Analysis of River Basin Management Plan for the Neman River and discussion, how Peatland Rewetting as a measure for improvement of water quality could be considered

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Summary

The anthropogenic changes to peatlands lead to an imbalance in the ecosystem and they undergo the degradation stages leading to land subsidence, peat fires, release of nutrients from drained peatlands which were subjected to heavy fertilization for agriculture purpose, loss of ecosystem services including C storage, flood protection, biodiversity loss and water purification. One such case is observed in the Neman river basin district, a transboundary catchment area. Being affected by the nutrients discharge from the drained peatlands, which are further transported to the Baltic Sea through the Neman river, causing the problem of eutrophication in the sea. To address this issue, DESIRE, an Interreg Baltic Sea Region project, with a flagship status of EU Strategy for the Baltic Sea Region (Policy area: Nutri) was initiated in 2019. The project improves the peatlands management and retention of nutrients through rewetting and paludiculture. However, the sensitive situation of peatlands, like in most of the EU nations, is not well recognized in the Neman River Basin Management Plan. An attempt is made to analyze the Neman RBMP for the purpose of possible integration of peatlands rewetting and paludiculture into the RBMP for sustainable peatland management and better water quality.

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1 Introduction

Earlier was the 'drain-age', now is the 'wet-age'. I mean to convey the message that decades ago the conception to drain peatlands was widespread, it was the age when wet-lands were anticipated to be waste piece of land since it didn't provide any provisional services. But some years later, this ideology gradually proved to be deleterious not only to the drained peatlands, but also to local habitats and biodiversity, adjoining water bodies, eventual provisional and economic loss from the land, and, the climate and the environment as a whole. This led up to the current age, where the notion of rewetting of drained peatlands and paludiculture is being raised and spread among the different environmental organizations and ministries, and public in general, to reverse the effects of drainage and support a sustainable system of peatlands. With the similar aim, DESIRE, an Interreg Baltic Sea Region project, with a flagship status of EU Strategy for the Baltic Sea Region (Policy area: Nutri) was initiated in 2019, for improving peatland management and retention of nutrients through rewetting and paludiculture, being managed from Greifswald University and Michael Succow Foundation, Greifswald, and partners from Poland, Lithuania and Russia (Kaliningrad). I had the opportunity to work under the DESIRE project for the analysis of river basin management plan of the project's target area, with the aim to examine the current peatland management practices described therein, and how they could be modified or proposed with some new ideas for sustainable management of peatlands.

1.1 Introduction to Neman river basin district (RBD)

Neman, or Nemunas (*Lithuanian*) is the 14th largest river in Europe, while being the 4th largest in the Baltic sea basin (Neman and Pregola river basin monitoring plan, 2017). Originating in Belarus, the Neman river basin spreads through the territorial boundaries of Lithuania, Russian Federation, Latvia and Poland, into the Baltic Sea. The Neman is a slow river flowing at 2 m/s, with highest depth at 5 m and extends around 500 m at its widest part. The Neman river basin spans around 97,928 km^2 of area, with 47,814 km^2 belonging to Lithuania. The Neman river basin district in Lithuania includes the Neman river basin in Lithuania, the Lithuanian coastal basin, part of Pregola river basin, Lithuanian part of Curonian lagoon in the Baltic sea and the Baltic coastal waters. Curonian lagoon in the southeastern part of the Baltic sea is a freshwater coastal lagoon which is classified as intermediate water in the Neman river basin district. In the Neman RBD, agriculture is the dominant form of land use in the district that constitutes around 57% of the surface area. Forests and semi-natural ecosystems accounts for around 39% surface area in the district (Neman and Pregola river basin monitoring plan, 2017). Some of these land use patterns have had impacts on the hydro-morphological status of water courses. There is an exhaustive demand of water from the river basin, where, Belarus utilizes 50% of its water, Lithuania exploits around 96% of the water from its basin, and around 53% is being consumed in Kaliningrad. The Lithuanian section contributes to 47.5% of the Neman river runoff. Almost the entire usage of Lithuania (96%) is sourced from surface water. In Lithuania, the Neman RBD have been sub divided into 12 sub basins (Fig.1), with 10 river basins shown in Table 1. Other two basins include Coastal river basin and part of Pregola basin belonging to Lithuanian

territory. As per the basins area, Merkys, Neris, Dubysa, Jura, Nevezis, Sesupe and Minija are the largest and longest tributaries of Neman in Lithuania, with Neris being the largest of them.

