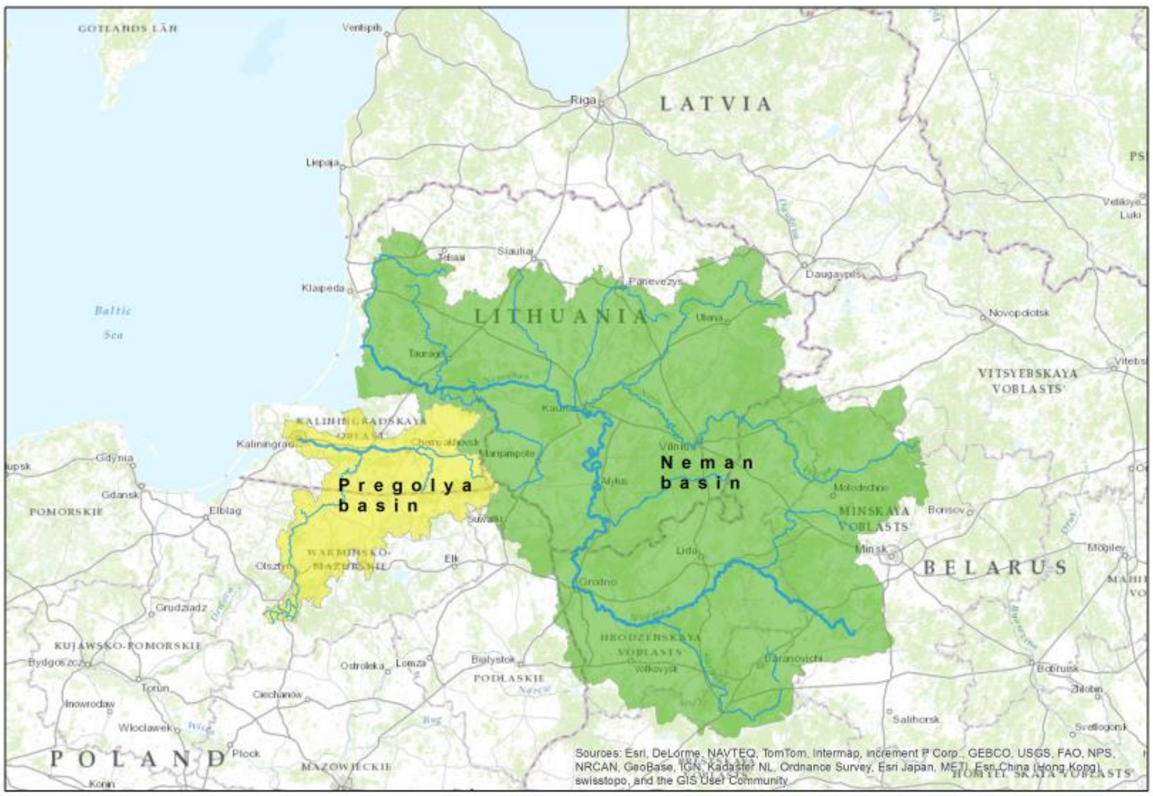
FINAL DRAFT

NEMAN & PREGOLA RIVER BASIN MONITORING PLAN

A Transboundary NGO-led partnership between Coalition Clean Baltic,
Belarus Center for Environmental Solutions, Lithuanian Fund for Nature,
Green Front, Green Planet, and the Polish Ecological Club



28 January 2017

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I. Executive Summary

Neman and Pregola River Basin Monitoring Plan is a transboundary NGO-led partnership created in 2016 between Coalition Clean Baltic, Belarus Center for Environmental Solutions, Lithuanian Fund for Nature, Green Front, Green Planet, and the Polish Ecological Club.

The Neman and Pregola

The Neman/Nemunas River is the 14th largest in Europe and the fourth largest in the Baltic Sea basin. The river drains the territories of Belarus, Lithuania, Russia (Kaliningrad Oblast), and Poland; originating in Belarus and flowing through Lithuania before draining into the Curonian Lagoon and then into the Baltic Sea. The quality of the water is influenced by a number of factors, primarily linked to industrial and agricultural production and inadequate household wastewater treatment. The implementation of the EU Water Framework Directive has revealed that most streams within the Neman river basin did not qualify for "good ecological status" and that a reduction of both nitrate and phosphorus pollution is required. Transboundary pollution management is absolutely critical in this basin as half of the total pollution load reaching the Baltic Sea through the Neman River originates in Belarus. Similar issues affect the smaller, adjacent Pregola River basin which drains the territories of Russia (Kaliningrad Oblast) and Poland. The river originates in Poland and flows through the city of Kaliningrad before discharging to the Vistula Lagoon and the Baltic Sea.

The Neman and Pregola Rivers have been identified as severely polluted and their poor environmental status represents an ongoing challenge to international efforts to restore the Baltic Sea environment. Management of these rivers requires close transboundary cooperation which has been so far politically difficult.

Project Background

Through creation of an NGO-designed and led Neman and Pregola River Monitoring Network, this project directly addresses these related challenges - poor water quality, weak transboundary cooperation, and low NGO capacity.

With 2014 funding from the Nordic Council of Ministers (NCM), NGOs in Kaliningrad came together to explore new ways to enhance river protection efforts on the Neman and Pregola. Joining them for the first time were NGOs in Lithuania and Belarus and the project produced an important "Statement of Shared Vision" for future river protection work together. The Top Priorities outlined in the Shared Vision was the development of an NGO river monitoring network.

In 2016, these NGOs again joined forces, this time expanding to include the regional Coalition Clean Baltic, Polish Ecological Club and Kaliningrad-based Green Planet.

River Basin Monitoring Programme Goals and Objectives

The Neman-Pregola River Basin Monitoring Program is designed on a citizen science model and establishes a clear strategy for sustained leadership by NGOs, active engagement of citizen scientists in communities all along the rivers to collect water quality data and educate their neighbours about river health, and strong academic partnerships to help ensure data quality and credibility. Therefore the Programme is based on the following goals and objectives.

1. **Build NGO capacity, encourage sustained transboundary cooperate**
2. **Development of valuable surface and groundwater data needed to help address pollution**
3. **Community education and engagement of volunteers to support monitoring system.**

Project Organization and Responsibilities - NGO Partners and Scientific Advisors

With Coalition Clean Baltic serving as the central coordinating entity, the Neman-Pregola River Basin Monitoring Program is managed within each county by a local NGOs with scientific partners from respected academic institutions and laboratories.

Table 1. Proposed setup of public river monitoring for Neman and Pregola basins

Country	NGO Lead	Scientific Advisor	Supporting Laboratory
Belarus	Belarus Center for Environmental Solutions	Grodno State University, Belarusian State University	Central Research Institute for Complex Use of Water Resources
Lithuania	Lithuanian Fund for Nature	Aleksandras Stulginskis University - Faculty of water & land management, Resources Engineering Institute, laboratory of environ. Monitoring	Laboratory of Evolutionary Ecology of Hydrobionts of The Nature Research Centre
Poland	Polish Ecological Club (Polski Klub Ekologiczny – PKE)	Warmia-Mazury University, Olsztyn	Regional Inspectorate Environmental Protection in Olsztyn and Białystok
Russia	Green Front Kaliningrad with support from Green Planet	Immanuel Kant Baltic Federal University	Atlantic Research Institute of Fisheries and Oceanography (AtlantNIRO)

Monitoring Locations, Parameters and Methods

Sampling locations were selected by NGO partner leads in each country with consultation with local scientific advisors. In all countries, priority was given to (1) areas not presently monitored by government programs, (2) transboundary areas shared by two counties, and (3) areas near known pollution sources. A mix of river surface waters and groundwater wells was identified as the best strategy for broadly characterizing water quality conditions in each country. Number of monitoring stations was correlated with the size of the river basin in each country as follows:

Table 2. Proposed number of public monitoring stations per country

Country	Surface water (rivers)		Groundwater (wells)		Total	
Basin	*Neman*	*Pregola*	*Neman*	*Pregola*	*Neman*	*Pregola*
Belarus	14		6		20	
Lithuania	11		4		15	
Poland	2	3			2	3
Russia	3	4	1	2	4	6

Map of proposed monitoring stations is presented at Figure 6.

With nutrient (nitrogen and phosphorous) pollution representing the most serious threat to the health of the Neman and Pregola River basins, the following parameters were agreed to be selected for this monitoring programme: **Temperature**, **Water Clarity**, **Acidity (pH),** Dissolved Oxygen (DO), and **Nitrogen & Phosphorus levels**.

Analysis of these parameters are managed through two readily-available, reliable and tested Water Quality Test Kits: the **Lamotte Basic Test Kit** covering DO, temperature, and pH and the **Aquamerck Compact Laboratory** for evaluation of Nitrogen and Phosphorous concentrations.

Data Management and Sharing

Each NGO lead will collect, quality check and upload data from the monitoring stations in their country to a shared on-line database which will organize and make the data available to all partners and the general public. Based on the successful www.watercontrol.by and managed by the Belarus Center for Environmental Solutions, the database will allow for universal access to the data as well as mapping tools to identify possible pollution sources and relationships.

Program Funding Needs

Due to the strength of Coalition Clean Baltic as the coordinating body combined with the established connections of each country NGO lead organization, the Neman-Pregola River Basin Monitoring Program represents a highly cost-effective means for managing citizen science volunteers in the collection, analysis and dissemination of quality data on river and groundwater health in Belarus, Lithuania, Poland and Russia.

$35,000 has been identified as Start-Up Capital Equipment costs, largely for Water Testing Kits, and $75,000 are the annual Operating Costs. The partners are committed to maintaining their close cooperation while long-term funding sources are secured for the program's implementation

II. River Basin Characterization

A. Neman River Basin

1. Geography and overview

The Neman river basin drains the territories of Belarus, Lithuania, Russian Federation (Kaliningrad Region), Poland and Latvia (only about 100 km^2). The Lithuanian part of the basin covers the area of 46 626 km^2. The total length of the river is 937 km, and the basin area constitutes 97 928 km^2. The Neman is a slow river – it flows at about 1 to 2 m/s. Its greatest depth is about 5 m and at its widest part extends about 500 m. Severe floods occur on the lower reaches of the river about every 12 – 15 years.

The river's source is located in Belarus and it flows into the Baltic Sea. The longest and the largest (by their catchment size) tributaries of the Neman in Lithuania are the Merkys, Neris, Nevėžis, Dubysa, Šešupė, Jūra, and the Minija. Other tributaries are the Shchara, Svisloch, Zelvyanka, Molchad, Roś, Servech, Losha, Gorodnichanka.

A one nautical mile wide strip of coastal waters assigned to the Neman river basin district stretches along 100 km of the Lithuanian coastline. The Curonian Lagoon, a freshwater coastal lagoon in the southeast of the Baltic Sea, is also assigned to the Neman river basin as transitional waters. The Curonian Lagoon is shared by Lithuania and the Russian Federation.

2. Land use

The dominant form of land use is agriculture, constituting approximately 57 % of the surface area. Forests and semi-natural ecosystems takes up approximately 39 % of the surface area. Most businesses in the region deal with trade and services, however the construction industry is also well-developed. Some forms of land use have influence on the hydromorphological status of water courses. A specific feature of watercourses in the NRB is that their profile and regimes have been changed by human activity: many of them have been straightened and serve as water receivers of multiple irrigation systems and some of them are connected with canals.

3. Water demand on rivers

Intensive water use goes on in the Neman river basin due to industry, household water consumption, agriculture, aquaculture and hydropower engineering. In the overall water use structure in Neman river basin comprises about 50 % in Belarus, about 96 % in Lithuania, and the Kaliningrad Region (Russia) uses surface water for the most part (about 53 %).

The main consumers are housing, public utilities and amenities, which together account for 65 % of the surface water and groundwater resources. Industry and energy account for about 20 % of the water use. Total water use in the basin makes up 2.75 % of the available water resources.

The Lithuanian section forms 47.5% of the Neman river runoff. Almost all of the water usage (96%) is from surface sources. Nearly 99% of the total water usage is for industrial purposes, which is explained by high water usage in hydropower generation (90% of the total). A significant proportion of the water (20%) is reused. The share of household water consumption is less than 1%, and agricultural water consumption around 1%.

The Kaliningrad Oblast section of the basin area contributes 6.2% of the Neman river runoff. The basin area occupies 20.7% of the Oblast's territory. Most water utilization (53%) is from surface sources, and less than 1 % is sea water. Around 40% of the water is used for industrial purposes, while the share of household water use is about 61%.

41.5% of the Neman river runoff is formed within **Belarus**. A portion of the runoff is being channelled through the Vileika-Minsk water system into the Dnieper River basin. Some 12.4% of the basin area is irrigated. Hydropower resources are being exploited, by operating small-scale hydropower plants.

4. Habitats and ecological status

The ecological status and characteristics of water bodies in different regions in Neman river basin are quite contrasting. An increased ammonium nitrogen content is generally characteristic of Belarus water bodies; meanwhile, it is not characteristic of Lithuania. In Lithuania high biological oxygen demand concentrations and high total phosphorus content are characteristic of water bodies. The following rivers were assessed as undamaged by anthropogenic activity: Chernaya Gancha (transboundary), Svisloch (transboundary), Myarkis, Ula-Pelesa, Veivirzhas, Yura, Miniya, Salanta, Akmena, Shventoyi and Zheizhmyana.

A major problem of the ecological status of the Curonian Lagoon is encountered in the Neman River estuary – the Neman river's runoff to the lagoon is over 80 % of the total runoff of rivers discharging into it. Hyper blooming of potentially toxic blue-green algae is observed in the lagoon, resulting in a deficit of oxygen due to algae accumulation and decomposition and in the adverse effects on the ecosystem.

Within the Neman river basin has eight areas of importance to the community, that occupy the area 12 5570 ha, while the two areas of special protection of birds occupy 10 3574 ha. In addition to the areas included in Natura 2000 network, the register includes the areas the establishment of which is governed by the Nature Protection Act. These are: national parks, nature reserves, landscape parks, and protected landscape areas.

5. Pollution threats and sources in the Neman river basin

The main environmental problems in the Neman river basin are due to the flow of pollutants into water bodies from point and nonpoint sources of pollution. A significant anthropogenic pressure is point source sewage of municipal, agricultural and industrial sewage. A serious threat to water quality from diffuse sources is the amount of nitrogen and phosphorus fertilizers in agricultural areas, as well as total nitrogen and total phosphorus.

Uncontrolled discharge of wastewater from households without access to sewage systems also has a negative impact on water quality. There are surface water inlets located in the water region, which extract water for irrigation, supply of fish reservoirs and other purposes, as well as groundwater boreholes for water abstraction used mainly for municipal and industrial purposes. Hydromorphological changes have a significant impact on surface water status due to hydro technical structures, built mainly for the purpose of flood control, hydropower, water abstraction and navigation.

5.1 Point sources of pollution and diffuse pollution

The major causative factors responsible for point sources of pollution are: agriculture, municipal management (including wastewater treatment plants), industry, landfills, urban territories.

In Lithuania, the city of Kaunas, with about 400,000 inhabitants, is the country's principal user of the river; the local industries that impact the river are hydropower generation, machinery, chemical, wood processing and paper production, furniture production, textile and food-processing.

In the Russian part of the Neman river basin industry is less developed. Effluents from two large pulp and paper mills located in the towns of Sovetsk and Neman and from facilities in the towns of Kransnoznamensk, Neman, Sovetsk and Nesterov mainly contribute to the anthropogenic impact. These industries use about 5 % of the surface flow formed in Kaliningrad Oblast from the surface water sources and 0.6 % of the total surface flow.

Public utility enterprises significantly contribute to pollution of surface waters in a number of the Oblast's districts and in the city of Kaliningrad. In general, the level of deterioration of water supply networks across Kaliningrad Oblast is 70.0 %. The deterioration of sanitation networks is 70.8%, that of treatment facilities for the water supply system is 61.2%, and the deterioration of treatment facilities of the sanitation system is rated at 78.0%. The majority of existing water supply and sanitation networks were built before the World War II. The systems are characterized by a high depreciation rate and require refurbishment and retrofitting. The available capacities of the water supply systems are significantly overloaded and are not adequate for uninterrupted water supply in many towns and settlements.

In Poland basin section the main sources of point source pollution are agricultural and industrial activities.

Industrial activities in the **Belarusian section** include metal processing, chemical industries, pulp and paper production, and manufacturing of building materials, as well as food processing plants. In this region the 15 largest enterprises in the NRB (of 84 enterprises located within the basin limits) account for about 86% of the total household and industrial wastewater discharge within the basin boundaries. Out of these 15 enterprises, 10 enterprises are housing and public utility enterprises operating treatment facilities; three are fish farms; one is an industrial enterprise; and one is an enterprise whose main line of business that requires water use is pond-based fish farming. Analysis of sanitation shows that slightly more than 70% of the total mass of pollutants in the composition of wastewater discharged by these 13 enterprises enters water bodies.

The impact of nonpoint pollution sources on water quality across the entire territory of the NRB may be dominant in comparison with pollution from point sources. In this case, pollution from nonpoint sources may be estimated to be between 40% and 90% of the total pollution index. It is noteworthy that surface discharge from the territories of these settlements is a sizeable source of pollution in the water bodies. Research results showed that diffuse agricultural pollution is one of the most important and significant factors affecting the quality of water bodies in the Neman river basin. Diffuse agricultural pollution consists of loads of organic matter, nitrogen and phosphorus compounds which enter soil with manure and mineral fertilisers.

