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Notes from the HELCOM Workshop on nutrient recycling measures

5 - 6 February 2020, Helsinki, Finland

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1 Introduction

The HELCOM workshop on nutrient recycling measures was organized by the Ministry of Environment and Ministry of Agriculture and Forestry of Finland, HELCOM, European Union Strategy for the Baltic Sea Region Policy Area Nutri and Bioeconomy as well as SuMaNu and BSR Water project platforms.

The workshop was attended by all HELCOM Contracting Parties except for Lithuania, as well as HELCOM Observers BFFE, CCB, EurEau, Race for the Baltic and WWF, the coordinators of EUSBSR Policy Areas Bioeconomy, Hazards and Nutri, representatives of international projects and invited guests. The list of participants is included in **Annex 1**. The workshop was chaired by Ms. Sari Luostarinen, the Chair of HELCOM Agri group.

The aim of the workshop was to outline possible measures that could increase recycling of nutrients in the Baltic Sea Region, achieve the agreed objectives of the strategy and be included in the updated Baltic Sea Action Plan. The workshop dealt with measures related to both agriculture and wastewater sector, and their synergies. The programme of the workshop is contained in **Annex 2**.

2 Background, vision and objectives

HELCOM Ministerial Meeting 2018 committed to elaborating by 2020 a Baltic Sea Regional Nutrient Recycling Strategy that aims for reduced nutrient inputs to and eutrophication of the Baltic Sea. MD2018 agreed that the strategy is to be established with a step-by-step approach and propose a common vision and objectives for nutrient recycling. The Ministerial Meeting further decided to develop, as a follow-up to the Strategy, possible nutrient recycling measures to be included in the updated Baltic Sea Action Plan beyond 2021.

The HELCOM Group on Sustainable Agricultural Practices (Agri group) is leading the work in cooperation with the HELCOM Working Group on Reduction of Pressures from the Baltic Sea Catchment Area (Pressure Working Group). Finland is the lead country for the work and developing the Baltic Sea Regional Nutrient Recycling Strategy is one of the priorities of the HELCOM chairmanship of Finland 2018 - 2020.

The HELCOM Workshop on regional nutrient recycling strategy was organized by the Ministry of Agriculture and Rural Development of Poland and HELCOM in cooperation with the European Union Strategy for the Baltic Sea Region Policy Area Nutri on 7 November 2018 in Warsaw, Poland. The workshop discussed a draft vision and suggested possible objectives for the strategy. The draft objectives were further worked on by the nutrient recycling drafting group and the Agri and Pressure groups (AGRI 7-2019 and PRESSURE 10-2019). The HELCOM Heads of Delegation endorsed the vision and objectives of the strategy in HOD 56-2019 meeting.

Ms. Marja-Liisa Tapio-Biström, Ministry of Agriculture and Forestry of Finland, presented the agreed vision and objectives, which are included in **Annex 3**.

3 Nutrient flows

Mr. Ludwig Hermann and Ms. Julia Tanzer, Proman Consulting, presented the results of a study on nutrient flows in the Baltic Sea region (**Presentation 1**). The aim of the study is to map the nutrient flows and surplus areas of nutrients in the Baltic Sea region to identify sectors and areas where measures to recycle nutrients could give maximum effects. The approach used in the study is Material (or Substance) Flow Analysis

As background for the HELCOM nutrient recycling work, the Agri group initiated in AGRI 4-2017 meeting the compilation of information on the nutrient flows and potential of their reuse in the Baltic Sea region. The idea was to collect information not only on national level but also on regional, e.g. county level, to map



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the areas where there is a surplus of nutrients. Also, the HELCOM Pressure Working Group agreed to start reporting on the use of sewage sludge in the Baltic Sea region stipulated by HELCOM Recommendation 38/1 on sewage sludge handling. The information reported by Agri and Pressure groups as well as data from HELCOM's sixth pollution load compilation (PLC-6), Eurostat, FAO and national statistics agencies were used in the study.

The conclusions of the study show that there is high potential for more efficient nutrient use in the Baltic Sea region. The use of mineral nitrogen and phosphorus fertilizers could be significantly reduced. This would require a combination of reducing nutrient surpluses and mobilizing untapped recovery potentials as well as nutrient exchange between regions and even countries.

There were uncertainties related to the results due to the data e.g. on the reported crop harvest. Some countries planned to check the figures and send new data to Proman Consulting for the updated version.

