction have been detected. There is only one problem related to the quality of groundwater which is of natural origin – the so-called anomaly of fluorides in aquifers of Upper Permian (P2) and aquifers of Žagarė Upper Devonian (P2) deposits.

Summary of environmental objectives set for all water bodies in the Venta RBD is given in the Table 3.3.1.

Table 3.3.1

Quality objectives set for water bodies of Venta RBD

Water body type	Latvia			Lithuania		
	High	Good	Extension of achievement of good ecological quality/ potential	High	Good	Extension of achievement of good ecological quality/ potential
River water bodies	3	51	1	-	46	42
HMWB (river)	-	6	-	-	13	2
AWB (river)	-	-	-	-	1	-
Lake water bodies	-	26	3	-	6	5
HMWB (lakes and ponds)	-	1	-	-	4	5
Coastal water bodies	-	-	5	-	-	-
Groundwater bodies	-	8	1 (part of body)	-	1	-

For **14** cross border surface water bodies in the Venta RBD it is anticipated to achieve good quality by 2015. Exception is made for coastal water body A in Latvia[6] as well as for **3** river water bodies in Lithuania (Lūšis (LT300114301), Varduva (LT300113104) and Dabikinė (HMWB LT300106101). Summary of quality objectives in cross border water bodies of Venta RBD is given in the Table 3.3.2.

For river water body Lūšis the risk not to achieve a good ecological quality is due to straightening of the river bed, for Varduva - due to impact of hydropower plants but for Dabikinė- due to overall qualitative status. In its turn, for coastal water body A (Baltic south eastern open stony coast) extension of achievement of good ecological quality is due to the overall water quality (see chapter 3.4 on water bodies at risk).

Table 3.3.2

Quality objectives in cross border water bodies within the Venta RBD

Code of water body	Name of water body	Existing ecological quality/ potential	Quality objective by 2015
LT700108102	Šventoji	2	2
LT800120103	Bartuva	2	2
LT800121702	Apšė	1	2
LT300114301	Lūšis	3	3
LT300114302	Lūšis	1	2

[6] Also the Lithuanian coastal water body "Open Baltic Sea stony coast (northern coast)" (LT100101200) belonging to Nemunas RBD but bordering with Latvian coastal water body "A" will not achieve good quality by 2015

Table 3.3.2 (continued)

Code of water body	Name of water body	Existing ecological quality/ potential	Quality objective by 2015
LT300113104	Varduva	3	3
LT300100018	Venta	2	2
LT300111701	Vadakstis	2	2
LT300111702	Vadakstis	2	2
LT300106101	Dabikinė	3 (HMWB)	3
V001	Sventāja basin	2	2
V010	Bārta	3	2
V011	Apše	2	2
V056	Venta	3	2
V062	Vadakste	2	2
V063	Ezere	2	2
V066	Vadakste	3	2
A	Baltic south eastern open stony coast	4	3

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3.4. Characterization of water bodies at risk

After assessment of pressures and impact of human activity on surface water and groundwater an identification of those water bodies that are at risk of failing to meet the environmental objectives of WFD is made. Water bodies "at risk" does not necessarily mean that the water bodies are already suffering poor status but it does highlight areas where appropriate management actions should be applied to ensure that good status is maintained or to ensure that it is achieved in the future[7]. Still, these are water bodies where quality objectives cannot be achieved without implementation of any additional or supplementary measures (if it is enough with basic measures to achieve the quality objective than this is not a water body at risk).

In **Lithuania** an additional analysis with respect to identification of water bodies at risk was carried out 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 Program of Measures (2010-2015). **60** water bodies at risk within the Venta RBD have been identified – **50** of them are river water bodies (**48%** of all river water bodies) and **10** - lake and pond water bodies (**50 %** of all lake and pond water bodies). Reasons for such status for river water bodies are mainly due to morphological changes (straightening) and pollution with nutrients, and for lake water bodies – due to pollution with nutrients. For the assessment of risk water bodies in Lithuania the mathematical model MIKE is used as well as experts` judgement is applied.

At the same time in **Latvia** there are **13** river water bodies (**22 %** of all river water bodies), **14** lake water bodies (**47 %** of all lake water bodies) and **5** coastal water bodies (all coastal water bodies in the RBD) as well as a small part of **1** groundwater body (**12 %** of all groundwater bodies) identified as water bodies at risk within the Venta RBD in which additional measures should be implemented. Reasons for such status are mainly due to pollution with nutrients and morphological alterations. For the assessment of risk water bodies in Latvia the mathematical models Mass Balance Model and ECOLAS are used. Besides, experts` judgement is applied, as well.

All inland surface water bodies at risk are pointed out in the Figure 3.4.1.

There are **2** river water bodies at risk identified in the Venta RBD of Latvia which have a transboundary pollution risk - *Bārta* (V010) and *Venta* (V056) subject to pollution load of nutrients from water bodies *Bartuva* (LT800120103) and *Venta* (LT300100018), respectively. The water quality in these water bodies mainly depends on implemented measures in Lithuania.

Summarizing, the main risk factors for river water bodies in the Venta RBD are hydromorphological modifications and water quality problems as well as combination of these two factors.

[7]Water matters. Pressures & Impacts Risk Assessment as part of the Characterisation Process. http://www.wfdireland.ie/wfd-ra.html

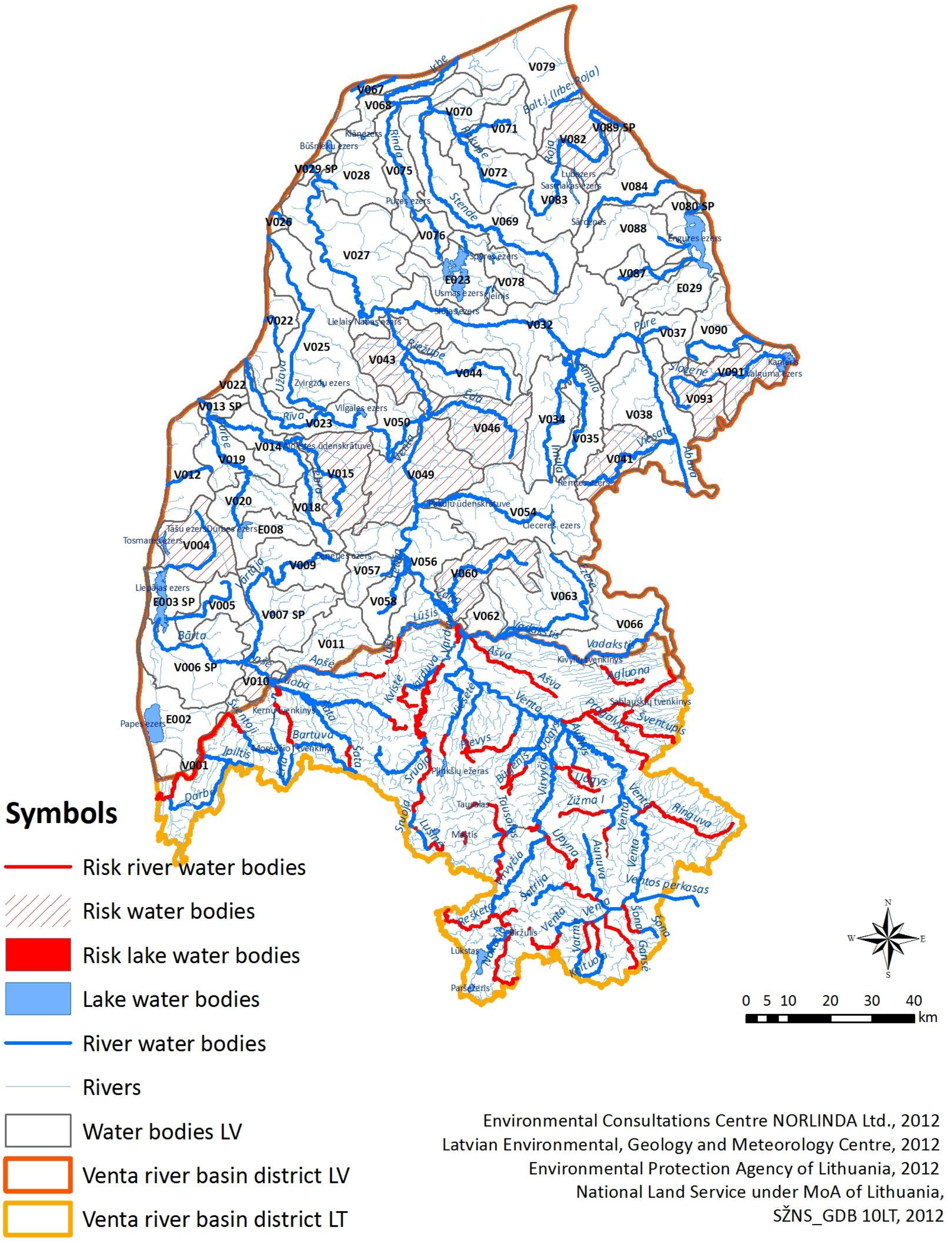

Figure 3.4.1. Inland surface water bodies at risk in the Venta RBD.

The factors which determine the assignment of river water bodies to the water bodies at risk are given in the Table 3.4.1 below.

Table 3.4.1

Risk factors for river water bodies at risk in the Venta RBD

River water bodies at risk		Risk factors			
		Point pollution	Diffuse pollution	Hydro-morphological modifications	Other reasons
V004	Ālande	x	x		
V010	Bārta				Transboundary pollution; flood risk
V015	Alokste	x	x		
V041	Viesata		x		Possible other unknown reasons for water quality problems
V043	Venta				Impact of water bodies in the upstream
V046	Ēda		x	x	
V049	Venta		x	x	Flood risk; impact of a water body in the upstream
V056	Venta		x		Transboundary pollution; flood risk
V060	Zaņa		x	x	
V082	Roja	x	x	x	
V089 SP	Roja ar Mazupīti	x			Flood risk; impact of water body in the upstream
V091	Slocene	x	x		
V093	Slocene		x	x	
700108102	Šventoji				Unknown pollution source of di(2-ethyhexyl) phthalate
800120102	Bartuva			x	Unknown reasons for quality lower than good

Table 3.4.1 (continued)

River water bodies at risk		Risk factors			
		Point pollution	Diffuse pollution	Hydro-morphological modifications	Other reasons
800121101	Luoba			x	
800121271	Šata			x	
800121701	Apšė			x	
300100011	Venta			x	
300100013	Venta			x	
300100014	Venta			x	
300100702	Varmė			x	
300100902	Knituoja			x	
300101301	Gansė			x	
300101302	Gansė			x	Water abstraction
300101742	Šatrija			x	
300102102	Šona			x	
300103801	Ringuva		x		
300103802	Ringuva		x		
300104801	Žižma I			x	
300104871	Upyna			x	
300105801	Avižlys			x	
300105901	Uogys			x	
300106101	Dabikinė		x		
300106102	Dabikinė	x	x	x	
300106103	Dabikinė	x	x		
300106281	Šventupis		x	x	
300106282	Šventupis		x		
300106651	Pragalvys			x	
300107401	Virvytė			x	
300107431	Nakačia			x	
300107621	Druja			x	
300107711	Rešketa			x	
300107911	Upyna			x	
300108253	Patekla			x	
300108321	Tausalas	x			
300108441	Gervainys			x	
300108443	Gervainys			x	
300108731	Bugenis			x	
300108811	Trimesėdis			x	
300109701	Pievys			x	
300110401	Viešetė			x	
300110901	Šerkšnė			x	
300111811	Agluona	x	x		
300112361	Ašva		x	x	
300112362	Ašva		x		

Table 3.4.1 (continued)

River water bodies at risk		Risk factors			
		Point pollution	Diffuse pollution	Hydro-morphological modifications	Other reasons
300112363	Ašva		x		
300113104	Varduva	x		x	Unknown source of di(2-ethylhexyl) phthalate (DEHP)
300113262	Sruoja			x	
300113264	Sruoja			x	
300113271	Lūšinė			x	
300113511	Kvistė			x	
300114301	Lūšis			x	

Most significant causes of risk for **14** lake water bodies in the Venta RBD in Latvia are point and diffuse pollution and hydromorphological modifications. **10** lake and pond water bodies in the Venta RBD of Lithuania are assigned to water bodies at risk due to point/diffuse pollution or due to other reasons, according to monitoring and modeling results. In the Table 3.4.2 short identification of risk factors for lake water bodies is given.

Table 3.4.2

Risk factors for lake water bodies in the Venta RBD

Lake water bodies at risk		Risk factors			
		Point pollution	Diffuse pollution	Hydro-morphological modifications	Other reasons
E003 SP	Liepājas lake		x		Possible impact of sea water, biogens from wastewaters
E004	Tosmares lake	x			
E006	Prūšu water reservoir	x		x	
E007	Sepenes lake		x		
E008	Durbes lake		x		
E013	Lielais Nabas lake		x		Unknown aspects
E014	Mazais Nabas lake				Unknown aspects
E016	Remtes		x		

Table 3.4.2 (continued)

Lake water bodies at risk		Risk factors			
		Point pollution	Diffuse pollution	Hydro-morphological modifications	Other reasons
	lake				
E017	Pakuļu HES water reservoir				Impact of run-of-river possible
E018	Cieceres lake	x			
E026	Lublake	x			
E027	Sasmakas lake	x	x		Other unknown aspects
E028	Laidzes lake	x		x	Possible impact of historical pollution
E031	Valguma lake		x		Possible impact of run-of-river Slocene, biogens from wastewaters
LT330030014	Gludas lake				Unknown reasons for bad quality
LT330030140	Alsėdžiu lake				Potential impact of historical pollution
LT330040050	Paežerių lake				Quality lower than good, due to reconstruction of dam
LT330040095	Tausalas lake				Potential impact of historical pollution
LT330040090	Mastis lake	x	x		
LT230050100	Mosedzio I pond		x		
LT230050140	Sablauskiu pond	x			U lakenknown reasons for quality lower than good

Table 3.4.2 (continued)

Lake water bodies at risk		Risk factors			
		Point pollution	**Diffuse pollution**	**Hydro-morphological modifications**	**Other reasons**
LT230050180	Ubiškes pond	x	x		
LT230050271	Kivyliu pond		x		
LT330040060	Biržulis		x		Resuspension of nutrients from bottom sediments due to low water level

Risk factors for coastal water bodies in the Latvian part of Venta RBD are mainly inland water status and amount of nutrients from rivers as well as historical load of nutrients in the Baltic Sea (Tab. 3.4.3).