5.2 Pollution of groundwater

Sources of point pollution that are related to objects of polluting economic activity, such as industries, large animal husbandry farms, shortages of fuel, fertilisers, pesticides and other materials, landfills of household and industrial waste, pollutant spill accidents in railways, etc., are common in all groundwater bodies.

5.3 Impacts of hydropower plants

Hydroelectric power stations may affect not only fluctuations of the water level and flow but also parameters indicative of physico-chemical quality elements and transportation of suspended particles. The present turbines which considerably damage fish and which fail to conform to the flow regime should be replaced with environmentally friendly ones. There are 32 hydroelectric power stations located in Lithuania in the territory of the Neman river basin, and the Kaunas hydroelectric power station is the biggest. About 10 small hydroelectric power stations situated in Belarus in the territory of the river basin. The Grodno hydroelectric power station station, to be placed on the Neman river (upstream of Grodno City), is under construction.

5.4 Management issues and necessity of cooperation

All in all the most pressing water management issues in the Neman river basin are:

- discharge of untreated or poorly treated municipal and industrial sewage,
- unsatisfactory sanitation of rural and recreation areas,
- contamination from solid waste leachate,
- threats to aquatic ecosystems,
- conflicts of interest among water users,
- inadequate public environmental awareness and education,
- inadequate systems of charges and subsidies,
- lack of adequate financing of water management.

The cooperation necessary to ensure the health of the river is complicated by the political divisions in the basin - its territory is shared among Russia, Belarus and the European Union countries of Lithuania, Poland. Several cooperation initiatives are underway to address the environmental issues of the river.

Main information sources:

1. https://www.unece.org/fileadmin/DAM/env/documents/2016/wat/04Apr_6-7_Workshop/Strategy_of_Adaptation_to_Climate_Change_ENG_for_print.pdf
2. http://vanduo.gamta.lt/files/Nemunas%20river%20management%20plan.pdf
3. http://www.apgw.kzgw.gov.pl/en/update/nemunas-river-basin
4. https://www2.unece.org/ehlm/platform/download/attachments/24707075/Neman.pdf

B. Pregola River Basin

1. Geography and overview.

Pregola catchment area lies within two ecoregions: the Baltic Sea Region and the Eastern Plains. The main river is the river basin district Pregola a total length of 123 km, which is the longest river in the Kaliningrad region and the whole flows through the area. Pregola flows into the Vistula Lagoon. The main river is the river basin district Pregola a total length of 123 km, which is the longest river in the Kaliningrad region and the whole flows through the area. Pregola flows into the Vistula Lagoon. The Pregola river with the catchment area of 14.1 thousand km^2. The Pregola originates from conflux of the rivers of Instruch and Angrapa. The lower part of its basin (49%) takes the major part of the territory of the Kaliningrad Oblast but the upper part of the basin (51%) is on the territory of Poland where almost all its tributaries originates from. Only the small part of its basin (ca 60 km2) is located in Lithuania in the area of Vyshtynets lake.

The main stream segment of the Pregola is crossing the Pregola Lowland from East to the West and discharges into Vistula Lagoon after passing Kaliningrad. The river valley was modified by anthropogenic influence, especially the last 7 km of river downstream, where is an area of sea harbor of Kaliningrad with a regularly dredged depth of 8-12 m.

Pregoła catchment area is one of eight occurring in the territory of Polish international river basins occupying 7 521.7 km2 in North-East Poland. Within the Polish catchment area Pregoła is represented by the region Lyna water and Węgorapa. The main rivers in the region are Łyna of approx. 208 km and Węgorapa of approx. 66 km. Łyna River has its source in Łyna, Węgorapa while flows out of Lake Mamry. Other important rivers occurring in the area of water region include: Gołdap, Guber, Wadąg, Dejna, Sajna and Sapina total length of the hydrographic network of the region is 3 365 km.

The biggest lakes in Pregola catchment are: Dargin, Mamry, Kisajno, Dobskie, Łańskie. Polish part.

2. Land use

At the Polish side of Pregola basin the farmland occupy approx. 67%, while forests account for approx. 27% of the region. The rest is urban areas covering mainly the area of the largest cities in the region Lyna and Węgorapa: Olsztyn, Kętrzyn, Mrągowo and Bartoszyce. In the region, most companies operating in the field of wholesale and retail trade, services, construction and industrial processing.

At the Russian side more than a half of the catchment area (54%) is occupied by agricultural areas. By 16% is accounted for by deciduous and mixed forests and open spaces, ca 9% – for coniferous forest, 3% is occupied by lands of towns and 2% is accounted for by surface inland water bodies.

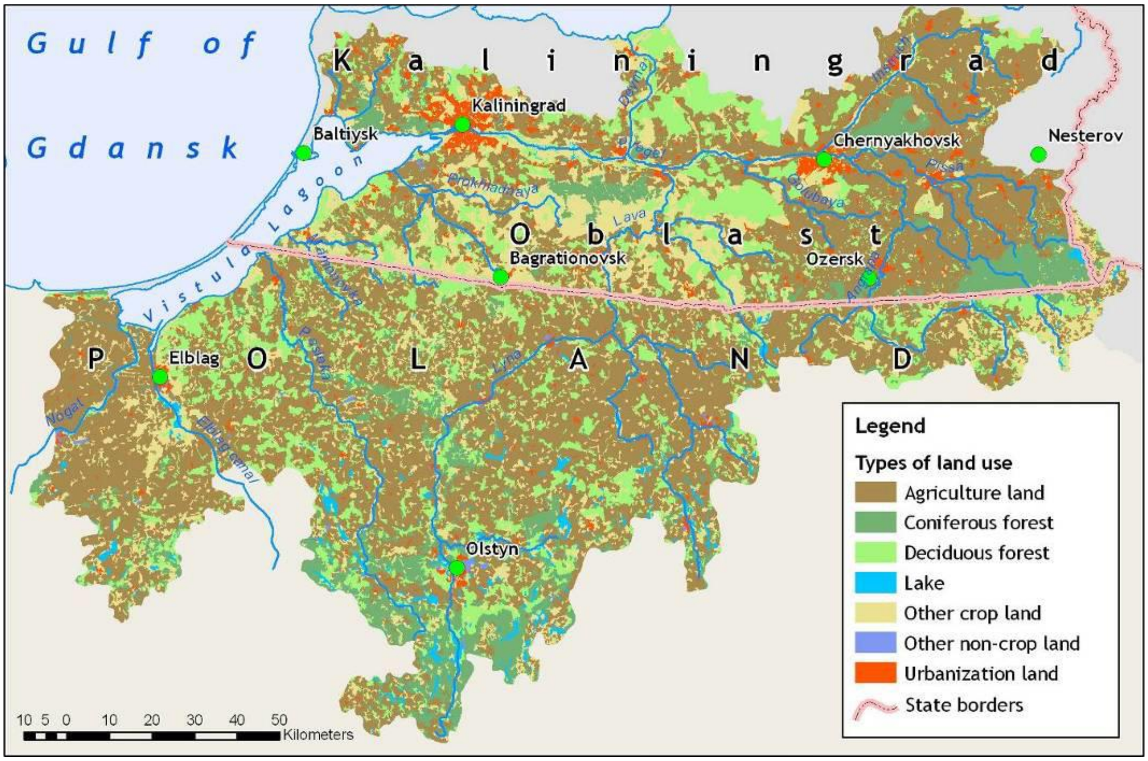

Figure 1. Land use types in Pregola catchment

3. Water demand on rivers

Polish part of Pregola basin:

The main ways of water use are: water consumption for municipal and industrial purposes, hydration of fish farms, tourism and recreation. There are surface water inlets located in the water region, which extract water for municipal and industrial purposes, irrigation, supply of fish reservoirs, as well as groundwater boreholes for water abstraction used mainly for municipal and industrial purposes.

Table 3. The water use in Warminsko-Mazurskie region in 2012.

	Specification	%
1.	Production (without agriculture, forestry, fishing) Surface water Groundwater	19,9 13,0 6,9
2.	Irrigation in agriculture and forestry, and filling and replenishing fish ponds	30
3.	Operation of water mains surface water	50,1 0,1

	groundwater	50,0

4. Habitats and ecological status

Within the river basin Pregoła designated two areas of vulnerable of nitrogen compounds pollution from agriculture sources (OSN).

The basin Pregoła established twenty-five protected landscape areas which occupy nearly half of the river basin Pregoła (42%), their total area is 147,961 hectares.

Among the protected areas dependent on the waters in the basin are located Pregoła 25 areas belonging to the Natura 2000 network, 33 reserves, 2 parks and 25 protected landscape areas. Under Natura 2000 there are 18 areas, which cover an area of 74548 hectares and 7 special bird protection areas - 16825 hectares. There are thirty-three nature reserves, which cover an area of 9883 hectares. Landscape Parks represent 2% of Pregola basin.

The special is Park Forest Landscape Rominta which Poland share together with Kaliningrad Oblast. Romincka Forest is characterized by unique flora and fauna, somewhat reminiscent of the taiga. Dominated stands of pine and spruce with a touch of oak, linden, birch and hornbeam, and in depressions - alder. Due to the hard to reach a terrain they live here all Polish wild species, except for bison, so elk, deer, roe deer, wild boar, wolf, fox, lynx, badger, raccoon, otter, pine marten and domestic, ermine, hare, shrew, smudge, otter and beaver. With birds it is worth noting cranes, black and white storks, herons, white-tailed eagle, the lesser spotted eagle, black grouse, ospreys, buzzards, owls, owl, rare varieties of woodpecker and many others. Here, there are only around lowland Polish position rare species of orchid.

5. Pollution threats and sources in the Pregola river basin

At the Polish side:

Significant anthropogenic pressures in the Pregola water region are point-source sewage of municipal and industrial sewage, as well as rainwater, and discharge from fish reservoirs. The largest amount of discharge comes from the small hydro in Sępopol. Uncontrolled discharge of wastewater from households without access to sewage systems also has a negative impact on water quality. A serious threat to water quality from diffuse sources is the amount of fertilisers used in agricultural areas and discharge from industrial areas not connected to sewage systems. There are surface water inlets located in the water region, which extract water for municipal and industrial purposes, irrigation, supply of fish reservoirs, as well as groundwater boreholes for water abstraction used mainly for municipal and industrial purposes.

The most pressing water management issues in the Pregola river basin are:

- discharge of untreated or poorly treated municipal and industrial sewage,

- unsatisfactory sanitation of rural and recreation areas,
- conflicts of interest among water users,
- inadequate public environmental awareness and education,
- inadequate systems of charges and subsidies,
- lack of adequate financing of water management

At the Russian side:

The most significant factors exerting its influence on water quality in Pregola River are:

- The predominance of agricultural land in the land fund structure
- High population density, especially in the western part of Kaliningrad region (downstream of river), predominance of urban population.
- The main water use sources at the Russian side are housing and communal services, in former time pulp and paper industry
- A transboundary state of main river basins.

Rivers and streams forming Pregola, flow mostly through agricultural used lands. Agriculture impacts on significantly on the environmental status of surface and groundwater. Runoff from arable lands is dominant during the creation of the nutrient load (39 % of phosphates, 71 % of nitrogen) from the catchment area above Kaliningrad. Taking into account the sewage discharge from Kaliningrad the P/N ratio from arable lands is 16/47 % respectively of the total nutrient load on Vistula Lagoon.

Another important factor influencing on water status is land reclamation, i.e. about 80% of Kaliningrad region is a reclamation land area, a lot of small rivers are channeled, deepened and regulated.

Transboundary rivers come to the territory of Kaliningrad region polluted (based on water quality measurements at border stations with rather high nutrient load). For example, nutrient load from the Polish part forms Angrappa and Lava Rivers jointly with their streams flowing to Pregola.

5.1 Main sources of catchment Pregola pollution.

a. Municipal and industrial wastewater discharge – 20 200 000 m3; 20 waste water treatment plants cover a need of 74% of citizens
b. Landfill effluents
c. Agriculture activities; animal husbandry – 100471 DPJ (130 DPJ/ha), two sources of nitrogen and phosphorus (artificial and from manure)
d. Municipal waste water discharge from areas without sanitation system – 26% of citizens

The result is – 12 rivers threatened by agriculture and 61 lakes environmentally endangered are to not reach environmental goals.

There are three hot-spots in Pregola basin at Russian side (Kaliningrad region) according to HELCOM base report:

- Sewage discharge from Kaliningrad flowing directly to Vistula Lagoon
- Kaliningrad Sea Fishing Port (located in the Pregola mouth at its coast line)
- Municipal landfill of hazardous waste (located in the forest on the western edge of Kaliningrad) 1 km from the Kaliningrad marine channel.

The hot-spot "Pulp and paper mill "Cepsuss" (located at right side of Pregola at its downstream; it used to be 30% of a total polluted water discharge from city). Since 2009 the company discontinued the production of paper, environmental stress on Pregola River significantly decreased, but this area still include squares of bark and slag dumps that effect negatively.

Summary

Total runoff from Polish and Russian side to the Vistula Lagoon.

The main tributary of the Pregola River is the cross-border Lava River, more than half of which water basin is located in Poland.

Total amount of total nitrogen to the Vistula Lagoon is 5384 tons a year, whereas total phosphorus – 529 tons a year. Out of this amount - 69% of nitrogen comes from the Pregola River and 26% - from the Kaliningrad Waste Canal. For phosphorus the correlation is different: 48% of total nitrogen comes from the Pregola River and 46% - from the Kaliningrad Waste Canal.

The problems:

Lack of cooperation between Polish and Russian side. The Agreement signed on 07.17.1964 (Warsaw, Poland) between the governments of the Union of Soviet Socialistic Republic and the Government of the Polish People's Republic on the water sector in boundary waters is a bilateral agreement for protection of water resources, regulating the activity of hydro-constructions, water supply, flood control and erosionof river basins of Neman, Pregola and Vistula. This Agreement is still the single document which regulates bilateral relations between Russia and Poland, as non- and EU counties, as Water Framework Directive (WFD) is not applied to non-EU countries.

Another possibility is cooperation within HELCOM, which goal is to establish good ecological status of Baltic Sea waters till 2021.

Sources:

1. *Plan dorzeczy Pregoły*
2. *Nutrient monitoring in Kaliningrad BASE Project Final Report*
3. *http://soils2sea.eu/xpdf/Pregola.pdf*
4. *http://www.rdw.kzgw.gov.pl/en/river-basin-districts/Pregola*
5. *Reducing nutrient loadings from agricultural soils to the Baltic Sea via groundwater and streams. Requirements Report BONUS. SOILS2SEA deliverable No. 1.2. 2014*
6. *D. Domnin, B. Chubarenko, A. Lewandowski. Vistula Lagoon Catchment: Atlas of water use. 2015*.
7. *Nutrient loads to the Baltic Sea from Kaliningrad Oblast and transboundary rivers.   Baltic Marine Environment Protection Commission HELCOM. 2014*.

III. Project Background and Introduction

A. Project Background

The Neman/Nemunas River is the 14th largest in Europe and the fourth largest in the Baltic Sea basin. The river drains the territories of Belarus, Lithuania, Russia (Kaliningrad Oblast), and Poland; originating in Belarus and flowing through Lithuania before draining into the Curonian Lagoon and then into the Baltic Sea. The quality of the water is influenced by a number of factors, primarily linked to industrial and agricultural production and inadequate household wastewater treatment. The implementation of the EU Water Framework Directive has revealed that most streams within the Neman river basin did not qualify for "good ecological status" and that a reduction of both nitrate and phosphorus pollution is required. Transboundary pollution management is absolutely critical in this basin as half of the total pollution load reaching the Baltic Sea through the Neman River originates in Belarus. Similar issues affect the smaller, adjacent Pregola River basin which drains the territories of Russia (Kaliningrad Oblast) and Poland. The river originates in Poland and flows through the city of Kaliningrad before discharging to the Vistula Lagoon and the Baltic Sea.

The Neman and Pregola Rivers have been identified as severely polluted and their bad environmental status represents an ongoing challenge to international efforts to restore the Baltic Sea environment. Management of these rivers requires close transboundary cooperation which has been so far politically difficult. Civil society capacity is not enough and partnerships between NGOs across the borders are limited. Through creation of an NGO-designed and led Neman and Pregola River Monitoring Network, this project will directly address these related challenges - poor water quality, weak transboundary cooperation, and low NGO capacity.

With 2014 funding from the Nordic Council of Ministers (NCM), NGOs in Kaliningrad came together to explore new ways to enhance river protection efforts on the Neman and Pregola. Joining them for the first time were NGOs in Lithuania and Belarus and the project produced an important "Statement of Shared Vision" for future river protection work together. This proposal implements one of the Top Priorities outlined in the Shared Vision: the development of an NGO river monitoring network. The following partners seek to continue their work together in this new effort: Green Front (with branches in Russia and Poland), the Center for Environmental Solutions in Belarus, and the Lithuanian Fund for Nature.

