Assessment of HELCOM Hot Spot No. 10 Agricultural runoff to the Archipelago Sea with the view to delete the Hot Spot by 2027

Maria Laamanen (edit.)

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Ministry of the Environment, Regional Centre for Economy,
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Natural Resources Institute Finland, Finnish Environment Institute
and Ministry of Agriculture and Forestry

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Abstract

This report assesses Finland's only remaining site on the Baltic Marine Environment Protection Commission (HELCOM) hot spot list, Hot Spot No. 10 Agricultural runoff to the Archipelago Sea. The objective is to apply for the deletion of this hot spot from the list by the end of 2027. The report evaluates progress towards meeting the deletion criteria. Advances have been made in water protection in the Archipelago Sea area, with 17 out of the 23 HELCOM criteria currently fulfilled. The fulfilled criteria include the hot spot boundaries, goals, nutrient load management plan, monitoring, funding, crop cover, application of soil amendments, restoration and nutrient recycling. The criteria not yet met relate to issues such as the ratio of land available for manure spreading to livestock numbers, the implementation of manure storage and spreading, ammonia emissions, and trends in the agricultural nutrient loads to the Archipelago Sea. The status of the unmet criteria will be reviewed regularly. Once the deletion criteria are met, this report can be updated and used as part of the deletion application. Applying for the deletion does not require an improvement in the marine environmental status of the Archipelago Sea. The state of the marine environment is influenced not only by nutrient loading but also by climate change and other human activities.

Keywords Baltic Sea, agriculture, water protection, eutrophication, nutrient recycling, protection of the Archipelago Sea, nutrient loading

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Maataloudesta Saaristomereen päätyvää kuormitusta koskevan HELCOM Hot Spot nro. 10:n tilannearvio tarkoituksella, että Hot Spot -status voitaisiin poistaa viimeistään vuonna 2027

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Tiivistelmä

Raportissa tarkastellaan Suomen ainoaa Itämeren suojelukomission (HELCOM) hot spot -listalla olevaa kohdetta, kohde nro 10: Saaristomeren valuma-alueen maatalouden kuormitus. Tavoitteena on hakea hot spot -statuksen poistoa vuoden 2027 loppuun mennessä. Arviointiraportissa tarkastellaan poistokriteereiden täyttymistä. Maatalouden vesiensuojelussa on Saaristomeren alueella edistytty ja HELCOM:n asettamista 23:stä kriteeristä 17 täyttyy. Täyttyneet kriteerit koskevat mm. hot spotin aluerajoja, tavoitteita, kuormituksen hallintasuunnitelmaa, seurantaa, rahoitusta, peltojen kasvipeitteisyyttä, maanparannusaineiden käyttöä ja vesistökunnostuksia sekä ravinteiden kierrätystä. Täyttymättömät kriteerit koskevat mm. lannanlevitysalaa suhteessa eläinmääriin, lannan varastoinnin ja levityksen toteutusta, ammoniakkipäästöjä ja Saaristomereen päätyvän maatalouden ravinnekuormituksen kehitystä. Täyttymättömien kriteereiden tilannetta aiotaan tarkastella säännöllisesti. Kun poistokriteerit täyttyvät, tämä raportti voidaan päivittää ja hyödyntää osana poistohakemusta. Poiston hakeminen ei edellytä Saaristomeren meriympäristön tilan paranemista. Tilan kehitykseen vaikuttavat ravinnekuormituksen ohella ilmaston muuttuminen ja muu ihmisen toiminta maalla ja merellä.

Asiasanat	Itämeri, maatalous, vesiensuojelu, rehevöityminen, ravinnekierto, Saaristomeren suojelu, ravinnekuormitus		
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Lägesbedömning av HELCOM hot spot nr 10 om jordbrukets belastning på Skärgårdshavet med avsikten att senast år 2027 avlägsna Hot Spot -statusen

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Referat

I rapporten granskas Finlands enda objekt på den hot spot-lista som HELCOM upprätthåller, belastningen från jordbruket i Skärgårdshavets avrinningsområde. Ett mål är att ansöka om att ta bort hot spot-statusen före utgången av 2027. I rapporten granskas hur kriterierna för borttagande uppfylls. Man har gjort framsteg kring Skärgårdshavet, och 17 av HELCOM:s 23 kriterier uppfylls. De kriterier som uppfylls gäller bl a. gränserna för hot spot-området, mål, plan för hantering av belastningen, övervakningsprogram, finansiering, växttäcke på åkrarna, vattenskyddsåtgärder, såsom användning av jordförbättringsmedel och restaurering av vattendrag samt återvinning av näringsämnen. De kriterier som ännu inte uppfylls gäller bland annat gödselspridningsareal i förhållande till antalet djur, genomförande av lagring och spridning av stallgödsel, ammoniakutsläpp och utveckling av näringsbelastningen från jordbruket i Skärgårdshavet. Situationen i fråga om de kriterier som inte uppfylls kommer att granskas regelbundet. När kriterierna för borttagande uppfylls, kan denna rapport uppdateras och användas i samband med ansökan om borttagande. Ansökan om borttagande förutsätter inte att den marina miljöns tillstånd i Skärgårdshavet förbättras. Utvecklingen av tillståndet påverkas förutom av näringsbelastningen också av den globala uppvärmningen och den mänskliga verksamheten på land och till havs.

Nyckelord	Östersjön, jordbruk, vattenskydd, övergödning, återvinningen av näringsämnen, skyddet av Skärgårdshav, näringsbelastning, nutrient loading
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Contents

EXECUTIVE SUMMARY

Finland's only remaining Hot Spot on the HELCOM's list of the biggest polluters in the Baltic Sea region is the Hot Spot "Agricultural runoff to the Archipelago Sea" (ID number 10). The national Archipelago Sea Programme has the goal to enable the deletion of this Hot Spot by the end of 2027. This report provides an assessment of the status of the Hot Spot and an analysis of the extent to which the Hot Spot deletion requirements by HELCOM have been met.

Extensive work is ongoing to enhance nutrient recycling in the Archipelago Sea catchment and to reduce agricultural nutrient loading to the sea. The Archipelago Sea Programme and its Roadmap for agricultural water protection measures lay out the measures necessary to improve the state of the sea and delete the Hot Spot from the list.

Due to the significant scale of different financing possibilities, especially through the national CAP plan, it is possible to conclude that the 18 M € per year cost estimate of implementation of the Archipelago Sea Programme's Roadmap for agricultural water protection measures has been covered in recent years and it will be covered in the following years at least up to 2028.

According to the analysis, 17 out of the 23 requirements for the deletion of the Hot Spot from HELCOM's list were fulfilled. The Archipelago Sea Programme and its Roadmap for water protection in agriculture serve as a non-point source pollution reduction plan required in hot spot's deletion criteria. There are long-term environmental goals, declining total loads of both nitrogen and phosphorus, signs of decreasing agricultural phosphorus loading, a monitoring programme and sufficient financing for measures in place enabling us to meet deletion criteria. The criteria for wintertime crop cover and pollution reduction measures, such as application of gypsum on fields, as well as the requirements for the design and location of animal houses and nutrient recycling, have also been met.

The six (in fact only five, since one unmet criterion repeats five other non-met criteria) criteria which have not yet been met all relate to livestock production and manure management and there are challenges especially in regions with intensive livestock production and high soil phosphorus content. The exemption on manure

spreading of the Phosphorus Decree hampers meeting the criteria. It was also observed that a data repository of plot level soil nutrient data could improve the implementation of water protection measures and permitting procedures.

In conclusion, the Archipelago Sea agricultural pollution Hot Spot is not yet ready for deletion and an application to HELCOM is not timely. Nevertheless, most of the deletion criteria have already been met and good progress is underway and contributing to decreasing the non-point source agricultural pollution to the Archipelago Sea.

The Archipelago Sea catchment has all the possibilities to become a pioneering region of nutrient recycling and achieve a continuous decline of nutrient loads from agriculture of the catchment. However, to maintain this trend and to reach the preliminary load reduction targets of the Marine Strategy, determination and further action is needed to reach the goal.

This gaps in meeting the criteria as well as the state of nutrient loading will be reviewed annually and this report updated until it can be concluded that the criteria have been met and it is possible to submit the deletion application to HELCOM. This report is intended to provide the justification to the eventual deletion application.

1 Introduction

In 1992, the Baltic Marine Environment Protection Commission, HELCOM, established a list of 162 significant pollution sites around the Baltic Sea called HELCOM Hot Spots. A major focus of the Hot Spots programme is to support measures to bring about a decisive reduction of pollution to the Baltic Sea from land-based sources according to the provision of the Helsinki Convention which require the Contracting Parties to: "…take all appropriate legislative, administrative or other relevant measures to prevent and eliminate pollution in order to promote the ecological restoration of the Baltic Sea Area and the preservation of its ecological balance."[1]

Hot Spots were initially designated according to the seriousness of their impact on the environment and human health. Out of total 162 HELCOM Hot Spots, 40 (25%) are still active and 122 (75%) had been cleaned up by December 2020 when HELCOM last assessed their status. Most of the original Hot Spots were industrial Hot Spots, and altogether 17 agricultural Hot Spots were included.

In this document we assess the status of Finland's last remaining Hot Spot, agricultural runoff to the Archipelago Sea, against deletion criteria provided by HELCOM. The aim is to provide the information needed to decide on whether Finland is ready to apply for the deletion of the Hot Spot.

1.1 Finland's only remaining Hot Spot, the agricultural runoff to the Archipelago Sea Hot Spot No. 10

Initially, ten Hot Spots were established in Finland, seven of them were industrial, one municipal, one agricultural and one concerned fish farming. The only remaining Hot Spot in 2025 is the Hot Spot "Agricultural runoff to the Archipelago Sea" (ID number 10).

1 Final-report-on-JCP-efficiency-1.pdf (helcom.fi)

HELCOM has not provided any description of the Hot Spot. In the report on the implementation of the Hot Spot programme in 2013, HELCOM stated that the only remaining Hot Spot of Finland is agricultural runoff to the Archipelago Sea and it is not proposed for deletion within the coming years due to the low effect demonstrated with measures undertaken so far.

In general, agricultural Hot Spots are characterized by intensive agriculture and livestock farming and there are nutrient losses to the Baltic Sea, which threatens coastal ecosystems. The sites included in the Hot Spot list have many livestock in relation to the arable area or deficiencies in agricultural water protection measures.