Table 3.4.3

Risk factors for coastal water bodies at risk in the Venta RBD

Coastal water body	Most significant causes of risk
A	Transboundary pollution, flood risk, inland water status
B	Flood risk, inland water status
C	Flood risk, inland water status
D	Flood risk, inland water status

Groundwater bodies in the Latvian part of Venta RBD have no significant risk to achieve good quantitative status and quality, except small part of the water body F1 near to Liepāja town and in the territory of South-East direction till significant water abstraction area „Otaņķi". In this area risk occurs due to intrusion of salt water from the Baltic Sea.

It shall be mentioned that after adoption of the river basin management plans in Latvia the Ministry of Environmental Protection and Regional Development prepared and the Cabinet of Ministers adopted the Regulations Nr. 418 "Regulations regarding water bodies of risk" (31 May 2011) in which the list of water bodies at risk differs a little – some of water bodies within the Venta RBD are not included in this category, namely, *Venta* (V056), *Lielais Nabas lake* (E013), *Mazais Nabas lake* (E014). Besides, for some of them the risk factors are also changed. It is done because of process of public commenting during which significant comments were taken into account.

References

1. Latvijas Vides, ģeoloģijas un meteoroloģijas centrs. Ventas baseina apgabala apsaimniekošanas plāns. 2009.

http://www.meteo.lv/public/29935.html (accessed on 16 March 2012).
2. Venta river basin district management plan. Approved by Resolution Nr. 1617 of the Government of the Republic of Lithuania of 17 November 2010. http://vanduo.gamta.lt/files/Venta%20river%20management%20plan.pdf (accessed on 16 January 2012).
3. Ministru kabineta 2001.gada 31.maija noteikumi Nr.418 „Noteikumi par riska ūdensobjektiem". http://www.likumi.lv/doc.php?id=231084 (accessed on 23 January 2012).
4. Water matters. Pressures & Impacts Risk Assessment as part of the Characterisation Process. http://www.wfdireland.ie/wfd-ra.html (accessed on 23 January 2012).

3.5. Typology and ecological water quality classification systems

3.5.1. General considerations

Water bodies in the Venta RBD are assigned to the following categories: rivers, lakes, sea coastal zones (only in Latvian part), artificial water bodies (AWB) and heavily modified water bodies (HMWB). Water bodies differ in their natural characteristics, such as size of the catchment area, 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 systems as well as relative indicators of various species in communities, largely depends on natural conditions. 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 (Fig. 3.5.1). Thus, according to WFD, the differentiation of water bodies with different natural characteristics into ecological types is a mandatory requirement for correct identification of the ecological status of these water bodies.

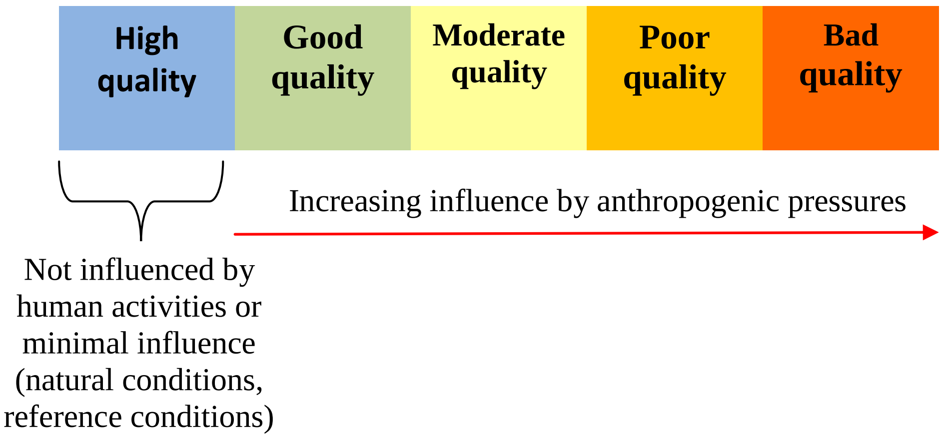

Figure 3.5.1. Ecological quality classes of water bodies.

Hydrological and morphological characteristics in AWB and HMWB 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. Conditions formed in AWB or HMWB are usually not identical to the ones in similar natural water bodies therefore characterization 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) (Fig. 3.5.2). Usually less stringent requirements for the parameters indicative of biological elements are set for AWB and HMWB. In the case of artificial ponds larger than 0,5 km^2 the hydromorphological conditions formed in ponds as well as the aquatic communities are usually consistent with those in natural lakes because the biological quality elements in such water bodies should conform to the high status criteria applicable for natural lakes.

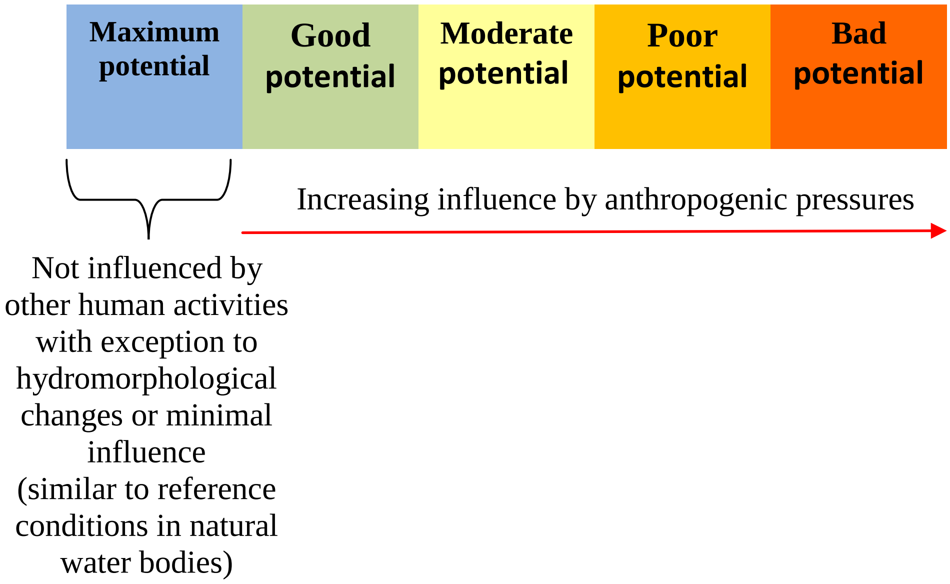

Figure 3.5.2. Ecological potential classes of AWB and HMWB.

As regards the physico-chemical water quality elements and chemical status they remain the same as those for natural water bodies. However, exception can be made due to the nature of an individual AWB or HMWB.

3.5.2. Ecological typology of rivers, lakes and sea coastal water

Five river types differing in the characteristics of their aquatic communities have been identified within the Venta RBD in Lithuania. The river types are characterized by two main natural factors which determine the major differences between the communities: catchment size and river bed slope (Tab. 3.5.1).

Table 3.5.1

Lithuanian typology of rivers in the Venta RBD

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

Generally, the river typology applied in Latvia is similar to Lithuanian one – the catchment size and river bed slope play the main role in determination of characteristic aquatic communities associated to a particular conditions. Totally, **six river types** have been identified in Latvia (Tab. 3.5.2) but only four of them are occurred within the Venta RBD – small ritral and potamal water bodies have not been determined[8]. The only one difference with respect to descriptors in both countries is the river slope but these differences are quite small. It should be stressed that the similar types` numbers are not coinciding.

Table 3.5.2

Latvian typology of rivers and their occurrence in the Venta RBD

Descriptors	Types					
	1*	**2***	**3**	**4**	**5**	**6**
Absolute altitude, m	< 200					
Geology	calcareous					
Catchment size, km^2	< 100		100 - 1000		> 1000	
Bed slope, m/km	> 1	< 1	> 1	< 1	> 1	< 1
Type name	Small ritral	Small potamal	Medium ritral	Medium potamal	Large ritral	Large potamal

*Not determined in the Venta RBD

Two main types of lakes and ponds have been identified in the Lithuanian part of Venta RBD. The major factor that determines the most significant differences between the communities of aquatic organisms is the average depth of lakes. As in the case of rivers, the characterization 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) (Tab. 3.5.3).

Table 3.5.3

Lithuanian typology of lakes in the Venta RBD

Descriptors	Types	
	1	**2**
Average depth, m	< 3	3-9
Absolute altitude, m	< 200	
Geology	calcareous	
Size, km^2	> 0.5	

The Latvian ecological typology of lakes is more complicated because two additional descriptors, namely, geological character of lake bed translated into water hardness as well as water colour are applied (Tab. 3.5.4). Water colour reflects amount of humic substances in the water characterizing lake as oligohumic (clear water lake) or polyhumic (brown water lake). Besides, three different depth gradients are used instead of Lithuanian two but these differences are quite small and could be neglected.

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[8] Latvijas Vides, ģeoloģijas un meteoroloģijas aģentūra. Upju baseinu apgabalu raksturojums. Antropogēno slodžu uz pazemes un virszemes ūdeņiem vērtējums. Ekonomiskā analīze. 2005.

In relation to other obligatory descriptor - absolute altitude all Latvian lakes belong to one type and only lakes larger than 0.5 km^2 (50 ha) are classified and assigned as water bodies. Following, **10 ecological types of lakes** have been described in Latvia, however deep, clear water lakes with low hardness (type 10) are not determined in no one of Latvian RBD. Additionally, very shallow and shallow, clear water lakes with low hardness (types 3 and 7, respectively) and shallow, brown water lakes with low hardness (type 8) are not determined within the Venta RBD.

Table 3.5.4

Latvian typology of lakes and their occurrence in the Venta RBD

Descriptors	**Types**									
	1	**2**	**3***	**4**	**5**	**6**	**7***	**8***	**9**	**10***
Average depth, m	< 2				2 – 9				> 9	
Water hardness determined by geology, mkS/cm	>165		< 165		>165		< 165		>165	< 165
Water colour, Pt-Co	<80	>80	<80	>80	<80	>80	<80	>80	<80	<80
Absolute altitude, m	< 200									
Size, km^2	> 0.5									
Type description	Very shallow, clear water lake with high hardness	Very shallow, brown water lake with high hardness	Very shallow, clear water lake with low hardness	Very shallow, brown water lake with low hardness	Shallow, clear water lake with high hardness	Shallow, brown water lake with high hardness	Shallow, clear water lake with low hardness	Shallow, brown water lake with low hardness	Deep, clear water lake with high hardness	Deep, clear water lake with low hardness

*Not determined in the Venta RBD

Only Latvia has sea coastal water bodies assigned to Venta RBD. The main factors determining ecological types of coastal water are water salinity, exposure to waves and dominating bottom substrate (Tab. 3.5.5). According to this typology **four sea coastal types** are established – two in the part of open Baltic Sea and two in the Riga Gulf.

Table 3.5.5

Latvian typology of sea coastal water in the Venta RBD

Descriptors	**Types**			
	Baltic south eastern open stony coast	**Baltic south eastern open sandy coast**	**Riga Gulf sandy coast**	**Riga Gulf stony coast**
Average depth, m	< 30			

Water mixing	complete	
Water exchange, days	< 7	
Salinity, ‰	6 < 18–20	0.5 < 6
Exposure to	open	moderate open

Table 3.5.5 (continued)

Descriptors	Types			
	Baltic south eastern open stony coast	**Baltic south eastern open sandy coast**	**Riga Gulf sandy coast**	**Riga Gulf stony coast**
waves				
Dominating substrate	boulder	sand-gravel	sand-gravel	boulder

Summary of ecological types of all water bodies designated in the Venta RBD is displayed in the Figure 3.5.3.

3.5.3. Defined reference conditions of rivers and lakes and maximum ecological potential for AWB and HMWB

In **Lithuanian rivers,** values of **reference conditions** for biological elements were established only for the parameters of fishes and zoobenthos. Values of parameters indicative of physico-chemical quality elements characterizing the quality of water, which ensure reference conditions for the biological elements, were established, as well. Reference conditions for rivers were also characterized in accordance with the hydromorphological and chemical status criteria. Values and characterization of reference conditions for river types according to the parameters of the water quality elements are provided in the Table 3.5.6.

Latvia has provisionally defined a list of characteristics describing **reference conditions for river** types based on macrophytes, zoobenthos, fish fauna and physicochemical parameters but some of them are qualitative criteria (lists of mostly occurred species) more or less applicable by expert judgment merely[9]. Furthermore, hydromorphological status criteria are not given. So, in the Table 3.5.7 numerically expressed parameters are provided only.

[9] Latvijas Vides, ģeoloģijas un meteoroloģijas aģentūra. Upju baseinu apgabalu raksturojums. Antropogēno slodžu uz pazemes un virszemes ūdeņiem vērtējums. Ekonomiskā analīze. 2005. 18.-19.lpp.