This project has evolved from 2014 NCM-funded NGO collaboration and implements one of the Top Priorities outlined on the Shared Vision: the development of a NGO-led river monitoring network. Original partnership of applicants consisted of the same set of NGOs as in 2014 with Stockholm Environment Institute (SEI) as the lead. However, due to organizational changes in late 2016-beginning of 2016, the Coalition Clean Baltic took over the project management from SEI with two more organizations joining the project from CCB's network: Polish Ecological Club and the Green Planet.

B. Statement of Monitoring Program Goals and Objectives

Partners reviewed existing NGO-led river monitoring programs from Europe and the United States designed on a citizen science model and set this program distinguished by a clear strategy for sustained leadership by NGOs, active engagement of citizen scientists in communities all along the rivers to collect water quality data and educate their neighbours about river health, and strong university partnerships to help ensure data quality and credibility. Therefore the Programme is based on the following goals and objectives.

i. Build NGO capacity, encourage sustained transboundary cooperate

The civil society challenge that this Joint Monitoring Programme seeks to address is specifically related to improving the organization capacity, sustainability and relationships between three important environmental NGO actors in Belarus, Lithuania and Poland, as well as Russia. The emphasis placed on the development of deep, lasting connections between these groups and with the resources available to CCB will generate new opportunities for ongoing support and sustainability.

Beyond the strengthening of personal and organizational relationships between these groups, the other sustainability factor is financing for maintenance of the River Monitoring Network beyond the life of this project. Once created and launched, the network will require funds for basic monitoring equipment for use by citizen volunteers, staff time for training volunteers and ensuring data quality, lab analysis costs, and website maintenance. Planning for and funding these needs is a part of the discussion of creating the monitoring network from the very beginning and project partners are already looking to new funding sources. CCB is committed to supporting them in this work.

It is important to also note that both the Lithuanian Fund for Nature and the Center for Environmental Solutions in Belarus have already proven their ability to secure significant funds for water resource monitoring work through their existing networks with WWF and Coalition Clean Baltic. These efforts will continue and will be strengthened by the transboundary partnership created through this project.

Yet another important aspect that will addressed mostly in a follow-up phase is related to channelling monitoring results into decision-making cycle, making them used for river basin management purposes at national and transboundary scale.

ii. Development of valuable surface and groundwater data needed to help address pollution reductions.

To help addressing the environmental challenges in the Neman/Nemunas basin, the Commission on Environmental Protection of the Board on Long-term Cooperation of Lithuanian-Russian Regional and Local Authorities has set up a working group to investigate transboundary surface water and groundwater bodies and identify pollution sources. This is a positive step, but there is a need for further improvements in such collaborative efforts to collect relevant data in order to mitigate nutrient and pollution flows in the basin. Citizen science programs, particularly local water quality monitoring efforts, have been proven to provide a strong platform for generating data that can be used by officials at all levels of government, and empower citizens to take ownership of their local waterways thereby building political support for river protection.

Besides setting up credible and verifiable Monitoring Programme with the set of parameters to be sampled and analysed at designated locations and frequency by trained volunteers, a web-based tool will be developed to hold, manage and share all river monitoring data from all countries on one website in a format that is easily-accessible and open to everyone.

Integration of a mobile smart phone application into the system is foreseen so that citizens can load and share information easily from anywhere within the three countries.

By creating a user friendly site shared by the three NGOs in each country, the river monitoring program will be well positioned for sustainability into the future. The data generated will become a resource for citizen environmental educators and advocates, as well as local, regional and national government officials

iii. Community education and engagement of volunteers to support monitoring system.

In other parts of the Baltic Sea region and throughout Europe, NGOs play a critical role in raising public awareness of environmental issues, educating people about the need and benefits to be accrued from clean water improvements, building political will which government officials can use to advance cleanup actions, and aiding in the implementation of on-the-ground projects such as the collection of environmental data through credible, "citizen-science" efforts. More and more, governments are viewing an active civil society as partners in the enhancement of environmental quality at the community level; partners able to employ methods and resources unavailable to government. Most importantly, a supportive NGO community can bring the key element that is needed in democratic societies to make change: an informed, engaged public.

C. Project Organization and Responsibilities - Description of the NGO Partners and Scientific Advisors

1. Belarus

a. NGO: Center for Environmental Solutions

The Center for Environmental Solutions (CES) was registered on February 5, 2009 as a non-profit, non-governmental institution. Headquartered in Minsk, the organization has a staff of 19 people and its activities cover all of Belarus. The organization is actively involved in international efforts to protect the environment and human health. CES

The organization's mission – promoting an environmentally friendly lifestyle and sustainable development, development of international cooperation in order to preserve the environment. CES is working on both policy and practical levels in Belarus, bringing and demonstrating practical environmental solutions, and also advocating for the better framework conditions in policy and management of the environment in Belarus.

All the activities of CES are implemented within 3 main thematic Programs:

1) Energy Efficiency Program;
2) Waste and Chemical safety Program
3) Program on Environmentally Friendly lifestyle. One of goal of this Program is sustainable water management approach developed in Belarus, to provide relevant quality level of drinking and running waters, to preserve biodiversity and improve quality of life of people.

CES has significant experience of implementing activities, focused on civil society and on environmental rights/environmental justice as a part of human rights. CES has been working with many local groups of citizens on helping them to solve local environmental problems, related to chemicals and waste pollution, and others health related issues. CES has also experience of empowering local groups to be more active in advocating their positions on different environmental issues.

CES has a financial and administrative routine and all necessary guidelines. Financial operations are executed by the financial department, which consists of the chief accountant, accountant (part-time) and economist. Administrative operations are executed by the secretary of the organization. Both types of operations are overall managed by the director of CES or deputy director.

CES is working with different local, national, and international stakeholders, including local communities, other environmental NGOs, ministries and governmental agencies, mass media, business, international organizations, like UNDP, EC, and the World Bank.

The common amount of funding received in 2014 is 331 810 Euro. Income in 2015: 188 359 Euro.

Contacts: Natallia Parechyna, Project Coordinator, Liubomir Klepach, Project Assistant

b. *Scientific Advisor: Grodno State University, Belarusian State University*

Grodno State University (GSU) – contact person Kremleva Olga, Ph.D (agriculture), Associate Professor at Biological and Ecological Dept. Department's research majors are bioindication of state and contamination of natural environment, as well as environmental education.

Belarusian State University (BSU) – main contact Yulia Veres, Ph.D. (biology), senior researcher of the Hydroecology Lab of the University. Main direction of the Lab's work is research on functioning of surface water ecosystems.

c. ***Laboratory:*** *Central Research Institute for Complex Use of Water Resources*

Central Research Institute for Complex Use of Water Resources (CRICUWR) – Lyubov Gertman, Senior Researcher, Water Monitoring and Cadaster Unit. Priority directions of the Institute's activities as the following: overall coordination of the State Water Cadastre, dissemination of the information on water quality, supply against the demand for the concerned institutions; information exchange on transboundary water bodies;

2. Lithuania

a. *NGO: Lithuanian Fund for Nature*

Lithuanian Fund for Nature (LGF) is a large organization based in Vilnius with 15 full-time staff and annual budget of 300,000€. They manage a network of Nature Reserves throughout the country and work with private landowners to restore and manage wetlands for biodiversity and protect water quality. They are also very active in public environmental education programs.

b. *Scientific Advisor: Aleksandras Stulginskis University, Faculty of water and land management water, Resources Engineering Institute, laboratory of environment monitoring*

Aleksandras Stulginskis University is a state institution of higher education and research. The main mission and task of the Water Resources Engineering Institute is investigation, creation and dissemination of results and knowledge related to sustainable use, effective management and thorough analysis of water resources as well as studies based on these results. Chemical analytical laboratory is accredited by the Lithuanian Environmental Protection Agency (EPA). New and modern equipment allow to do natural (surface and underground) water and wastewater (domestic, industrial, livestock farms) researches and various soil studies. Also identifies sewage sludge, manure, liquid manure and compost fertilization value. In addition this laboratory supplies drinking water quality testing services. Main researched water parameters are pH, dry mass, suspended solids, chemical oxygen demand (COD), biochemical oxygen demand (BOD), dissolved oxygen (DO), calcium, potassium, sodium, phosphates, total phosphorus, iron, sulphate, chlorides, ammonium nitrate, ammonium nitrites, ammonium nitrogen, water hardness, conductivity, alkalinity.

http://vuzf.asu.lt/wp-content/uploads/sites/6/2015/01/chal_laboratorija.pdf

c. Laboratory: Laboratory of Evolutionary Ecology of Hydrobionts of The Nature Research Centre

The main research trends are the evolutionary ecology of water invertebrates, biology of invasive and endangered species, biological diversity of aquatic communities, structure and variability of food webs, functional regularities of ecosystems and ecology of phytoplankton.

Researchers of the Laboratory focus on biochemical regulation mechanisms and evolution of life history in crustaceans, as well as effects of biological invasions on community structure, food webs and functions of ecosystems and biological peculiarities conditioning the rate of invasion of alien species. The Laboratory is involved in the creation and improvement of methods for assessment of ecological status and biological pollution of water ecosystems.

http://www.gamtostyrimai.lt/en/users/viewGroup/id.52

3. Poland

a. NGO: Polish Ecological Club (Polski Klub Ekologiczny – PKE)

PKE is a nationwide organization with 35 years of history. Its aim is to promote sustainable development, protect   the environment , take care of landscape natural values, promote sustainable spatial planning, wide ecological education for each age group, international cooperation including solving transboundary problems.

To fill the tasks PKE takes initiatives in variety of fields, cooperates with municipalities, regional administrations, the government and EU bodies as well as Polish and NGO from other countries.

Over 40 experts in various fields consult opinions prepared by PKE.

Main areas of interest PKE activists were involved in last years were:

- Eutrophication in waters in Baltic Sea catchment
- Plastic and microplastic in Baltic waters
- Educational campaign – save the energy
- Building IT platform to discuss environmental issues
- Promoting “zero waste” policy and circular economy.

b. Scientific Advisor: Warmia-Mazury University, Olsztyn

As Neman and Plegolya catchments in Poland cover north-eastern part of the country we decided to contact Warmia Mazury University – UWM in Olsztyn. The searching process finally took us to Department of Environmental Sciences, Engineering Water Conservation Cathedral.

Since 1956 in the cathedral are run research works on water bodies recultivation. An important part of the research works touch the innovative perfecting solutions in smart monitoring water environment, modelling phenomenon's in water ecosystems concerning climate change, anthropogenic factors as well as natural ecological succession.

c. Laboratory: Regional Inspectorate Environmental Protection in Olsztyn and Białystok

In Poland the environmental laboratories are situated in every voivodship. The official state inspectorate runs the measuring of environmental factors in waters, air, ground, noise.

The methods used in WIOŚ Olsztyn are listed online: http://www.wios.nettom.eu/dzialalnosc-laboratoryjna/zakres-badan/

The results are presented biannualy on the site : http://www.wios.nettom.eu/monitoring-srodowiska/monitoring-rzek/

4. Russia

a. NGO: Green Front & Green Planet, Kaliningrad:

Green Front will provide the trips of specialists to collect water samples and its transport to laboratory. GreenFront is an interregional environmental advocacy organization working in both Kaliningrad, Russia and in Poland. They started work in 2011 in Kaliningrad and their members are part of the Kaliningrad Public Council and work well to maintain open dialogue with government officials. Greenfront's largest projects involve cleanup of illegal dumping (animal wastes, pesticides, fertilizer, and debris) and restoration on agricultural lands. Actively engaging media to raise awareness of problems and get action.

Green planet may provide support of volunteers, teachers and local community engagement and participation in collecting water samples for the further analysis. Green Planet was founded in 2013 and works with schools to provide ecology education programs through teacher trainings and curriculum guides with a focus on the Baltic Sea, energy/climate and biodiversity issues. They also operate a summer camp for kids on the Baltic coast in Primorje village working closely with the Regional Ecological Center in Kaliningrad.

b. Scientific Advisor: *Immanuel Kant Baltic Federal University & Atlantic Research Institute of Fisheries and Oceanography (AtlantNIRO)*

The Immanuel Kant Baltic Federal University (IKBFU) was established in 2010 on the basis of the Kaliningrad State University. A most innovative university, the Immanuel Kant Baltic Federal University strives to maintain and spread academic and research traditions of its predecessor – the Albertina University of Königsberg.

Scientific expertise being used in the project is located at Shared Experimental Facilities Center (SEFC), which manages and coordinates the use of the equipments park in Fabrika. The Science and Technology Park "Fabrika" at IKBFU combines state-of-the-art machines, methods and scientific expertise for the growth, analysis, morphological/structural characterization and investigation of material properties. Fabrika enables the scientific groups of the IKBFU and their collaborators to have their samples prepared and characterized by a large number of very sensitive tools able to optimize the fabrication conditions and the structure, thus allowing the tailoring of the physical properties functional to specific devices.

The University also has dedicated Institute of Chemistry and Biology (ICB) that educates future professionals in natural sciences. The ICB infrastructure is based on the state-of-the-art equipment carefully selected to form closed-cycle installations, from auxiliary sample preparation instruments to complete research facilities. Their scientific expertise and competence can be also applied for the purposed of the joint monitoring plan.

Atlantic Research Institute of Fisheries and Oceanography (AtlantNIRO) is the leading scientific institution in Russian in the field of living biological resources of the Atlantic ocean and its seas. The Institute has the Baltic Sea Lab that performs various methods of monitoring of both biological as well as hydrological and hydrochemical parameters of natural environment. Actual analytical work is carried out by the Section of physical, chemical and bacteriological research and its lab of physical-chemical studies.

c. Laboratory: *Atlantic Research Institute of Fisheries and Oceanography.*

AtlantNIRO (see above) has recently acquired accreditation to study surface waters and will serve as the core laboratory for the joint monitoring plan.

BFU's Fabrika ecological lab was preparing for accreditation and considered to be the major scientific advisor for the project, however due to restructuring of the University, its further role in joint monitoring is unclear.

IV. Project Management

A. Monitoring Locations (River and Groundwater)

1. Belarus – 20 stations (14 river, 6 wells)

CES considers it necessary to do quality monitoring points of water above and below the flow of small rivers - tributaries of the Neman in places where livestock farms are located in the water protection zone, or in the immediate vicinity and may have a negative impact on the status of surface water and groundwater. Location of our items will be different from the location of the monitoring points of the National Environmental Monitoring System (NEMS), since they do not carry out monitoring on small rivers. In addition, the potential hot spots can be fish farms, only in the floodplain of the Neman on the Belarusian side of which there are 16 units. Specific locations will be determined depending on the place of residence of volunteers involved.

The monitoring of physical and chemical parameters is one of the important aspects of water management. Analytical results depend on correct sampling, which also allows results' comparability at transboundary level.

Within national monitoring system of Belarus the sampling sites are usually set approx. 1 km upstream the nearest water use site (drinking water intake, bathing or recreational site, settlement), and in case of lakes and reservoirs – at 1 km up- and downstream from water use site. Usually, the samples are taken in 3 points within one sampling location (at both banks and in the middle e.g. fairway), but also 1-2 sampling spots are acceptable (in case of limited technical capacity or at small water bodies), depending of the type of water use, hydrological character and sewage water dispersion in a water body.

NEMS monitoring network covers 297 sampling locations (64 of which are within Neman catchment) with 29 hydrochemical parameters: physical and chemical properties, mineral composition, nutrients and organic compounds, metals. Monitoring results are submitted to the information and analytical centre of NEMS

Stationary system of groundwater monitoring covers 112 background monitoring spites (555 wells) and 56 sites nearby various industries.

Within Belarusian part of Neman catchment, NEMS covers: 35 water bodies, 64 monitoring sites, including 22 watercourses and 41 monitoring sites on those, 5 transboundary water courses and 4 background site;13 water bodies with 23 monitoring sites. Monitoring is held also nearby wastewater discharges from WWTPs and industries. Local monitoring is performed at 19 industrial sites of Grodno Oblast, as well as 27 sites are monitoring the state of groundwater nearby locations of potential and identified sources of pollution.

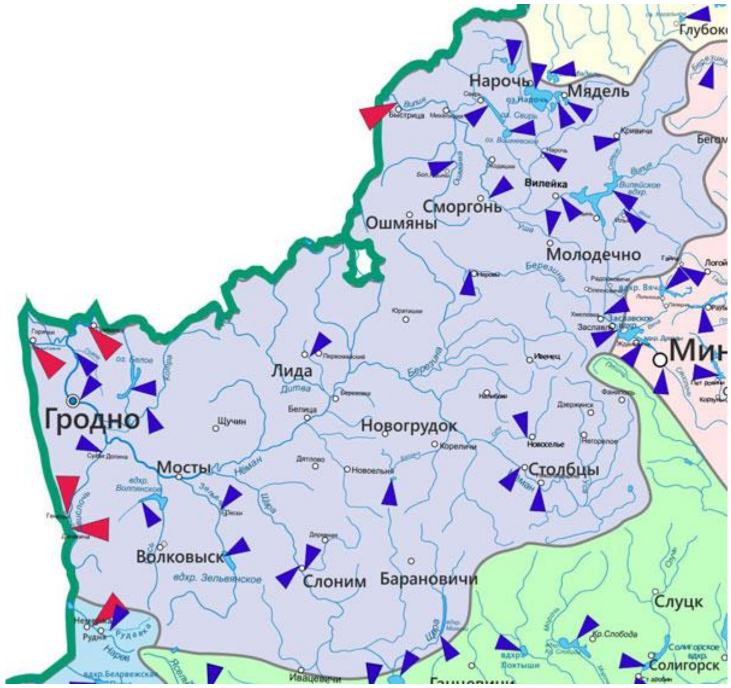

Figure 2. Monitoring stations within Neman basin in Belarus

Figure 3. Network of transboundary surface water monitoring stations in Belarus

As demonstrated above the monitoring is usually performed at larger water courses and bodies, where due to a dilution in large volumes of water, it is very difficult to identify specific polluter. So, CES suggests performing public monitoring of smaller rivers and tributaries to have better possibility of judging about concrete source of pollution and implement the abatement measures.