Photo: Sari Luostarinen

1.2 Criteria for deleting a Hot Spot from the HELCOM list

To guide the process of deleting Hot Spots, HELCOM has provided "Criteria for Inclusion and Deletion of Hot Spots: Procedures and Guidelines for Inclusion and Deletion of Hot Spots"[2].

2 Document (helcom.fi) Criteria-for-inclusion-and-deletion-of-hotspots.pdf

For deleting agricultural Hot Spots HELCOM gives the following criteria:

> *"An agricultural Hot Spot or subdivision thereof, may be considered for deletion, provided that the Hot Spot unit has been formally defined by the co-operating government on the basis of administrative and/or drainage basin/sub-basin boundaries, long-term environmental goals are established for the area, and it fulfils the following criteria:*
>
> *(i) an agricultural non-point source management plan has been prepared, which includes an appropriate monitoring programme, and there is demonstrated funding which will be adequate for a sustained incremental programme of on-farm activities including improved agricultural practices, investments in manure, urine and slurry handling, and the establishment of buffer strips;*
>
> *(ii) the management plan will result, through a series of phased actions, in all relevant provisions of the Helsinki Convention Annex III being fulfilled;*
>
> *(iii) farms within a watershed with an animal density higher than [1.5] livestock units per ha or large animal farms with more than 250 livestock units have demonstrated that fertilisers and manure are adequately stored and are applied on an appropriate area and according to official national or regional fertilisation guidelines; and*
>
> *(iv) if located in a vulnerable area that requires special measures according to national considerations, the management plan will support a series of activities to fulfil these requirements."*

HELCOM has provided general procedures for agricultural Hot Spot deletion:

> **Step 1: Quantify pollutant loadings and downstream water quality**
> Implementation of the management plan for the area would support a series of farm-level interventions that over the medium and long term would result in a high and/or significant reduction of amounts of polluting substances released via rivers or directly to Baltic Sea marine and coastal waters, including wetlands, lagoons and semienclosed basins.

Step 2: Compare monitoring results against relevant HELCOM Recommendations and Annexes or other relevant international agreements

The management plan for the area is technically sound and adequately funded to allow for a phased series of farm-level activities that are consistent with Annexes of the Helsinki Convention (especially Annex III), and relevant HELCOM Recommendations, or other international agreements relevant to countries in the Baltic Sea catchment area, if HELCOM Recommendations are not available and/or applicable.

Step 3: Assess management plan, performance indicators and monitoring programme

Assess whether the management plan will fulfil objectives for the reduction of non-point source pollution from agriculture. Review the adequacy of the monitoring programme with regard to information on farm-level interventions and longer-term environmental benefits through pollution load reductions.

In addition, HELCOM recommends that recognizing the slow response times of interventions for the control of non-point source pollution from agriculture, countries should provide satisfactory information concerning the types of management plans, monitoring programmes, funding commitments and their implementation status, as the basis for deleting an individual management unit.

2 The Archipelago Sea and its catchment

2.1 Description of the area

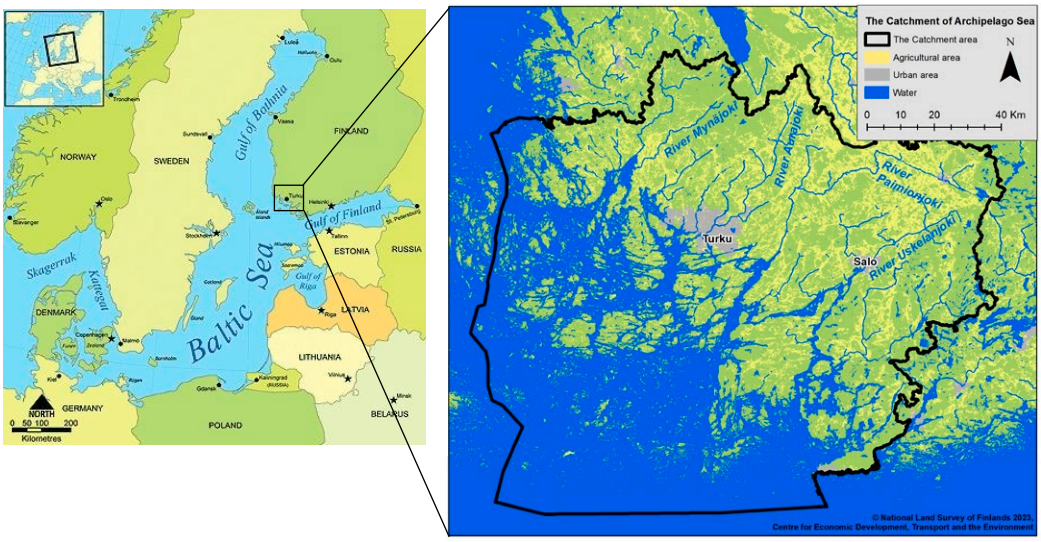
The Archipelago Sea in the Southwest of Finland is a relatively shallow sea area with a unique mosaic of islands, skerries and marine water (Figure 1). In the south, the sea area is delimited to the boundary of the Finnish coastal waters (1 NM from the baseline as in the MSFD) and in the west to the waters of the Åland Islands, an autonomous region of Finland. The number of islands is over 40 000. Water depth is 23 meters on average with the deepest site being 146 meters. Coastal waters are shallower, usually less than 10 meters deep. Water salinity varies between 5.5 and 6.5 PSU.

The archipelago can be divided into inner coastal, middle and outer archipelago according to the share of islands and skerries in relation to water surface and biota. The marine environment of the Archipelago Sea provides conditions for diverse communities of plants and animals. Underwater life consists of species of both marine and freshwater origin. Large parts of the area have been designated as a national park and also have a Natura2000 status.

Photo: Maria Laamanen

The marine area of the Archipelago Sea is large and there are a number of major rivers flowing into it, such as the rivers Mynäjoki, Aurajoki, Paimionjoki and Uskelanjoki. These rivers are large and impacted by the high clay content of the soils of the catchment. They are also classified to a poor or moderate ecological status according to the Water Framework Directive.

Figure 1. The Archipelago Sea is located in the Southwest of Finland and has a large catchment area with several rivers.



2.2 State of the Archipelago Sea

In addition to the HELCOM targets, the goal for all EU Member States is to achieve a good status of all coastal waters as required by the Water Framework Directive (WFD) and of the marine environment as required by the Marine Strategy Framework Directive (MSFD). According to the WFD assessment of ecological status in 2019, the Archipelago Sea is mostly in a moderate ecological status (Figure 2). The main problem is eutrophication manifested by algal overgrowth and blooms, hypoxic and anoxic sediments as well as changes in species composition towards species that favor less transparent and warmer water. The MSFD assessment report in 2024 'State of the marine environment 2024' also defines eutrophication as the major problem.[3]

3 Suomen meriympäristön tila 2024

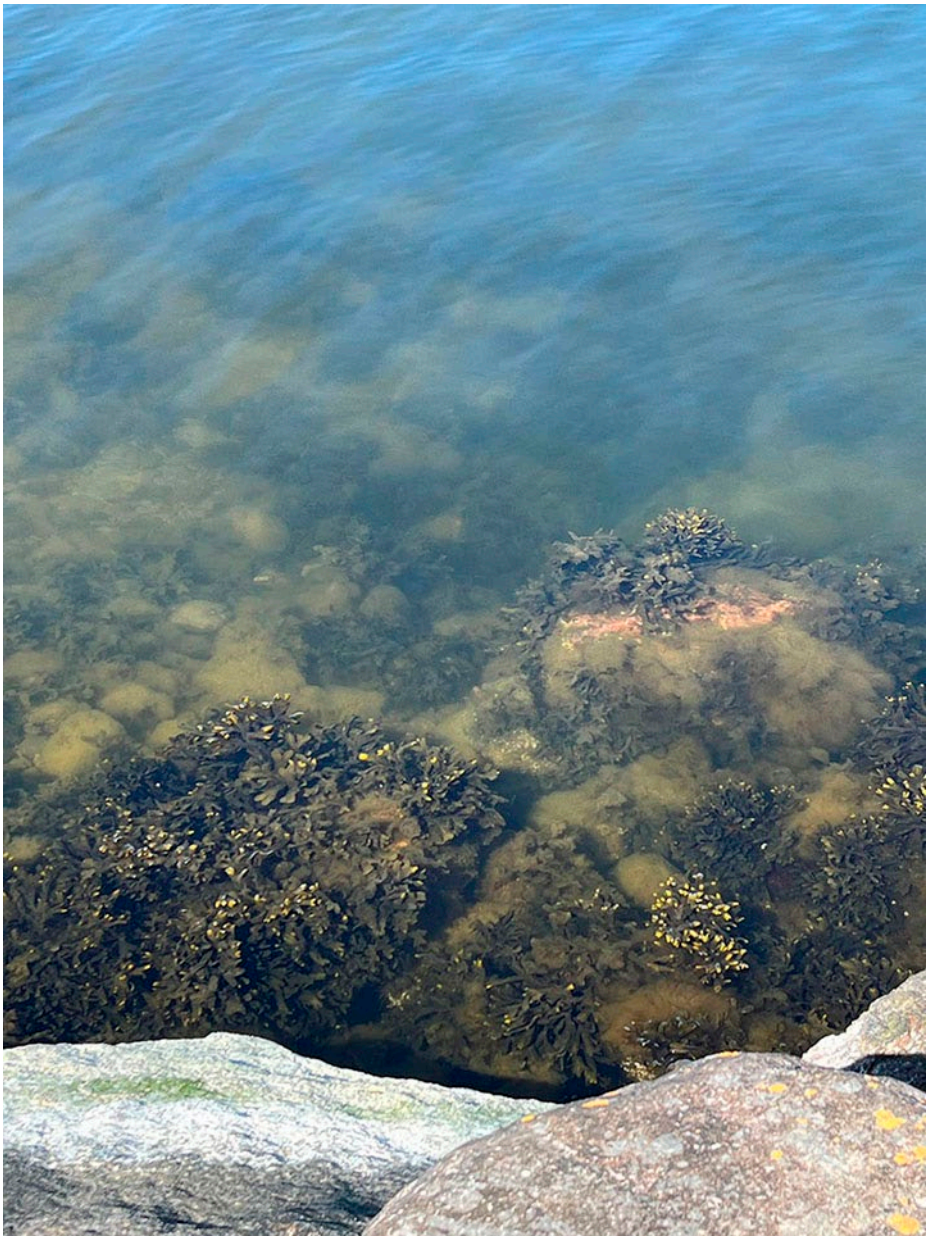


Photo: Maria Laamanen

The waters in the inner archipelago closest to the coast are in the worst condition, often classified as poor. None of the water bodies in the Archipelago Sea are classified as being in a good status.