3 Measures

Two project platforms financed by the Interreg Baltic Sea Region Programme were designed to support the work on measures to improve nutrient recycling by providing syntheses of information derived from various related projects. Keynote speeches on measures for efficient use of nutrients and cost-effective nutrient recycling in agriculture and palette of solutions for wastewater sector were given at the plenary session by Ms. Minna Sarvi, SuMaNu project platform (**Presentation 2**), and Taavo Tenno, BSR Water project platform (**Presentation 3**), respectively.

After the plenary, the work in six groups resulted in a long list of potential measures under each objective and sub-objective (**Annex 4**). Many synergies and interlinkages between the objectives as well as the measures to reach those objectives were recognized. At the joint final plenary session, the participants discussed a compilation of the proposed measures under relevant objectives and made several additional remarks on the presented suggestions. The remarks at the closing plenary session are summarized below.

1. Baltic Sea region as a model area for nutrient recycling

The possibility to use the payments under the EU common agricultural policy (CAP) to enhance sustainable agriculture and nutrient recycling in the HELCOM countries that are EU members was highlighted. The CAP support is paid on implementing measures but not on the basis of how efficient the measures are, e.g. in reducing nutrient runoff in a particular farm. It was suggested that methods to better quantify the efficiency of measures should be developed.

One suggested measure was limiting livestock density to reduce nutrient surpluses. It was discussed that an alternative to moving the animals or limiting animal density is moving the nutrients from the surplus areas. Moving the nutrients relies on manure processing which in turn depends on volume. Thus, limiting livestock density could result in a situation where processing is not viable. However, there are other environmental aspects to consider since large livestock densities can for instance increase ammonia emissions and the leaching of nitrates to ground water. On the other hand, in some cases the problem might not be the large amount of manure in the areas where the livestock density is high but the inefficient use of manure and adding mineral fertilizers on top of the manure. Manure nutrients should be used efficiently, and manure should not be considered as a waste that the farm needs to get rid of but as a valuable resource.

Another suggested measure was mandatory nutrient recycling for large wastewater treatment plants. It was pointed out that according to the conclusions of the recent Swedish sludge inquiry the mandatory recovery is not yet feasible. Nutrient recovery would require large investments which would be paid by



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water users. The larger the city the better the chances of financing such investments. It might be better to say that nutrient recovery in the wastewater sector should be promoted.

2. Reducing environmental impacts

It was pointed out that although nutrient recovery technologies in the wastewater sector should be promoted, in areas with high livestock density, manure should be used first. It was also questioned whether promoting organic fertilizers, as suggested, leads to reducing the nutrient losses and not increasing them.

Regarding ammonia emissions, the participants discussed that there are many measures which are “low-hanging fruits” for reducing ammonia emissions and the implementation of such measures and practices should be enhanced.

Soil quality and carbon sequestration issues will rise in importance in the future, as well as climate change adaptation. This could be a driver for nutrient recycling. Adapting to climate change may require a need to rethink manure use, spreading and storage.

3. Safe nutrient recycling

Analysis of harmful substances from nutrient rich streams was suggested as a measure but it was discussed that analysing a large number of substances is very expensive. Concentrations of hazardous substances can often be below the detection limit. There are also emerging substances to consider.

Since end-of-pipe solutions are difficult and expensive, the focus should be on the upstream measures both in agriculture and wastewater sectors. Awareness raising among consumers is also important, e.g. to avoid unnecessary use and release of pharmaceuticals and safe handling of chemicals in households. Regarding harmful substances, also the use of plant protection products should be considered.

4. Knowledge exchange and awareness raising

In general, there is a need to improve our knowledge on nutrient flows. In the global context, cooperation with other regional seas conventions and relevant global fora could be considered. The important role of advisory was recognized and information exchange on new advisory models such as catchment officers should be increased.

5. Creating business opportunities

It was discussed that, currently, the profitability of manure processing depends on the business model of biogas production. Nutrient recycling should be included. Currently, financial value is allocated for the energy production but not the nutrient fraction. There is also a gap between laboratory or pilot scale and real scale solutions. Closing this gap demands high risk investments. These investments are to be received from external financing for scaling up from pilot scale to real scale.

As regards increasing consumer demand on the use of recycled fertilizers in the food sector, the focus should first be on the food industry, rather than on final consumers.