Within recent years a significant increase of farmed animals has been observed in Belarus, thus the share of diffuse pollution inputs into the water bodies is also growing. At the state level there is no control after impact of manure handling at surface waters. The NEMS only covers local monitoring of ground waters at farms with agricultural lands being used for manure spreading. However, numerous facts of breaching Belarusian environmental law in the field of manure management have been observed (see watercontrol.by).

For the above reasons, within our joint public monitoring plan CES suggests the following approach for selection of monitoring sites: sampling should be done 500 m up- and downstream industrial animal farm or other potentially polluting object, if those are located within 1 km distance from a water body. Quality of surface water bodies will be controlled after 6 main parameters that are easily available for public monitoring and at the same time rather informative to assess level of contamination. Sampling will be performed monthly/quarterly, number of sampling sites can be increased in case of more volunteers will be available.

2. Lithuania – 15 stations (11 river, 4 wells):

Areas within the Neman basin identified by the community as potentially benefitting from additional water quality testing to help solve local problems]

Selecting locations for monitoring in Lithuania

State water monitoring in Lithuania well reflects the general condition of water bodies. However, some areas and water bodies receive less attention due to different types of water monitoring used to observe changes. The quantitative and chemical condition of most of the groundwater basins is good; they are subject to surveillance monitoring.

Old hydropower plants, operating up to now, have negative impact on local water ecosystems throughout Lithuania (Figure 4). In state monitoring program such objects have small number of observation points. In this case local communities can help to observe the impact of such power plants in long and short time periods.

Many point sources of pollution are well known in Lithuania but state agencies receive some complaints about perceived instantaneous pollution in small regions. Such pollution monitoring is complex and must be done quickly, therefore it requires a local community's support and rapid response.

Figure 4. Hydropower plants in Lithuanian part of Neman river basin

We must also pay attention to small tributaries' sub-basin of Nevežis and Nemunas during this project. According to state's monitoring data, large proportions of water bodies in these regions have poor ecological status and are affected by different types of pollution (Figure 5).

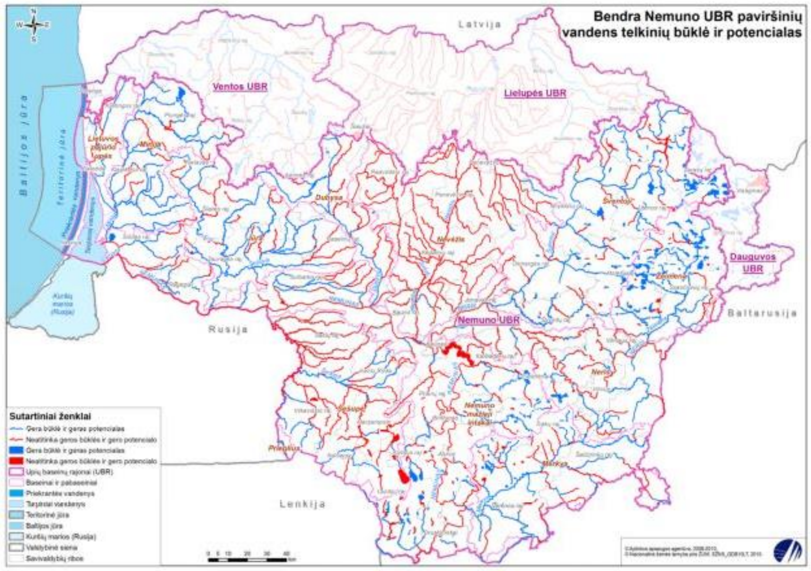

Figure 5. General status of water bodies in Lithuanian part of Neman river basin.

3. Poland – 5 stations (5 river)

Existing national monitoring system in Poland covers both Pregola and Neman river basins, with 101 and 53 monitoring stations respectively. Monitoring of water quality is carried out in a 6-year cycles called measurement programs. Recently completed 2010-2015 monitoring round allows to perform a full evaluation of all water bodies in both regions Warminsko-Mazurski and Podlaski. Assessment of the status and ecological potential of water bodies is available on the websites of the regional environmental inspectorates in Olsztyn and Białystok. In Neman basin 15% of water bodies have good ecological status and 31% have bad ecological status. In Pregola basin 25 water bodies were tested and only 4 of those have good ecological status and for the rest ecological status was bad.

The quality of ground waters are tested by State Hydrological Service in all Poland. In Poland was defined 161 ground water bodies, 16 of them are threatened, but none of those threatened is located within Neman or Pregola basins.

The monitoring stations which were chosen to the project are close to the border, therefore directly indicate water status crossing Polish border and Polish impact on water quality in the basin.

The information was based on:

1. http://www.wios.nettom.eu/fileadmin/user_upload/monitoring/KomunikatOlsztynRzeki2014.pdf
2. http://www.wios.nettom.eu/fileadmin/user_upload/monitoring/KomunikatOlsztynRzeki2014.pdf
3. http://www.wios.nettom.eu/fileadmin/user_upload/monitoring/KomunikatGizyckoRzeki2014.pdf
4. http://www.wios.bialystok.pl/pdf/Ocena_w_ppk_2015_tekst.pdf
5. http://www.wios.bialystok.pl/pdf/Ocena_w_ppk_2015_tekst.pdf

4. Russia – 10 stations (7 rivers, 3 wells)

   It is proposed to carry out monitoring at 10 sampling locations. (7 of rivers and 3 of wells). Within rivers, 4 stations will be located in Pregola, and 3 - in Neman catchment. The proposal was elaborated based on already ongoing work, carried out by Green Front Kaliningrad within a separate project, funded from Russian national sources, to set up public monitoring of the surface waters in Neman and Pregola catchments, with total 48 stations being monitored within 4 seasons of 2016. Preliminary map, indicating the results of this monitoring, is presented on the map here: https://goo.gl/cjwroK.

   The major reasoning behind designation of the stations was similar to the proposals by other partners/countries, based on the need to a) extend the network of 15 state monitoring stations and b) enable the use of public monitoring to trace the pollution sources in both catch Neman and Pregola basin. In case of Kaliningrad, the transboundary component in both catchments is very important and therefore some of the proposed stations can be also used to evaluate potential transboundary pollution coming from upstream sources.

5. Compilation of all proposed stations in a joint scheme

   An online map (online map is available at https://goo.gl/ByGdEx) was created for this purpose, where the information is compiled about proposed monitoring site locations, existing state monitoring sites, as well as various hotspots, e.g. hydropower dams, industrial animal and aquaculture farms, WWTPs, etc. Information about location of all of the proposed monitoring stations is presented on Figure 6, while existing state monitoring stations are shown at Figure 7 and already identified hotspots on Figure 8.

   More detailed information about geographic location of stations and problems addressed by those stations is presented in Table 4 (Belarus), Table 5 and Table 6 (Lithuania), Table 7 (Poland) and Table 8 (Russia).