Table 1. River basins and their areas in km^2 (Nemunas river basin district management plan, 2017)

River	Total length (Km)	Length in Lithuania (km)	General Basin area (km^2)	Basin area in Lithuania (km^2)
Merkys	203	185.2	4,415.7	3,798.7
Neris	509.5	228	24,942.3	4,266.8
Dubysa	139	139	1,965.9	1,965.9
Šešupė	297.6	157.5	6,104.8	4,769.8
Jūra	171.8	171.8	4,005.1	4,005.1
Nevėžis	208.6	208.6	6,140.5	6,140.4
Minija	201.8	201.8	2,940	2,940
Šventoji	246	246	6,789.2	6,789.2
Žeimena	79.6	79.6	2,775.3	2,775.3

Most of the streams in Neman RBD do not qualify for good ecological status for the nitrate and total nitrogen concentrations as per the requirements laid down by WFD (Nemunas river basin district management plan, 2017), and therefore demand a reduction in their concentrations. Neman RBD is a transboundary basin, therefore, transboundary management of pollution is censorious. It is because 50% of the pollution reaching the Baltic Sea through the river Neman, emanates from Belarus. The severely polluted rivers and their poor environmental status reflects an ongoing International challenge for its joint management, therefore, close cooperation between the countries with multi-lateral agreements is the need of the hour for Neman river basin management.

In the year 2004, Lithuania joined the European Union, and laid down its first river basin management plan for Neman RBD with reference to the Water Framework Directive in the 2010. Since 1992 based on an agreement for environment protection, Poland and Lithuania have been cooperating in the field of environment protection, including the protection of water bodies. During the year 2005, a bilateral agreement for shared basin management was signed between the Governments of Republic of Poland and Republic of Lithuania. Every two years Governments of Republic of Poland and Republic of Lithuania meet up to draw cooperation plans for environment protection including the protection of water bodies. Based on the agreement a transboundary commission was established, including the creation of 3 working groups. It is the first working group that deals with the preparation and implementation of Neman river basin management plans. Similarly, an agreement is signed with Belarus and Russia (Kaliningrad) for cooperation in environment protection, including the protection of water bodies. A regional cooperation agreement was signed with Kaliningrad for setting up working group meetings for cooperation in monitoring and inventory of point sources, and data exchange of monitoring of water bodies in the border areas. In the year of 2008, a technical

protocol was signed between Lithuania and Belarus for monitoring and exchange of data regarding status of transboundary surface water bodies. In order to improve the RBMPs, a public consultation process is involved in Lithuania, wherein, pubic organizations and citizens area consulted and they can comment on the plans and measures of water protection. I opted for a deeper analysis of Nemunas RBMP in Lithuania because a major part of Lithuania constitutes the Nemunas RBD among the partners of DESIRE, and it makes up to half of the Neman runoff, thereby contributing a major part of pollution into the Neman river and the Curonian Lagoon. Therefore, Lithuania has a significant affect on the regulation of water quality in Neman RBD.