The terminology could be checked since recycled nutrients could be also in mineral form. An option would be to say fertilizers of organic origin or bio-based fertilizers.

6. Improving policy coherence

On the whole, legislation should facilitate recycling of nutrient instead of creating barriers. The importance to monitor the implementation of regulations was also discussed.



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It is important to share experiences of best practices, but we should also share information on best available policies to learn from each other.

4 Next steps

The workshop generated a variety of possibly nutrient recycling measures to meet the objectives of the strategy. After the workshop, the work on measures will continue in the HELCOM Agri and Pressure groups based on the suggestions of the workshop. The aim is that the strategy will be finalized by the end of 2020.



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Annex 1. List of participants

Name	Representing	Organization	Email address
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Annex 2. Programme

5 February 2020

Venue: Radisson Blu Royal Hotel (Runeberginkatu 2, Helsinki)

Chair: Sari Luostarinen, Chair of HELCOM Agri group

Time	Activity
12:00-13:30	<p>Welcome by Chair and Finland</p> <p>The vision and objectives of the Baltic Sea Regional Nutrient Recycling Strategy <i>Marja-Liisa Tapio-Biström, Ministry of Agriculture and Forestry of Finland</i></p> <p>Nutrient flows in the Baltic Sea region <i>Ludwig Hermann and Julia Tanzer, Proman Consulting</i></p> <p>Measures for efficient use of nutrients and cost-effective nutrient recycling in agriculture <i>Minna Sarvi, SuMaNu project platform</i></p> <p>Measures for efficient use of nutrients and cost-effective nutrient recycling in waste water sector <i>Taavo Tenno, BSR Water project platform</i></p>
13:30 – 14:00	Coffee break
14:00 – 17:00	<p>Group work, part I</p> <p>Facilitated discussion with the aim to propose at least one measure/action for each objective</p>
18:00 -	Joint dinner

6 February 2020

Venue: Radisson Blu Royal Hotel (Runeberginkatu 2, Helsinki)

9:00 – 10:30	<p>Recap of the first day</p> <p>Group work, part II</p>
10:30 – 11:00	Coffee break
11:00 - 12:30	Joint discussion of group work outcomes aimed at discussing each objective
12:30 - 13:00	Conclusions



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Annex 3. Vision and objectives of the Baltic Sea Regional Nutrient Recycling Strategy

VISION

Nutrients are managed sustainably in all HELCOM countries, securing the productivity of agriculture and minimizing nutrient loss to the Baltic Sea environment through efficient use of nutrients and cost-effective nutrient recycling.

OBJECTIVES

Objectives and sub-objectives
<p><i>Baltic Sea region as a model area for nutrient recycling</i></p> <ul style="list-style-type: none"> - Increasing nutrient use efficiency - Increasing the circulation of the available nutrient resources and reducing nutrient inflows to the region - Utilizing nutrient rich organic residues originating from areas with high nutrient surplus for production of fertilizer products
<p><i>Reducing environmental impacts</i></p> <ul style="list-style-type: none"> - Reducing nutrient losses to the Baltic Sea area and closing nutrient cycles - Reducing greenhouse gas emissions - Reducing ammonia emissions - Utilizing appropriate solutions to recycle nutrients for the specific conditions preventing contamination of the environment - Improving soil quality and enhancing carbon sequestration by using organic fertilizers - Promoting/advancing site specific optimized fertilization plans
<p><i>Safe nutrient recycling</i></p> <ul style="list-style-type: none"> - Minimizing the risks for humans and environment posed by contamination
<p><i>Knowledge exchange and awareness raising</i></p> <ul style="list-style-type: none"> - Promoting new research and technological development - Increasing research and knowledge sharing on risks and safe practices - Facilitating knowledge transfer and information exchange on nutrient recycling - Cooperating with other regions and global organizations to exchange information on the most up-to-date knowledge and techniques - Raising awareness of the benefits of nutrient recycling - Promoting holistic view of food production
<p><i>Creating business opportunities</i></p> <ul style="list-style-type: none"> - Encouraging new business models with cross-sectoral cooperation - Improving the economic viability of nutrient recycling
<p><i>Improving policy coherence</i></p> <ul style="list-style-type: none"> - Increasing cooperation of governmental agencies to improve policy coherence - Updating legal framework to facilitate nutrient recycling



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Annex 4. List of potential measures