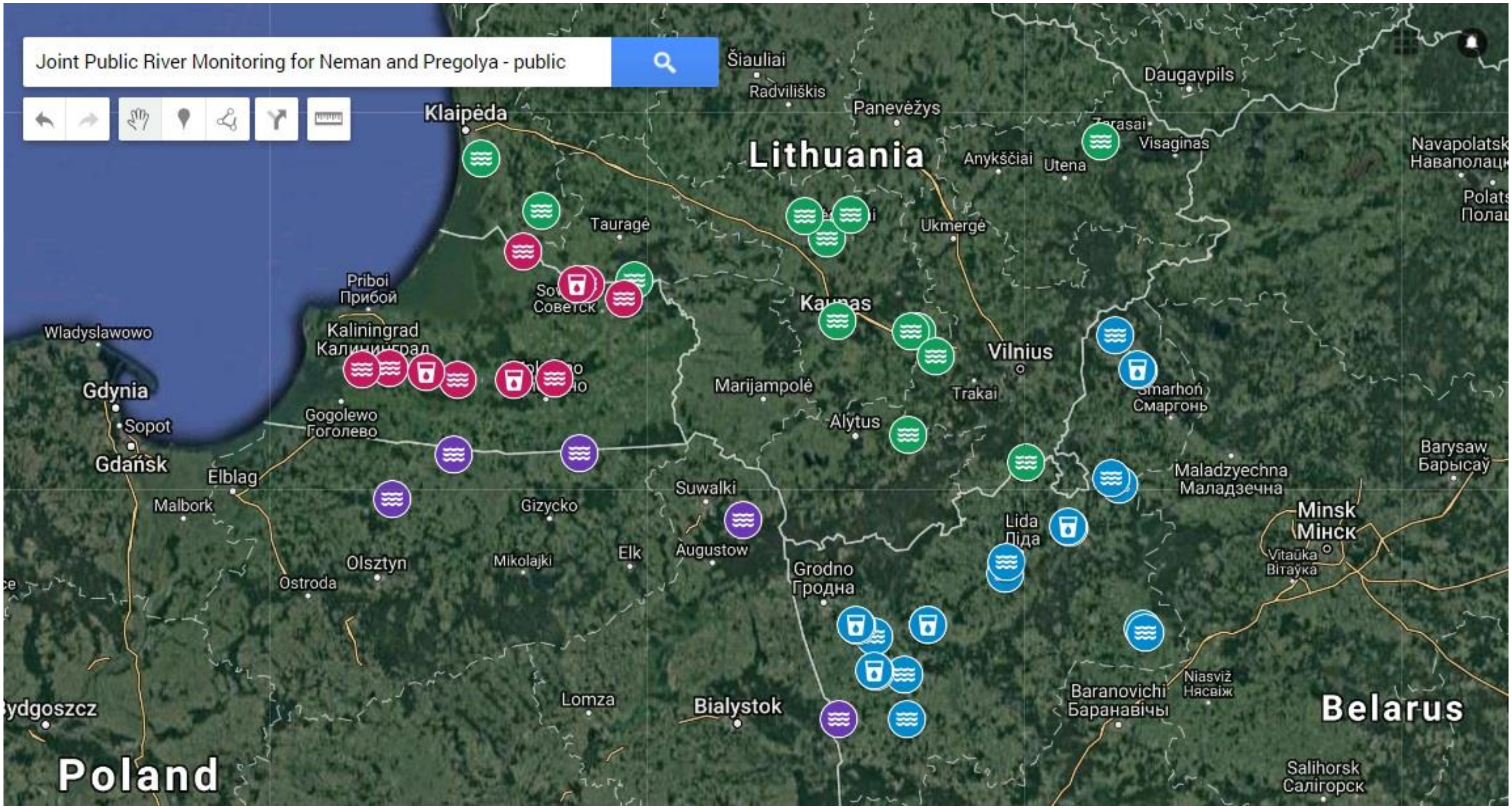

Figure 6. Map of selected public monitoring stations in Neman and Pregola basins

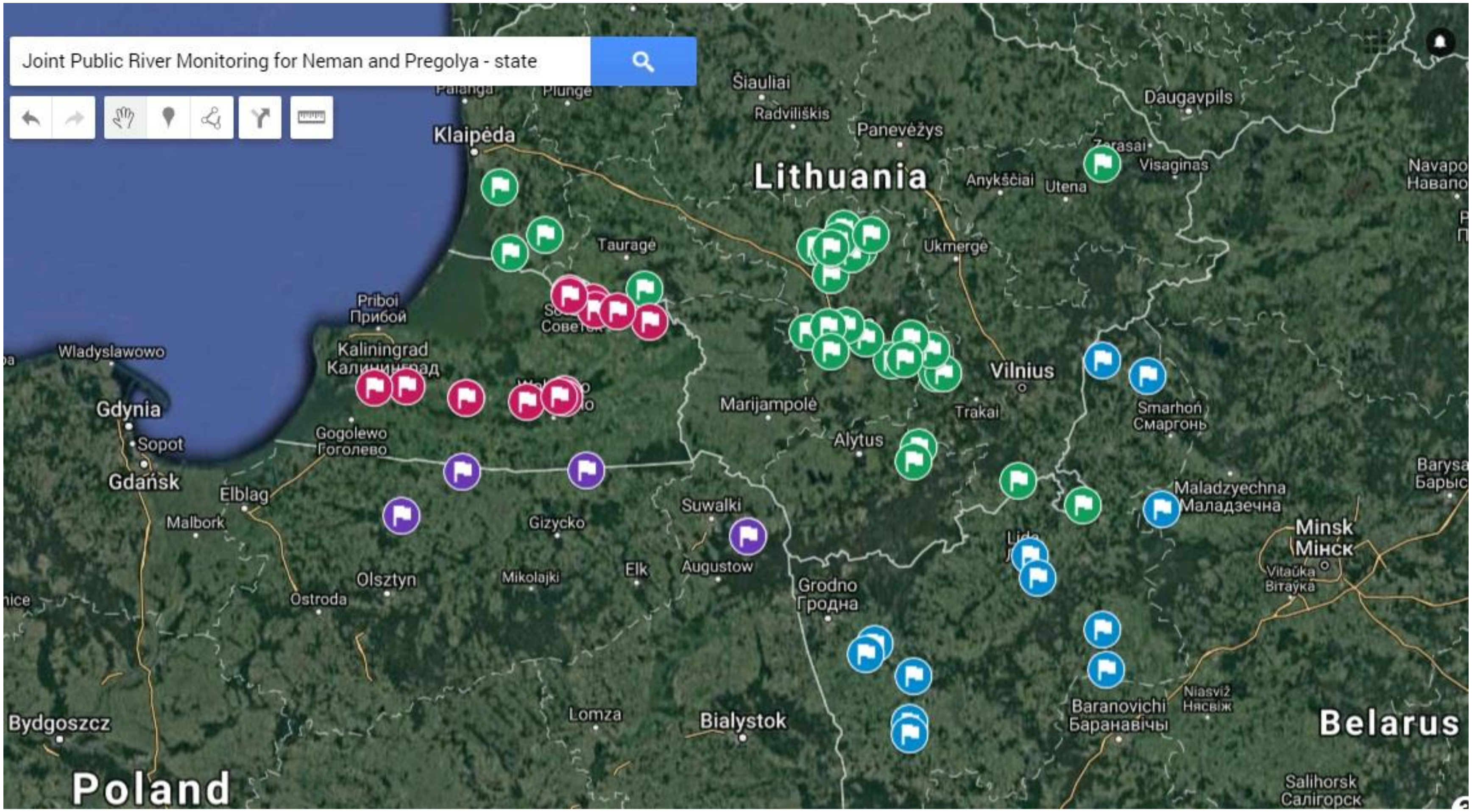

Figure 7. Map of adjacent state monitoring stations in Neman and Pregola basins

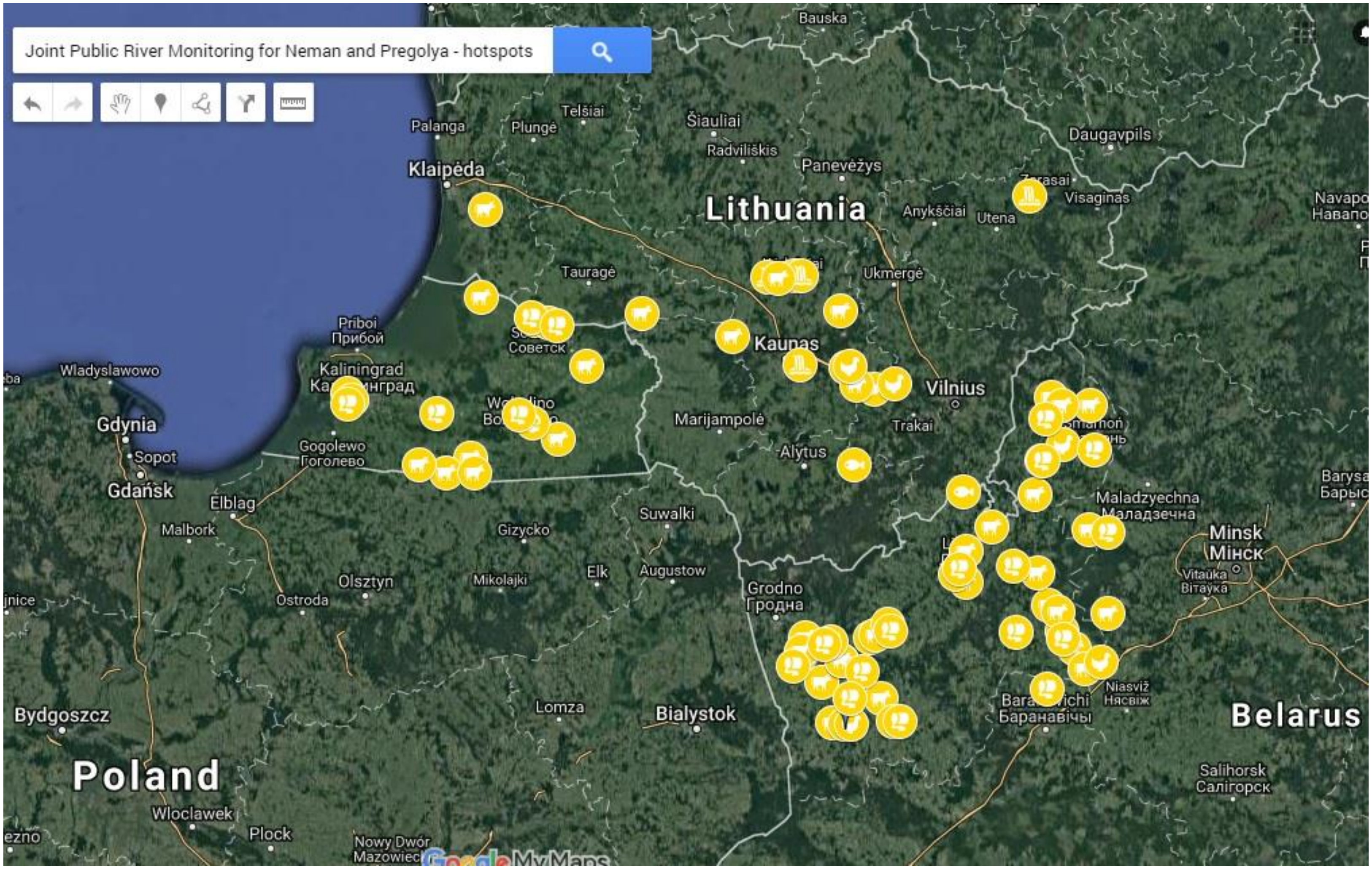

Figure 8. Map of identified hotspots in Neman and Pregola basins

Table 4. Selected public monitoring stations in Belarus

##	Location	Problem description	River/ Groundwater	Coordinates	State monitoring
BY1.	Ludviki village Korelichi disctrict	Industrial pig farm	River Servech	53.5561 26.1761	No
BY2.	Volya village Volkovyssk disctrict	Industrial pig farm	River Ross	53.1568 24.4208	no
BY3.	Dubovcy village Volkovyssk disctrict	Industrial pig farm	River Ross	53.3559 24.4047	no
BY4.	Kovshovo village Grodno disctrict	Industrial pig farm	River Neman	53.5231 24.1800	No
BY5.	Komotovo village Grodno disctrict	Industrial pig farm	River Kotra	53.5706 24.0482	No
BY6.	Komotovo village Grodno disctrict	Industrial pig farm	Wells	53.5706 24.0482	Yes
BY7.	Luki village Korelichi disctrict	Industrial pig farm	River Servech	53.5379 26.1955	No
BY8.	Gudevichi village Mosty disctrict	Industrial pig farm	Melioration channel	53.3646 24.1814	No
BY9.	Gudevichi village Mosty disctrict	Industrial pig farm	Wells	53.3646 24.1814	Yes
BY10.	Mihailovchshina village Oshmyany disctrict	Industrial pig farm	River Kleva	54.1911 25.9987	No
BY11.	Dorgishki village Oshmyany disctrict	Industrial pig farm	River Kleva	54.2174 25.9391	No
BY12.	Elnya village Schuchin disctrict	Industrial pig farm	River Elnya	53.5732 24.5732	No
BY13.	Elnya village Schuchin disctrict	Industrial pig farm	Wells	53.5732 24.5732	Yes
BY14.	Gervyaty village Ostrovec disctrict	Industrial pig farm	River Losha	54.6859 26.1447	No
BY15.	Gervyaty village Ostrovec disctrict	Industrial pig farm	Wells	54.6859 26.1447	yes
BY16.	Rytan village Ostrovec disctrict	Industrial pig farm	River Rytenka	54.8386 25.9711	no
BY17.	Tarnovo village Lidskiy disctrict	Industrial pig farm	River Ditva	53.8018 25.1486	no
BY18.	Ditva village Lidskiy disctrict	Industrial pig farm	inflow of the river Ditva	53.8512 25.1631	no
BY19.	Lipnishki village Lidskiy disctrict	Industrial pig farm	inflow of Gauya river	54.0032 25.6355	no
BY20.	Lipnishki village Lidskiy disctrict	Industrial pig farm	Wells	54.0032 25.6355	yes

Table 5. Selected public monitoring stations in Lithuania

##	Location	Problem description	River/ Groundwater	Coordinates	Nearest state monitoring stations
LT1.	**Viešvilė village, Jurbarkas municipality**		Viešvilė river, direct tributary of the Nemunas (7 km)	397004, 6105373 (LKS) 55.0734, 22.3872 (WGS)	
LT2.	**Žemaičių Naumiestis village (Šilutė district)**	Unidentified source of pollution	Šustis river	354112, 6138989 (LKS) 55.3644, 21.6987 (WGS)	**Šyša close to Šilutė** LTR20 Surveillance monitoring (intensive)
LT3.	**Josvainiai village (Kėdainiai district)**	Angirių HE (after), wastewater discharger, agriculture	Šušvė	489023, 6123573 (LKS) 55.2475, 23.8274 (WGS)	**Šušvė close to Josvainiai** LTR260 Operation water monitoring
		Angiriai HE (before), agriculture		478295, 6134633 (LKS) 55.3465, 23.6578 (WGS)	**Angiriai pond** LTL410 Research water monitoring
LT4.	**Tiskūnai village community, Baltic Farmer of the Year Award national winner 2015** https://www.facebook.com/Tisk%C5%ABn%C5%B3-bendruomen%C4%97s-centras-1519813511606241/	Sustainable agriculture	Nevėžis	500149, 6135249 (LKS) 55.3525, 24.0023 (WGS)	No
LT5.	**Dituvos community, Klaipėda** http://www.lietuvossodai.lt/2015/10/25/dituvos-sodai-virto-nuoteku-kloaka/	Wastewater, irregular pollution, fertilizer run off	Curonian lagoon	326487, 6165210 (LKS) 55.5908, 21.2471 (WGS)	**King Vilhelm channel close to Dreverna** LTR267 Surveillance monitoring (intensive)
LT6.	**„Sodžius" community (Kaišiadorys)** http://www.delfi.lt/grynas/gyvenimas/kolektyviniu-sodu-nuotekos-tersia-lietuvos-upes-ar-kaimynu-fantazija.d?id=59056035	Wastewater, irregular pollution, fertilizer runoff	Kriaučiškių lake, Lomena river	532022, 6079625 (LKS) 54.8518, 24.4986 (WGS)	No

LT7.	**Klovainiai community (Kaišiadorys)** http://www.skrastas.lt/?data=2016-07-27&rub_raj=1140535305&id=1468499935&pried=2016-07-15&step=10	Agriculture, beef cattle farm (ŽŪB „Šiaurės bulius“)	Daugyvenė, Rytbalė river	528795, 6080012 (LKS) 54.8554, 24.4484 (WGS)	No
LT8.	**Kaunas city schools** http://www.delfi.lt/grynas/aplinka/istirti-kauno-vandens-telkiniai-keliose-vietose-padetis-labai-bloga.d?id=71442942	Industry pollution, city run off, wastewater	Kaunas reservoir, Nemunas Karmėlavos reservoir Nemunas, Gričiupis, Veršvis.		No
LT9.	**Šalčininkai city UAB "Šalčininkų žuvininkystės ūkis"** http://www.szu.lt/en/	Aquaculture (most efficient fishing farm in Lithuania, 500 ha)	Svinčelė, Beržė rivers	585349, 6017138 (LKS) 54.2842, 25.3108 (WGS)	**Šalčia near to road Nr. 126** LTR1482 Operation water monitoring
LT10.	**Elektrėnai city UAB "Bartžuvė"** http://bartzuve.lt/	Aquaculture (390 ha)	Skersnė river, Elektrėnai reservoir, Gaviekas/Gilušis lake	541017, 6068232 (LKS) 54.7487, 24.6371 (WGS)	**Gilūšis lake** LTL534 Surveillance monitoring (intensive)
LT11.	**Daugai community UAB „Daugų žuvis“** http://zuvys.96.lt/wordpress/en/	Aquaculture (700 ha)	Varėnė, Žižma, Dusmena river	528062, 6029900 (LKS) 54.4052, 24.4322 (WGS)	**Varėnė river close to Vėžionys village** LTR521 Operation water monitoring
LT12.	**Antalieptes village community** **http://www.antaliepteskb.lt/apie.php**	Significant negative impact Antalieptes HE	Sventoji river, Liedis lake	55.6598, 25.8656	

Table 6. Additional potential stations (to be considered)

LT13.	**Kalvarijai community** http://www.delfi.lt/grynas/aplinka/ir-vel-gamta-kencia-nuo-kiauliu.d?id=58340100 **Case analysis** http://www.llri.lt/wp-content/uploads/2015/09/Kiauli---kompleksas-1.docx One of the biggest conflict between pig's farm and communities. Conflict rose because of unpleasant smells (air pollutions), water pollution.	Agriculture, pig farm (UAB„Idavang" previous name „Saerimner") in Jusevičiai village	Kirsna river, Šešupė river	54.4148, 23.2230	Šešupė žemiau Kalvarijos LTR27 Šešupė žemiau Aukštosios Butkos LTR1577
LT14.	**Kelmė district partnership LAG (Local Action Group)** **(LT KELMĖS KRAŠTO PARTNERYSTĖS VIETOS VEIKLOS GRUPĖ)** http://www.kelmevvg.lt/ Kelme district - one of the largest raw milk producer regions in Lithuania. In Kelme district are 2380 cow keepers which keep 12338 cows in this territory. **Kelmė district partnership LAG is active community which joins all small village communities in this district.** This monitoring point could be very useful to integrate public monitoring activities in small agriculture territory.	Cow and cattle farms Biggest farms in the districts: • Liudviko Janušausko farm UAB „Šimšė"	Rivers in Neman basin Dubysa sub-basin	55.62101, 23.2299	None (depends on the point)

Table 7. Selected public monitoring stations in Poland

##	Location	Problem description	River/Groundwater	Coordinates	State monitoring
PL1.	**Lyna from Kirsna to Symsarna**	Ecological Status - good	Pregola	54.129, 20.58299	PLRW7000205845999
PL2.	**Lyna from Pisa to Polish border**	Ecological Status - moderate	Pregola	54.323, 21.043	PLRW700020584911
PL3.	**Wegorapa from Mamry lake to Polish Border**	Ecological Status – good	Pregola	54.327, 21.98	PLRW70002058253
PL4.	**Swisłocz – Bobrowniki**	Ecological status - good	Neman	53.15261, 23.91419	PLRW80001962691
PL5.	**Czarna Hańcza – Wysoki Most**	Ecological Status - moderate	Neman	54.037, 23.20299	PLRW80002564549

Table 8. Selected public monitoring stations in Russia

##	Location	Problem description	River/Groundwater	Coordinates	State monitoring
RU1.	**Kaliningrad city.**	Mouth of Vostochniy stream	Pregola River	54.6942, 20.5663	
RU2.	**Pregel coast (near Kosmodemjanskogo village)**	in front of landfill in Kaliningrad	Pregola River	54.6903, 20.3614	
RU3.	**Chernyakhovsk town**	at confluence of Instruch and Angrappa	Pregola River	54.6478, 21.7908	
RU4.	**Gvardeisk town**	At confluence of Pregola and Deima	Pregola River	54.6459, 21.0672	
RU5.	**Timofeevo village, Krasnoznamenskiy municipality**	Shesupe river	Neman River	54.9916, 22.3081	
RU6.	**Neman town**		Neman River	55.0561, 22.0290	
RU7.	**Jasnoe village, Slavskiy municipality**		Neman River	55.1967, 21.5585	
RU8.	**Ushakovo village, Gurievskiy, municipality, near kirk Heiligenwalde**		Groundwater well in Pregola Basin	54.6807, 20.8328	
RU9.	**Poddubnoe village, Chernyachovskiy municipality**		Groundwater well in Pregola Basin	54.6421, 21.4952	
RU10	**Dubki village of Neman municipality**		Groundwater well in Neman Basin	55.0562, 21.9616	

B. Monitoring Parameters

Composition of the natural water depends not only on physical conditions of the environment and biological and microbiological processes, but also on human activities within the watershed of river systems. Quality classes (or pollution levels) can be based on factors such as concentration of contaminating substances, characteristics of hydrobionts, trophicity and saprobity of a water body. Various countries may have different regulatory documents specifying classes of quality or pollution levels in rivers and other water bodies. In many countries these are state standards and sanitary norms and regulations. Public groups are recommended to choose to study those indexes which they can verify with in the field conditions or with the help of simple laboratory measurements. It makes sense to start with the simplest observations and measurements. The following parameters were agreed to be jointly selected for this monitoring programme.

1. Temperature

Temperature fluctuations cause different impact on plants and aquatic animals. Some animals thrive in warm water; other ones can exist only in the colder temperatures. Expansion of phyto- and zooplankton depends on the temperature of the water. For example, saprogenic bacteria can develop only if the temperature is above 10 degrees. The temperature affects metabolism of aquatic organisms and their resistance to toxic substances, diseases, and parasites. Besides this, various chemical water conditions also depend upon the temperature. With an increase of temperature, solubility of gases goes down, including that of the oxygen.

Relative increase of the temperature in a water body may indicate thermal pollution or climate change. If the goal is to detect thermal pollution, then temperature should be measured in several spots of the water body, distanced several hundred meters from each other, in a place where a thermal pollution is expected and in a control point (background temperature).

It is necessary to consider that the selected locations should have similar physical and hydrological conditions: the stream velocity, depth, breeze, solar illumination, etc.

The control point in the river should be upstream from the possible source of thermal pollution. There is no reason to measure temperature in the points of possible natural temperature increase, i.e., sand banks, water growths, etc., because in such areas the temperature usually exceeds the general temperature background.

2. Water Clarity

Turbidity and transparency are characteristics of the same phenomenon. Turbidity of water (decrease of its transparency) is connected with the presence of micronized suspended matters, e.g., sand, clay, nonorganic compositions (aluminum hydroxide, carbonates of various metals) and organic impurities, e.g., phyto- and zooplanktons.

For quality assessment of muddiness, a dark background is placed behind the test tube and the water is described in the following way: transparent, softly opalescent, opalescent, very opalescent, softly muddy, muddy, very muddy.

As transparency decreases, light transmitting through the water column decreases. This decreases efficiency of the photosynthesis and natural biological productiveness of the water reservoir and conditions for the water animals' habitat change. In the field conditions, transparency/turbidity is measured with the aid of a Secchi disk: a white disk with a diameter of approximately 20cm, tied up to a long marked-on string. The Secchi disk is submerged into the water until it disappears from view. Then this depth is measured (in cm).

3. Acidity (pH)

Under ordinary river conditions, the pH index usually varies within the 6.5 to 8.5 interval. Values beyond this interval are unfavorable for hydrobionts (living inhabitants). The pH value depends upon a number of factors including vegetation. Plants absorb carbon dioxide from the water in the daytime and thus reduce its acidity: pH goes up; in the night, the reverse process takes place.

Natural acidity (pH below 6.5) is typical for marshy waters at the account of enhanced content of humic and other natural acids. Enhanced acidity might be stipulated by acid precipitations and anthropogenic wastes, water contamination with industrial waste waters without undergoing neutralization. Acidity below 5 is destructive for the majority of living organisms.

The pH value exceeding 8.5 tells about the water alkalinity stipulated by both natural fac tors (e. g., enhanced content of hydro carbonates and carbonates) and industrial or household wastewaters.

The easiest way to measure pH is to use test-bands that change their color depending upon the level of water acidity. Altered testband is compared with a color scale; it roughly specifies the pH value by color matching.

A more exact value of pH could be specified with the aid of a portable device, a pH-meter* or with the help of chemical agents and visual color measurement (see more at the website www.baltfriends.ru/rw_main/rw_manual/).

4. Nitrogen & Phosporous

In the context of water quality control, compounds which, first, are wastes of various organisms and, second, are "construction material" for living organisms are considered biogenic elements (nutrients). These are, in the first place, nitrogen compounds (nitrates, nitrites, organic and non-organic ammonias compounds) and phosphorus compounds (orthophosphates, polyphosphates, organic esters of phosphorous acid, etc.).

Stipulated by external sources, nitrogen compounds in water bodies transform from one form into another. For example, in the course of the first two hours after manure discharge into the water, enhanced content of ammonium cations will be registered; later on, ammonium cations transfer into nitrites, and almost immediately after this, they transfer into nitrates. In other words, nitrates are a cumulative characteristic and its specification is the easiest for public observers.

Nitrates are salts of nitric acid. Enhanced content of nitrates in the water might indicate pollution of the water body as the result of fecal or chemical contamination (household, agricultural, industrial). Many mineral fertilizers contain nitrates which can cause pollution of water bodies in case of excessive or irrational introduction to soils. Surface runs from grass lands, animal farms, milk farms, etc. can also be sources of nitrate contamination. Nitrates enhance eutrophication of water bodies and facilitate mass growth of aquatic vegetation (blue-green algae in the first place).

The method of nitrate identification is a visual-colorimetric technique. You can use both ready test bands and agents. Nitrate content in drinking water should not exceed 45mg/L; however, it is much better if they are not present at all.