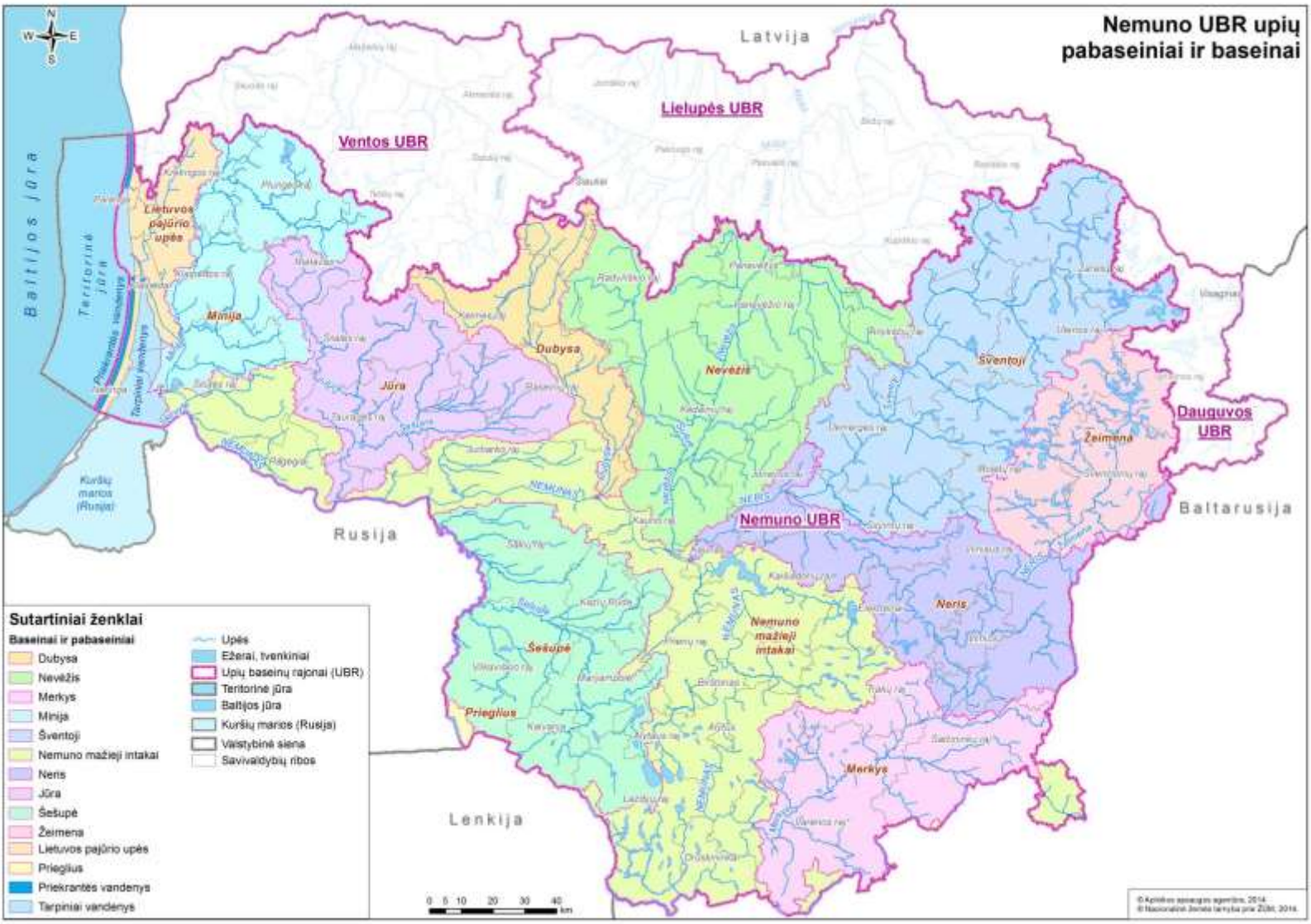

Fig.1. Nemunas RBD in Lithuania and its Sub-basins (Nemunas river basin district management plan, 2017)

1.2 Peatlands status and diffuse pollution in Neman River Basin District, Lithuania

Since the time when first river basin management plan for Neman was drafted, significance of diffuse agriculture pollution and its impact on quality of water bodies was well established. Diffuse agriculture pollution alone can be responsible for 45-80% of total nitrate-nitrogen load being discharged into the water bodies, therefore, acting as a significant source of nutrient pollution. The intensity of agriculture can regulate the severity of nutrient leaching, that includes loads of nitrogen and phosphorous which enter the soils through animal manure and mineral fertilizers. The basin wise pollution loads are represented (Table 2) for Neman RBD. The nutrient loads have been calculated based on the declared number of contract animals and on account of anticipated utilization of mineral fertilizers.

Table 2. Pollution loads in Nemunas RBD Lithuania (Nemunas river basin district management plan, 2017)

Sub-Basin	2010 First RBMP		2012 estimation based on data	
	N kg/ha	P kg/ha	N kg/ha	P kg/ha
Žeimena	13.0	2.2	12.5	2.8
Šventoji	26.5	4.5	24.4	6.1
Neries ir mažųjų intakų	15.7	2.7	18.8	4.4
Nevėžis	46.5	9.3	43.3	13.8
Merkys	15.6	2.8	14.8	3.9
Nemuno ir mažųjų intakų	28.3	5.0	31.4	7.9
Dubysa	39.1	7.2	43.1	11.5
Šešupė	47.2	9.2	50.0	14.6
Jūra	39.7	7.0	48.0	11.5
Minija	33.1	5.6	41.1	9.6
Lietuvos pajūrio upių	26.4	4.9	30.3	8.2
Prieglius	33.7	5.5	35.5	7.8

There hasn't been any significant improvement seen in the reduction of the nutrient pollution since the first river basin management plan, rather slight increase has been observed in some sub-basins in the year 2012, possibly because of an overall increase in the agriculture activity. The largest diffuse nutrient pollution is observed in central Lithuania and least being in the south-eastern part of the country. Nevėžis, Šešupė, Dubysa and Jūra sub-basins bear the highest loads of nutrient pollution. It has been reported in Nemunas RBD that 117 water bodies of river category have been recognized as being confronted with significant effects of diffuse nutrient pollution, therefore, not allowing them to have a good ecological status and are at risk. Mathematical modelling and river monitoring data has confirmed that diffuse agriculture pollution have highest impacts on the rivers of Nevėžis sub basin. It is partly because of the hydrogeological condition of the sub basin; characterized by small volume runoff and a large part of the sub basin has been drained that reduces the transfer time for nitrates into water

bodies, thereby, not allowing the system to retain or decompose the nutrient. This coupled with intense agriculture activities is the cause of high impacts on Nevėžis sub basin. As a result, 58 of 70 water bodies do not hold good ecological status for river category in the Nevėžis sub basin. Similar drainage activities were also followed in other sub basins, that now face its negative impacts (Table 3).