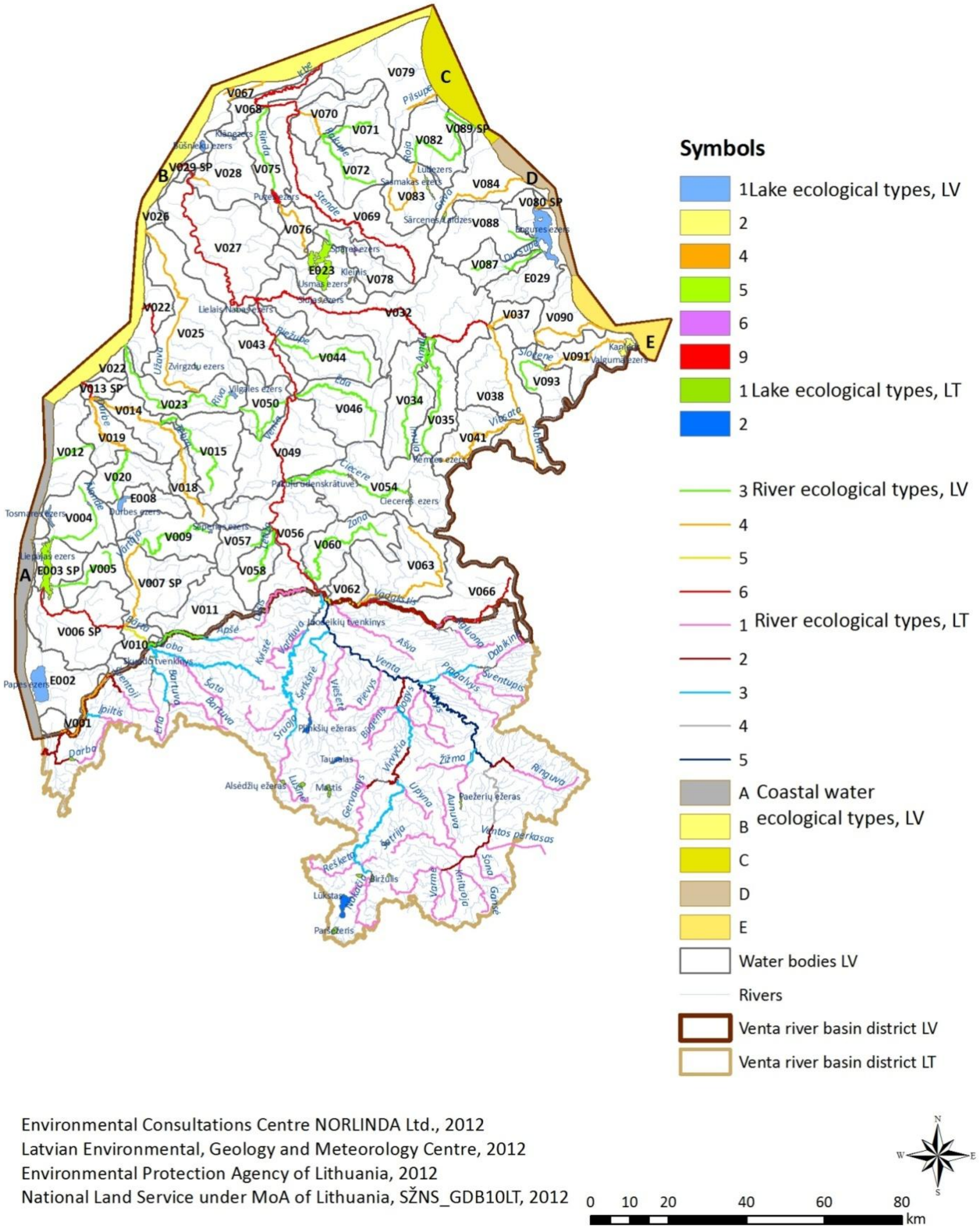

Figure 3.5.3. Ecological types of designated water bodies in the Venta RBD according to typologies adopted in Lithuania and Latvia.

In **Lithuanian lakes,** values of **reference conditions** for the biological water quality elements are specified only for the parameter of phytoplankton – more precisely, for chlorophyll a reflecting the total biomass of phytoplankton in the water. Also values of parameters indicative of physico-chemical water quality elements, which should ensure reference conditions for the biological elements, were established as well as parameters for the hydromorphological quality elements and criteria for chemical status were characterized. Values and characterization of reference conditions for lake types according to the parameters of the water quality elements are given in the Table 3.5.8. In the case when the hydromorphological characteristics before start of human impact are unknown data on characteristics of the water level fluctuations in comparable lakes which have not been affected by human activities can be used.

Similar to Latvian ecological types of rivers, **reference conditions of Latvian lakes** are partially characterized by a number of lists of aquatic organisms - dominating groups of macrophytes, phytoplankton and zoobenthos providing qualitative description made by experts only. Again, hydromorphological status criteria are not given. Analogues to rivers, numerically expressed parameters are provided in the Table 3.5.9 merely.

Description and criteria for **reference conditions** regarding ecological types of **Latvian sea coastal zone** are based on qualitative and quantitative criteria resting upon dominating phytoplankton groups, cell numbers and biomass during different seasons of the year, occurrence depth of macro algae and physicochemical parameters including level of heavy metals in fishes[10].

Table 3.5.6

Reference conditions for Lithuanian river types

Quality element	**Parameter**		**River type**				
			1	**2**	**3**	**4**	**5**
			Value/characterization of reference conditions				
Biological	**Zoobenthos**						
	Taxonomic composition and abundance	Average annual value of the Danish Stream Fauna Index (DSFI)	7	7	7	7	7
		Ecological quality ratio (EQR) of the Danish Stream Fauna Index (DSFI)	1	1	1	1	1
	Fishes						
	Taxonomic composition,	Average value of the					

[10] Latvijas Vides, ģeoloģijas un meteoroloģijas aģentūra. Upju baseinu apgabalu raksturojums. Antropogēno slodžu uz pazemes un virszemes ūdeņiem vērtējums. Ekonomiskā analīze. 2005. 33.-34.lpp.

Table 3.5.6 (continued)

Quality element	Parameter		River type				
			1	2	3	4	5
			Value/characterization of reference conditions				
	abundance and age structure	Lithuanian Fish Index (LFI)	1	1	1	1	1
		Relative abundance of intolerant fish individuals in the community (NTOLE n), %	61	22	45	18	27
		Absolute number of intolerant fish species in the community (NTOLE sp), units	3	-	5	-	5
		Relative abundance of tolerant fish individuals in the community (TOLE n), %	1	33	2	37	23
		Relative number of tolerant fish species in the community (TOLE sp), %	-	18	14	18	14
		Relative abundance of omnivorous fish individuals in the community (OMNI n), %	3	37	4	53	38
		Absolute number of reophilic fish species in the community (RH sp), units	-	5	8	6	10
		Relative abundance of litophilic fish individuals in the community (LITH n), %	96	52	93	33	65

Table 3.5.6 (continued)

Quality element	Parameter		River type 1	2	3	4	5
			Value/characterization of reference conditions				
		Relative number of litophilic fish species in the community (LITH sp), %	83	41	72	39	52
Physico-chemical	**General**						
	Nutrients	Annual average value of nitrate nitrogen (NO3-N), mg/l	≤ 0.90	≤ 0.90	≤ 0.90	≤ 0.90	≤ 0.90
		Annual average value of ammonium nitrogen (NH4-N), mg/l	≤ 0.06	≤ 0.06	≤ 0.06	≤ 0.06	≤ 0.06
		Annual average value of total nitrogen (Nt), mg/l	≤ 1.40	≤ 1.40	≤ 1.40	≤ 1.40	≤ 1.40
		Annual average value of phosphate phosphorus (PO4-P), mg/l	≤ 0.03	≤ 0.03	≤ 0.03	≤ 0.03	≤ 0.03
		Annual average value of total phosphorus (Pt), mg/l	≤ 0.06	≤ 0.06	≤ 0.06	≤ 0.06	≤ 0.06
	Oxygen conditions	Annual average value of dissolved oxygen in water (O_2), mg/l	≥ 9.5	≥ 8.5	≥ 9.5	≥ 9.5	≥ 9.5
	Organic matter	Annual average value of biological oxygen	≤ 1.80	≤ 1.80	≤ 1.80	≤ 1.80	≤ 1.80

Table 3.5.6 (continued)

Quality element	Parameter		River type 1	2	3	4	5
			Value/characterization of reference conditions				
		demand in 7 days (BOD_7), mg/l					
	Specific pollutants						
			Measured values are below the quantitative assessment limit for the respective substance (detection limit)				
Hydromorphological	**Hydrological regime**						
	Quantity and dynamics of water flow	Quantity of water flow	There are no changes in the natural water flow quantity due to human activities (water intake, operation of hydropower plants (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).				
	River continuity*						
			There are no artificial barriers for fish migration				
	Morphological conditions*						
	Structure of the riparian zone	Structure of the river bed	Natural bed (unregulated, no shore embankments)				
		Length and width of the natural riparian vegetation zone	The zone of natural riparian vegetation (forests) covers at least 70% of the length of the shoreline of the river. The width of the forest zone must be at least 50 m.				

* Are assessed on the river stretch. The length of the river stretches: 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.

Table 3.5.7

Reference conditions for Latvian river types

Quality element	Parameter		River type 1	2	3	4	5	6
			Value/characterization of reference conditions					
Biological	**Zoobenthos**							
	Taxonomic composition and abundance	Saprobity index	1-1.5	1.3-1.8	1.1-1.6	1.3-1.8	1.3-1.8	1.5-2
	Fishes							
	Taxonomic composition and abundance	Shannon index	0.5-1.1	0.5-1.1	0.5-1.6	0.5-1.6	1-2.4	1-2.4
		Number or characteristic species	>2 [1)]	>2 [2)]	>5 [3)]	>5 [4)]	>15 [5)]	>15 [6)]
		Occurrence of susceptive species, number	at least 2 [7)]	at least 1 [8)]	at least 2 [9)]	at least 1 [10)]	at least 2 [11)]	at least 2 [12)]
	Health status	Level of anomalies, sicknesses and parasites, %	< 2	< 2	< 2	< 2	< 2	< 2
	Macrophytes							
		Overgrowing of mirror surface, %	≤ 30	5-30	5-30	5-30	5-30	5-30
Physico-chemical	**General**							
	Nutrients	Annual average value of ammonium nitrogen (NH4-N), mg/l	<0.09	<0.1	<0.09	<0.16	<0.09	<0.1
		Annual average value of total nitrogen (Nt), mg/l	<1.5	<1.5	<1.8	<2	<1.8	<1.8
		Annual average value of total phosphorus (Pt), mg/l	<0.04	<0.045	<0.05	<0.06	<0.04	<0.045
	Organic matter	Annual average value of biological oxygen	<2	<2	<2	<2	<2	<2

Table 3.5.7 (continued)

Quality element	Parameter		River type					
			1	2	3	4	5	6
			Value/characterization of reference conditions					
		demand in 5 days (BOD_5), mg/l						
	Oxygen conditions	Minimal concentration of dissolved oxygen in water (O_2), mg/l	>8	>7	>8	>7	>8	>7

Notes: 1) from characteristic species *Salmo trutta, Lampetra spp., Phoxinus phoxinus, Noemacheilus barbatulus*; 2) from characteristic species *Phoxinus phoxinus, Noemacheilus barbatulus, Cottus gobio, Perca fluviatilis*; 3) from characteristic species *Phoxinus phoxinus, Noemacheilus barbatulus, Cottus gobio, Salmo trutta*; 4) from characteristic species *Phoxinus phoxinus, Noemacheilus barbatulus, Cottus gobio, Gobio gobio, Esox lucius;* 5) from characteristic species *Noemacheilus barbatulus, Salmo salar; Cottus gobio, Phoxinus phoxinus, Lauciscus cephalus, Alburnoides bipunctatus; 6)* from characteristic species *Leuciscus cephalus, Rutilus rutilus, Alburnoides bipunctatus, Noemacheilus barbatulus, Rhodeus sericeus, Perca fluviatilis*; 7) from *Lampetra spp., Salmo trutta;* 8) from *Lampetra spp., Salmo trutta, Esox lucius;* 9) from *Salmo trutta, Lampetra spp., Esox lucius, Alburnoides bipunctatus;* 10) from *Esox lucius, Alburnoides bipunctatus;* 11) from *Salmo salar, Alburnoides bipunctatus, Lampetra spp., Lota lota;*12) from *Alburnoides bipunctatus, Esox lucius, Lota lota*

Table 3.5.8

Reference conditions for Lithuanian lake types

<table>
<tr><th rowspan="3">Quality element</th><th rowspan="3" colspan="2">Parameter</th><th colspan="2">Lake type</th></tr>
<tr><th>1</th><th>2</th></tr>
<tr><th colspan="2">Value/characterization of reference conditions</th></tr>
<tr><td rowspan="4">Biological</td><td colspan="4">Phytoplankton</td></tr>
<tr><td rowspan="3">Chlorophyll a</td><td>Average annual value of chlorophyll a, µg/l</td><td>2.5</td><td>2.5</td></tr>
<tr><td>Maximum value of chlorophyll a, µg/l</td><td>5</td><td>5</td></tr>
<tr><td>EQR of the average annual value and of the maximum value of chlorophyll a</td><td>1</td><td>1</td></tr>
<tr><td rowspan="5">Physico-chemical</td><td colspan="4">General</td></tr>
<tr><td rowspan="2">Nutrients</td><td>Annual average value of total nitrogen (Nt), mg/l</td><td>≤ 1</td><td>≤ 1</td></tr>
<tr><td>Annual average value of total phosphorus (Pt), mg/l</td><td>≤ 0.02</td><td>≤ 0.02</td></tr>
<tr><td colspan="4">Specific pollutants</td></tr>
<tr><td colspan="2"></td><td colspan="2">Measured values are below the quantitative assessment limit for the respective substance (detection limit)</td></tr>
<tr><td rowspan="3">Hydromor-phological</td><td colspan="4">Hydrological regime</td></tr>
<tr><td>Quantity and dynamics of water flow</td><td>Changes in the water level</td><td colspan="2">There is no unnatural decrease in the water level (the level has not been lowered, there is no intake of water), or changes are insignificant (the level is not lower than the natural minimum average annual water level), or there is no anthropogenic impact which would determine the said alteration of the water level. There is no unnatural fluctuation of the water level (fluctuation conditioned by the operation of a HPP constructed on an effluent or tributary of the lake), or such fluctuation is within the limits of the minimum and maximum natural average annual water level.</td></tr>
<tr><td colspan="4">Morphological conditions</td></tr>
</table>

Table 3.5.8 (continued)

Quality element	Parameter		Lake type 1	Lake type 2
			Value/characterization of reference conditions	
	Structure of the lake shore	Changes in the shoreline	The shoreline is natural (not straightened, no shore embankments), or changes are insignificant (≤5% of the lake shoreline)	
		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.	