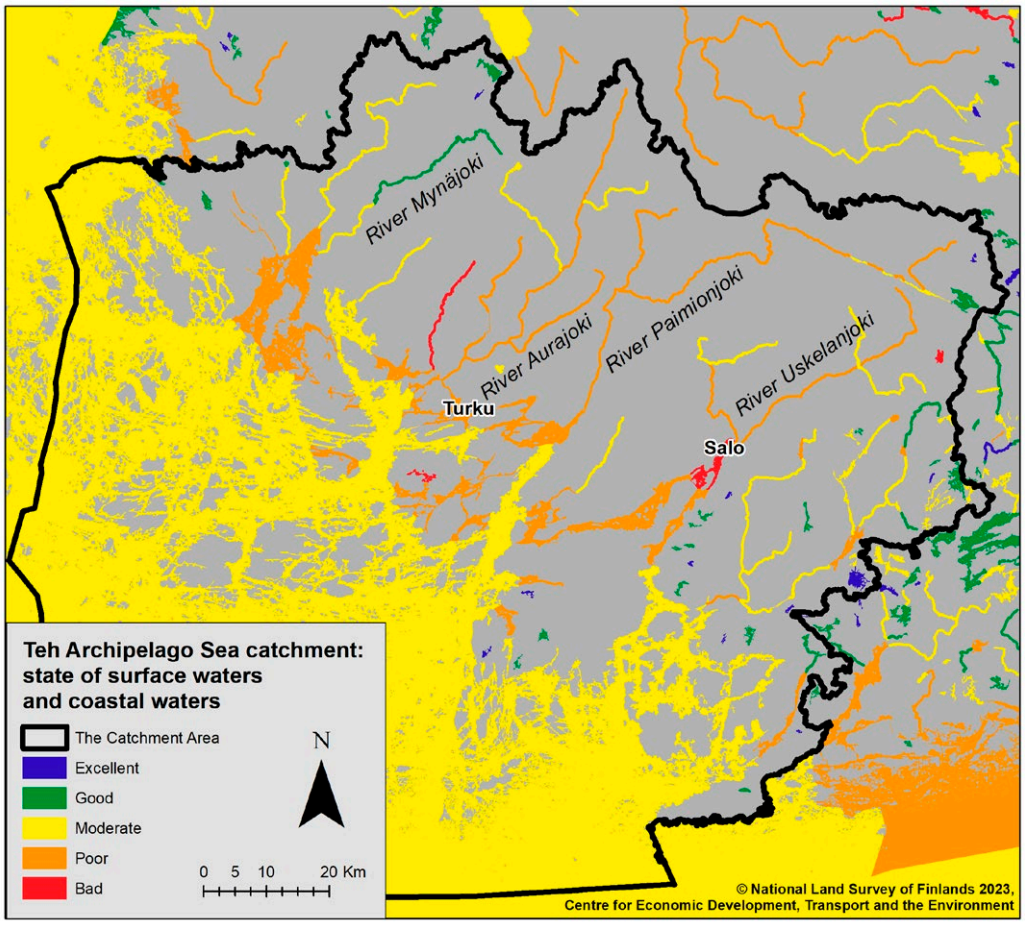


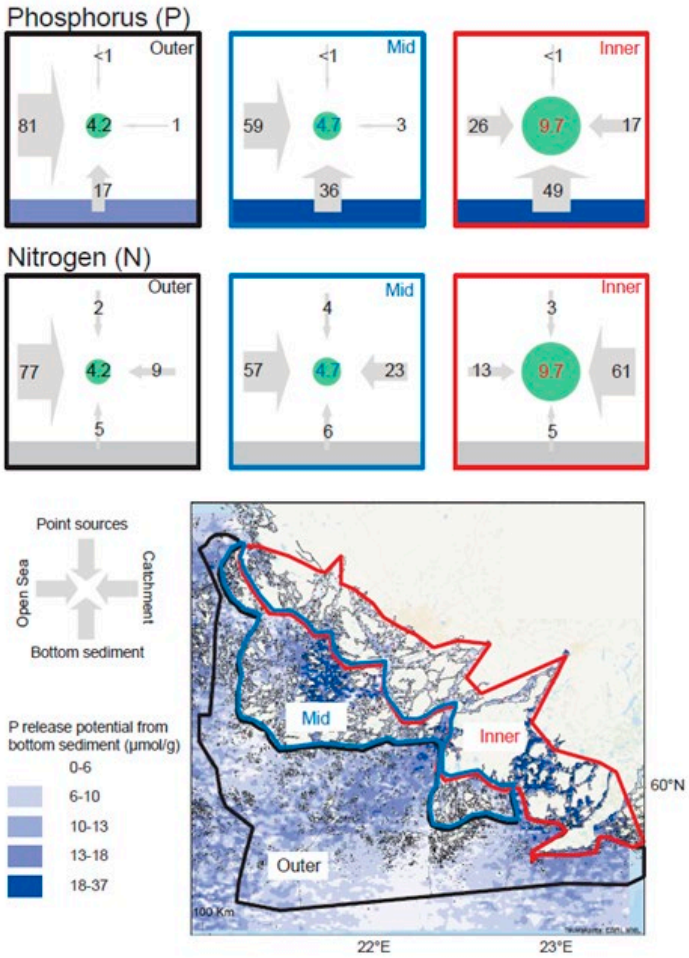
Figure 2. The ecological status of the Archipelago Sea (Syke 2022) is based on biological, chemical, and hydrological quality factors in comparison to its natural state. The greater the human impact, the lower the ecological quality of the water body.

In addition to the nutrient loading from the catchment, the status of the marine waters, especially in the outer archipelago, is affected by nutrients from the neighboring, severely eutrophicated sea areas, the northern Baltic Sea and the Gulf of Finland (Figure 3). Nitrogen also enters the system via atmospheric deposition. In addition, the eutrophicated state partly persists due to historical loading and inability of the sediments that are impacted by anoxia to withhold and permanently bury the nutrients which results in so called internal loading[4]. Benthic anoxia and thus also internal loading, however, is seasonal. This means that phosphorus released from anoxic sediments to the water during summer-late summer can be

4 MAAMERI-hanke – Vaikuttavaa merentutkimuksen yhteistyötä Saaristomeren parhaaksi (2).pdf

partially adsorbed back to the particles in the water column settling to seafloor and also sediment surface when the sediment oxygen conditions improve along with cooling waters, breaking of the seasonal thermocline and enhanced vertical water exchange.

Figure 3. In the upper panel the share of phosphorus fluxes from different sources as a percentage of total loading, (point sources, catchment, bottom sediment, open sea) based on FICOS-model calculation[5]) of phosphorus and nitrogen and in the lower panel total phosphorus (P, µmol/g) release potential from bottom sediment in the outer, middle and inner Archipelago Sea. Size of arrows in the upper panel is proportional to nutrient flux, also presented as percentage in number. Green circle in the middle of panels shows the algal biomass as concentration of chlorophyll-a in µg/L in the different parts of the Archipelago Sea as calculated by the FICOS model. It is to be noted that FICOS-model calculation represents overall balance of nutrient sources available to planktonic algal biomass growth. Processes driving phosphorus fluxes from and to the sediment are dynamic and seasonal; phosphorus released from the sediments during seasonal anoxia can be adsorbed back to particles in the water column and the sediment when the sediment returns to oxygenated state after summer period.



5 Fleming, V. & al. (2021): Rannikkovesiemme vedenlaadun ja rehevöitymistilan tulevaisuus ja sen arvioiminen. Valtioneuvoston selvitys- ja tutkimustoiminnan julkaisusarja 2021:14. http://urn.fi/URN:ISBN:978-952-383-111-7

2.3 Agriculture in the Archipelago Sea catchment

The largest rivers in the catchment of the Archipelago Sea are the Rivers Paimionjoki, Aurajoki, Kiskonjoki and Uskelanjoki, along with numerous smaller rivers that flow from the catchment into the sea. The terrain of the area is relatively flat, and the surface soil consists mainly of layers of clay (even in the order of 80 % of all soils) and silt deposited on top of basic moraine. There are no large lakes in the catchment. The high clay content of the soil makes them susceptible to erosion, which decreases the quality of the river waters.

The share of arable land in the Southwest of Finland is relatively high compared to the rest of the country as over 10% of the Finnish agricultural and horticultural enterprises are in Southwest Finland.

Nearly one-third of the total land area of the Archipelago Sea catchment, about 240,000 hectares, is farmland. Farms producing different plants make up 80% of the farms. Grain, especially wheat, and special crops such as sugar beet, pea and rapeseed are cultivated in the area.

The region's livestock farming focuses on pig and poultry production. About two thirds of all laying hen and 20 % of broilers are reared in Southwestern Finland (within or in close proximity to the Archipelago Sea catchment), while the share of all pigs is 28 %[6]. Cattle production is significantly smaller, only 3 % and 8 % of all dairy cows and suckler cows, respectively, are reared in the area. This also explains the small field area for grass production.