Table 3. Impact of drainage systems on diffuse pollution in the Nemunas RBD Lithuania (Nemunas river basin district management plan, 2017)

Sub Basin	Total area drained from sub basins(ha)	Percentage equivalent of drained area from total sub basin area (%)	Part of drained areas under poor condition (%)	Area drained by meliorative drainage (ha)
Žeimenos	34,580.78	12.5	19.4	33,220.89
Šventosios	226,789.89	33.4	10.1	221,812.37
Neries m. intakų	86,715.99	20.3	11.1	84,262.67
Nevėžio	395,372.18	64.4	8.7	385,052.69
Merkio	54,835.66	14.4	12.3	47,780.63
Nemuno m. intakų	329,789.12	35.9	8.6	317,914.94
Dubysos	87,789.14	44.7	6.5	85,304.03
Šešupės	269,723.55	56.5	6.8	265,278.53
Jūros	193,858.94	48.4	10.4	187,101.49
Minijos	136,731.59	46.5	8.9	129,671.56
Lietuvos pajūrio upių	51,879.86	47.2	7.8	49,662.66
Priegliaus	1,028.00	11.6	8.1	1,027.0

Artificially drained soils have higher risk of discharging soluble nitrogen and phosphorous nutrients into the water courses. Land activities such as tillage practices, crop composition and drainage runoff volume can regulate the extent of release for nitrogen and phosphorous compounds. Concentrations of nitrate nitrogen and phosphorous (PO_4-P) leaching through drainage in Nemunas RBD are represented in the Table 4, and Figures 2 and 3. As per the data and the figures, it is clear that hydraulic discharge of nitrogen substances from the drained areas has its impacts on the rivers, predominantly affecting the rivers of central Lithuania such that it does not allow them to achieve the water protection objectives (Fig.4). However, it can be seen that phosphorous leaching from drained areas does not have significant impacts on the quality of river waters.

Table 4. Nitrate-nitrogen and phosphorous leaching drainage in the Nemunas RBD Lithuania (1997-2012) (Nemunas river basin district management plan, 2017)

Sub basin	Average annual leaching by artificial drainage (Nitrate-N kg/ha)	Total quantity Nitrate-N (kg annually)	Average annual leaching by artificial drainage (PO_4-P kg/ha)	Total quantity PO_4-P (kg annually)
Žeimenos	0.12	3,986.5	0.014	465.1
Šventosios	0.94	208,503.6	0.048	10,647.0
Neries mažųjų intakų	0.67	56,456.0	0.026	2,190.8
Nevėžio	3.10	1,193,663.3	0.053	20,407.8
Merkio	0.15	7,167.1	0.010	477.8
Nemuno mažųjų intakų	2.83	848,436.9	0.075	22,485.1
Dubysos	2.79	237,998.2	0.055	4,691.7
Šešupės	3.44	912,558.1	0.113	29,976.5
Jūros	4.27	798,923.4	0.062	11,600.3
Minijos	5.77	748,204.9	0.046	5,964.9
Lietuvos pajūrio upių	7.31	363,034.0	0.057	2,830.8
Priegliaus	0.15	154.1	0.033	33.9

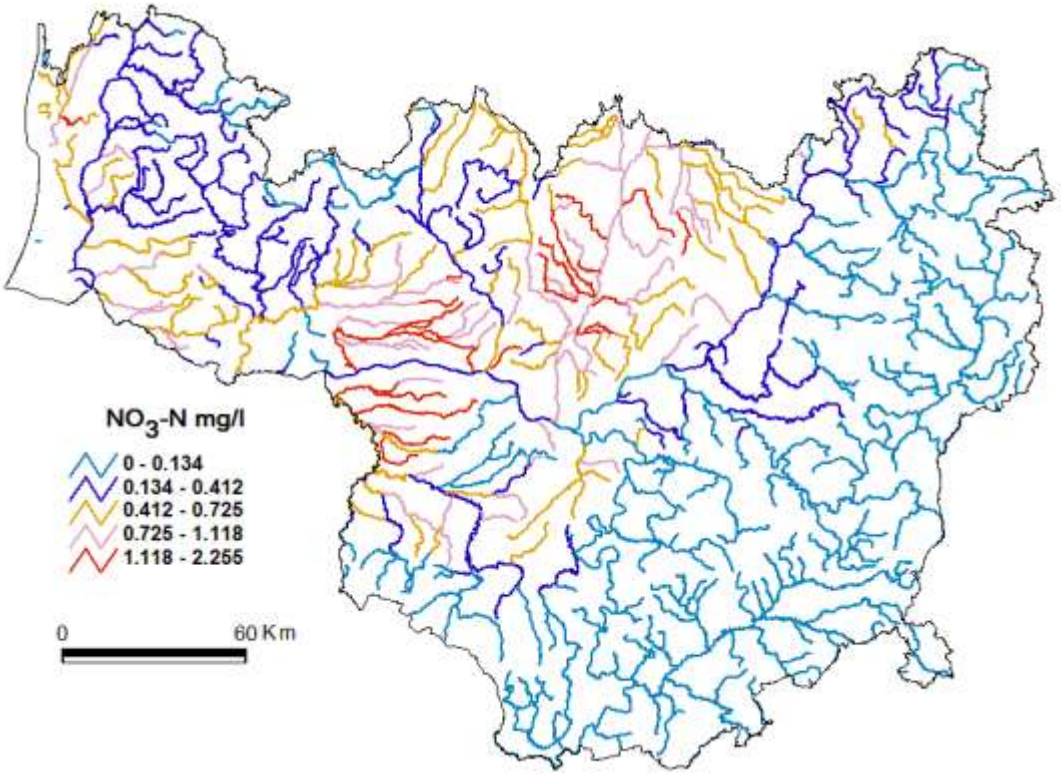

Fig.2. Average annual concentrations of soluble mineral nitrogen (NO_3-N) in rivers of the Nemunas RBD due to inflow from drainage systems (1997-2012) (Nemunas river basin district management plan, 2017)