Table 3.5.9

Reference conditions for Latvian lake types determined in Venta RBD

Quality element	Parameter		Lake type 1	2	3	4	5	6	9
			Value/characterization of reference conditions						
Biological	**Phytoplankton**								
		Total biomass*, mg/l	<0.15	<0.27	0.95-1	0.05-0.3	0.2-1.2	0.5-1.5	0.1-1.5
	Macrophytes								
		Overgrowing of mirror surface, %	>80	>50	<30	<30	>30	>30	<10
	Zoobenthos**								
	Taxonomic composition and abundance	Number of species	17	8-25	36	54-81	80	No data	29
		Number of organisms in one m^2	1960	1380-2380	2360	1220-5610***	740-3600	No data	2000
		Biomass, g/m^2	1.18 ****	2.16-46.04	16.10	1.40-7.3***	12.24-30.5	No data	149
Physico-chemical	**General**								
	Nutrients	Annual average value of total nitrogen (Nt), mg/l	<1	<1	<1	<1	<0.5	<0.8	<0.5
		Annual average value of total phosphorus (Pt), mg/l	<0.025	<0.03	<0.025	<0.03	<0.02	<0.03	<0.02

Table 3.5.9 (continued)

Quality element	Parameter		Lake type						
			1	2	3	4	5	6	9
			Value/characterization of reference conditions						
	Water transparency	With Secchi disc, m	Up to bottom or more than mean depth	-	Up to bottom or more than mean depth	-	>4	-	>4.5

*not clearly defined but probably during vegetation season
**in littoral zone
***if dominated by *Chironomidae*

****without *Mollusca*

The **maximum ecological potential** of the heavily modified rivers with a straightened bed should be defined following the criteria applicable for the assessment of the types of rivers of the corresponding catchment size and bed slope. The same considerations apply to artificial canals. High ecological status by the biological quality elements in AWB and HMWB cannot be achieved due to the absence of certain specific habitats and changes in the natural hydrological regime. 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.

Maximum ecological potential according to the chlorophyll a concentration in heavily modified lakes should conform to the high ecological status criteria applicable to natural lakes.

Characterization of maximum ecological potential for artificial canals and heavily modified rivers as well as for heavily modified lakes and ponds in Lithuania is reflected in Tables 3.5.10 and 3.5.11.

Still due to lack of knowledge about differences between natural water bodies and AWB/HMWB with respect to their ecological properties, special criteria for maximum ecological potential in Latvia are not defined. For the management purposes in the framework of the first Venta RBD management plan maximum ecological potential is considered to be close to reference conditions of natural water of the corresponding type.

Table 3.5.10

Characterization of maximum ecological potential in artificial canals and heavily modified rivers[11]

Quality element	Parameter		Value/characterization of maximum ecological potential
Biological	**Fishes**		
	Taxonomic composition, abundance and age structure	Average value of the Lithuanian Fish Index (LFI)	> 0.7
	Zoobenthos		
	Taxonomic composition and abundance	Ecological quality ratio (EQR) of the Danish Stream Fauna Index (DSFI)	>0.63
Hydro-morphological	**Hydrological regime**		
	Quantity and dynamics of water flow	Quantity of water flow	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).
	River continuity*		
			There are no artificial barriers for fish migration
	Morphological conditions*		
	Shore structure	Structure of the river bed	The shoreline is meandrous, there are shallow and deep places in the bed determining changes in the flow velocity and soil composition.
		Length of the natural riparian vegetation zone	The zone of natural riparian vegetation (forests) covers at least 50% of the length of the shoreline.

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

[11] Maximum ecological potential for the physicochemical elements has to meet the criteria for good ecological status in respective natural rivers, according to characteristics of designated Lithuanian HMWB- river types 1 and 3

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

Table 3.5.11

Characterization of maximum ecological potential in heavily modified lakes and ponds[12]

Quality element	Parameter		Value/characterization of maximum ecological potential
Biological	**Phytoplankton**		
	Chlorophyll a	EQR of the average annual value and of the maximum value of chlorophyll *a*	> 0.67
Physico-chemical	**General**		
	Nutrients	Annual average value of total nitrogen (Nt), mg/l	<1.30 (< 2*)
		Annual average value of total phosphorus (Pt), mg/l	<0.04 (< 0.1*)

*are applied for assessing the ecological potential of high-drainage lakes

3.5.4. Criteria for assessment of ecological quality of rivers and lakes

First of all, the ecological status of rivers in Latvia and Lithuania is assessed on the basis of the physicochemical quality elements, which are parameters characterizing general conditions (nutrients, organic matter, oxygenation): NO_3-N, NH_4-N, N_{total}, PO_4-P, P_{total}, BOD_5 or 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 (Tab. 3.5.12 for Lithuania, Tab. 3.5.13 for Latvia). It is claimed that criteria have been agreed between the both countries.

Additionally, the indicators used to assess the ecological status of rivers according to the taxonomic composition and abundance of zoobenthos in Lithuania is DSFI index as well as Lithuanian Fish Index (LFI) concerning taxonomic composition, abundance and age structure of fish fauna. In its turn, Latvia has based its biological assessment system on the Saprobity index of zoobenthos.

Observing the Saprobity index in Latvia or average annual value of DSFI EQR in Lithuania, water bodies are assigned to one of five ecological status classes (Tab. 3.5.13 and 3.5.14, respectively). The respective recalculated DSFI values are the

[12] Hydromorphological conditions should conform to reference conditions applicable to natural lakes with exception to water reservoirs of hydropower plants with unnatural fluctuation of the water level

following ones: for high quality - > 6; for good quality – 5-6; for moderate quality – 4; for poor quality – 3; for bad quality – 1-2.

Similarly, according to LFI water bodies are assigned to one of five ecological status classes (Table 3.5.15).

With respect to hydromorphological quality criteria in Lithuania a river is considered to have high quality if all elements indicated in the Table 3.5.6 correspond to reference conditions. In Latvia such criteria are not put into the assessment system.

Table 3.5.12

Ecological status classes of rivers according to parameters indicative of physicochemical quality elements in Lithuania

Quality element		Parameter	River type	Parameter value for reference conditions	Criteria for ecological status classes				
					High	Good	Moderate	Poor	Bad
General	Nutrients	NO_3-N, mg/l	1-5	0.90	<1.30	1.30-2.30	2.31-4.50	4.51-10.00	>10.00
		NO_4-N, mg/l	1-5	0.06	<0.10	0.10-0.20	0.21-0.60	0.61-1.50	>1.50
		N_{tot}, mg/l	1-5	1.40	<2.00	2.0-3.0	3.01-6.00	6.01-12.00	>12.00
		PO_4-P	1-5	0.03	<0.05	0.05-0.09	0.091-0.180	0.181-0.400	>4.000
		P_{tot}, mg/l	1-5	0.06	<0.10	0.10-0.14	0.141-0.230	0.0231-0.470	>0.470
	Organic matter	BOD_7, mg O_2/l	1-5	1.80	<2.30	2.30-3.30	3.31-5.00	5.01-7.0	>7.0
	Oxygenation	O_2, mg/l	1,3,4,5	9.50	>8.50	8.50-7.50	7.49-6.00	5,.99-3.00	<3.00
		O_2, mg/l	2	8.50	>7.50	7.50-6.50	6.49-5.00	4.99-2.00	<2.00

Table 3.5.13

Ecological status classes of rivers according to physicochemical and biological quality elements in Latvia[13]

Parameter	Criteria for ecological status classes				
	High	Good	Moderate	Poor	Bad
River type 3 – medium ritral					
O_2, mg/l	> 8	6-8	4-6	2-4	<2
BOD_5, mg/l	< 2	2-2.5	2.5-3	3-3.5	>3.5
NH_4-N, mg/l	< 0.09	0.09-0.12	0.12-0.15	0.15-0.18	>0.18
Ntot., mg/l	< 1.8	1.8-2.3	2.3-2.8	2.8-3.3	>3.3
Ptot., mg/l	< 0.05	0.05-0.075	0.075-0.1	0.1-0.125	>0.125
Saprobity index	< 1.8	1.8-2	2-2.3	2.3-2.7	>2.7
River type 4 – medium potamal					
O_2, mg/l	> 7	5-7	3-5	1-3	<1
BOD_5, mg/l	< 2	2-3	3-4	4-5	>5
NH_4-N, mg/l	< 0.16	0.16-0.24	0.24-0.32	0.32-0.4	>0.4
Ntot., mg/l	< 2	2-3	3-4	4-5	>5
Ptot., mg/l	< 0.06	0.06-0.09	0.09-0.135	0.135-0.18	>0.18
Saprobity index	< 2	2-2.3	2.3-2.7	2.7-3	>3
River type 5 – large ritral					
O_2, mg/l	> 8	6-8	4-6	2-4	<2
BOD_5, mg/l	< 2	2-2.5	2.5-3	3-3.5	>3.5
NH_4-N, mg/l	< 0.09	0.09-0.12	0.12-0.15	0.15-0.18	>0.18
Ntot., mg/l	< 1.8	1.8-2.8	2.8-3.8	3.8-4.8	>4.8
Ptot., mg/l	< 0.04	0.04-0.065	0.065-0.09	0.09-0.115	>0.115
Saprobity index	< 2	2-2.3	2.3-2.7	2.7-3	>3
River type 6 – large potamal					
O_2, mg/l	> 7	5-7	3-5	1-3	<1
BOD_5, mg/l	< 2	2-3	3-4	4-5	>5
NH_4-N, mg/l	< 0.1	0.1-0.16	0.16-0.24	0.24-0.32	>0.32
Ntot., mg/l	< 1.8	1.8-2.8	2.8-3.8	3.8-4.8	>4.8
Ptot., mg/l	< 0.045	0.045-0.09	0.09-0.135	0.135-0.18	>0.18
Saprobity index	< 2.25	2.25-2.5	2.5-2.75	2.75-3	>3

[13] Only river types determined in the Venta RBD

Table 3.5.14

Ecological status classes of Lithuanian rivers according to taxonomic composition and abundance of zoobenthos

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

Table 3.5.15

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

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

The parameters characterizing general conditions (nutrients) in Lithuanian and Latvian lakes are 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 3.5.16 and 3.5.17).

Table 3.5.16

Ecological status classes of Lithuanian lakes according to parameters indicative of the physicochemical quality elements

Quality element		Parameter	Lake type	Parameter value for reference conditions	Criteria for ecological status classes				
					High	Good	Moderate	Poor	Bad
General	Nutrients	N_{tot}, mg/l	1,2	1.00	<1.30	1.30-1.80	1.81-2.30	2.31-3.00	>3.00
		P_{tot}, mg/l	1,2	0.020	<0.04	0.04-0.06	0.061-0.090	0.091-0.140	>0.140

Table 3.5.17

Ecological status classes of lakes according to physicochemical and biological quality elements in Latvia[14]

Parameter	Criteria for ecological status classes				
	High	**Good**	**Moderate**	**Poor**	**Bad**
Lake type 1 - Very shallow, clear water lake with high hardness					
Ptot., mg/l	<0.025	0.025-0.05	0.05-0.075	0.075-0.1	> 0.1
Ntot., mg/l	<1	1-1.5	1.5-2	2-2.5	> 2.5
Chlorophyll a, µg/l	<9.9	9.9-21	21-40	40-60	> 60
Transparency with Secchi disk, m	Up to the bottom or > mean depth	1.5-2.2 or >mean depth	1-1.5	0.5-1	< 0.5
Biomass of phytoplankton, mg/l	<0.5	0.5-2.5	2.5-5	5-10	> 10
Lake type 2 - Very shallow, brown water lake with high hardness					
Ptot., mg/l	<0.025	0.025-0.05	0.05-0.075	0.075-0.1	> 0.1
Ntot., mg/l	<1	1-1.5	1.5-2	2-2.5	> 2.5
Chlorophyll a, µg/l	<9.9	9.9-21	21-40	40-60	> 60
Transparency with Secchi disk, m	-	-	-	-	-
Biomass of phytoplankton, mg/l	<0.5	0.5-2.5	2.5-5	5-10	> 10
Lake type 4 - Very shallow, brown water lake with low hardness					
Ptot., mg/l	<0.025	0.025-0.05	0.05-0.075	0.075-0.1	> 0.1
Ntot., mg/l	< 1	1-1.5	1.5-2	2-2.5	> 2.5
Chlorophyll a, µg/l	< 7	7-20	20-40	40-60	> 60
Transparency with Secchi disk, m	-	-	-	-	-
Biomass of phytoplankton, mg/l	< 0.5	0.5-2.5	2.5-5	5-10	> 10
Lake type 5 - Shallow, clear water lake with high hardness					
Ptot., mg/l	< 0.02	0.02-0.045	0.045-0.07	0.07-0.095	> 0.095
Ntot., mg/l	< 0.5	0.5-1	1-1.5	1.5-2	> 2
Chlorophyll a, µg/l	< 7	7-12	12-30	30-50	> 50

[14] Only lake types determined in the Venta RBD

Table 3.5.17 (continued)

Parameter	Criteria for ecological status classes				
	High	Good	Moderate	Poor	Bad
Transparency with Secchi disk, m	> 4	2-4	1-2	0.5-1	< 0.5
Biomass of phytoplankton, mg/l	< 0.5	0.5-1.5	1.5-5	5-10	> 10
Lake type 6 - Shallow, brown water lake with high hardness					
Ptot., mg/l	< 0.03	0.03-0.055	0.055-0.08	0.08-0.105	> 0.105
Ntot., mg/l	< 0.8	0.8-1.3	1.3-1.8	1.8-2.3	> 2.3
Chlorophyll a, µg/l	< 7	7-12	12-40	40-60	> 60
Transparency with Secchi disk, m	-	-	-	-	-
Biomass of phytoplankton, mg/l	< 1	1-2.5	2.5-5	5-10	> 10
Lake type 9 - Deep, clear water lake with high hardness					
Ptot., mg/l	< 0.02	0.02-0.04	0.04-0.06	0.06-0.08	> 0.08
Ntot., mg/l	< 0.5	0.5-1	1-1.5	1.5-2	> 2
Chlorophyll a, µg/l	< 5	5-12	12-25	25-35	> 35
Transparency with Secchi disk, m	> 4.5	3-4.5	1.5-3	0.7-1.5	< 0.7
Biomass of phytoplankton, mg/l	< 0.5	0.5-1.5	1.5-5	5-7.5	> 7.5

The ecological status of lakes in both countries is assessed on the basis of the following parameters indicative of biological quality elements - chlorophyll a reflecting the total biomass of phytoplankton and total biomass of phytoplankton (only in Latvia). Additionally, Latvia has introduced criteria for water transparency measured by means of Secchi disk. Lithuania declares that the average annual value and the maximum value of chlorophyll a is assessed translating the concentrations into EQR (Table 3.5.18). In its turn, Latvia uses direct measurements of concentration being most likely determined during vegetation season. The same statement applies to phytoplankton analysis (3.5.17). Actually it must be the case in Lithuania too as usually according to monitoring programs biological quality elements of lakes are studied during vegetation season only. Similar to rivers lake water bodies are assigned to one of five ecological status classes based on values of biological parameters.