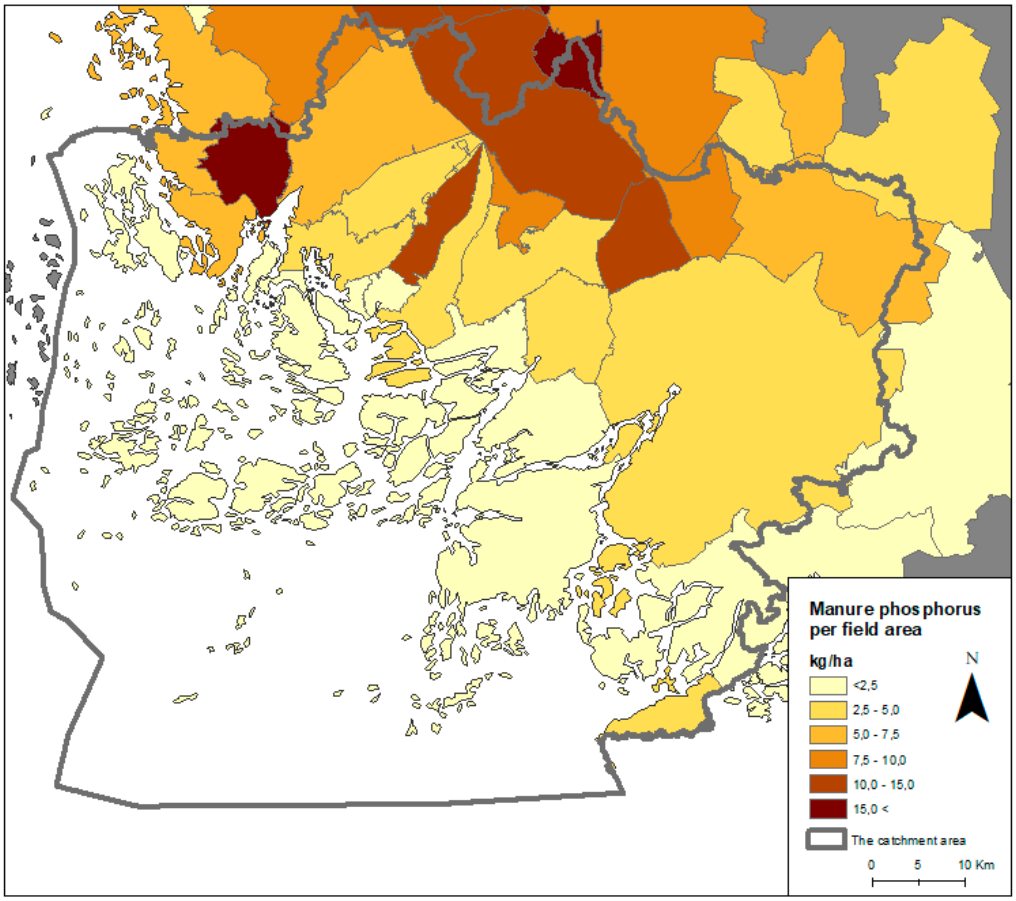
6 https://www.luke.fi/fi/tilastot/kotielainten-lukumaara

Photo: Sari Luostarinen

The animal density in Southwest Finland is 0.45 LSU/ha (average in Finland 0.40 LSU/ha)[7]. However, the livestock production and hence also the manure nutrients in the Archipelago Sea catchment are highly concentrated in the western and northern parts of the area and the animal density for the whole catchment does not give a representative picture of the situation (Figure 4). The higher the number of livestock is, the higher the amount of manure nutrients available for fertilization and the higher also the risk of leaching to waters in case the manure is not sustainably managed and used. Most of the manure produced in the area is directly applied on fields on or close to the livestock farms, while little is processed or transported to be used elsewhere.

7 Eläinyksiköiden suhde hehtaareihin maakunnittain | Taloustohtori

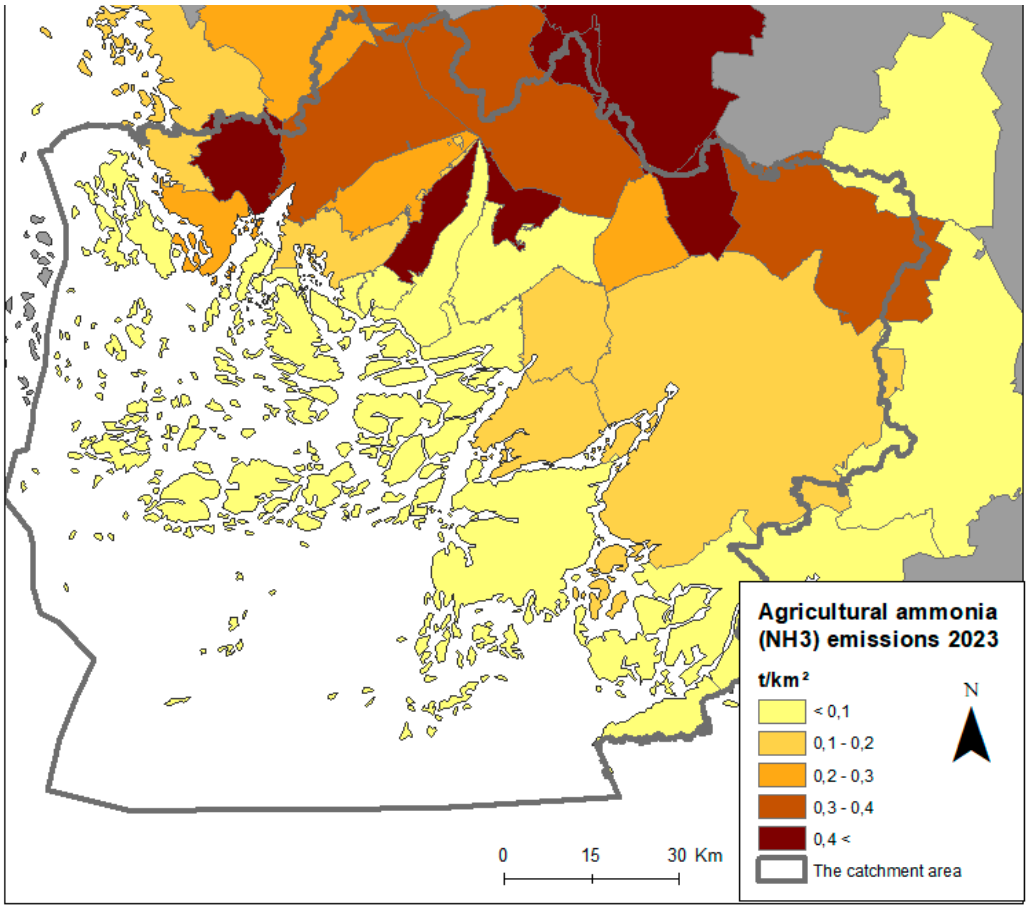
Figure 4. The amount of manure phosphorus produced per field area (ha) per municipality in Southwest Finland. Average Finnish amount of manure phosphorus per field hectare was 6.7 kg/ha in 2023.[8]



In addition, most of the ammonia emissions causing atmospheric deposition of nitrogen to the sea originate from manure management. The quantity of emissions to the air thus also follows the number of animals within the region (Figure 5).

8 http://urn.fi/URN:ISBN: 978-952-380-612-2

Figure 5. Ammonia emissions (t/km^2) from agriculture by municipality in 2023[9].

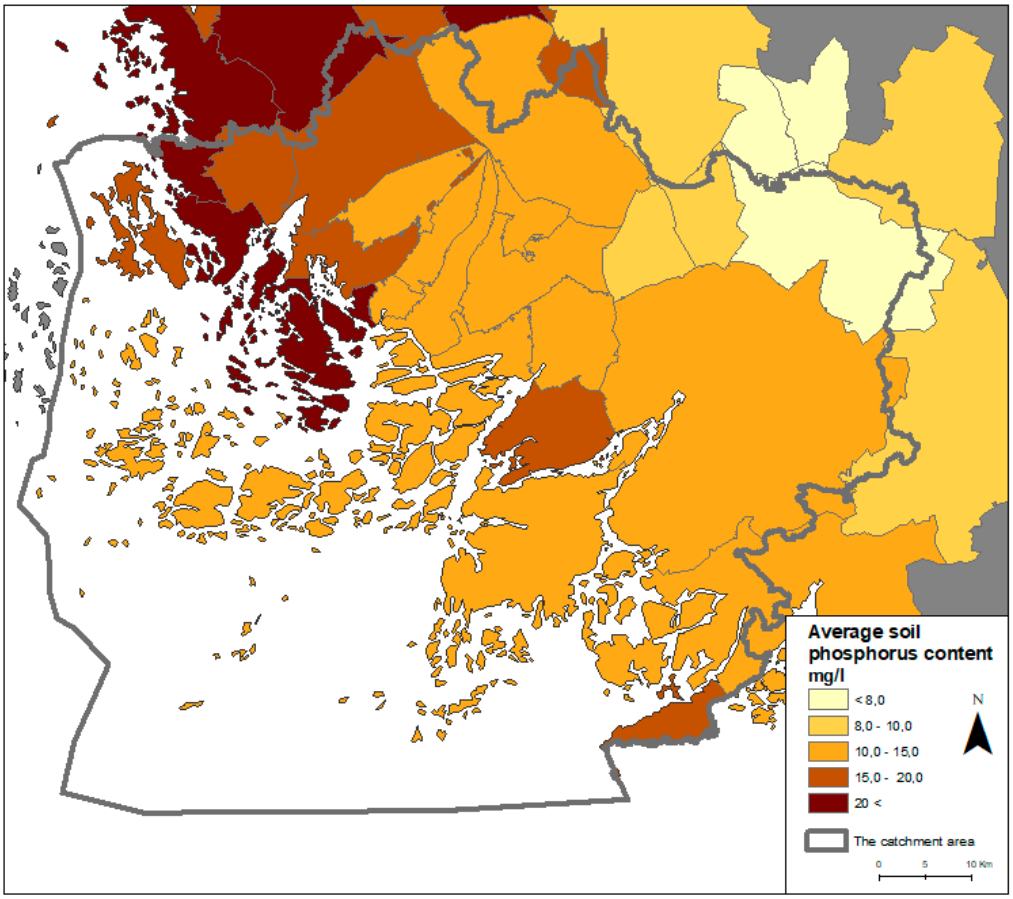


Due to the long agricultural history of the Archipelago Sea area, previous high use of fertilizers in all agricultural production and regionally concentrated intensive livestock production, phosphorus content of the field soils is rather high in the area (Figure 6). This reduces the need for phosphorus fertilization in the region. The higher the soil phosphorus content is, the higher also the risk for phosphorus losses from the fields to the waters. The highest average soil phosphorus content is usually in municipalities and sub-catchments with high animal density and/or production of special plants such as sugar beet, potato and pea. High manure use in fertilization has been one reason for persistently high phosphorus content of soils when the overall use of phosphorus fertilizers is not balanced against the needs of plants.