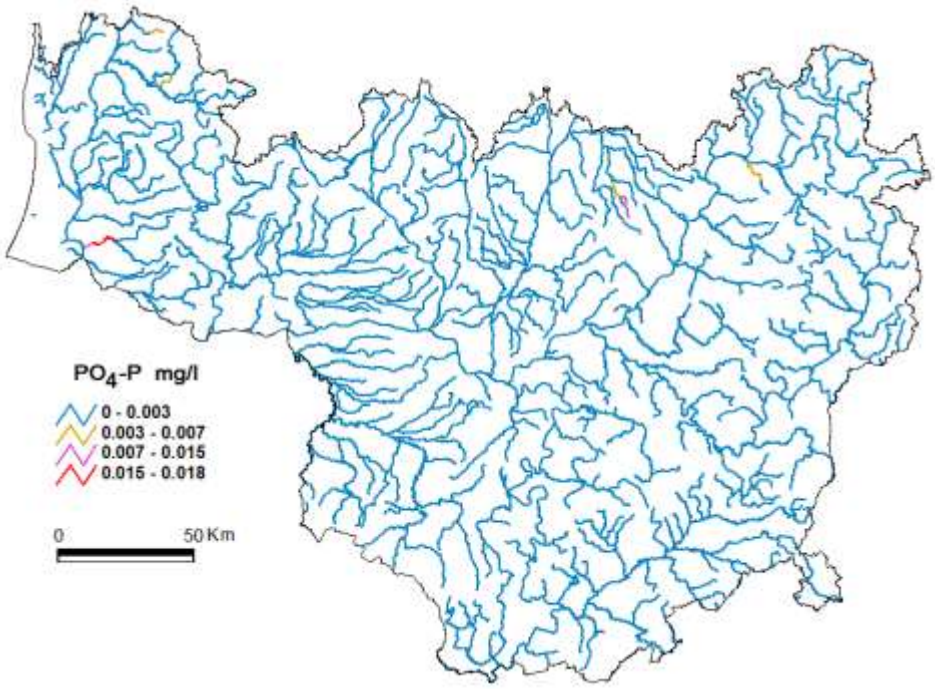

Fig.3. Average annual concentrations of soluble mineral phosphorus (PO_4-P) in rivers of the Nemunas RBD due to inflow from drainage systems (1997-2012) (Nemunas river basin district management plan, 2017)

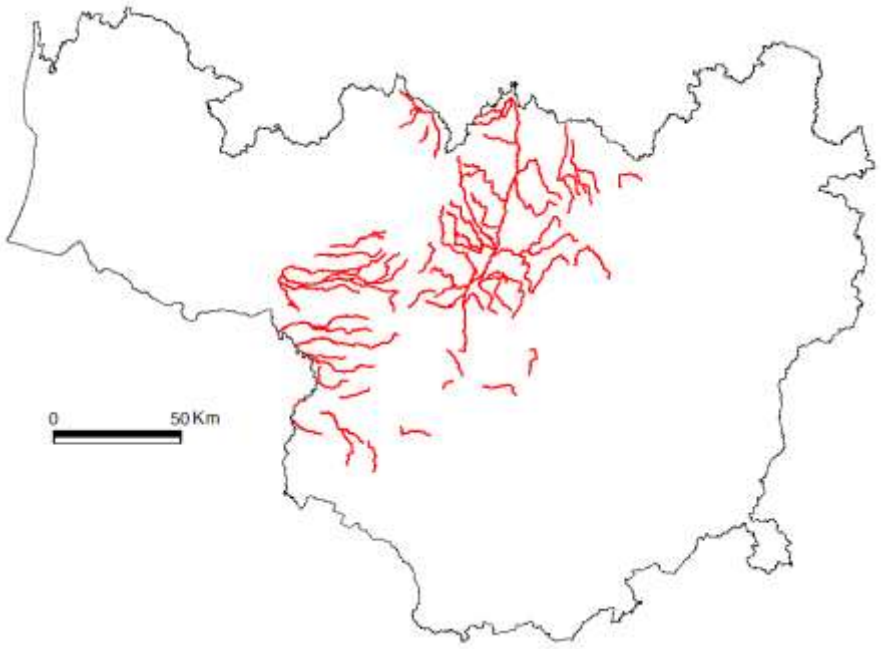

Fig.4. Rivers of Nemunas RBD, where high mineral nitrogen prevents to achieve water protection objectives (Nemunas river basin district management plan, 2017)