It should be stressed that it is impossible to express classification of quality classes based on concentrations of substances using EQR approach if the full scale of possible concentrations is not defined. It remains unclear how Lithuania intends to classify its lakes quality according to measurements of chlorophyll a in this way.

With respect to hydromorphological quality criteria in Lithuania a lake is considered to have high quality if all elements indicated in the Table 3.5.8 correspond to reference conditions. Again, Latvia has not specified its hydromorphological quality criteria for lakes concerning their classification.

For the final classification of ecological quality of surface water bodies based on a number of quality elements quite complicated assessment criteria and rules in Lithuania are applied[15] but Latvia defines that the final assessment is based on the quality class determined by element showing the worst quality status, namely, “one out, all out” principle is used according to informal legal explanations made by European Commission.

Table 3.5.18

Ecological status classes of Lithuanian lakes according to chlorophyll a concentration

Quality element	Parameter	Lake type	Criteria for ecological status classes, EQR values				
			High	Good	Moderate	Poor	Bad
Taxonomic composition, abundance and biomass of phytoplankton	Chloro-phyll a*	1,2	>0.67	0.67-0.33	0.32-0.14	0.13-0.07	<0.07

*The mean of the EQR of the annual average value and of the EQR of the maximum value

The final assessment with respect to 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.

With respect to quality criteria for classification of sea coastal water bodies the initial assessment reflected in the Latvian Venta RBD management plan was made using expert judgment and the related numerical criteria are still not provided.

3.5.5. Criteria for assessment of ecological potential of AWB and HMWB

The ecological potential of rivers which have been designated as HMWB and of artificial canals with regard to physicochemical parameters in both countries is assessed and assigned to one of five ecological potential classes on the basis of the average annual values of each parameter according to the Table 3.5.12 and 3.5.13.

The ecological potential of rivers designated as HMWB and of artificial canals according to the taxonomic composition, abundance and age structure of fish fauna in Lithuania is assessed using LFI. The water body is assigned to one of five ecological potential classes on the basis of the average annual value of the LFI (3.5.19).

[15] Venta river basin district management plan. Approved by Resolution Nr. 1617 of the Government of the Republic of Lithuania of 17 November 2010. pp. 34-40.

Table 3.5.19

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

Quality element	Indicator	Type of WB	Criteria for ecological potential classes				
			Max	Good	Moderate	Poor	Bad
Taxonomic composition, abundance and age structure of fish fauna	LFI	1-5	≥0.71	0.70-0.40	0.39-0.20	0.19-0.10	<0.10

The ecological potential of rivers designated as HMWB and of artificial canals according to the taxonomic composition and abundance of zoobenthos in Lithuania is assessed using DSFI. The water body is assigned to one of five ecological potential classes on the basis of the average annual value of the DSFI EQR (3.5.20). The respective recalculated DSFI values are the following ones: for high potential - > 4.5; for good potential – 3.5-4.5; for moderate potential – 2.5-3.4; for poor potential – 1.5-2.4; for bad potential – < 1.5.

Table 3.5.20

Ecological potential classes of Lithuanian rivers designated as HMWB and of artificial canals according to taxonomic composition and abundance of zoobenthos

Quality element	Indicator	Type of WB	Criteria for ecological potential classes, EQR values				
			Max	Good	Moderate	Poor	Bad
Taxonomic composition and abundance of zoobenthos	DSFI	1-5	≥0.64	0.63-0.50	0.49-0.36	0.35-0.21	<0.21

With respect to hydromorphological quality criteria, Lithuanian rivers designated as HMWB or artificial canals are considered to have maximum ecological potential if all requirements indicated in the Table 3.5.6 are fulfilled.

Like physicochemical parameters, all identified classes` values of biological parameters serving for classification of natural rivers in Latvia can be applied for assessment of ecological potential for artificial and modified rivers, too.

The ecological potential of Lithuanian lakes and ponds which have been designated as HMWB with regard to physicochemical parameters is assessed and 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 according to the Table 3.5.21. In its turn, Latvia uses the same physicochemical and biological criteria as for natural lakes outlined in the Table 3.5.17.

Table 3.5.21

Ecological potential classes of ponds and lakes designated as HMWB according to parameters indicative of physicochemical quality elements in Lithuania

Quality element		Parameter	Type of WB	Criteria for ecological potential classes				
				Max	Good	Moderate	Poor	Bad
General	Nutrients	N_{tot}, mg/l	1,2	<1.30	1.30-1.80	1.81-2.30	2.31-3.00	>3.00
		N_{tot}, mg/l*	1,2	<2.00	2.00-3.00	3.01-6.00	6.01-12.00	>12.00
		P_{tot}, mg/l	1,2	<0.04	0.04-0.06	0.061-0.090	0.091-0.140	>0.140
		P_{tot}, mg/l*	1,2	<0.10	0.10-0.14	0.141-0.230	0.231-0.470	>0.470

* for assessing the ecological potential of high-drainage lakes

The ecological potential of Lithuanian lakes and ponds which have been designated as HMWB is assessed on the basis of the following parameter indicative of biological quality elements reflecting the total biomass of phytoplankton in the water: the average annual value and the maximum value of chlorophyll a. Assessing the EQR of the annual average value and the maximum value of the parameter, water bodies are assigned to one of five ecological potential classes according to the same criteria as for natural lakes outlined in the Table 3.5.18. Again, it should be stressed that it is impossible to express classification of ecological potential classes based on concentrations of substances using EQR approach if the full scale of possible concentrations is not defined. It remains unclear how Lithuania intends to classify its lakes` and ponds` ecological potential according to measurements of chlorophyll a.

With respect to hydromorphological quality criteria, ponds with unregulated water level designated as HMWB in Lithuania are considered to have maximum ecological potential if requirement indicated in the footnote associated to the Table 3.5.11 is fulfilled.

Again, for the final classification of ecological potential of AWB and HMWB based on a number of quality elements quite complicated assessment criteria and rules in Lithuania are applied[16] but Latvia uses the principle “one out, all out” analogous to natural water bodies.

3.5.6. EU intercalibration process of biological quality elements for assessment of ecological quality of water bodies

The general objective of the WFD is to achieve ‘good status’ for all surface waters by 2015. ‘Good status’ means both ‘good ecological status’ and ‘good chemical status’. The so called "intercalibration exercise" is a key element in making this general environmental objective operational in a harmonized way throughout the EU. Its objective is to harmonize the understanding of ‘good ecological status’ in all

[16] Venta river basin district management plan. Approved by Resolution Nr. 1617 of the Government of the Republic of Lithuania of 17 November 2010. p. 40.

Member States, and to ensure that this common understanding is consistent with the definitions of the WFD. Although the WFD defines which biological elements must be taken into account when assessing ecological status, it leaves the Member States flexible to define the details of their own assessment systems. So, the task of intercalibration is to compare these systems and to show to which extent they are applicable for assessment of ecological quality in a harmonized way. Special task of intercalibration is to set boundaries for "high" and "good" as well as for "good" and "moderate" ecological quality with respect to different biological quality elements and to ensure that these boundaries are consistent among different assessment methods used in different Member States for a particular quality element in question.

All the process started in 2003. The technical work is coordinated by the European Commission's Joint Research Centre (JRC) in Ispra, Italy. The intercalibration exercise is carried out within 14 Geographical Intercalibration Groups (GIGs). These are groups of Member States that share ecological types of rivers, lakes and coastal/transitional waters, and can thus compare monitoring results between themselves. Latvia and Lithuania are included in the Central - Baltic River GIG and Central - Baltic Lake GIG.

The first results of the intercalibration process were issued on 30 October 2008 in a Commission Decision published in the Official Journal of the EU. In the first phase of intercalibration it was not possible to intercalibrate all biological quality elements in all water categories. The existing gaps were due mainly to the lack of development of WFD compliant national assessment methods and the lack of data for some quality elements. So, the second phase of the intercalibration exercise was anticipated from 2008 to 2011 in order to achieve comparable and WFD consistent class boundaries for all biological quality elements. Final technical so called GIG Milestone Reports are published at the JRC CIRCA Information exchange platform in the December 2011[17].

In the first stage of intercalibration macrozoobenthos in relation to rivers was intercalibrated. Both Lithuania and Latvia proposed their own methods implemented in the countries: Lithuania – Danish Stream Fauna Index (DSFI), Latvia – national Saprobity index developed in the country. The Saprobity index reflects the level of pollution by organic matter. Unfortunately, the intercalibration results for Latvia were failure because the method was not appropriate for assessment of general degradation of rivers which was actually intercalibrated. In its turn, DSFI was successfully intercalibrated.

Following, the fate of Saprobity index within the framework of implementation process of WFD is not clear.

In 2008 Latvia launched the project "Elaboration of scientifically based ecological classification system for surface water according to WFD" within which new assessment method Latvian Macroinvertebrate Common Index or Latvian Macroinvertebrate Common Metrix (LMCM) was proposed based on combination of two methods - DSFI and Average Score per Taxon (ASPT)[18]. The method was additionally suggested for the common EU intercalibration exercise however it is indicated by involved experts that the new method is applicable mainly for assessment

[17] European Commission Environment. Ecological status and intercalibration. http://ec.europa.eu/environment/water/water-framework/objectives/status_en.htm

[18] Latvijas Universitāte.Virszemes ūdenu ekoloģiskās klasifikācijas sistēmas zinātniski pētnieciskā izstrāde atbilstoši Eiropas Parlamenta un Padomes Direktīvas 2000/60/EK (2000. gada 23.oktobris), ar ko izveido sistēmu Kopienas rīcībai ūdens resursu politikas jomā prasībām. 2009.

of organic pollution. Nevertheless, active intercalibration process of river zoobenthos was already ended. Discrimination of all five quality classes in relation to LMCM for small and medium river types is proposed, as well. In the new Latvian monitoring program for 2009-2014 it is not indicated whether LMCM is suggested for application instead of Saprobity index. Assessment of applicability of LMCM should be continued but is has not been done due to lack of financing.

As regards the lakes, chlorophyll a intercalibration was successfully completed during the first stage of intercalibration process both in Latvia and Lithuania.

It shall be added that applicability of other biological quality elements (macrophytes, fishes, etc.) for assessment of ecological quality have been studied within the mentioned Latvian project but final conclusions are not drawn because these investigations should be continued. Furthermore, in the last years Latvia has not participated in the common intercalibration process due to lack of financing. It should be mentioned that Lithuania has also stopped its participation in the intercalibration process since 2011 or a bit earlier due to lack of resources but regarding some of the biological elements, for instance, zoobenthos in lakes was more successful than Latvia.

With respect to the second stage of intercalibration Final GIG Milestone Reports contain outcomes concerning macrophytes intercalibration in rivers as well as macrophytes, phytoplankton and zoobenthos intercalibration in lakes. It must be pointed out that fish fauna intercalibration is still not ended.

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December 2011. http://circa.europa.eu/Public/irc/jrc/jrc_eewai/library?l=/intercalibration_6&vm=detailed&sb=Title (accessed on 4 February 2012).

3.6. Characterization of water monitoring system

3.6.1. Legal basis

Generally, the environmental monitoring in Latvia and Lithuania is regulated by a number of wide-ranging legal acts:

In Latvia -

- Regulations of the Cabinet of Ministers Nr. 158 on requirements for environmental monitoring and its performance, establishment of register of polluting substances and availability of information for the public (2009, last amended in 2010);
- Order Nr. 187 of the Cabinet of Ministers dated 11 March 2009 on the guidelines on the environmental monitoring program for 2009-2012;
- Order Nr. 121 of the Minister of Environment dated 19 April 2010 on the environmental monitoring program[19].

In Lithuania-

- Law of the Republic of Lithuania on Environmental Monitoring (1997);
- Resolution Nr. 130 of the Government of the Republic of Lithuania dated 7 February 2005 on the approval of State Environmental Monitoring Programme for 2005-2010;
- Resolution Nr. 315 of the Government of the Republic of Lithuania dated 2 March 2011 on the State Environmental Monitoring Programme for 2011-2017.