Nitrates in wells

Pollution of surface waters can lead to soil degradation not only in natural water bodies, but also in drinking wells. Often, a well in a village is the only source of water used both for drinking and household needs. Sometimes, animal barns or vegetable gardens and fields where fertilizers and pesticides are used are not far from the well. Toilets with waste pits may also be placed too close to the wells. The more polluted the soil through which the water is seeping, the more polluted the water becomes. Frequently one can encounter nitrate water pollution. This type of water has no alien taste or smell, and ordinary people cannot recognize the danger. Drinking water and nutrition products can cause diseases. With excessive content of nitrates in the water they turn into very toxic nitrites which enhance the risk of cancer. Under the circumstances, little children have high risk of methemoglobinemia, which can cause hypo-oxygenation and in some cases even deaths.

After a number of chemical and biochemical transformations in the soil, nitrogen in the form of nitrates flows with the water into rivers and lakes and underground waters. In the surface waters, plants actively absorb nitrates thus radically decreasing concentration. There are no plants in undersurface reservoirs and nothing can de-nitrate there.

Due to this, nitrate concentration in unprotected groundwater occurring at small depths can be much higher (in tens of times) than in rivers and lakes. By some data, nitrates can penetrate into the earth's depth for up to 30 meters, and in some cases they could be detected at much bigger depths.

To protect well water against nitrates, it is important to liquidate sources of pollution

Phosphorus

Phosphorous is a necessary element for living. In natural concentrations, this element participates in the cycle of matters in water ecosystems.

Excessive penetration of phosphorous compounds from fields (up to 0.4–0.6 kg of phosphorous can be runoff from one hectare of irrigated lands), with farm runoff s (0.01–0.05 kg/day per one animal), with unpurified or under-purified household waste waters (0.003–0.006 kg/day per one resident), and also with some industrial runoff s leads to sharp uncontrolled growth of vegetable biomass of a water body. This process is especially typical for low-flow and stagnant basins. Alteration of the trophic status of the basin, adaptation of the entire aquatic community, domination of putrefactive processes (and, correspondingly, escalation of muddiness, salinity, and bacteria concentration) takes place. Phosphorous content in the natural water of 12 micrograms per liter can cause eutrophication. In the field conditions, only major immediate pollutions (milligrams per one liter) could be detected.

Phosphorus in the solid phase in natural basins is usually located in bottom sediments; however, it can occur, and in big amounts, in sewage waters and polluted natural waters.

Phosphates should be detected by colorimetric method.

C. Workplan/Task Description

The following workplan and task distribution has been developed by the project partners, as presented in Table 9.

Each partner, except CCB Secretariat and PKE will carry all the tasks listed below. Meanwhile, each of the tasks will be coordinated by one/two partners.

Table 9. Workplan and task distribution for joint public river monitoring in Neman and Pregola basins

Activities / Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Task leader
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	
A. Training	Each partner							Camp					LGF/CES
B. Equipment purchase, preparation and distribution	All partners												GP/GF
C. Sampling campaign				x			x			x		x	LGF
D. Data recording and submission to the database													CES
E. Data analysis													CES
F. Reporting													CCB Secr.
G. Coordination and communication	Will be carried out by CCB Secretariat in coordination with partnerds												CCB Secr.

V. Sampling/Data Acquisition

A. Data Quality Objectives

The designed joint monitoring plan represents a mixture of so-called "contributory citizen science" and "collaborative" co-created project, when the objectives, monitoring programme, survey protocols, process and analysis of data, as well communication of the results, is done in collaboration of scientists, core NGOs upon explicitly identified policy needs/gaps. Volunteers are invited to collect and submit data according to clearly defined guidelines, and then participate in data analysis and interpretation, to the extent possible, with further communication of the findings to both policy and local community levels. Contributory citizen science is well suited to engaging diverse participants, raising awareness of an issue and gathering lots of data over a wide geographic area. While co-created citizen science works well for projects that:

- benefit from establishing a community-led or volunteer-led monitoring scheme. All parties have a stake in the project and the longevity of involvement provides opportunities for training and sharing of expertise. It does, though, require time and ongoing commitment;
- require repeat measurements over time (and which therefore need a greater commitment from participants);
- are targeted at a specific, locally relevant environmental problem or question.

Therefore, despite that community education and engagement in solving local environmental issues remains the principle goal of the joint monitoring plan, it will apply methods which make data useful to government and academic users, and will help identifying areas of concern for further analysis and actions by the authorities.

For this reason, quality of data remains of relative priority. The quality of data collected by volunteers is heavily influenced by monitoring programme design, training materials and support that is provided by partners and scientific advisors to the volunteers. Data accuracy can be excellent, but, as with any project, it's important both to minimise the opportunities for errors to occur and to understand how data quality varies between samples or even participants. Data of known quality are scientifically useful and are also more likely to be used as evidence by policy makers; data of unknown quality are open to scientific criticism. Validation and verification are two ways in which you can reduce error rates within your data:

Validation is an automated process of checking if something satisfies a certain criterion and can therefore be interpreted successfully. It is possible to add validation checks to web-based data entry forms (e.g. ensuring that dates, grid references or coordinates are given in the correct format and within valid ranges).

Verification is an additional, usually manual, process through which data can be checked. For example, a photograph of a plant, animal or physical feature (e.g. the amount of water in a stream) can be checked visually to confirm that the information that has been provided is correct. Asking participants to provide photos can add huge value to the data by allowing verification.

Another approach is to verify a subset of the data, e.g. by requesting samples to be sent in or by accompanying a few participants and observing the measurements that they take.

Verification can also be crowd sourced, for instance by asking people to assess each other's photographs or asking different people to take measurements at the same site.

Understand the quality of your data by observing participants and identifying the types of errors they make. Ensure that your protocol allows you to check the quality of a subset or all of the data and maybe even investigate ways to rate and reward participants' abilities. Although poor quality data can be omitted, this represents a waste of participants' time! Instead, variation in data quality (including between participants) can be modelled statistically and taken into account when undertaking analysis.

Increasingly, citizen science projects are incorporating data validation and verification steps ensuring the data are of known quality. Sometimes, only verified data is accepted, so the data are known to be correct. In other projects a sample of the data is verified in order to assess the quality of the data so that error or bias can be taken into account in the analyses. Both approaches provide trustworthy data. The results of many such projects have been published in the scientific literature, and citizen science data is also used in national indicators.

Joint public monitoring plan for Neman and Pregola catchments will address the above challenges at all stages: planning, training of volunteers, sampling and analysis of data.

B. Volunteer Training: Recruitment, Approach and Methods

Volunteers' training will differ from country to country, which depends on both national peculiarities and leader organization's experience. Project partners in each country will be responsible for coordinating volunteers' training and deployment.

Initial selection and training should be carried out in each country using the same methodology and then after half-a-year of work a joint international field camp(-s) can be arranged to exchange the experience. Most of the partners already have certain number of trained volunteers for monitoring and the rest of them could be recruited through NGO messaging, social media, announcements at the universities, etc. E.g. CES in Belarus has very good contacts with media, where the information about such projects is shared via interviews on radio and TV, besides those activists, who are regularly connected through organization's website.

Initial training of the volunteers will primarily focus on education by scientific advisors on sampling and analytical methods, as well as recording of data for submission to the online database. Besides it includes training on communication with local residents and

authorities, as well as media. It is important to engage local residents in the public monitoring process for future sustainability of the project. One of the successful examples how local residents can be engaged is dissemination of information about nitrates concentrations in drinking water and about how determination of concentrations can be done. For this purpose the nitrate test stripes can be used, supported by spreading the awareness materials about this problem and the ways to solve it. It is important to describe the sources of such pollution (runoff from farms, household toilets, excessive fertilisation, etc.) and how those may affect the state of contamination and quality of drinking water and natural water bodies.
In addition to actual sampling of various parameters, the volunteers will be trained to evaluate the state of surface waters by visual observations, as often the problem can be rather visible.
Besides volunteer training seminars, it is proposed to arrange joint international field camp(-s) to exchange the experience among partners from different participating countries. Within such international camps it is useful to perform discussions on available ways to solve the problems through international cooperation of NGOs and local public.
Proposed training scheme should be based to the extent possible on interactive channelling of information, use of "equal-to-equals" education method, as well as be as practical as possible in explaining the material.
For efficient volunteers' work when accomplishing the trainings it is suggested to develop a short Volunteer's Guide, which would comprise of short overview of the methods of determination of major monitoring parameters and interpretation of obtained results, hints for communication with local residents and authorities, as well as any other relevant information. Each volunteer should be provided with necessary equipment and materials, as well the coordinators should work out the model for compensating volunteers' travel expenses.

C. Sampling Methods, Handling Requirement, Calibration Procedures and Preventive Maintenance for Field Equipment

1. LaMotte World Monitoring Challenge Kits

(http://www.monitorwater.org/order-kits)

This easy-to-use test kit which will enable individuals and groups to sample the waters of the Neman and Pregola watershed for a core set of water quality parameters including temperature, pH (acidity), turbidity (clarity) and dissolved oxygen (DO). By conducting simple water quality tests in Community and sharing the data through a network of citizens from 4 countries, participants become part of the solution for clean water and healthy waterways worldwide.

The Basic Test Kit includes one set of hardware and enough reagents to conduct up to 50 rounds of testing for pH, dissolved oxygen, temperature, and turbidity.

pH (Acidity) – measures how acidic or basic a liquid is. pH is measured on a scale from 0-14, where 0 is most acidic, and 14 is most basic, and 7 is neutral. A pH between 6.5 and 8.5 is favorable for supporting life in natural waters.

Dissolved oxygen (DO) – measures how many molecules of oxygen are in the water. Since oxygen is important for fish and other aquatic life, higher DO readings support more diverse species and a healthier ecosystem. Low levels of DO can weaken or kill fish and other aquatic life.

Turbidity (Clarity) – measures the water's clarity. Debris, sand, silt and other materials can make the water less clear (more turbid). Turbidity can impact the aquatic ecosystem by affecting photosynthesis, respiration and reproduction of aquatic life.

Temperature – measures the warmth or coldness of the water. This indicator is important because it affects dissolved oxygen, photosynthesis, and the food supply. Waters that are too hot or too cold can have severe effects on fish and other aquatic life.

2. Compact laboratories Aquamerck ® – MColortest™ and Agroquant ®

On site with the lab. No matter whether you wish to check a specific concentration range for a given parameter on the spot or if you just want to check a limit – the Aquamerck ® compact laboratory contains all the reagents and accessories necessary for the application in question. The robust carry-case provides protection for the contents, and the opened cover can be used as an on the-spot workbench.

Economical refi ll packs are available for each parameter for the compact laboratories, too. These reagent bottles can be placed in the case directly and reduce the costs for the later determinations.

The advantages of the compact laboratories:

- User-oriented compilation of the reagents
- All reagents in a minimum space
- No further instruments or accessories necessary
- Safely packaged
- Easy to handle and robust
- On site with the lab

For example: MColortest™ compact laboratory for water testing

Compact laboratory for the determination of pH, ammonium, biological oxygen demand (BOD), carbonate hardness, total hardness and residual hardness, nitrate and nitrite, phosphate and oxygen.

The tests of this compact laboratory can be used to rapidly check all major parameters of standing or flowing surface water and to assess the current water quality. The compact laboratory is optimally suited for use in school lessons as well as for professional applications e.g. by water monitors.

3. Hydrobiological equipment Scandidact (http://www.scandidact.dk/biologi/biologi/okologi-feltudstyr) (except above mentioned)

recommended to use for sampling and data acquisition (may be purchased and used as several kits of equipment for each working group)

The kit may include:

- hydro suit
- set of bottles for water collecting
- holder for bottles
- Secchi disk
- hydrochemical test (Øko-vandtest, box) – for inspection of smaller concentrations of phosphates, nitrates, ammonium, hardness.

VI. Data Management & Dissemination

A. Data Documentation and Record-keeping

It is suggested to use a common data sheet for the partners, to harmonise the methodology of data collection and keep the results comparable for all the stations across the basins. A template datasheet is contained in APPENDICES. It will be further developed to fit for the joint monitoring plan purposes.
Volunteers will enter sampling data using datasheet and submit these datasheets to relevant national coordinators. It is also possible that volunteers may enter sampling data directly into the online web database. However, the experience from Belarus, where the system operates so far, is that data still needs to be checked by designated quality control personnel of partner organizations or coordinating partner (CES). The original datasheet is stored by partner organization for the joint monitoring records.

All the results are proposed to be submitted to a joint online database at www.watercontrol.by.

Submitted data will be analysed using the expertise of scientific advisors of the project and in case of finding deviations from the background environmental status will be delivered to relevant environmental authorities to taking necessary actions to curb the pollution. After obtaining relevant data from a certain period, e.g since a year from start of the project, it should be possible to undertake comparisons of accumulated data for various parameters at each sampling point and in transboundary context, as well as draw conclusions about possible impacts of various pollution sources. Analysis of data can be performed with certain frequencies for timely tracing the development of the situation (e.g. quarterly). In case of identification of specific pollution source the volunteers can prepare inquiries to relevant local authorities for taking necessary actions towards the polluter.

B. Web-based Data Management System

Center for Environmental Solutions (CES) contributes to sustainable water management in Belarus with a goal to halt pollution of natural water bodies by any means. In order for everyone to feel its involvement in the conservation of water resources in Belarus, we have launched a site public monitoring of the state of natural waters (www.watercontrol.by). Each of the inhabitants of the country can bring to the resource information about anthropogenic contamination of the reservoir, the level of nitrate pollution of drinking water in the wells.

The results of Neman and Pregola Basin public monitoring will be available online and will be followed-up in co-operation with relevant authorities. CES will pay special attention to solving nitrate-pollution problem in rural communities, by development model technical and institutional approaches. Additionally, CES will address the issue of absence of waste-water treatment facilities in rural areas, by running and promoting eco-sanitation pilots in different regions.

The expert knowledge in this area is represented by Grodno State University and Belarusian State University, which is the organization that has elaborated the methodology and the detailed guidelines for the other partners to work with. The spread of testing activities covering all regions and a systematic approach to water analysis becomes possible owing to the involvement of different regional and national NGOs. CES and local activists have jointly taken the responsibility for implementing wells testing and River Watch activities in different geographical areas, and thus the activity covers different regions of Neman and Pregola catchment areas. Accumulation of the research results is realized via a joint online-database that has been developed by CES in cooperation by all partners, and data from the regions is filled-in by them (www.watercontrol.by). At the moment, the monitoring data on nitrate-pollution from more than 2400 wells in Belarus are available online, which is the largest public input in this area so far.

The work in this field contributes to greater public awareness both directly, through some of the activities, and as a result of the analysis and presentation of the testing result. The presentation of the aggregated results also raises the awareness among authorities and other decision makers, and helps to strengthen the role and status of the participating

NGOs in their lobbying and dialogue on the need for appropriate policies and improved water management, and technical approaches in local level.

A feature of the project is that it is driven by the public: anyone who has checked the quality of the water (http://watercontrol.by/issledovanije-vody) in their well with a special test strip or found contamination source (http://watercontrol.by/db), can make a contribution to the common cause, adding information to the site. The more willing to take part in the project, the more complete picture of the quality of water in Belarus we get, the easier it will be to work on its improvement. Water quality checks are carried out 4 times a year in accordance with the seasons, as nitrate concentration can be varied in accordance with the season of the year. We analyze the information about the quality of water in wells, conduct an additional survey of local residents and to identify the so-called "Hot spots", ie, those towns in which most of the sources of drinking water have water with high content of nitrates. In this case, we conduct additional research to identify potential sources of contamination, conduct informational work with the local population with an explanation of what may influence the content of nitrates and how to remedy the situation.

In addition to data on the quality of water in wells, users can add information about illegal dumps waste found them, manure runoff from farms, farms, manure and other sources of pollution with accompanying photos, audio and video, text comments. All pollution data posted on the site, be sure to check the moderator, and then appear in the public domain. Next, we begin with the activist to solve the problem: preparing a request to the local authorities with a request to investigate the situation. Depending on the level of complexity of the problem we are preparing from 1 to 4 written requests and then control the process of eliminating the problem or to reduce impact on water bodies.

To help users on the site is also available database of legislative acts of the Republic of Belarus and scientific articles in the field of ecology, presented lists and contacts are regional centers of hygiene and epidemiology, which can signal the violation of environmental laws.

No special hardware requirements for use of the site is not. Under the new project, we plan to expand the functionality of the site, as well as to develop a mobile app for smartphones and androids. Using GIS technology to expand the existing site could help to enhance the functionality of the analysis in part (including the space - interpolation values of nitrate pollution, coupled analysis of the various factors that influence the distribution of nitrate pollution, export data on pollution-specific parameters (eg at a certain area), the construction of buffer zones (for example, 40-meter zone around the wells and zones with different rules of economic activity around the bodies of water), the definition of "hot spots", etc.), would eliminate a number of errors due to " human factor "- the introduction of observation points without gridding, duplication and / or incomplete insertion of data would make it possible to implement the functional needs of different user groups - volunteers, NGOs, Proos inspections of decision management solutions.

The development of mobile applications, which will be synchronized with the database of the site (on the ESRI ArcGIS platform and its mobile application) will allow for the collection of data directly in the "field" conditions. Mobile version of the site is suitable for any platform.