9 Suomen ympäristökeskuksen ilmapäästötietojärjestelmä/Juha Grönroos 2025

Photo: Sari Luostarinen

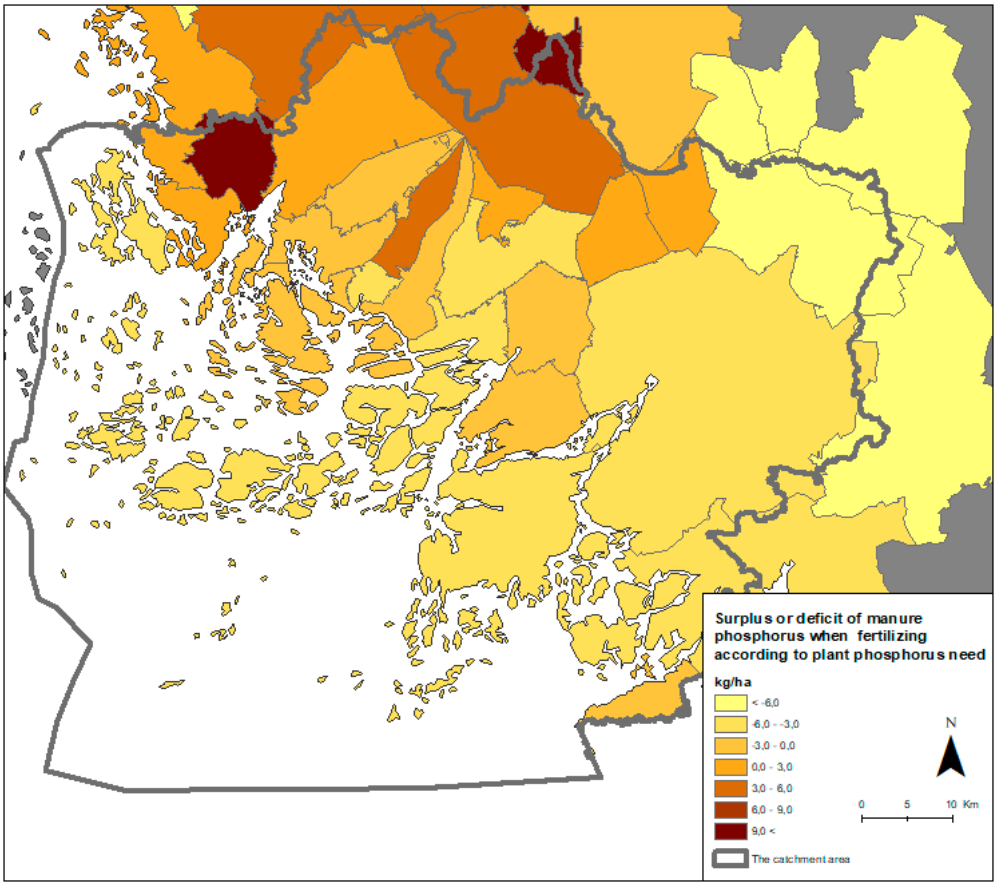
Figure 6. Average soil phosphorus content (soil test P; mg/l) per municipality in the fields of Southwest Finland. Average soil phosphorus content in Finnish field soils is 11 mg/l.[10]



When comparing the amount of manure phosphorus and the need for phosphorus fertilization (taking into account the soil phosphorus content and plants produced) per municipality in the Archipelago Sea area, a surplus can be identified in the municipalities with higher animal density (Figure 7). While noticing that this comparison assumes manure phosphorus is applied on all field area benefitting from phosphorus fertilization, and that mineral phosphorus fertilizers are also used, it shows there is an overall need to reduce phosphorus fertilization in the area and improve allocation of manure nutrients between the livestock and plant producing farms.

10 http://urn.fi/URN:ISBN: 978-952-380-612-2

Figure 7. Regions of surplus and deficiency in the availability of manure phosphorus (kg/ha) in comparison to phosphorus fertilization needed in crop production per municipality in Southwest Finland. The fertilization need for an area is calculated considering soil phosphorus content, crops produced and crop-specific needs for phosphorus fertilization[11].



2.4 Nutrient loading to the Archipelago Sea

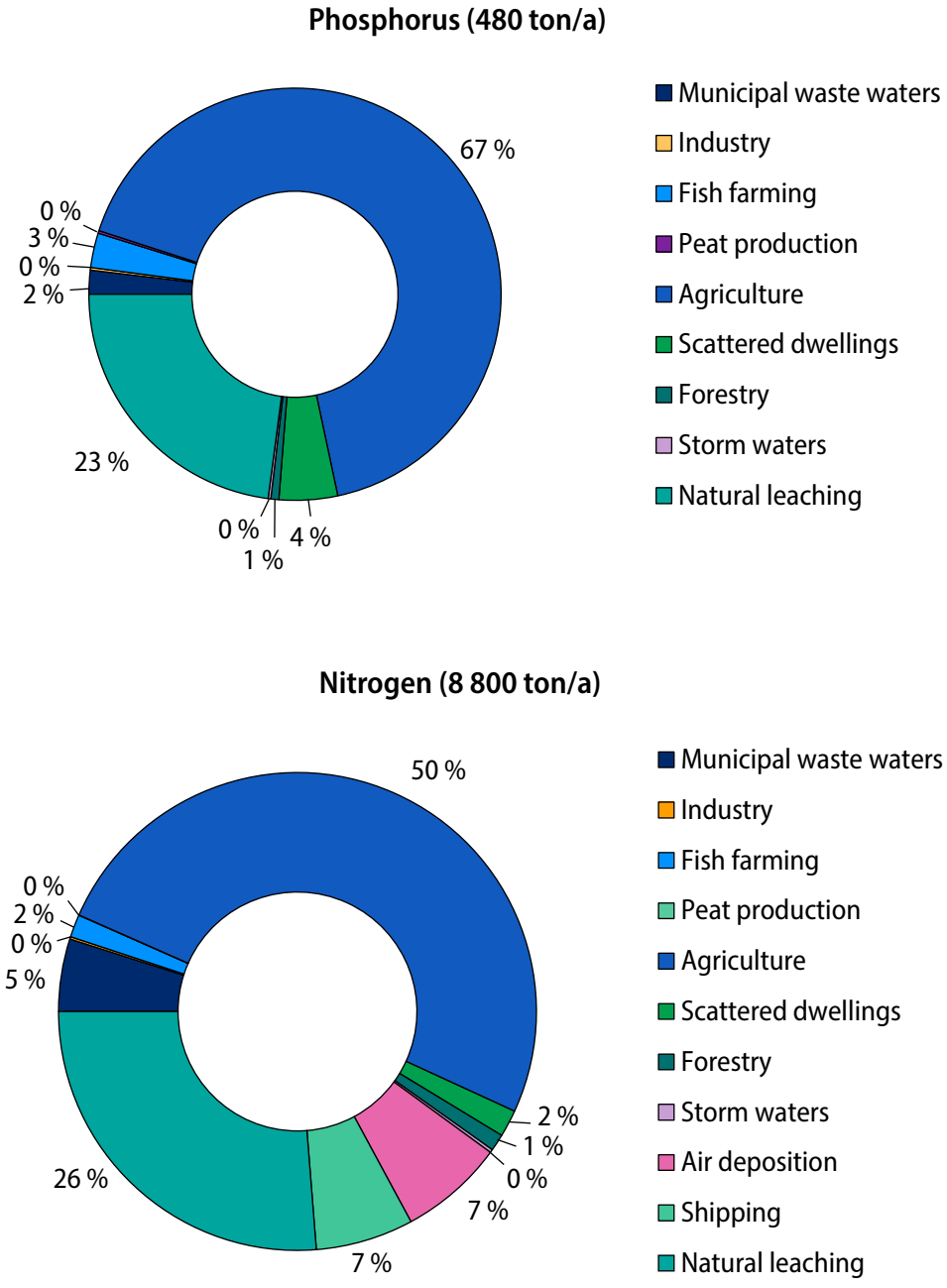
The eutrophication of the Archipelago Sea is caused by long-term land-based nutrient loading from the catchment, direct point source discharges, transport of nutrients from the neighboring sea areas and atmospheric deposition. In addition, anoxic sediments release nutrients, especially phosphates, that have accumulated in the sediments over time.

11 http://urn.fi/URN:ISBN: 978-952-380-612-2

Point source pollution from municipal wastewaters and fish farming started to remarkably decrease already in the 1980s first related to phosphorus and only later related to nitrogen. The Urban Waste Water Treatment Directive from 1991 (revised in 2025) significantly improved the municipal wastewater treatment and reduced the discharge[12]. Nowadays, the largest source of nutrients to the Archipelago Sea is agriculture. It causes 50 % of loading of nitrogen and 67% of phosphorus even when natural leaching of nutrients is accounted for (Figure 8). This is due to intensive farming activities, and concentrated livestock production, in combination with slowly impacting or insufficient water protection measures in western and northern parts of the area. The high clay content of the field soils and the lack of lakes that could retain nutrients make the catchment area prone to land-based nutrient loading.

12 https://vesi.fi/aineistopankki/yhdyskuntien-jatevesien-kuormitus-vesiin/

Figure 8. The share (%) of sources of nitrogen and phosphorus loading to the Archipelago Sea from local sources (the catchment area and islands in the archipelago area) as an average of years 2010–2019. Data from Finnish Environment Institute Syke.



Nutrient loading to the sea has decreased over the years and there is a statistically significant decreasing trend for total loading of both nitrogen and phosphorus over 1995–2023 (Figure 9). The decrease is mainly a result of improved wastewater treatment and fish farming methods.

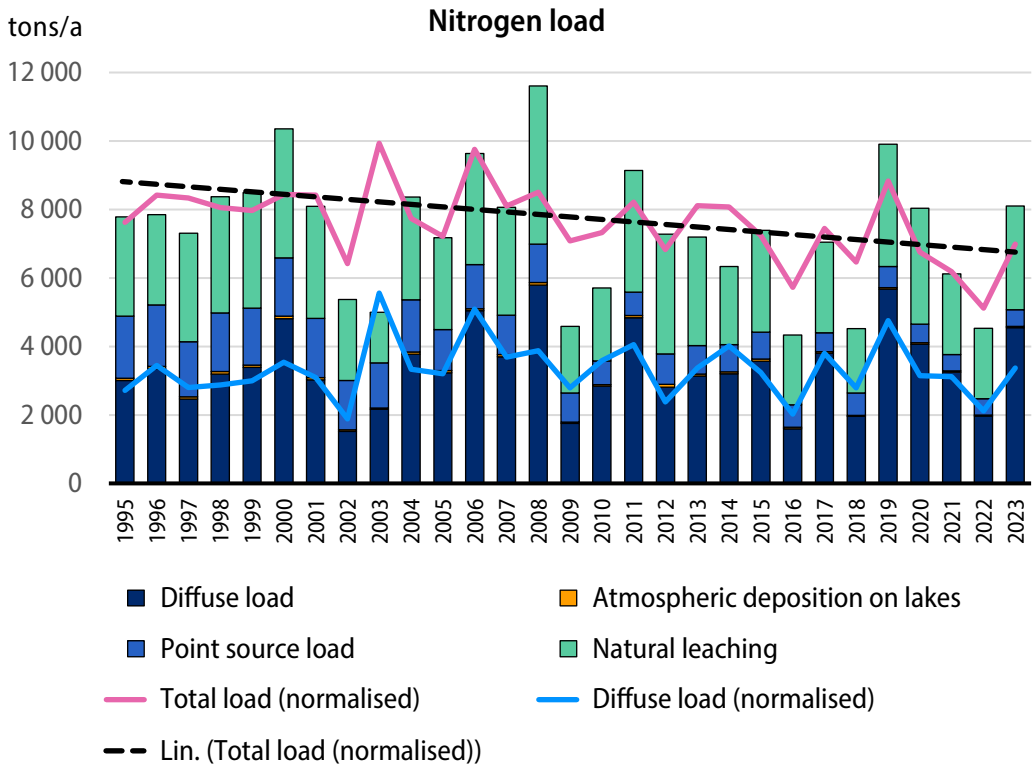
Diffuse loading, mainly (ca. 89%) from agriculture, has also decreased in a statistically significant way when it comes to phosphorus, but diffuse loading of nitrogen shows no sign of a decrease (Figure 9).