Additionally, specific requirements for water monitoring are given by the following key special legal acts on water protection and management:

In Latvia –

- Law on Water Management (2002, last amended in 2011);
- Regulations of the Cabinet of Ministers Nr. 92 on requirements for monitoring and elaboration of monitoring programs in relation to surface water, groundwater and protected areas (2004, last amended in 2010);
- Regulations of the Cabinet of Ministers Nr. 235 on obligatory requirements for safety and quality of drinking water, procedure of monitoring and control (2003, last amended in 2010);
- Regulations of the Cabinet of Ministers Nr. 608 on bathing water monitoring, quality assurance and requirements for public information (2010, last amended in 2011);

[19] Environmental Monitoring Program for 2009-2014

In Lithuania-

- Law of the Republic of Lithuania on Water (1992, last amended in 2003);
- Order Nr. 726 of the Minister of Environment dated 31 December 2003 on the on the approval of general provisions for the monitoring of water bodies;
- Law of the Republic of Lithuania on Drinking Water Supply and Wastewater Management (2006);
- Bathing Water Quality Monitoring Program for 2009-2011 approved by Resolution Nr. 668 of the Government of the Republic of Lithuania on 25 June 2009.

The national environmental monitoring programs are the basic documents outlining monitoring networks, sampling frequencies and parameters in question as well as related methods. It should be stressed that Latvian monitoring program for 2009-2014 is more detailed but Lithuanian program for 2011-2017 more general giving only the overall framework and key figures with respect to number of sampling stations and sampling frequencies. For the particular year implementation plans of Lithuanian national environmental monitoring program, including surface water and groundwater monitoring, are elaborated and approved by the minister of environment. Such approach is more flexible.

3.6.2. Concept on surface water monitoring according to WFD

WFD provides quite complicated concept on surface water monitoring differentiating a number of monitoring types (surveillance, operational, investigative) and proposing different quality elements (physico-chemical, biological, hydromorphological), which could contain a broad number of specific parameters. According to the monitoring type and quality element with its particular parameter in question there are specific sampling frequencies and times during the actual calendar year and changing necessity for the repetition of observations in the following years within the six-year period chosen as the main single implementation stage of WFD (Fig. 3.6.1). The detailed tactical solutions in relation to performance of surface water monitoring is up to the countries but all quality elements provided by the WFD must be implemented for assessment of water body which is quite disputable from scientific point of view and creates much difficulties for the EU member states.

Pursuant to the requirements of WFD and, following, of the *Law of the Republic of Lithuania on Water* as well as of the Regulations of the Cabinet of Ministers of the Republic of Latvia Nr. 92 *on requirements for monitoring and elaboration of monitoring programs in relation to surface water, groundwater and protected areas*, 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 programs` implementation period, on provision of conditions for the attainment of good ecological and chemical status of rivers, lakes, ponds, and related ecosystems. As it was indicated previously, monitoring is carried out in accordance with the national environmental monitoring programs in both countries.

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 the legal acts, the surveillance monitoring network is selected so in order to enable an assessment of the status of water bodies within each river basin district, basin or sub-basin.

Taking into account the monitoring site and the importance of information in respect of the entire river basin district, surveillance monitoring was subdivided into two types in Lithuania: intensive (conducted every year) and extensive (conducted at least once during the implementation of the management plan in a RBD). Surveillance intensive monitoring sites have been selected:

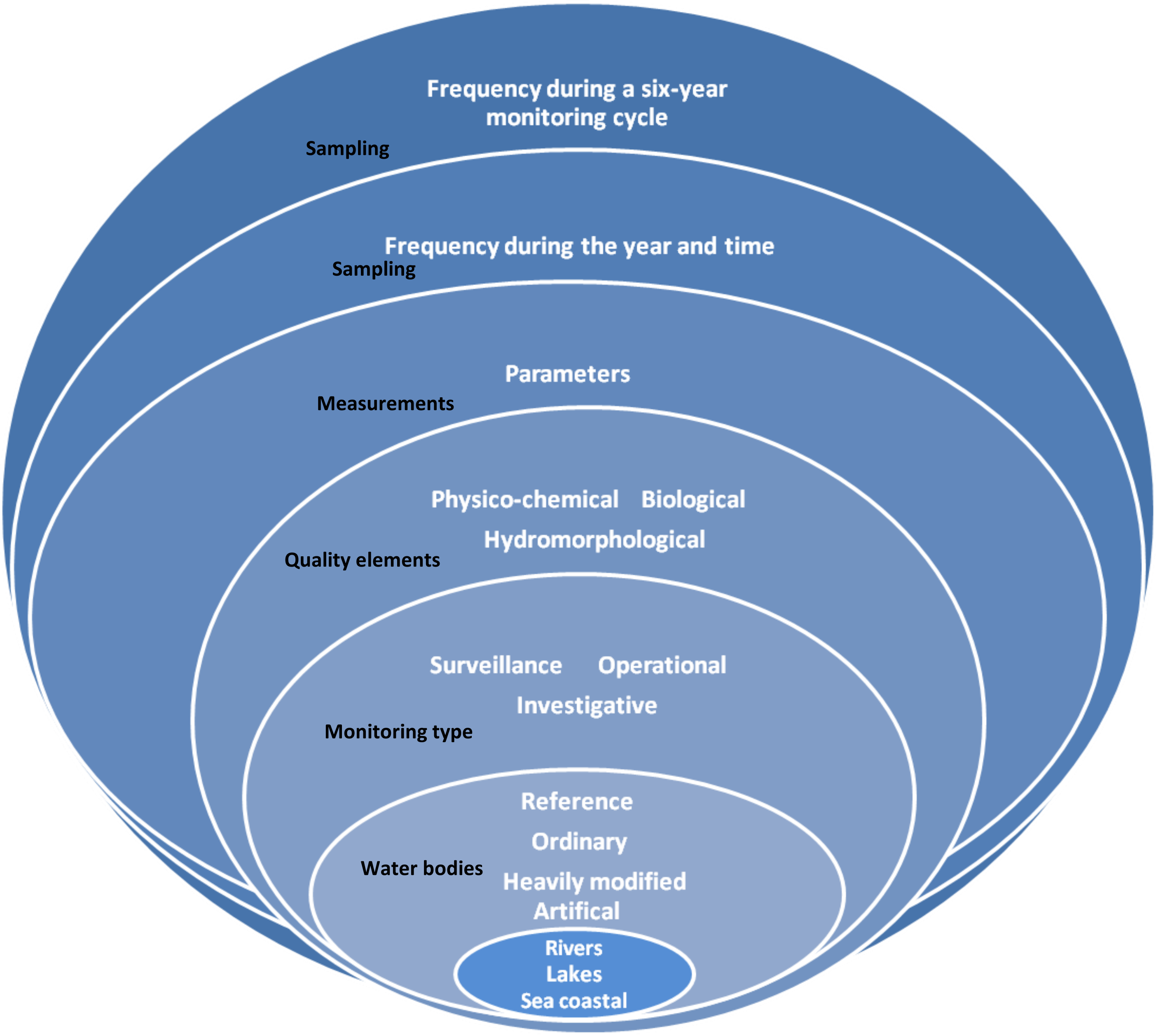

Figure 3.6.1. Complex model of surface water monitoring according to WFD.

- in the major rivers of the basin;
- in transboundary water bodies situated at the border;
- in water bodies suffering from significant agricultural pressures;
- in reference water bodies (unaffected by anthropogenic pressures);
- in other water bodies of national significance.

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.

Such differentiation of surveillance monitoring into intensive and extensive monitoring is not given by Latvia however there is variability concerning sampling frequencies within surveillance monitoring program resembling Lithuanian approach.

Operational monitoring is undertaken in water bodies where the current ecological status or ecological potential 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 programs 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.

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.

Much easier is the monitoring concept of groundwater in the framework of which only quantitative as well as qualitative chemical monitoring is distinguished.

3.6.3. General comparison of water monitoring networks and programs in the countries

The key objective of monitoring programs is to establish and monitor the status of all water bodies in the country including heavily modified and artificial water bodies. – rivers, lakes, sea coastal zone and groundwater aquifers and therefore the network of monitoring sites is established in respect of water bodies of all kinds. In Lithuania the possibility of grouping of river water bodies with the same natural conditions and anthropogenic influences has been applied since **51** river monitoring stations are generally reflecting the status of all **104** river water bodies in the Venta RBD. Additionally, **20** water bodies in the category of lakes and ponds have been identified and monitored because according to Lithuanian experts lakes are considered more individually variable and not subject to grouping. Again, it must be said that the grouping approach is not clear declared and applied in Latvia as well as Latvia don’t have pond water bodies.

Comparison of number of all water monitoring stations in Latvia and Lithuania is shown in the Figure 3.6.2. Only Latvia has **23** sea coastal stations within four coastal water bodies but Lithuanian part of Venta RBD does not have any coastal water body. Totally Latvia has more different water monitoring stations (**64** river, **31** lake and **27** groundwater stations in comparison to Lithuanian **51** rivers`, **20** lake and pond as well as **19** groundwater stations) but it should be taken into account that Latvian part of Venta RBD is almost two times larger.

With respect to biological quality elements monitored in the inland surface water Lithuania has more developed system of hydrobiological monitoring (Fig. 3.6.3 and 3.6.4) as Latvia has still not established its national fish and phytobenthos monitoring in relation to implementation of WFD. The same statement must be done with regard to physicochemical monitoring. Lithuania has grouped all quality elements concerning monitoring for supporting of implementation of RBD management plans in a number of so called analytical packages which allows easy to manage the monitoring process. Grouping of different parameters within analytical packages suggested by Lithuania (13 for rivers and 11 for lakes and ponds) provides the possibility to compare both countries, as well. Routine monitoring of specific pollutants (heavy metals in the water and in the bottom sediments and biota as well as priority and hazardous substances in all these media establishing four different analytical packages) is now postponed in Latvia until a number of special projects on identification of specific pollutants in water systems will be finished in the near future. It must be underlined that some groups of specific pollutants in the lakes and ponds in Lithuania are envisaged for investigative monitoring only.

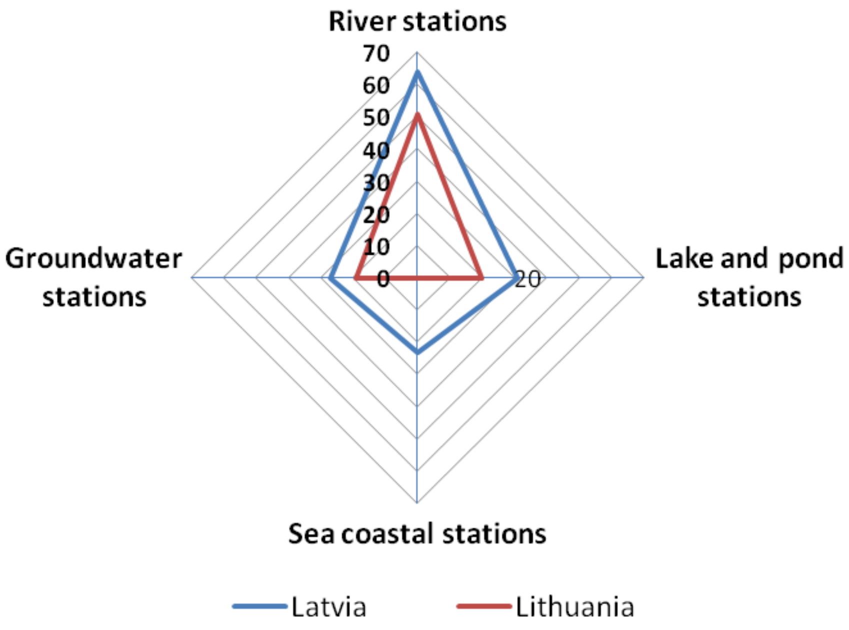

Figure 3.6.2. Comparison of water monitoring network in Latvia and Lithuania regarding Venta RBD.

The **general chemical parameters** monitored in both countries include temperature, water colour (Pt mg/l), pH, transparency (only in lakes and ponds), oxygen concentration, BOD_5 or BOD_7, suspended matter, P total, PO_4-P, N mineral, N total, NO_3-N, NH_4-N, NO_2-N, TOC, COD, Ca, electric conductivity, alkalinity as well as the main ions Cl, SO_4, Na, K, Mg, Si, etc. The sampling frequency in Lithuania is from one to 12 times per year for each year during the six-year period for surveillance intensive monitoring or up to four times per year and only some years or even one year within the six-year period for surveillance extensive and operational monitoring, being generally more rarely in lakes and ponds. In Latvia a special approach for surveillance monitoring is adopted based on intensive sampling usually 12 times per year for one year and then followed by 6 times sampling in the next five years in rivers and 4 times – in lakes. As it was indicated previously Latvia doesn't discriminate between intensive and extensive surveillance monitoring. As regards the operational monitoring, sampling is performed 4 times per year only one year during the six-year period.

With respect to **biological elements** (macrophytes, zoobenthos, phytoplankton, phytobenthos and fishes) species composition, abundance of individuals of each species and sometimes biomass is determined. Additionally bottom coverage with each species for macrophytes and age structure for fishes is described. In relation to phytoplankton abundance and biomass of indicative groups, for example, cyanobacteria is determined as well as chlorophyll a being a simple way how to assess the overall biomass of phytoplankton is analyzed. Data on biological parameters are translated into a number of indices, for example Danish Stream Fauna Index (DSFI) in Lithuania or Saprobity Index in Latvia with regard to zoobenthos in rivers or fish indices in Lithuania.