C. Data Dissemination Strategy - communication of results

Neman & Pregola River Basin Monitoring Communication and Data Dissemination Plan

Introduction

The overall purpose of the communication and data dissemination plan is to increase public awareness about water quality issues in Neman and Pregola basin, to encourage local communities to participate in public monitoring and to assure efficient dissemination of public monitoring data as an alternative source of information for state institutions and other stakeholders.

Project communication plan provides relevant, accurate, and consistent information to public society, stakeholders and other appropriate audiences. By effectively communicating the project can accomplish its work with the support and cooperation of each group of target audience.

The communication data dissemination plan provides a framework to manage and coordinate the wide variety of communications that take place during the project. The communication plan covers who will receive the communications, how the communications will be delivered, what information will be communicated, who communicates, and the frequency of the communications.

Communication Objectives

Effective and open communications is critical to the success of the project. The key communication objectives for the project are:

- ✓ To increase public awareness about water quality issues in Neman and Pregola basin.
- ✓ To encourage local communities to take part actively in public monitoring.
- ✓ To ensure active use of public monitoring data by state institutions and other stakeholders.

Communication Purpose and Target Audiences

This section identifies the audiences targeted in this Communication Plan, and the purpose of communicating with each audience.

Target audience	Communication Purpose
Public audience	To increase public awareness about water quality issues in Neman and Pregola basin.
Local communities in rural areas	To encourage local communities in rural areas to take part actively in public monitoring.
Local communities in urban areas	To increase participation of urban communities in public monitoring. To increase public awareness about environmental problems in Neman and Pregola basin and by this way to create public pressure to stakeholders.
Teachers of local schools	To increase an involvement of schoolchildren in public monitoring.
People living in Neman river basin area	To increase public awareness about water quality issues in Neman and Pregola basin. Promotion of public monitoring idea and collected data
Public audience (nearly all the possible target groups: members of local communities, local NGO's, teachers and schoolchildren from local schools)	To increase public awareness, encourage participation in public monitoring and interest in collected data.
International (LT, LT, K) communities in Nemunas river basin	Dissemination of public water monitoring results as well as success stories from local communities.
Emergency/Ad Hoc	To show rapid reaction in cases of emergency – to prove "public guardiancy".
Water tourism enthusiasts	To encourage water tourism enthusiasts as well and entrepreneurs to take part actively in public monitoring.
State institutions	To ensure active use of public monitoring data by state institutions and other stakeholders.

Communication Message and Delivery

The following outlines the targeted audiences, the key communication messages to be delivered, and the method for delivering the information, the communicator, and the frequency of the delivery.

Nr.	Audience	Message	Delivery Method	Delivery Frequency	Communicator
1.	Public audience	The quality of water in Neman and Pregola rivers is not good enough and every person living in basin shares the responsibility for a good environmental state of rivers.	Press release in national media channels. International media, such as "Baltic Times" etc.	Once – for a launch of public monitoring campaign. Every three months – as a reminder and an update of public monitoring results.	There can be centralized press release prepared by CCB about common state of Neman and Pregola rivers and sources of pollution in general and then NGO from each country can add a paragraph of national context.
2.	Local communities in rural areas	Every member of community is related to Neman (or Pregola) river through the network of small rivers.	Local small scale press, which is extremely popular in rural areas.	An article every two months.	Each national organization prepares it's own text, adapted to the local context. Articles about an opportunity to take part in public monitoring, active local communities, success stories (including the ones from previous projects, for example "Ja Mogu" in Belarus)
3.	Local communities in urban areas	"Every city matters". To encourage inhabitants of cities to observe the quality of the water and by this way to create public pressure to stakeholders in order to	Public sampling of water in river before the water treatment facilities and after it. Public educational lessons about water quality led by experts – explanation of the results of	5-6 cities in each participating country	Each country organizes event separately.

		ensure waste water treatment is a question of high priority.	sampling and general state of the water quality in the city. Communication through direct participation, as well as social media and invitation of representatives of national media.		
4.	Teachers of local schools	"Adopt the river"	Campaign "Adopt the river". An international campaign in order to increase participation of schoolchildren in public monitoring. Competition for the best "river saving" plan. Each participating school is taking water samples ofrom the small river (tributary of Neman or Pregola). After six months they will analyze the result of water sampling, identify possible sources of pollution and write "three step plan" – what they can do in order to reduce pollution. All the plans compete in national competition and every country has its own national winner. Every national winner as a prize receives an opportunity to visit national winner in another country.	An announcement of campaign through MoE communication channels. Water sampling – for 6 months. Articles about winners in national media.	Partner NGO from each country coordinates national competition. Selection of winners – by international jury.
5.		Public audience (nearly all the possible target groups: members of local	All the intakes meet in Neman and affect the quality of the river. All the communities in NRB are	An educational expedition: from the start to the end of Neman.	Separately communication plan for communication of expedition. Duration – 2 weeks.

		communities, local NGO's, teachers and schoolchildren from local schools)	united by common goal – to protect Neman river.	The goal – to meet the most active communities and hear their concerns and issues (since some of participants of expedition would be environmental experts, they could as well provide some practical advices.) At the same time, number of educational events will be organized – in order to engage more communities. As well as number of public debates. International core of expedition team will create an effect of transboundary cooperation. Some of representatives from local communities or local NGOs will join them time to time. Photo, video materials, interviews with representatives of local communities will be published in social media and websites of all partner NGO. Media representatives will be invited to take part in an expedition.	
6.	International (LT, LT, K) community	All around the Neman and Pregola river basin people are ready to take responsibility and bring their special efforts in order to increase the quality of the water in Neman river	Press trip. 2 – 3 journalists from each country will visit local communities with success stories and by this way the message about empowerment of local communities in solution of local water quality issues will be spread.	After approximately one year of involvement of international audience in public monitoring.	

7.	Emergency/*Ad Hoc*	To show the real "guardiancy" – react immediately when it is needed.	Press release. Informing responsible state institutions.	When collected data shows a rapid deterioration of water quality or there is any accident which may affect water quality.	In relevant country. Shared inside the network of NGO's with a possibility to publish it in other country.
8.	Water tourism enthusiasts	River means much more than just "water way". If we want to continue enjoy the water tourism, we need to protect rivers.	Representatives of companies, renting water tourism inventory will explain to tourists how to take water samples in a proper way. After the water trip they will help evaluate water quality and bring data to database.	Since water tourism is highly popular, at least in Lithuania, in summer season water tourism enthusiasts could provide much information about water quality.	Although the number of people informed about initiative by this way will not be very high, it will be efficient through its multiplication effect. By this way will be affected people who have special relationship to rivers, therefore they will be spreading message about quality of water and an opportunity to take part in public monitoring.
9.	State institutions	"Official data" doesn't represent real state of water quality. Therefore public monitoring data from can be used as an alternative source of information about environmental state of the river.	International conference will create a special space for discussions between representatives from state institutions, NGO's and other stakeholders.	After one year of public monitoring	Organiser – CCB; coordinators – partner NGO in each country

VII. Provisional Project Budget

Budget - Neman & Pregola River Basins Monitoring Program

Start-up and Annual Operating Costs

	Belarus			Lithuania			Russia			Poland			Coalition Clean Baltic			
	20 monitoring sites			*15 monitoring sites*			*10 monitoring sites*			*5 monitoring sites*						
	80 tests/year			*60 tests/year*			*40 tests/year*			*20 tests/year*						
	est. 40 volunteers			*est. 30 volunteers*			*est. 20 volunteers*			*est. 10 volunteers*						
Capital/Start-Up Costs																subtotals
Test Kits	#	cost		#	cost		#	cost		#	cost		#	cost		
LaMotte Basic Kits (DO, pH, temp, etc)	30	€ 13,25	€ 397,50	22	€ 13,25	€ 291,50	16	€ 13,25	€ 212,00	8	€ 13,25	€ 106,00	4	€ 13,25	€ 53,00	$ 1060
Aquamerck Compact Lab (BOD, N & P)	22	€ 570,00	€ 12 540,00	17	€ 570,00	€ 9 690,00	12	€ 570,00	€ 6 840,00	7	€ 570,00	€ 3 990,00	2	€ 570,00	€ 1140,00	$ 34 200
Start-Up Subtotals by Partner		***Belarus***	***$ 12 938***		***Lithuania***	***$ 9 982***		***Russia***	***$ 7 052***		***Poland***	***$ 4 096***		***CCB***	***$ 1 193***	***$ 35 260***
Annual Operational Costs																subtotals
NGO staff Costs	hours/yr	rate/hr		hours/yr	rate/hr		hours/yr	rate/hr		hours/yr	rate/hr		hours/yr	rate/hr		
NGO River Monitoring Coordinators	400	€ 20,00	$ 8 000	300	20	$ 6 000	200	20	$ 4 000	100	20	$ 2 000				$ 20 000
Overhead/Administration (15%)	8000	0,15	$ 1200	6000	0,15	$ 900	4000	0,15	$ 600	2000	0,15	$ 300				$ 3 000
CCB Program Coordination													100	20	$ 2 000	$ 2 000
Web-based Data Management System	hours/yr	rate/hr														
Staff Coordinator	200	€ 20,00	$ 4 000													$ 4 000
Web Registration/IT support			$ 3 000													$ 3 000
Maintaining Sampling Kits	#	cost		#	cost		#	cost		#	cost		#	cost		
Misc. Equipment & repairs	20	€ 50,00	$ 1000	15	€ 50,00	$ 750	10	€ 50,00	$ 500	5	€ 50,00	$ 250				$ 2 500
LaMotte DO refills (100 count)													3	€ 16,40	$ 49,20	$ 49
LaMotte pH refills (50 count)													5	€ 14,10	$ 70,50	$ 71
Training and promotion of volunteers	#	cost		#	cost		#	cost		#	cost		#	cost		
National training sessions	40	€ 5,00	$ 200	30	€ 5,00	$ 150	20	€ 5,00	$ 100	10	€ 5,00	$ 50				$ 500
International training camp	10	€ 50,00	$ 500	10	€ 50,00	$ 500	10	€ 50,00	$ 500	5	€ 50,00	$ 250				$ 1750
Award to best volunteer (4 national and 1 regional)	1	€ 50,00	$ 50	1	€ 50,00	$ 50	1	€ 50,00	$ 50	1	€ 50,00	$ 50	1	€ 50,00	$ 50	$ 250
Annual all Partner's Conference	#	cost		#	cost		#	cost		#	cost		#	cost		
Travel	10	€ 500,00	$ 5 000	10	€ 500,00	$ 5 000	10	€ 500,00	$ 5 000	10	€ 500,00	$ 5 000	10	€ 500,00	$ 5 000	$ 25 000
Venue/Hotel Accommodations	10	€ 250,00	$ 2 500	10	€ 250,00	$ 2 500	10	€ 250,00	$ 2 500	10	€ 250,00	$ 2 500	10	€ 250,00	$ 2 500	$ 12 500
Staff - Meeting Coordination													150	20	$ 3 000	$ 3 000
Communication & outreach	#	cost		#	cost		#	cost		#	cost		#	cost		
Publications/leaflets	1	€ 1000,00	$ 1000	1	€1000,00	$ 1000	1	€1000,00	$ 1000	1	€ 1000,00	$ 1000				$ 4 000
rt video/animation about public monitoring methods	1	€ 1000,00	$ 1000	1	€1000,00	$ 1000	1	€1000,00	$ 1000	1	€ 1000,00	$ 1000				$ 4 000
Operating Subtotals by Partner		**Belarus**	**$ 27 450**		**Lithuania**	**$ 17 850**		**Russia**	**$ 15 250**		**Poland**	**$ 12 400**		**CCB**	**$ 12 670**	**$ 85 620**
TOTAL (Start-Up + Annual Operating Costs)		**Belarus**	**$ 40 388**		**Lithuania**	**$ 27 832**		**Russia**	**$ 22 302**		**Poland**	**$ 16 496**		**CCB**	**$ 13 863**	**$ 120 880**

Note: all costs in US Dollars

Budget Assumptions

1. Sampling to be done 4 times per year at each site
2. Assume two volunteers needed to cover each sampling site
3. One complete sampling kit per monitoring location to be shared by volunteers for that site
4. Estimate 20 hours per monitoring site per year to train/support volunteers, manage data
5. Overhead/Admin Fee per NGO set at 15% of personnel costs
6. Misc. Sampling Equipment, repairs estimated at $50 per site per year
7. $500 Travel, $250 Accommodation per person for conference, assume 10 participants per NGO plus 10 CCB staff, experts, guests
8. Sampling kit refills to be purchased by CCB and distributed to partners each year.

APPENDICES

Neman & Pregola Rivers Public Monitoring Program Water Sampling Data Sheet 2017

General Conditions

____________ Station ID #	River Basin: ____________	
____________ Sample Date	Volunteers Name: ____________	
____________ Munic., Country	NGO Coordinator: ____________	
# ________	Weather Conditions: (choose 1)	1 Cloudless 2 Partly Cloudy 3 Overcast 4 Fog/Haze 5 Drizzle 6 Intermit. Rain 7 Rain 8 Snow
________	24 hour Precipitation (choose one) 1 None 2 Light 3 Heavy	
________	Air Temperature (°C)	
________	Water Color (choose one) 1 Clear 2 Light Brown 3 Dark Brown 4 Other ____________	
________	(meter) Secchi disk depth ____________ (meter) Total water depth at station	
Other observations Please continue comments on back		

Depth Specific Chemical Parameters

	SURFACE ___**cm** below surface	Units	Replicate Duplicate	**BOTTOM** ___**cm** up from bottom	units	Replicate Duplicate
Collection Time						
Sample collection depth		m/cm			m/cm	
Water Temperature		°C			°C	
Dissolved Oxygen		Ppm			ppm	
Hydrometer Reading	1.0_____		1.0______	1.0______		1.0______
Graduated Cylinder Temperature		°C			°C	
pH (acidity)		pH			pH	
Nitrate		Mg/l			Mg/l	
Phosphorus		Mg/l			Mg/l	

Please check over the data sheet and then mail to: ____

Supporting maps of the catchment

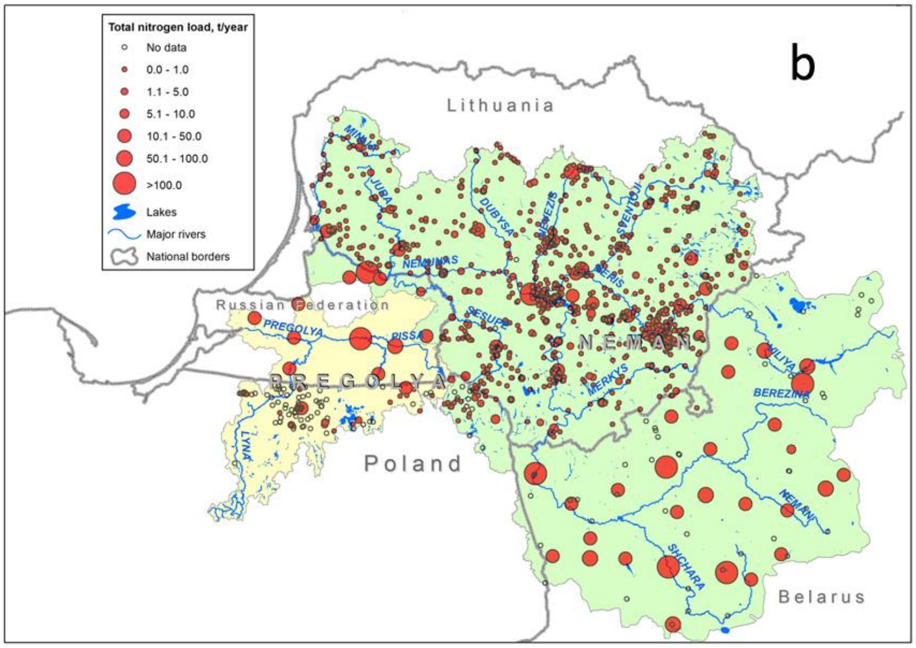

Figure 9. Total nitrogen load from the catchment, t/yr (http://levis-gdb.sggw.pl/neman_pregolya/)

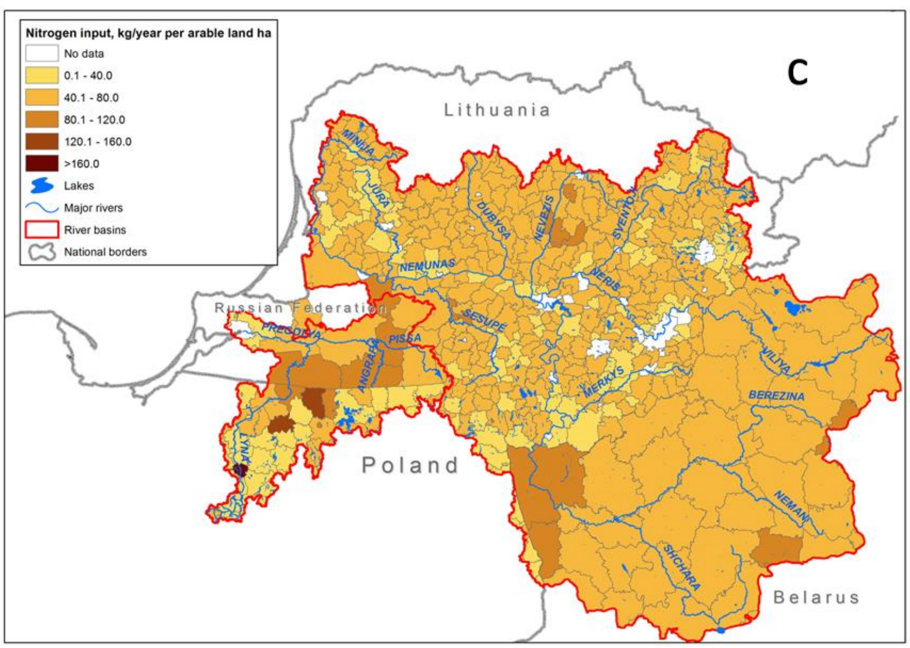

Figure 10. Nitrogen input, kg/yr per ha of arable land, (http://levis-gdb.sggw.pl/neman_pregolya/)