1.3 Diffuse pollution in Neman river basin district from partner countries

The Neman river and its tributaries carry the pollution load to the Curonian lagoon, that acts as its main source of pollution. Being a transboundary basin the total pollution load that is discharged into the Curonian lagoon is formed together with the international pollution, contributed mainly from the countries of Belarus, Lithuania, Kaliningrad region and Poland. As per the state water quality monitoring data, 2010-2013, an average of around 45.6 thousand tons of total nitrogen and 1.6 thousand tons of total phosphorous were discharged into the Curonian lagoon annually. Largest load of pollution transported to the lagoon is the agricultural load from Lithuania and pollution load from Belarus. Belarus is responsible for 30% of total nitrogen and 37% of total phosphorous discharge (Nemunas river basin district management plan, 2017), it is mainly because Neman river springs from Belarus and constitutes around half of the river flow in the country. Similarly, the agriculture loads from Lithuania constitutes 50% of total nitrogen and 33% of phosphorous loads being transported into the Curonian lagoon. Besides this, as per 2011-2013 data received from Kaliningrad region, a transfer of 5.4 thousand tons of total nitrogen and 217 tons of total phosphorous is observed from Kaliningrad region under Nemunas RBD, into the lagoon annually (Nemunas river basin district management plan, 2017).

2 Analysis of River Basin Management Plan, Lithuania

2.1 Findings from RBMP

Lithuania's latest river basin management plan (2017) was researched to analyze the existing peatland management practices or any restoration plans described therein, in order to modify them if needed, or to propose new management practices or plans if required for sustainable peatland management. It was observed that 57 wetlands are to be protected under NATURA 2000 sites. Amalva wetland is one such wetland that is covered under NATURA 2000 site, that demands protection. The Dovine river water body with medium ecological potential and the Amalvė-Šlavanta river water body with poor ecological potential enter the territory of this site. For the purpose, a nature management plan has been prepared and approved that involves preparation of necessary 7,120 actions for the purpose of restoring the degraded wetland lying on the Western and North Western edge of the Amalvas Botanical and Zoological Reserve. The plan mainly involves restoration of its characteristic woody vegetation, and re-establishment of natural hydrological regime to develop the natural habitat. Similarly, the Voke river water body that has a poor ecological potential have similar nature management plan for its NATURA 2000 site, that involves adjusting the hydrological regime of the area for flooding the dry areas of peat bogs. Therefore, for the maintenance and management of existing wetlands, and their restoration, certain measures are conveyed in a series of nature management plans approved by the Ministry of Environment of Lithuania. Such plans that exclusively focus on NATURA 2000 site involves the restoration of hydrological regime of different water bodies, including the peatlands.

It has been mentioned in the RBMP, about the implementation of basic measures that involve execution of appropriate legal, institutional and procedural measures and other non-investment-intensive measures in order to meet the requirements of many directives concerning environment. Among others, include the nitrate directive for the protection of waters against pollution caused by nitrates from agricultural sources, habitat directive (habitat protected areas that covers wetlands as part of their regions), and the Water Framework Directive for protection of waters. If the basic measures are not enough to achieve good ecological status, then some additional measures are stated to further keep a control on diffused agriculture pollution. They include fertilization preparation plans with mineral and organic fertilizers, development of methodology for preparing such fertilization plans, development of system to provide consumption data for mineral and organic fertilizers, following good agricultural practices for reducing negative impacts on water quality, monitoring of implemented measures, development of plan for mineral nitrogen monitoring and to publish changes in mineral nitrogen and pH, reconstruction of drainage system by installing horseshoe shaped ponds at drainage estuary, etc. Out of these, drainage system reconstruction is one measure that somewhat deals with trapping of nutrients in specially designed wetlands as horse shoe shaped ponds grown with moisture loving vegetation, that can act as buffer zones. However, the problem with this measure was such measures were not supported and were opposed by local farmers, some public organizations and the Ministry of Agriculture in Lithuania.

On analysis of Lithuania's RBMP it was observed that the nutrient pollution from agriculture, and its subsequent transfer paths with its impacts on water bodies, and sub-basin specific nutrient loads and its effects are well known by Environment Protected Agency (EPA). There is a brief mention about series of approved nature management plans for the maintenance and management of existing wetlands. Though, implementation of few basic measures for fulfilling certain environmental directives are communicated, along with some additional measures for reduction of agricultural pollution, I believe, as per what the peatlands hold an ecologically critical status in the nature, very little importance is given to peatlands in the RBMP, and no concrete sustainable management or restoration practice is described therein. At few instances, restoration of hydrological regime is discussed for re-establishment of natural vegetation and habitats, but that alone is not sufficient to achieve the water protection objectives, and is not sustainable management for future evolution of peatlands.

Therefore, I propose what I call as 'BLUEPRINT', to intricately integrate Peatlands into the river basin management plan, thereby, attempting to provide peatlands the status they deserve in the river basin management plan as per the key status they possess in the environment.

2.2 The Proposal: BLUEPRINT

For the ease of understanding, I structured the BLUEPRINT based on the table of contents of the latest Neman river basin management plan of Lithuania (2017). The BLUEPRINT walks parallel to the table of content of Neman RBMP, and proposes additions in different chapters

and sub-chapters, and introduces new sub-chapters if required. It communicates key information regarding Peatlands, rewetting and Paludiculture, and precisely discusses the sections and points where this information can be added or updated.