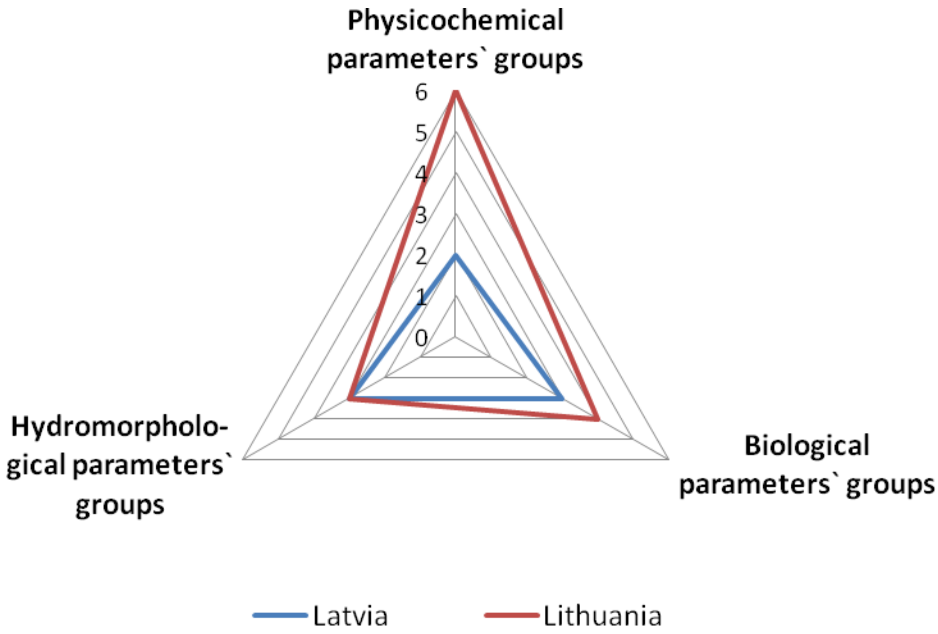

Figure 3.6.3. Number of parameters` groups of different quality elements for surveillance and operational monitoring of rivers.

Notes: Biological parameters` groups in Latvia: macrophytes, zoobenthos, phytoplankton. Biological parameters` groups in Lithuania: macrophytes, zoobenthos, phytobenthos, fishes.

Concerning sampling frequency for biological elements macrophyte communities are considered in both countries as the most inert ones among biological elements because their reaction to qualitative changes in their living environment is exceptionally slow. The same considerations are relevant for fish fauna and zoobenthos in Lithuanian lakes as water exchange rate is much lower in lakes and ponds than in rivers, hence communities of fish fauna and zoobenthos also change very slowly. Consequently, the mentioned biological elements are sufficient to be monitored once in six years[20].

Zoobenthos in rivers is sampled one time per year each year during the six-year period for surveillance intensive monitoring or each third year for surveillance extensive and operational monitoring in Lithuania. In Latvia zoobenthos in rivers and lakes for surveillance monitoring is sampled more often – up to two times per year and almost each year during the six-year period and one time during the six-year time span for operational monitoring. Fishes in Lithuanian rivers are sampled one time per year each third year for all types of monitoring but phytobenthos more often – three times per year and each year for surveillance intensive monitoring and from one to three times each third year for surveillance extensive and operational monitoring, respectively.

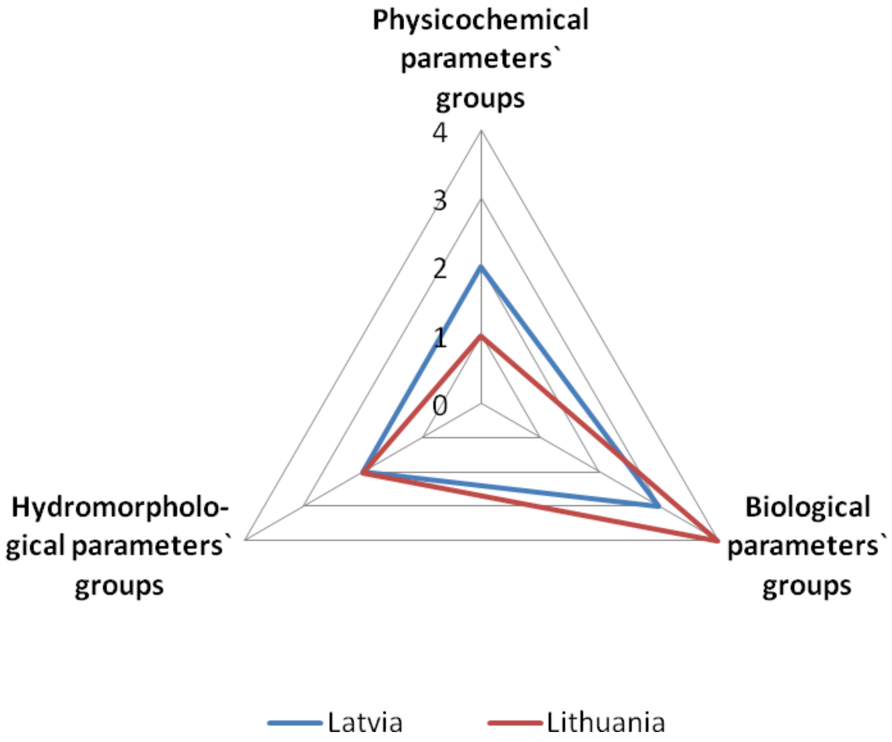

Figure 3.6.4. Number of parameters` groups of different quality elements for surveillance and operational monitoring of lakes and ponds.

Notes: Biological parameters` groups in Latvia: macrophytes, zoobenthos, phytoplankton. Biological parameters` groups in Lithuania: macrophytes, zoobenthos, phytoplankton, fishes.

Phytoplankton in Lithuanian lakes and ponds is sampled during the vegetation period 6 times per year and each year for surveillance intensive monitoring and 4 times only in one year (surveillance extensive monitoring) or each third year (operational monitoring) during the all six-year period. In Latvian lakes it is done only 4 times per year each year (surveillance monitoring) or even two times per year only

[20] With exception for some reference sites

one year during the all period (operational monitoring) which seems to be a bit not sufficient.

It is proposed to sample phytoplankton and in Latvian rivers from 2 to 4 times per year according to usual regime of hydrochemical monitoring but the relevance for assessment of ecological quality is questionable.

With respect to **hydromorphological quality elements** hydrological regime (water level and discharge) in rivers is minimally determined 12 times per year each year for surveillance intensive monitoring and 4 times (covering the main hydrological phases) each third year for other types of monitoring but in the case of automated monitoring stations it is possible to obtain continuous data flow. For other hydromorphological parameters (morphological conditions in rivers and lakes, river continuity and water exchange rate for lakes) it is enough to do assessment once during the all six-year period.

According to the marine monitoring program of Latvia in the coastal water bodies, additionally to the general chemical and biological parameters already mentioned, zooplankton is analyzed however it is not included in the WFD as an obligatory biological quality element what is probably an error. Besides, heavy metals are determined in mollusks *Macoma baltica*, fishes *Perca fluviatilis* and algae *Fucus vesiculus* one time per year in a selected number of stations. Sampling for chemistry is envisaged from 4 to 10 times per year, for plankton – up to 8 times per year but for zoobenthos - one time per year each third year.

Additionally to the surface water monitoring already outlined, in a selected number of stations in both countries radioactive monitoring of water is carried out determining usually ^{137}Cs isotope and total β radioactivity once per three years. For instance, in the Latvian part of Venta RBD it is done in the river mouth of Venta and in the lakes Liepāja and Engure. Besides, in the Lithuanian monitoring program sediments and biota are proposed to be covered, too.

Groundwater monitoring is composed of **quantitative** and **qualitative** chemical monitoring. Quantitative assessment covers water table measurements usually manually from 4 to 12 times per year (monthly measurements) or several times per day in the case of automated measurement systems. General chemical parameters for qualitative assessment are temperature, pH, oxygen concentration, electric conductivity, reduction-oxidation potential, COD, TOC, total Fe, N mineral, N total, NO_3-N, NH_4-N, NO_2-N, water hardness, as well as the main ions Cl, SO_4, Na, K, Ca, Mg, Si, hydrocarbonates, etc., which are analyzed from 2 to 6 times during the total six-year period (so, one time per year in a more often regime of monitoring). Additionally, specific pollutants – heavy metals, pesticides and other specific organic pollutants are determined up to two times within the whole six-year period. Besides, radioactive substances in specially selected places are monitored 1-2 times during the year depending on the particular parameter the spectrum of which is a bit broader than in the case of surface water monitoring.

Lithuania proposes more sophisticated approach to groundwater monitoring based on protection level of water aquifers. Groundwater sampling for assessing general chemical composition and biogenic elements is more frequent (at least once a year) in shallow aquifers the composition of which is changing more rapidly, and less frequent (every two years) – in confined aquifers. Generally, the monitoring is organized on the principle of rotation. Specific chemical components, such as organic compounds, pesticides, metals the concentrations whereof in groundwater are very low, are monitored once in five years in selected wells where these components are likely to be detected. Besides, the groundwater table in confined aquifers is usually measured only prior to the sampling.

3.6.4. Number and placement of water monitoring stations in the countries

The number of monitoring sites for **rivers** in the Lithuanian part of Venta RBD is provided in the Table 3.6.1 below. Furthermore, the map of river monitoring network is given in the Figure 3.6.5. Totally, the monitoring program covers **51** sites. The surveillance intensive monitoring program also includes observations in the river flowing into the Baltic Sea (1 site) and 3 sites at transboundary rivers as well as in 2 rivers subject to agricultural pressures.

Table 3.6.1

Type and number of monitoring sites for rivers within the Lithuanian part of Venta RBD

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

According to the newest Latvian surface water monitoring program, there are **64** river monitoring stations within Venta RBD (Tab. 3.6.2 and Fig. 3.6.5).

Table 3.6.2

Type and number of monitoring sites for rivers within the Latvian part of Venta RBD

Surveillance monitoring sites	Operational monitoring sites	Investigative monitoring sites	Total
11	51	2	**64**

The number of monitoring sites for **lakes and ponds** within the Lithuanian part of Venta RBD is provided in the Table 3.6.3 below and the related monitoring network is displayed in the Figure 3.6.5. There are **20** monitoring sites in lakes and ponds in total.

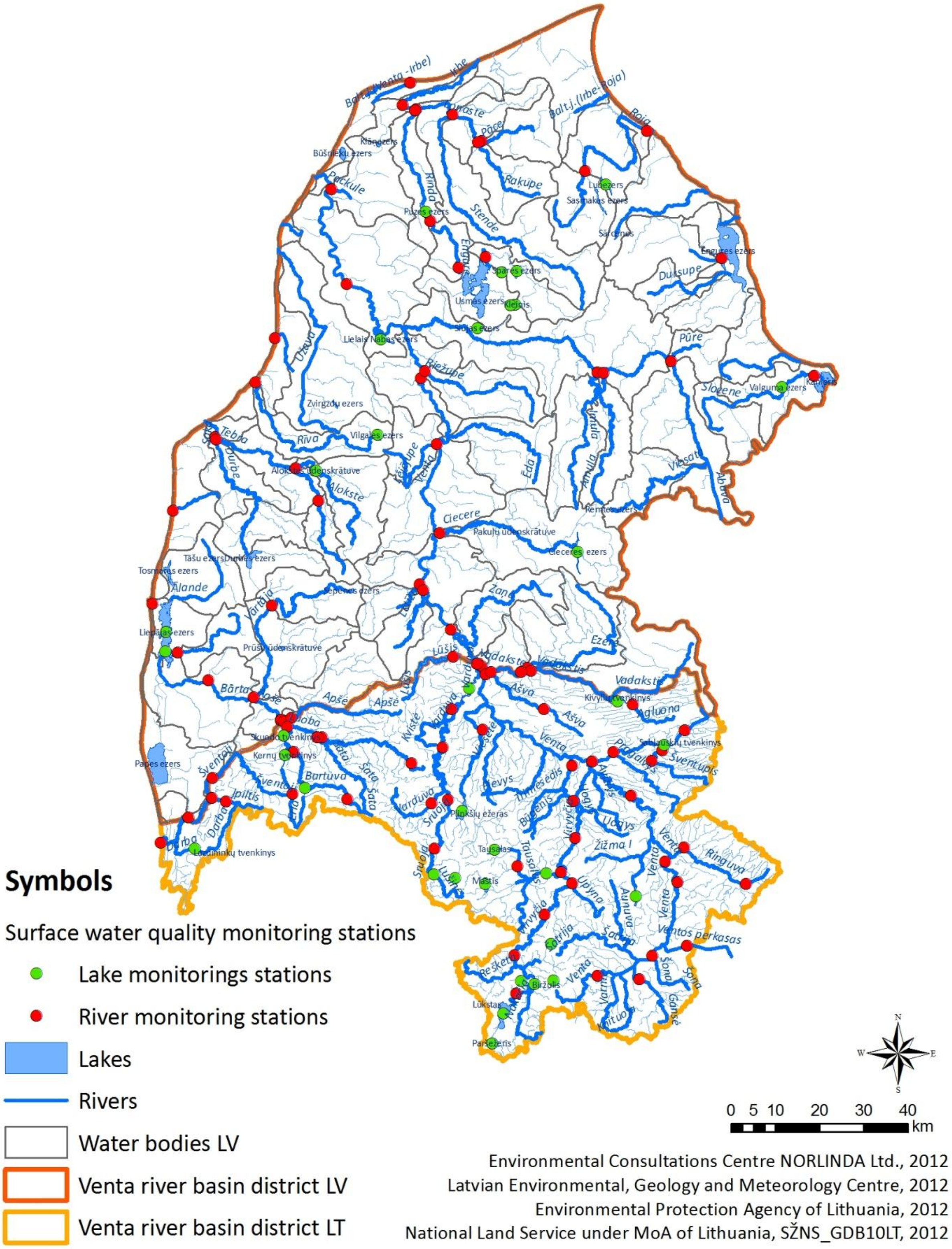

Figure 3.6.5. Surface water monitoring network within the Venta RBD.