1. Baltic Sea region as a model area for nutrient recycling

Increasing nutrient use efficiency

- Enhance fertilization planning and optimization according to crop need instead of amount of nutrients
- Use farm-gate balancing
- Support the use of recycled nutrients in agriculture including manure storages and transport of manure
- Set goals for biomass recycling
- Prioritize use of manure as a fertilizer before using other fertilizers
- Develop digital tools and applications to assist farmers in sustainable nutrient use
- Share good practices and demonstrate e.g. via demo farms

Increasing the circulation of the available nutrient resources and reducing nutrient inflows to the region

- Limit livestock density
- Use locally produced feeds and reduce import of nutrients, e.g. tax on nutrient imports
- Create a network for exchange of nutrients (nutrient markets)
- Enforce mandatory nutrient recycling for large WWTPs
- Implement strict requirements for sludge quality
- Enhance source separation of wastewater in newly built areas
- Promote technologies that capture several substances
- Reduce the use P-rich chemicals e.g. as food additives
- Promote use/consumption of under used fish stocks
- Promote the development of technologies that capture nutrients in internal reserves

Utilizing nutrient rich organic residues originating from areas with high nutrient surplus for production of fertilizer products

- Support taking best available technologies in use for efficient nutrient recycling, e.g. alternative sewage treatment to facilitate higher P availability
- Introduce subsidies for use and production of recycled nutrients
- Create regional nutrient balance strategies for each country
- Subsidize the use of recycled nutrients or implement a tax on mineral fertilizers
- Set requirements on the share of recycled nutrients in fertilizers

2. Reducing environmental impacts

Reducing nutrient losses to the Baltic Sea area and closing nutrient cycles

- Advice and assist farmers in sustainable farming (e.g. soil tests, data, information etc.)
- Promote decreasing of allowed surplus in fertilization plan
- Promote organic farming and organic fertilizers
- Promote balanced animal farming
- Facilitate more efficient organization of manure logistics
- Increase cooperation between crop and livestock farmers
- Promote increasing of the requirement for WWTP implementation and cleaning level (97 % P)
- Establish various technologies for biogas production (and other BATs)
- Improve financial tools for BAT implementation and subsidies for research
- Promote new technologies for removal and recovery of nutrients from WWTPs



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- Find ways for improvement of soil quality to reduce leaching of nutrients and investigate opportunities of carbon sinks and binding nutrients to soil

Reducing greenhouse gas emissions

- Calculate nutrient recycling's impact on local, national and regional level Carbon Footprint
- Clarify nutrient recycling's role in EU carbon neutrality plan 2050
- Stop or restrict farming and fertilization on peatlands
- Reduce livestock density
- Promote research and implementation of nutrient recovery technologies (esp. energy)
- Promote reduction of using meat products in diets (consumer awareness)

Reducing ammonia emissions

- Promote improving quality, quantity and characteristics of manure storages
- Promote air treatment/scrubbing, acidification and other technologies for housing and spreading systems
- Support mandatory use of BATs for all farmers, incl. cattle farms

Utilizing appropriate solutions to recycle nutrients for the specific conditions preventing contamination of the environment

- Communicate and promote benefits of safe nutrient recycling to tackle contamination

Improving soil quality and enhancing carbon sequestration by using organic fertilizers

- Promote regulation development to support use of sewage sludge pyrolysis product in agriculture
- Facilitate establishing market for nutrient recycling and carbon capture
- Develop methods for measuring and verification of soil carbon
- Support business opportunities
- Raise awareness among farmers on the use of perennial crops
- Promote agroforestry as a method for improving soil quality and enhancing carbon sequestration

Promoting/advancing site specific optimized fertilization plans

- Define feasible subsidies for precision farming
- Promote creating an application for farmers to utilize for fertilization optimization
- Elaborate on easy soil tests for farmers (advisory service)

3. **Safe nutrient recycling**

Minimizing the risks for humans and environment posed by contamination

- Avoid unnecessary use of antibiotics and other pharmaceuticals
- Promote upstream separation of sewage water (e.g. minimizing mixing of industrial effluents to municipal water)
- Organize focused analysis of harmful substances of nutrient rich streams
- Enhance cooperation with pharmaceutical companies to promote technologies for detection of potentially harmful components
- Implement limits for harmful substances in national market fertilizer trade
- Implement a tax on cadmium in fertilizers
- Implement pollutant monitoring systems and certifications for sludge used in agriculture
- Organize long-term field study on health risks of harmful substances
- Increase awareness of fertilizer producers and users on the health perspective
- Promote stronger chemical legislation