I mark the beginning of the BLUEPRINT by proposing to introduce peatlands as 'Semi-Aquatic Water Body', which would act as an addition to the existing water bodies in the river basin management plan. The current water bodies in the RBMP are: rivers (including rivers classified as heavily modified water bodies and canals), lakes (including lakes classified as heavily modified water bodies, ponds and quarries), intermediate waters (Curonian Lagoon of the Baltic Sea) and the coastal waters of the Baltic Sea (coastal waters - territorial waters within 1 nautical mile from the shore).

The following description would assist to add information, critical concerns and measures regarding peatlands in the integration process. It starts from chapter 1, 'CHARACTERISTICS OF THE NEMUNAS RIVER BASIN AREA' and moves step wise along the different chapters of the RBMP.

1. CHARACTERISTICS OF THE NEMAN RIVER BASIN AREA
   1.1. SURFACE BODIES OF WATER
      1.1.1. Description of water bodies:
         - Introducing a new category of water body
         - Defining what is semi-aquatic water body
         - Brief description of semi-aquatic water body (peatlands), about its basic characteristics, information on total area of peatlands in the Neman RBD, etc.
         - The plan then moves to description of sub-basins of Neman RBD; and area percentage of wetlands under each sub – basin is already mentioned in the RBMP.

      1.1.2. Typology of water bodies:
         - Either under 1.1.2 or a new sub-chapter can be made under Chapter 1.1 as 'Semi aquatic water bodies'
         - Description about peatlands in detail, the characteristics, natural conditions and ecological system of peatlands.
         - Their functioning in the environment.
         - The habitats, species and ecological services they provide.

      1.1.3. Heavily modified water bodies
         - Describing the degradation of peatlands by drainage

1.1.5. Reference conditions for surface water bodies:

- Untouched peatlands could act as reference condition.
- Need to think about the quality elements/indicators that could assess the status of peatlands; biological indicators (current vegetation, macroinvertebrates, bird species, etc.), physio-chemical indicators (nutrient content in soil, pH of soil, oxygen content in soil, etc.), morphological or say geological indicators (subsidence level, ground water table level, status of soil – its extent of degradation, etc.).

1.1.7. Methodology for determining the status of surface water bodies:

- Depending on the results of the quality elements, if the ecological status of the peatland should be classified into five classes: very good, good, medium, bad and very poor, as is for other surface water bodies; or should it be classified into two classes: good or not in good status, as is in case with heavily modified and artificial water bodies. In the latter option, it is termed as ecological potential instead of ecological status (as per the existing RBMP).

1.3. IMPACT OF CLIMATE CHANGE ON SURFACES AND GROUNDWATER BODIES

- Discussion about potential effects of climate change on natural peatlands and their water quality.

2. SUMMARY OF THE IMPACT OF ECONOMIC ACTIVITIES

2.1. SIGNIFICANT IMPACTS ON RIVERS AND LAKES

2.1.1. Significant effects of pollution:

- This section in the RBMP discusses about diffuse pollution from agriculture and its impact on different sub-basins, based on drainage; and number of water bodies affected by it, etc. But nowhere it has been mentioned about the impact of economic activity (agriculture) on the peatlands itself.
- Therefore, a new sub- section can be made under section 2, that discusses about the impact of agriculture and drainage on peatlands, and their successive degradation; with its impacts not only on rivers, but also on the ecological services it provides, and on the biodiversity as a whole.

2.4.3 Impact of diffuse and concentrated pollution on groundwater and, through it, on surface water bodies.

- Impact from agricultural and silvicultural activities on peatlands on water bodies (drainage, fertilization, …)
- Effects from rewetting and Paludiculture.

- Impact (potential) of rewetted peatlands on reduction of diffuse loads from agricultural and silvicultural areas in the upper catchment.

3. PROTECTED AREAS
    - Some of the wetlands have been considered as protected areas, but only under NATURA 2000; or if they fall in the regions of protected areas. But their protection, as of their own existence have not been considered.
    - Therefore, I propose to put all the peatlands which have not been drained yet, under protected areas as per the following remarks from RBMP:
        - Protection of natural & cultural heritage, landscape and biodiversity
        - Maintain ecological balance of the landscape
        - Restore natural resources

4. MONITORING OF WATER BODIES IN THE NEMUNAS RBD AND RESULTS OF THE STATUS ASSESSMENT
    4.1. SURFACE BODIES OF WATER
        4.1.1. Surface water monitoring program:
        - As a sub – topic under 4.1.1, briefly mention possible reasonable number of monitoring sites, type of monitoring (surveillance, performance, exploratory) and frequency of monitoring of peatlands.
        - Making a new sub chapter under 4.1, as '4.1.5. Monitoring program for semi-aquatic water body'. In detail discuss, monitoring sites, possible type of monitoring to be carried out at what locations. Discussing the different quality elements/indicators, and frequency of monitoring for each indicator (e.g. monitoring once in 6 months or once in 3 years, etc.)