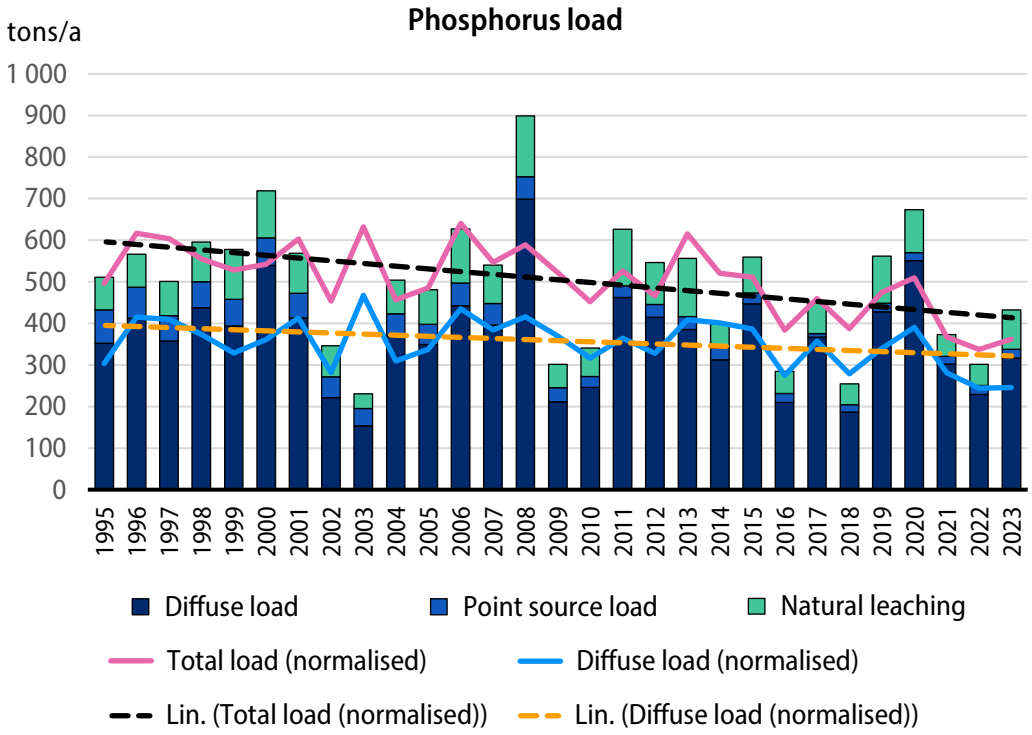
Photo: Sari Luostarinen

The decrease in diffuse loads was detected in flow-normalized inputs, whereas no such decrease was observed in non-normalized inputs. Flow-normalized load estimates decrease the impact of variation in water flow on the nutrient load and they better show the effects of load-reducing measures.

Noteworthy is that currently there are large gaps in the coverage of monitoring, which increases the uncertainty in estimating trends in nutrient loads (see Chapter 5.4).

Figure 9. Land-based loading (tons per year, t/a) of nitrogen (N) and phosphorus (P) to the Archipelago Sea (excluding the Åland Islands) in 1995–2023 with point source and diffuse (ca. 89 % agricultural) loads as well as natural leaching presented for both nutrients with bars, and for nitrogen atmospheric deposition is also included. The total and diffuse loads are also denoted with a waterflow normalized line as well as with a linear trend when the trend is statistically significant (P>0.95). Data from Syke.




Phosphorus load
tons/a
1 000
900
800
700
600
500
400
300
200
100
0
1995
1996
1997
1998
1999
2000
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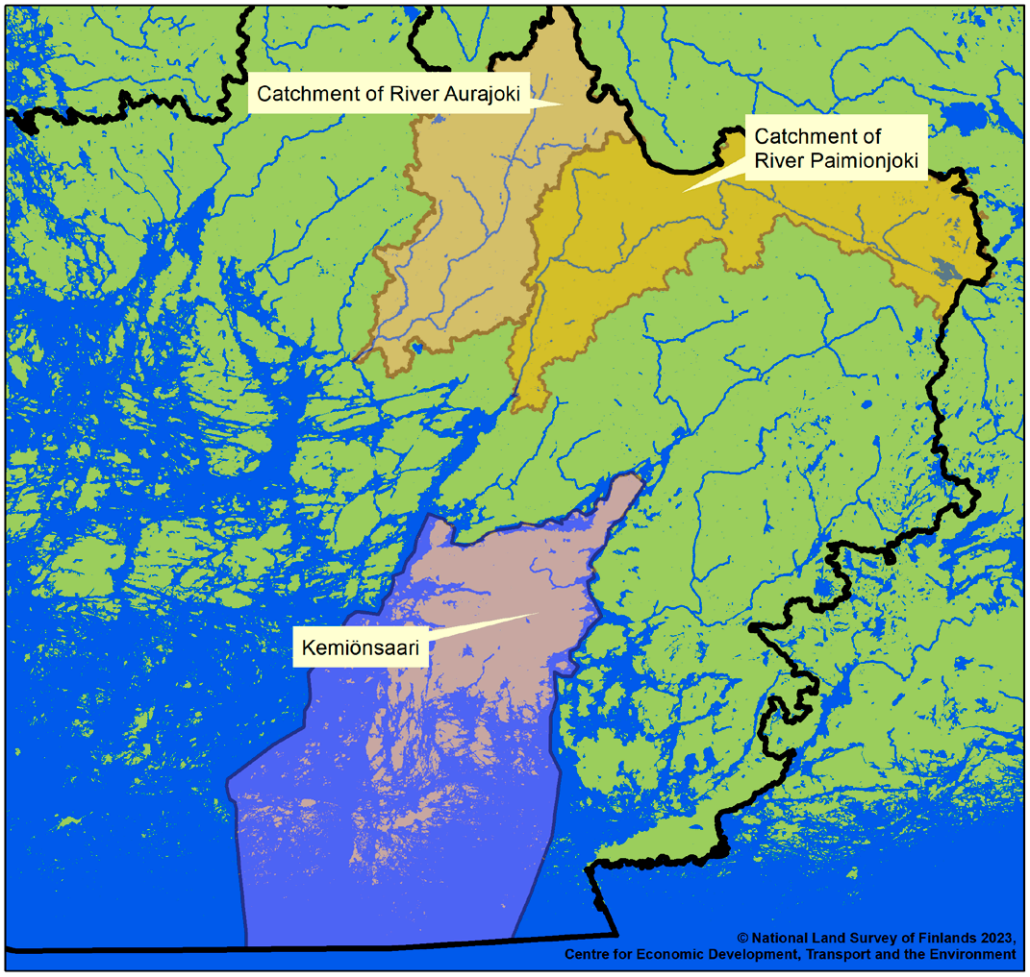
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Diffuse load
Point source load
Natural leaching
Total load (normalised)
Diffuse load (normalised)
Lin. (Total load (normalised))
Lin. (Diffuse load (normalised))

3 Formal definition of the geographical unit of the Hot Spot

HELCOM requires the Contracting Party or its cooperating government to formally define the Hot Spot based on administrative and/or drainage basin/sub-basin boundaries before it can apply for Hot Spot deletion. The Archipelago Sea agricultural Hot Spot No. 10 covers the whole drainage basin or catchment of the Archipelago Sea as shown on the map (Figure 1). The drainage basin has been defined based on the geographical boundaries of the catchment area and some administrative boundaries.

Within the national Archipelago Sea Programme, aiming at improving the state of the sea and deleting the Hot Spot status (see: Chapter 5), three pilot areas have been defined (Figure 10). They are two river basins within the catchment, the Rivers Aurajoki and Paimionjoki, and an island with its surrounding marine area, Kemiönsaari. The pilot areas are subject to intensified measures and higher activity to reduce agricultural nutrient pollution. They have been selected due to their significant nutrient loading in comparison to most other areas. In addition, the inclusion of an island with its surrounding marine area into the set of pilot areas will enable measures taken in the sea as well.

Figure 10. Three pilot areas of the Archipelago Sea catchment: river basins within the catchments of the Rivers Aurajoki and Paimionjoki, and an island with its surrounding marine area, Kemiönsaari.



4 Long-term environmental goals

4.1 Goals for nutrient load reductions to the Archipelago Sea

One of the prerequisites for the Hot Spot deletion is setting long-term environmental goals for the Hot Spot. These goals need to be aligned with internationally and nationally set goals.

For Finland, the goals for the status of marine and surface waters are set in the national Marine Strategy[13] and River Basin Management plan for the area[14]. Nutrient load reduction goals are given as environmental goals of the National Marine Strategy[15]. Overall, it is evident that the total nutrient load to the Archipelago Sea from the catchment must be reduced considerably to achieve a good state of the marine environment and a good ecological status of coastal waters.

The preliminary nutrient load reduction targets presented in the national Marine Strategy show the long-term reduction targets required to achieve a good ecological status of marine waters. The targets were updated in 2024 for the period 2024-2030. These targets for the whole Archipelago Sea are -140 tn P/year (-30 %) and -750 tn N/year (-10 %) of total nutrients in comparison to the average loads of the years 2012–2021.