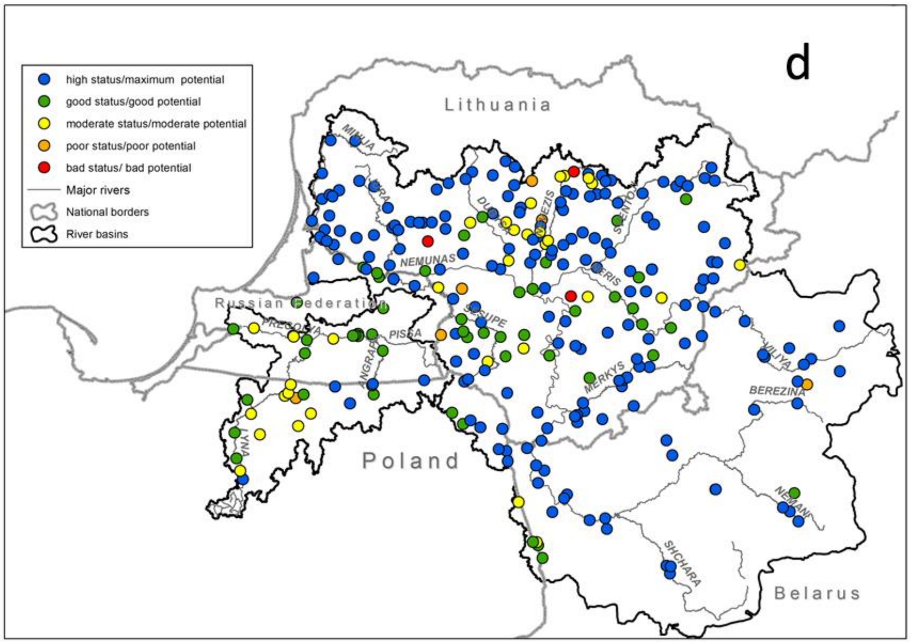

Figure 11. Ecological status of watercourses in the catchment, (http://levis-gdb.sggw.pl/neman_pregolya/)

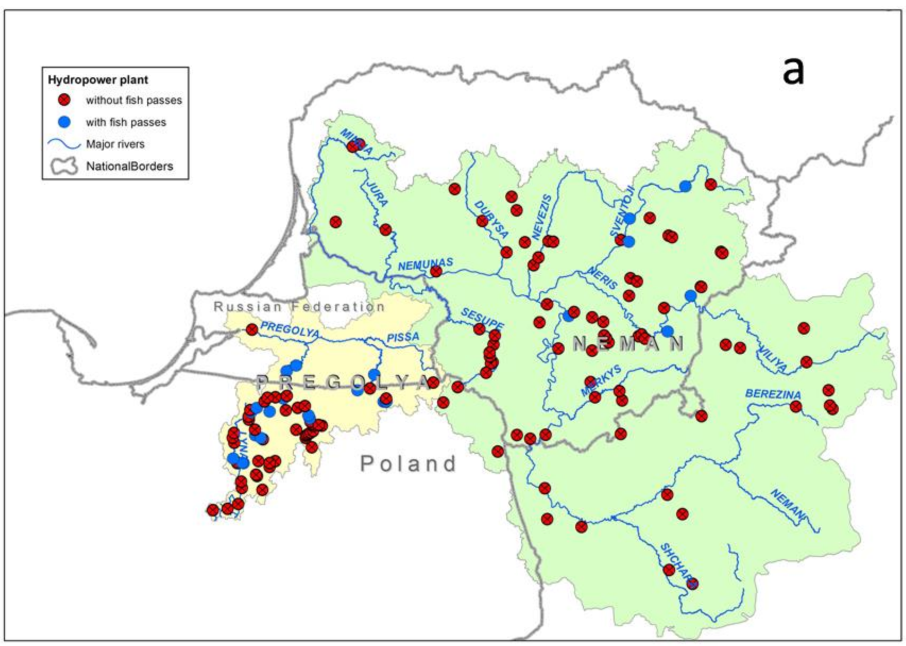

Figure 12. Hydropower plants (http://levis-gdb.sggw.pl/neman_pregolya/)

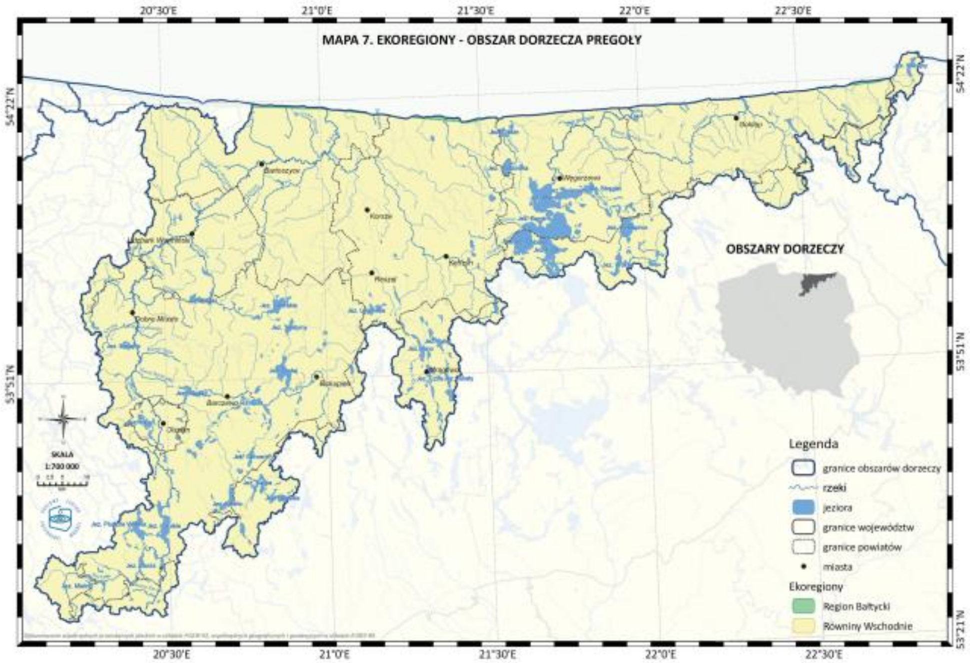

Figure 13. Catchment of Pregolya (http://www.apgw.kzgw.gov.pl/en/update/pregolya-river-basin)

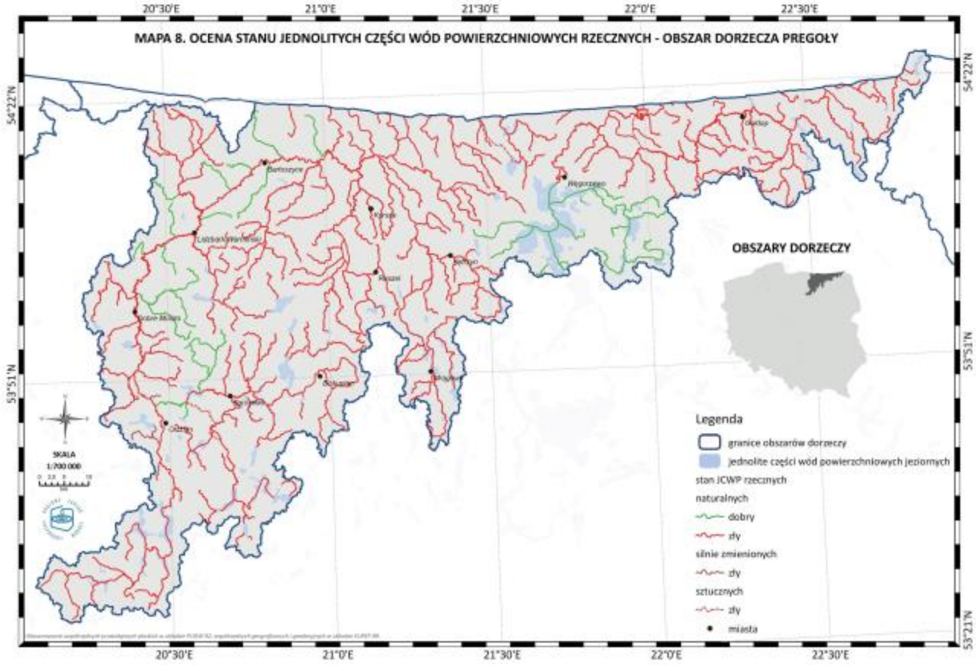

Figure 14. Assessment of surface water river - catchment area Pregoła (http://www.apgw.kzgw.gov.pl/en/update/pregolya-river-basin)

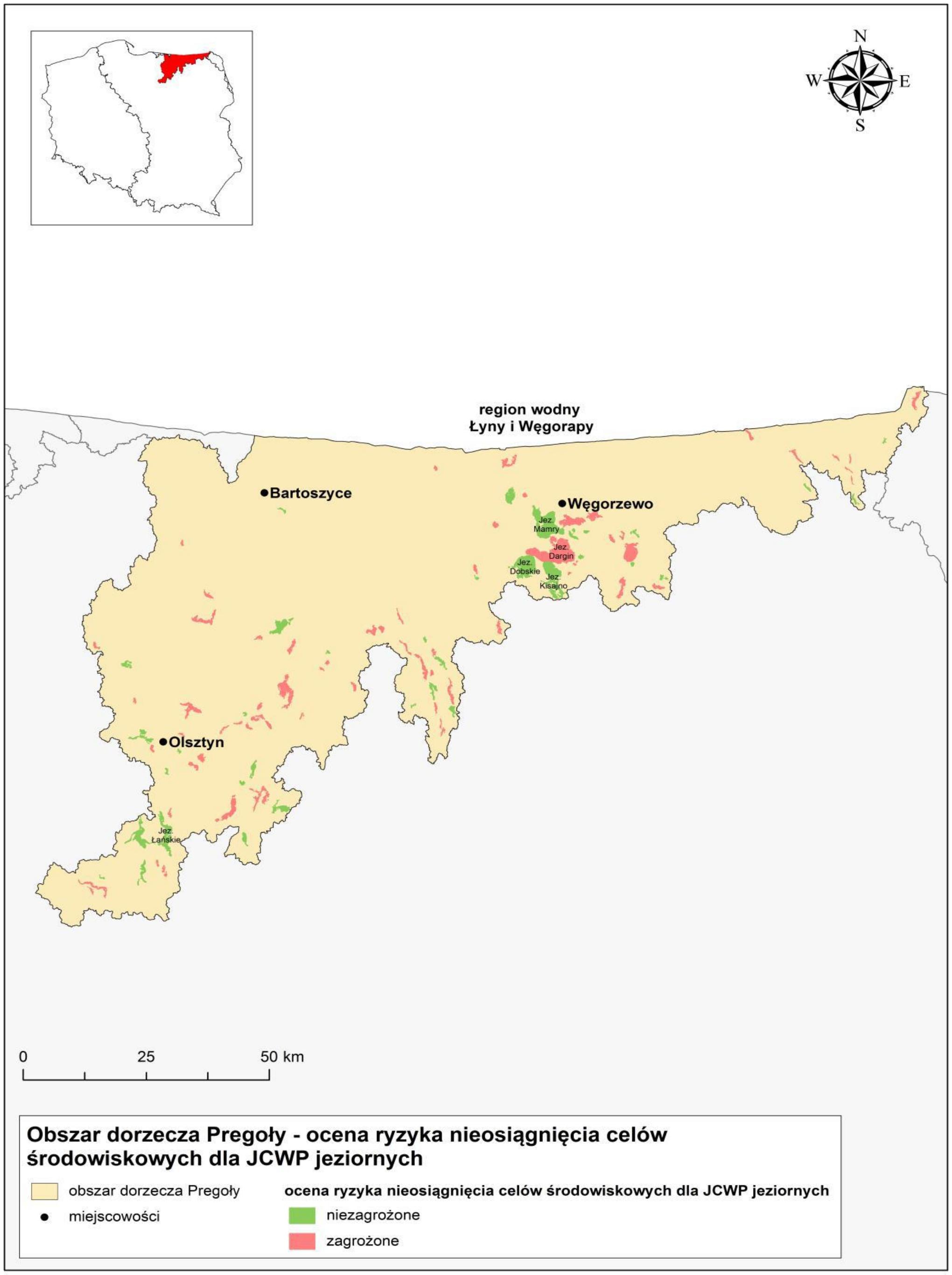

Figure 15. River Basin of Pregola - Assessment of the risk of failing to achieve the environmental objectives for rivers. (http://www.apgw.kzgw.gov.pl/en/update/pregolya-river-basin)

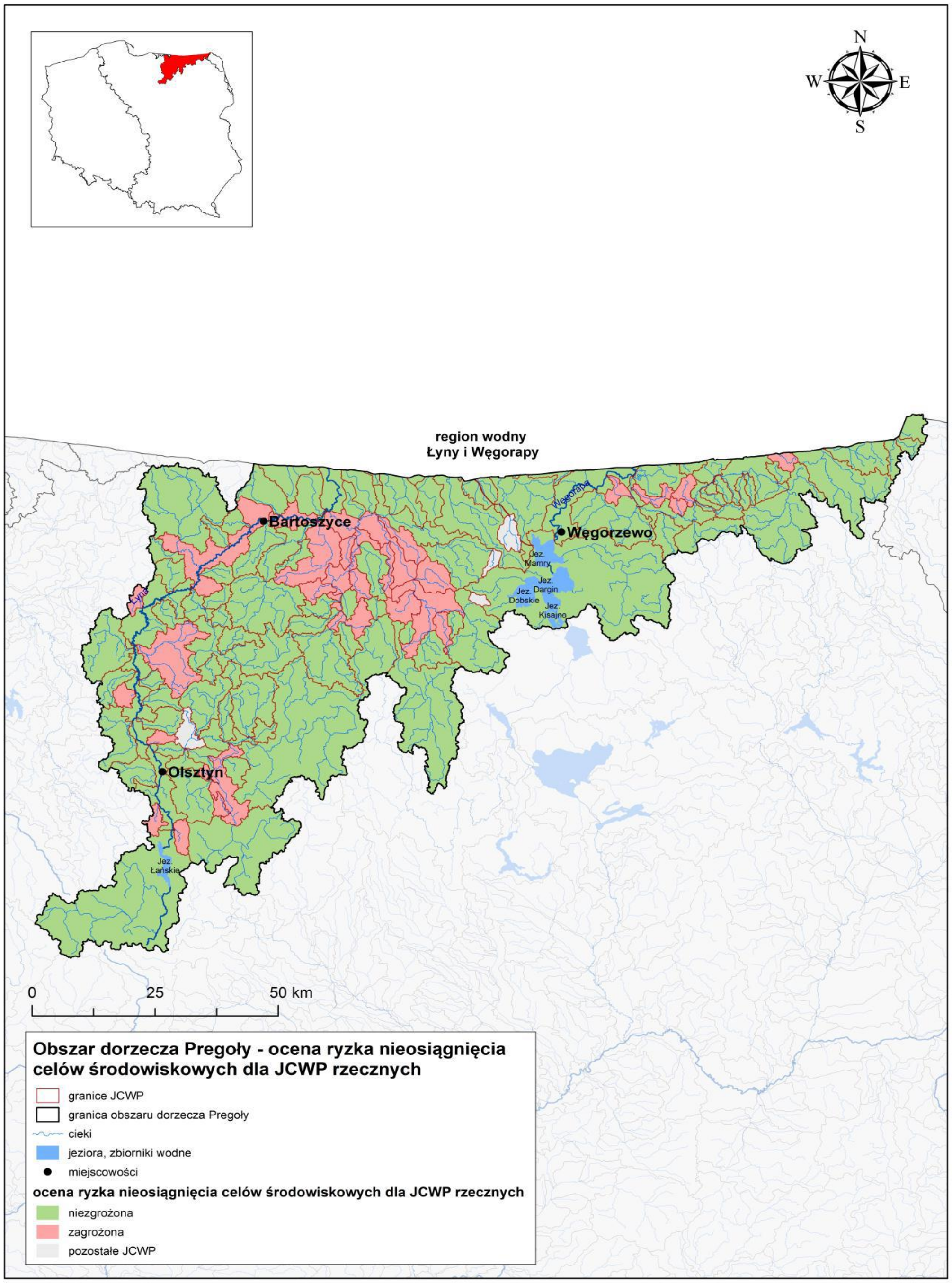

Figure 16. Assessment of the risk of failing to achieve the environmental objectives for JCWP lake in the basin Pregoła – 66 lakes are threaten. (http://www.apgw.kzgw.gov.pl/en/update/pregolya-river-basin)