Table 3.6.3

Type and number of monitoring sites for lakes and ponds within the Lithuanian part of Venta RBD

Basin	Number of monitoring sites of lakes				Number of monitoring sites of ponds		
	Surveil-lance intensive	Surveil-lance extensive	Opera-tional	Investi-gative	Surveillance extensive	Opera-tional	Investi-gative
Venta	1	5	2	4	1	2	1
Bartuva	0	0	0	0	2	1	0
Šventoji	0	0	0	0	1	0	0
Total	**1**	**5**	**2**	**4**	**4**	**3**	**1**

Concerning Latvian part of Venta RBD, **31** lake monitoring sites have been established (Tab. 3.6.4 and Fig. 3.6.5).

Table 3.6.4

Type and number of monitoring sites for lakes within the Latvian part of Venta RBD

Surveillance monitoring sites	Operational monitoring sites	Investigative monitoring sites	Total
4	26	1	**31**

Hydrological monitoring network of Venta RBD in Lithuania is subordinated to existing water sampling stations and is separately not reported in the Lithuanian management plan of Venta RBD. On the opposite, Latvia has historically separately located hydrological monitoring stations not always coinciding with existing water sampling stations, so calculations in relation to water quality sites must be done. Totally, there are **21** hydrological monitoring stations within Venta RBD of Latvian part including rivers, lakes and sea coastal area (Fig. 3.6.6).

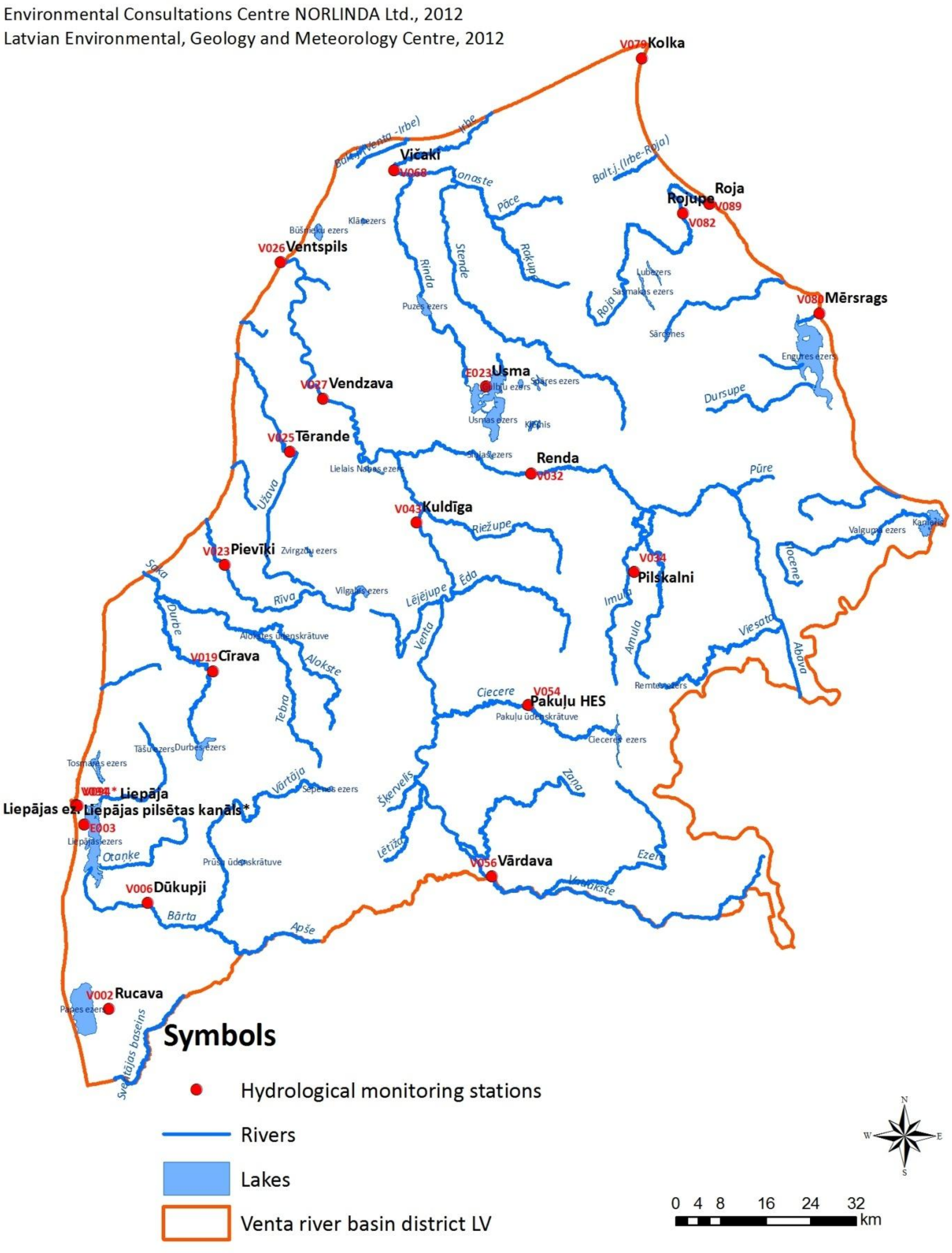

Figure 3.6.6. Hydrological monitoring network in the Venta RBD of Latvia.

Only Latvia has sea coastal water bodies assigned to Venta RBD with **18** general monitoring sites (Tab. 3.6.5 and Fig. 3.6.7) and **5** point or polygon supplementary stations for determination of toxicants (only heavy metals for the moment) in biota.

Table 3.6.5

Number of monitoring sites for sea coastal water bodies within the Latvian part of Venta RBD

Name of water body	Number of monitoring sites
Baltic south eastern open stony coast	6
Baltic south eastern open sandy coast	7
Riga Gulf sandy coast	4
Riga Gulf stony coast	1
Total	**18**

All marine monitoring stations are divided into two large groups – intensive monitoring stations to be sampled up to **10** times per year and seasonal monitoring stations to be sampled **4** times per year during a particular season of the year.

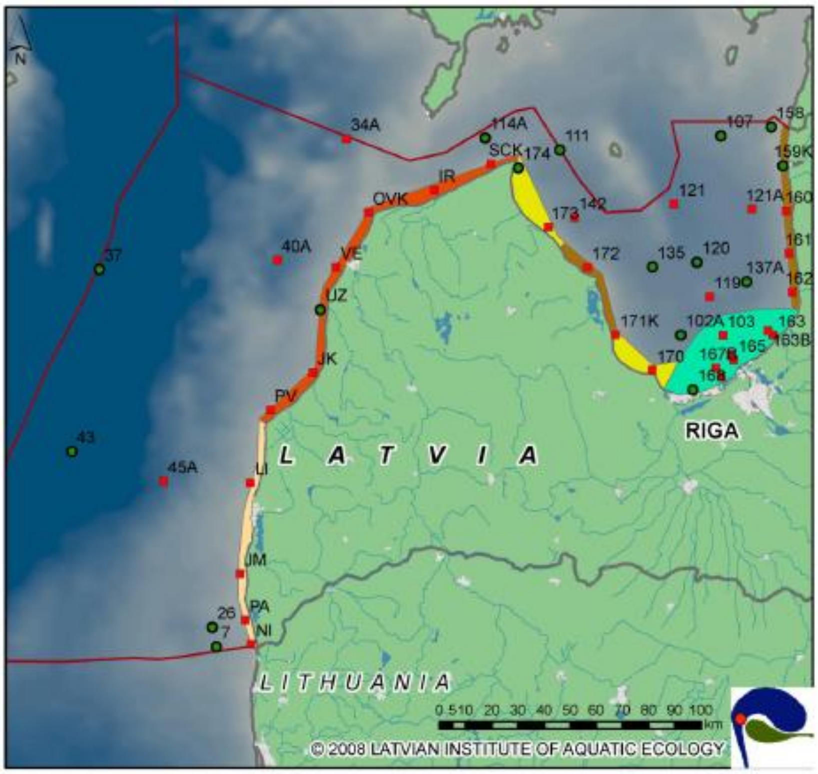

Figure 3.6.7. Sea coastal monitoring network within the Latvian part of Venta RBD.

Red dotes – intensive monitoring stations
Green dots – seasonal monitoring stations

With regard to **groundwater** monitoring network in Lithuanian part there were **6** stations in shallow aquifers and **13** stations in confined aquifers both for monitoring of quantitative and qualitative status with a much more amount of boring wells in each station. Almost the same network is included in the new environmental monitoring program for 2011 – 2017 (Fig. 3.6.8). It is claimed that the Lithuanian 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. But the interconnection of groundwater with surface water and other ecosystems was practically not taken into account. This has resulted in uneven distribution of the national groundwater monitoring posts in individual river basins.

Table 3.6.6

Sites for groundwater monitoring within the Lithuanian part of Venta RBD

Basin	Type of aquifer	
	Shallow	Confined
Venta	5	10
Bartuva	1	2
Šventoji	0	1
Total	**6**	**13**

Figure 3.6.8. Groundwater monitoring network in the Lithuanian part of Venta RBD.
Red dots – monitoring stations in confined aquifers
Green dots – monitoring stations in shallow aquifers

On the contrary to Lithuania, Latvia doesn't discriminate between shallow and confined aquifers establishing its groundwater monitoring program and network consisting of **19** stations in **13** of which qualitative monitoring in approximately 50 boring wells is carried out, as well (Fig. 3.6.8). Additionally, **8** springs in Venta RBD are covered by qualitative monitoring observations providing supplementary data on status of groundwater resources.

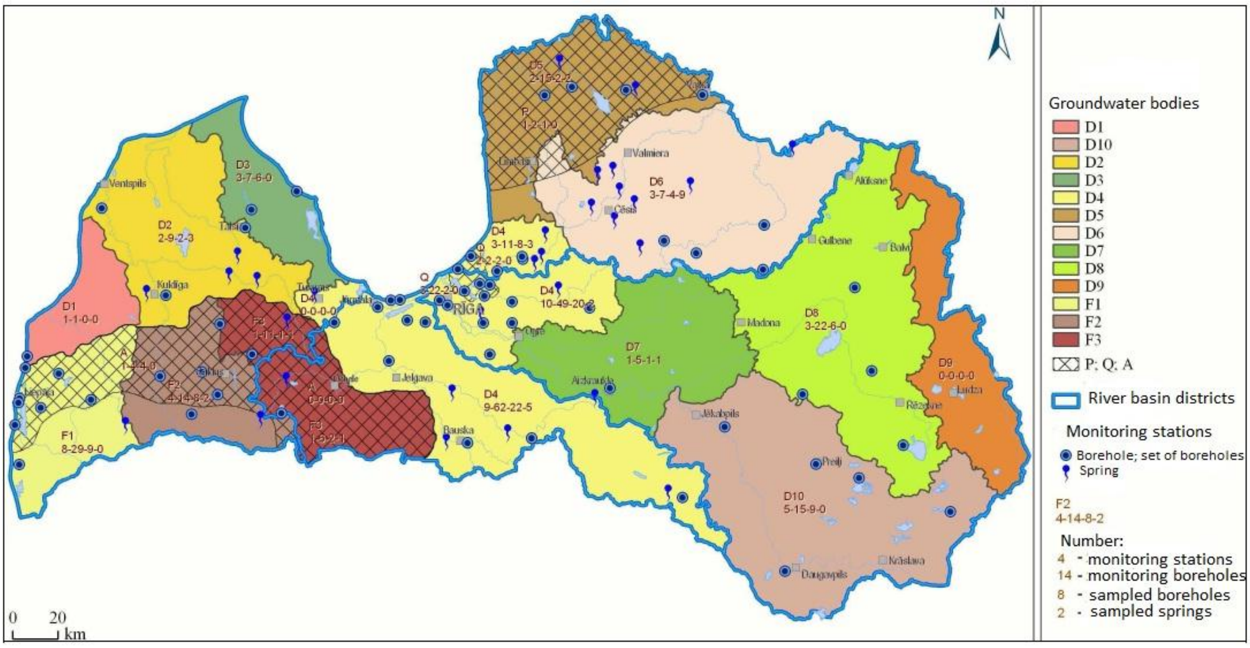

Figure 3.6.8. Groundwater monitoring network in Latvia.

3.6.5. Actual range of water monitoring in the last years

It should be mentioned that water status monitoring in Latvian part of Venta RBD during 2006 - 2008 which was used for the first assessment supporting the first RBD management plan included 68 surface water quality monitoring stations in rivers` water bodies and 30 stations in lakes` water bodies as well as 13 hydrological monitoring stations.

The newest Latvian monitoring program for 2009 - 2014 could be considered as theoretically more or less optimal observations` program of water. Unfortunately, due to the lack of funding the total number of monitoring stations as well as sampling frequency was greatly reduced in 2009, 2010 and 2011 including Venta RBD. During 2009 observations in 27 rivers` sites and 11 lakes` sites have been performed with sampling effort for chemical parameters 2-6 times but until July only. Also one time zoobenthos and from 1 to 3 times phytoplankton was sampled. In its turn, during 2010 the limited range of monitoring has been carried out from July till October covering 10 rivers` stations and 4 lakes` stations. Water chemistry was sampled 4 times but zoobenthos and phytoplankton – from 1 to 2 times. Actually, hydrochemical and phytoplankton data obtained in such a way do not allow an objective assessment of ecological quality of water bodies.

In 2011 the sampling was even more infrequent - 3 times per year for water chemistry however rather well distributed over the year. Again, only 10 rivers` stations and 7 lakes` stations were monitored in the Latvian part of Venta RBD.

In relation to groundwater monitoring in 2009, quality assessment is performed in 9 groundwater monitoring stations. Similarly to 2009, quantity measurements were carried out in all 19 groundwater stations in 2010 also, but the qualitative monitoring was not performed due to lack of financing. Unfortunately, this is the case in 2011, too.

The total amount of sea coastal monitoring stations is dropped a little but the sampling frequency was reduced dramatically to 4 times in 2009, to 2 times in 2010 and even to 1 time in 2011 irrespective of initial division of stations by their functionality.

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