The National Marine Strategy includes also updated goals for nutrient load reductions in certain sectors. The preliminary reduction goals for agriculture in the Archipelago Sea catchment area are exactly the same as the general goals above. This is relevant since the anthropogenic loading is mostly diffuse loading from agriculture.

13 Taustaraportti Hyvän tilan määritelmät 2024.pdf

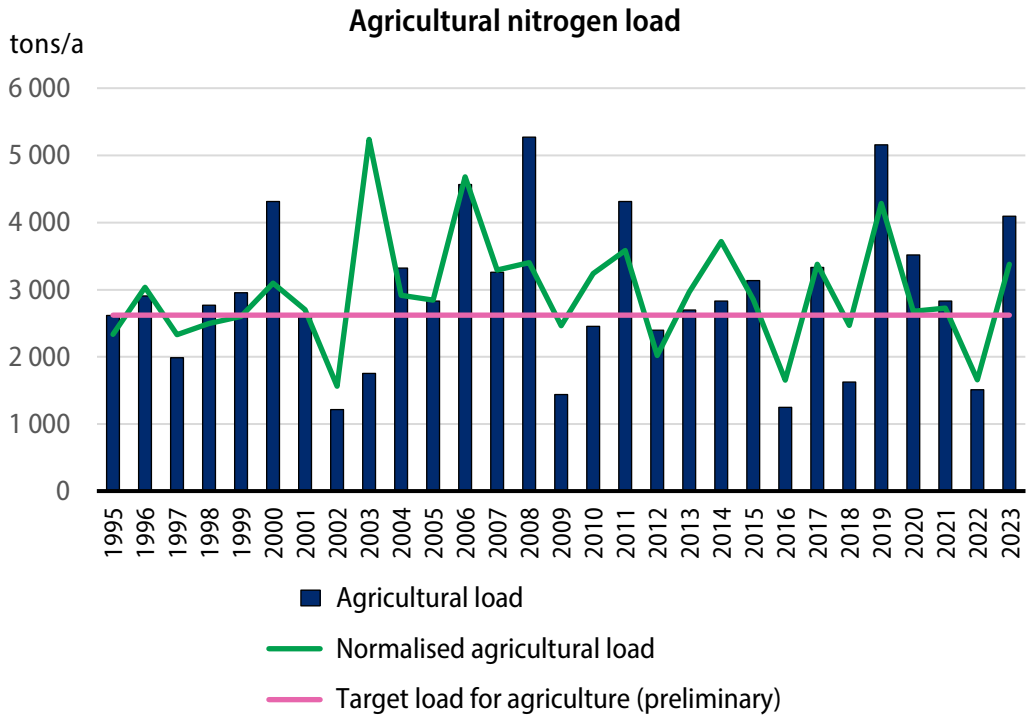
14 Kokemäenjoen – Saaristomeren – Selkämeren vesienhoitoalueen vesienhoitosuunnitelma vuosille 2022–2027. Osa 1: Vesienhoitoaluekohtaiset tiedot.

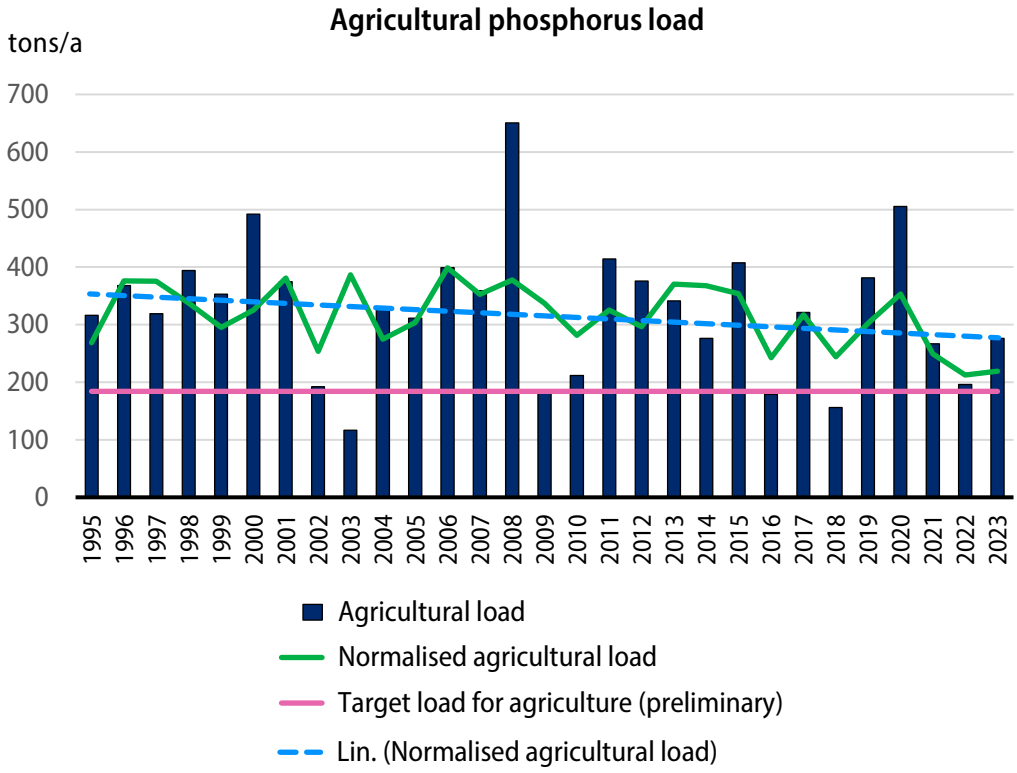
15 Tausta-asiakirja Merenhoidon ympäristötavoitteiden tarkistaminen 2024_0.pdf

Photo: Riku Lumiaro

Even though nutrient loading is decreasing, reaching a good status of the Archipelago Sea marine environment will take a long time. It is also influenced by additional factors such as climate change. Reaching a good environmental status is not a prerequisite for deletion by HELCOM. The long-term environmental goal Finland sets for the deletion of its HELCOM Hot Spot is a decrease of N and P loads from agriculture towards the preliminary reduction targets of Marine Strategy. When considering reaching the goal, the delaying effects of climate change and other potential factors that may hinder the achievement of the objective will be taken into account. Nutrient loading will be monitored using data from the Archipelago Sea monitoring programme and modeling. This is in line with the hot spot deletion approaches used by some other HELCOM countries.

Figure 11. Agricultural nitrogen and phosphorus loading in tons/year (bars, non-normalized; dotted line, flow-normalized and dashed line, statistically significant trend of flow-normalized) into the Archipelago Sea from 1995 to 2023 together with the level of loading at the preliminary nutrient load reduction target for total nitrogen and total phosphorus set in the updated of the Marine Strategy (2024). Data from Syke.





No deadline for achieving the preliminary targets has been set because the underlying data and modeling information are not yet considered sufficiently reliable to do so. The goals will be reviewed according to the regular six-year cycles of the Marine Strategy and new data and modelling will be used to set the goals. The goal is to achieve a continuing decrease of the loads towards the targets, preferably in the 2030s, and subsequently to a level allowing a good ecological status to be reached.

The goals are based on an estimate made by modeling how much the nutrient load into the Archipelago Sea will decrease if all the measures included in the River Basin Management plans for the Archipelago Sea catchment area for 2022–2027 are implemented in full.

According to a study, which used modeling of needed reductions to reach a good status of the marine environment as a starting point, reaching a good status for summertime eutrophication indicators would require a 68 % reduction of loading of both N and P. These reductions would equal to the maximum loadings of

1 794 tn/year of N and 126 tn/year of P[16]. These results, however, were not considered sufficiently reliable to be used as a basis for setting the load reduction targets of the Marine Strategy due to perceived uncertainties in modelling and unknown or not well understood factors related to internal loading, among other things. Hence, the preliminary less ambitious reduction targets were set, and they will be reviewed regularly as further knowledge is accumulated.

Photo: Susa Niiranen

HELCOM, on the other hand, has used a slightly different approach to estimating load reductions necessary for reaching a good status of marine waters in terms of eutrophication. Their method focuses on the open sea and is based on the reduction needs of eutrophication in the open sea areas, while the focus in our approach is on the eutrophication of coastal waters. HELCOM estimated the reduction needs and input ceilings of the Archipelago Sea in 2023 (Technical NIC background report, HELCOM 2023). According to those estimates, the need to

16 Rannikkovesien ravinteiden kuormituskatot ja kuormituksen vähentämisen keinoja – Loppuraportti

reduce phosphorus load would be about the same or slightly lower than Finland's nationally defined goal in national Marine Strategy. The slightly lower nitrogen load reduction needs would have already been reached with current loading.

To reach a good status of the coastal waters, higher load reductions are necessary compared to the open waters, where the effect from open sea sources, e.g. transboundary pollution from other countries and legacy pollution is higher and the task of reducing the loading is divided among the coastal countries (HELCOM system of County Allocated Reduction Targets). On the other hand, Finnish load reduction goals will have a greater impact on the near shore coastal waters, where the external pollution is largely of national origin, and the effect of external transboundary pollution is less[17]. In addition to national approaches, the subject of this report, international cooperation and action by other countries to reduce nutrient loads according to the HELCOM Baltic Sea Action Plan and its nutrient load reduction system is highly necessary but is not the subject of this paper.

Although a lot of focus has recently been put on phosphorus loading, nitrogen loading is just as important to reduce. Internal loading of phosphorus from the sediments due to anoxia poses a challenge both in coastal and open waters but its level can mainly be brought down by reducing external loading of both nitrogen and phosphorus. Nitrogen is the main nutrient driving spring blooms which are the main pelagic biomass peak settling as particles to the sediments and consuming oxygen as they decompose. Anoxia drives internal loading of phosphorus from the sediments and the continuous vicious cycle of eutrophication. Similarly, coastal annual filamentous algae, which give many coastal environments a slimy appearance are driven by nitrogen and their decomposition also consumes oxygen.

4.2 Secondary preliminary goals for nutrient load reductions from the pilot areas

In addition to the main long-term environmental goals of the Hot Spot, preliminary nutrient load reduction targets have been set for each of the three nationally chosen pilot areas within the Hot Spot area (see: Chapter 3). The method for setting the secondary goals is the same as for the priority goals, i.e., they are based on an

17 Hyytiäinen, K., Huttunen, I., Kotamäki, N., Kuosa, H. and Ropponen, J. Good eutrophication status is a challenging goal for coastal waters. Ambio (2023). https://doi.org/10.1007/s13280-023-01965-7

estimate made by modeling of how much the nutrient load into the Archipelago Sea will decrease if all the measures included in the River Basin Management plan, when accounting only for the pilot area, are implemented in full.