4. **Knowledge exchange and awareness raising**

Promoting new research and technological development

- Include education on nutrient recycling in agricultural universities and colleges



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- Open a best practice information and collaboration platform
 - Offer seed funding for technology development and up-scaling
 - Organize competitions for new technologies
 - Launch research program for the development of new fertilizer products
- Increasing research and knowledge sharing on risks and safe practices
- Organize common meetings for stakeholders -> shared discussion
 - Facilitate open access for scientific publications
 - Support popularization of nutrient recycling research (practical language)
- Facilitating knowledge transfer and information exchange on nutrient recycling
- Educate advisors on nutrient recycling
 - Create neighborhoods for WWTP practitioners for sharing experiences
 - Organize farm/facility visits for stakeholders
 - Engage NGOs operating in the field of nutrient recycling
 - Collect and share information on organic farming (with case examples)
- Cooperating with other regions and global organizations to exchange information on the most up-to-date knowledge and techniques
- Create innovation funds for nutrient recycling
 - Establish closer cooperation with international phosphorus platforms
 - Facilitate cross-border technology development cooperation
- Raising awareness of the benefits of nutrient recycling
- Support independent advisors
 - Define value of carbon in relation to nutrient recycling
 - Communicate health risks of nitrates in groundwaters
 - Organize focused knowledge campaigns for stakeholders
 - Organize projects and campaigns in all levels of education (e.g. in primary schools)
 - Design environmental labels that include nutrient recycling (e.g. implement in existing labels)
- Promoting holistic view of food production
- Promote balance between animal and plant production
 - Organize open competitions around nutrient recycling
 - Promote campaigns targeted for food industry and consumers
 - Design a quality system to increase traceability
- 5. Creating business opportunities**
- Encouraging new business models with cross-sectoral cooperation
- Organize “WETSUS” type of projects that connect companies, universities, research institutions etc.
 - Employ “headhunters” for recycled nutrients and defining paths for recovered nutrients (case examples)
 - Enhance market information availability on nutrient recycling (open access to data)
 - Improve availability and publication of nutrient market survey results
 - Organize a support scheme for bio-methane
 - Find incentives for biogas producers to process digestate (recoupling of livestock and crop agriculture)
 - Investigate opportunities for centralized nutrient recycling factories for sewage sludge ash
 - Improve the scalability of new business innovations and financial incentives
 - Find flagship companies to open up market
 - Encourage new business models
 - Build cross-sectoral cooperation (vertically and horizontally)



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- Improve grant policies and financial support (seed-funding / investment support)
- Improving the economic viability of nutrient recycling
- Create economical tools and incentives for making organic fertilizers to be more attractive than mineral fertilizers
 - Support increased requirements for blending of recovered phosphorus with mineral fertilizers
 - Strengthen regulation that prevents specialization and special separation of crop and livestock production
 - Put more focus on product development, not only technical development
 - Improve ways for consumers to demand recycled nutrient based goods -> Find ways for increasing consumer awareness e.g. Greta Thunberg for nutrient recycling
 - Organize a market for recycled nutrients
 - Map contractors and service production in nutrient recycling and create an action plan with supportive policy mix for market establishment
 - Provide support for actors willing to access to nutrient market (business help desk)
 - Establish common quality standards for recycled fertilizer products

6. Improving policy coherence

Increasing cooperation of governmental agencies to improve policy coherence

- Create a strategy for a holistic view on sustainable food system including nutrient recycling across sectors
- Enhance cooperation between sectors (agriculture, WWT, businesses) so that they speak “the same language”
- Define clear roles and responsibilities for actors around nutrient recycling
- Define clear joint goals for plant nutrient balances (also quantitative)
- Create joint verification systems for nutrient recycling technologies (BAT)

Updating legal framework to facilitate nutrient recycling

- HELCOM should set limits for the use of mineral fertilizers and not only manure
- Facilitate the trade of recycled fertilizers by EU fertilizer trade legislation
- Create limits for farm-gate nutrient balance and related consequences, if balance not met
- Identify regional boundaries for N/P (nutrient badges) for setting N/P reduction targets and actions
- Find local/regional key issues for targeted legislation