5. WATER PROTECTION OBJECTIVES OF SURFACE AND GROUNDWATER BODIES
    5.2. REQUIREMENTS FOR GOOD CONDITION OF SURFACE WATER BODIES
        - Under a new subtopic as semi-aquatic water bodies, discuss the allowable limits or range of different quality elements across biological, physio-chemical and morphological elements.

6. SUMMARY OF THE ECONOMIC ANALYSIS OF WATER USE
    6.8 FARMING
        6.8.1 Paludiculture

7. SUMMARY OF THE PROGRAM OF MEASURES

7.3. ADDITIONAL MEASURES

7.3.2. Measures to reduce diffuse pollution:

- Drainage system conversion is already mentioned, specially formed wetlands for nutrient entrapment. Here is the scope to add more detailed information about the measures and introducing paludiculture, as sustainable inclusive solution.
- Cost per area can also be shared for the restoration.

8. CROSS-BORDER COOPERATION

- Need for multilateral agreement and joint management of Neman basin is required. Need for a joint commission is there, which among management and working of other activities could also focus on the restoration/management/ protection of transboundary peatlands, also, on the peatlands of the neighboring countries in a similar way to avoid the nutrient input into the river system from their end.

2.3 Administrative Process for Proposal

The Ministry of Environment of the Republic of Lithuania as per its released Orders, hold Environment Protection Agency of Lithuania (Aplinkos apsaugos agentūra) to be responsible for the administration of river basin districts or parts thereof to achieve the water protection objectives. EPA collects, analyzes and shares information on the status of environment, chemical flows and pollution prevention measures, and ensures the organization of water protection and management in order to achieve the water protection objectives, and further reports to European commission. As per the orders from the Ministry of Environment of the Republic of Lithuania, the Lithuanian Geological Survey organizes part preparation of river basin management plan and program of measures, which it submits to the EPA. The Lithuanian Geological Survey carries out research and supervision of groundwater resources, organizes state surveys of earth's depth, and, collects, stores and manages the state geological information. The Regional Environmental departments control the implementation of environment protection laws and other regulatory enactments in the region.

Aplinkos apsaugos agentūra holds public consultation process, where the citizens and public organizations can participate to pitch their views, ideas or plans, or comment on existing programs. During the first phase, the issue and the comments are to be pitched in brief within a deadline. If they find the proposal to be worthwhile, they give their acceptance, to which during the second phase a detailed analysis and research results are to be shared with them for further successful acceptance and implementation, if they find it to be concrete and efficient.

Currently, Lithuanian Fund for Nature together with Michael Succow Foundation have pitched the proposal under the DESIRE project for supplementing Lithuanian Nemunas RBMP with nature-based solutions, involving Paludiculture for sustainable management of peatlands in order to improve the water quality of the Baltic Sea and the inland waters. Further focusing its effects and importance in GHG reduction, reduced agriculture diffused pollution and biodiversity restoration and protection. It has been proposed in the first phase of public consultation process organized by Aplinkos apsaugos agentūra.

3 Conclusion and Discussion

Peatland is a wasteland; this decades old perception is the root cause of the issues that we are now dealing with. All the big investments made in the history to drain the peatlands is forcing us now to again invest big to make them wet again. And this is the need of the hour, which cannot be ignored, else the consequences in the future could be really detrimental, not only for the lands and waters, but also for the mankind itself. This is a sensitive issue which needs to be realized by the environmental agencies as well. Peatlands demand an equivalent focus as other waterbodies. Since, these are unique set of ecosystems exhibiting some rare biodiversity, acting as carbon stocks, regulating the local climate, buffering the water quality among many ecosystem services under their pristine state. Though some programs have been addressed by the Lithuanian environmental agency involving rewetting, but that is not sufficient, neither sustainable. Paludiculture offers an all in all solution, from helping restore natural hydrological regime, preventing further degradation of peatlands, nutrient retention for better water quality to enriching biodiversity and mitigating climate change by reduction of GHG emissions. Furthermore, it provides socio-economic benefits. This urgently needs to be incorporated into legal enactments and be efficiently integrated into the RBMP for its better implementation and use. But Neman RBD is a little tricky, since it's a transboundary basin. Therefore, for its successful integration, implementation and water protection, transboundary basin management is required. Currently there are no multi-lateral agreements in place for joint management, only unilateral agreements for monitoring and data exchange. There is a need for formation of a Joint Commission for collective management of the transboundary Neman river basin district, including joint management of peatlands and paludiculture. Because implementation of measures in one country won't be sufficient enough since it won't be able to tackle the International pollution.

This report and the BLUEPRINT is a small step for realization of the sensitive situation of peatlands and, possible integration of rewetting and paludiculture, and sustainable peatland management into the Neman river basin management plan for water protection and better water quality. I hope in the future this could act as a practical important tool for successful integration and realization of peatland management and paludiculture in the Neman RBMP, which could set as an example under the DESIRE project for other countries across Europe for recognition of peatland management in their respective RBMP.

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