The preliminary load reduction targets for the pilot areas are in the order of 13–16 % from the average level of 2012-2021 loading for nitrogen and 34–36 % for phosphorus (Table 1). These reduction levels are higher than those for the whole catchment since the pilot areas are sources of higher loading per unit area in comparison to most other areas.

These goals are preliminary and indicative in nature, and they provide a reference point for the efforts to reduce loads. No timetable has been set for these reductions.

Table 1. The level of current loading (tn/year) and preliminary load reduction targets (tn/year and %) of total nitrogen and phosphorus for each of the three nationally chosen pilot areas within the Hot Spot area.

Area	Nitrogen		Phosphorus	
	Average 2012–2021 loading (tn/year)	Reduction target (tn/year and %)	Average 2012–2021 loading (tn/year)	Reduction target (tn/year and %)
River Aurajoki	590	-90 (-15 %)	52	-19 (-36 %)
River Paimionjoki	800	-130 (-16 %)	93	-33 (-36 %)
Kemiönsaari	290	-37 (-13 %)	19	-6 (-34 %)

5 Assessment of the Archipelago Sea Hot Spot against HELCOM's agricultural pollution related hot spots' deletion criteria

Already for long, Finland has been and is currently taking measures to reduce nutrient loading to the Archipelago Sea to improve its state. The legislation, policies and programmes contain norms, obligations and incentives to agricultural water protection measures. In 2021, Finland also launched an Archipelago Sea Programme with the aim to achieve a clear decrease of agricultural loading through more effective cooperation and implementation of intensive measures in the area and with the ultimate goal to delete the Hot Spot status preferably by 2027.

5.1 Legislation, policies and programmes providing the framework for measures

Much of the national legislation listed above stems from EU legislation and policies, such as the Water Framework Directive (2000/60/EC), Marine Strategy Framework Directive (2008/56/EC), Nitrates Directive (91/676/EEC) and EU CAP (EU/2115/2021 ja EU/2116/2021).

The Programmes of Measures for years 2022-2027 under the River Basin Management Plan for the Western Finland[18] and the national Marine Strategy[19] provide the framework for further measures targeted at improving the state of the Archipelago Sea. The aim of these Programmes is to achieve and maintain a good status of the marine environment and a good ecological status of surface waters.

Agricultural water protection measures have been implemented and financed since the last millennium, primarily through the CAP. There is a number of measures under the CAP that are obligatory to receive the funding. In addition, there are

18 Varsinais-Suomen ja Satakunnan vesienhoidon toimenpideohjelma vuosille 2022–2027.

19 Suomen merenhoitosuunnitelman toimenpideohjelma vuosille 2022–2027

water protection measures in the national CAP plan that are voluntary. More precise guidance for nutrient use in fertilization and manure management is given also in the legislation.

The whole of Finland has been designated as a nitrate vulnerable zone, meaning that the Nitrates Directive is applied throughout the country. The Nitrate Decree sets out practices for the storage and spreading of manure and fertilizer products to reduce nitrogen emissions into water bodies, soil, and air from the use, storage, and handling of fertilizers. The Fertilizing Product Act, Decree on Fertilizing Products and especially the Decree on the use of phosphorus fertilizers, including manure, have recently set stricter rules and boundaries for all fertilization in agriculture, horticulture and landscaping.

The most important national legislation, policies and programmes regulating and supporting the protection of marine and surface waters and water protection measures in agriculture include:

Environmental legislation especially related to waters

- Environment Protection Act (527/2014) and the relevant related Government Decrees
- Water Act (587/2011)
- Government Decree on Urban Waste Treatment (1303/2004)
- Waste Act (646/2011) and Government Decree on Waste (978/2021)
- Act on the Environmental Impact Assessment Procedure (2017/252)
- Nature Conservation Act (9/2023)
- Water Resources Management Act (2004/1299)
- Government Decree on Water Resources Management Areas (1303/2004)
- Government Decree on Water Resources Management (1040/2006)
- Government Decree on the Organization of the Development and Implementation of the Marine Strategy (2011/980)
- Government Decree on the Granting of Assistance for Projects to Improve the Use and Condition of Water Bodies and the Aquatic Environment (2001/688)
- Government Decree on State Grants to Non-Profit Organizations and Foundations for the Promotion of Health and Social Well-Being (1552/2016)

Photo: Sari Luostarinen

Legislation related to agricultural policy and subsidies affecting on water protection

- Government Decree 867/2024 on requirements related to good agriculture and environmental conditions related to EU and national farmer subsidies
- Government Decree 1278/2023 on statutory management requirements related to EU and national farmer subsidies
- Government Decree 78/2023 on environmental compensation
- Government Decree 28/2025 on decoupled direct payments from agricultural production 2025
- Act on the Management of the Common Agricultural Policy Strategic Plan (1324/2022)
- Act on Direct Payments to Farmers in the European Union (1332/2022)
- Act on Certain Rural Development Compensation Measures (1333/2022)
- Act on the Implementation of Certain European Union and National Agricultural Supports (1334/2022)
- Act on Supporting Rural Development in the 2023–2027 Funding Period (1325/2022)
- Decree of the Ministry of Agriculture and Forestry on Environmental Protection Requirements for Subsidized Construction (606/2023)

Legislation on fertilizing products and their use

- Nitrate Decree, the Government Decree on the Restriction of Certain Emissions from Agriculture and Horticulture (1250/2014)
- Fertilizing Product Act (711/2022)
- Decree of the Ministry of Agriculture and Forestry on Fertilizing Products (964/2023)
- Decree of the Ministry of Agriculture and Forestry on the Operation and Supervision of Fertilizing Products (965/2023)
- Plant Protection Products Act (2011/1563)
- Government Decree on the Use of Phosphorus-containing Fertilizing Products and Manure (64/2023)

National Programmes and subsidies for agricultural water protection measures and nutrient recycling and relevant related legislation

- Finland's CAP Strategic Plan 2023–2027
- National Marine Strategy 2022–2027
- River Basin Management Plans 2022–2027
- Ahti programme for Water and Marine Protection 2024-
- A strong and committed Finland: Programme of Prime Minister Petteri Orpo's Government 20 June 2023, including its chapter on the protection of the Archipelago Sea and the Ahti Programme for protection of waters and the marine environment
- Operational grants for nutrient cycles (Government Decree 81/2024)
- Nutrient Recycling Pilot Programme (Government Decree 382/2016)
- Nutrient Recycling and Urban Waste Water energy efficiency, RAKI Programme 2020–2026 (657/2020)

5.2 Archipelago Sea Programme and the Roadmap for agricultural water protection

The state of the Archipelago Sea has been of concern for a rather long time and measures to improve its state have also been carried out for quite some time. In 2010, in the high-level Baltic Sea Action Summit[20], the Finnish government committed to effective action to reach a good state of the Archipelago Sea by

20 The President of the Republic of Finland: Press Releases and News

2020. In another commitment in 2010, the government agreed to make Finland a model area of nutrient recycling[21]. Since then, several governments have prioritized nutrient recycling and measures to improve the state of the Baltic Sea and Finnish surface waters, directing funding to research, development and innovation projects and investments related to these topics.

In April 2021, due to increasing public pressure and a certain lack of progress related to the state of the Archipelago Sea, the Finnish government (2019-2022) decided to initiate a specific Archipelago Sea Programme[22] with the aim to reduce pollution to the sea in such a way that the area could be deleted from the HELCOM list of Hot Spots by 2027[23].

The Programme (Figure 12) has since been further detailed and elaborated and the current government has laid out the main objectives of decreasing pollution and improving nutrient recycling, as explained in its Government Programme (2023–2027). The need to fully and effectively implement the Programme was further accentuated by the Finnish National Audit Office in 2024, which highlighted shortages in the effectiveness of agricultural water protection measures in Finland in its 2024 report[24].

21 Suomesta ravinteiden kierrätyksen mallimaa – Valto

22 Saaristomeri-ohjelma – Saaristomeri – ELY-keskus

23 Puoliväliriihessä turvattiin luonnonsuojelun rahoitus, päätettiin Luontolahjani Suomelle -kampanjan jatkosta ja Saaristomeren tilan parantamisesta – Valtioneuvosto

24 Vesien- ja merenhoidon ohjaus, rahoitus ja tuloksellisuus – Maatalouden ravinnekuormituksen vähentäminen – Valtiontalouden tarkastusvirasto

Figure 12. Logo of the Archipelago Sea Programme.

Both the ministers of the Environment and Climate as well as Agriculture and Forestry have been actively involved in promoting the Programme since its establishment. The stakeholder meetings organized by the ministers to promote the implementation of the Programme have involved relevant ministries, farmer associations, main food enterprises with production or other activities in the Archipelago Sea catchment area, nature protection NGOs, foundations working on protection of the Baltic Sea and academia. In February 2025, minister of the Environment and Climate Sari Multala set up an Archipelago Sea monitoring group to follow-up and boost the implementation of the Programme until the end of 2027.

The regional Centre for Economic Development, Transport and the Environment in Southwest Finland (ELY Centre) was put in charge of coordinating the Programme under the guidance of Ministry of the Environment and Ministry of Agriculture and Forestry. The ELY Centre set up a regional collaboration group to widely engage regional and national stakeholders in the work.

In 2021, the general status of the Archipelago Sea agricultural Hot Spot was assessed for the first time and a report[25] presenting the gaps in relation to deletion criteria was published. The report concluded that there is no single integrated management plan for agricultural water protection and management in the Archipelago Sea catchment, which would be fully in line with the HELCOM criteria, but the legislation, water and maritime management plans and the parts of the national CAP plans promoting water protection together form a management plan.

The strong regional concentration of livestock farming in the South-West Finland poses challenges for manure spreading, which means that manure processing and transportation opportunities should be developed. Some shortcomings were identified in fulfilling Annex III of the Helsinki Convention.

The second phase of the Programme assessed bottlenecks in the implementation of agricultural water protection measures. The report[26] concluded that one of the most significant challenges of agricultural water protection is targeting the measures in areas where they can bring the greatest benefits in terms of water protection. In the Archipelago Sea catchment, especially the vegetation cover should be targeted in areas where the risk of erosion and nutrient leaching is greatest. The region's concentrated livestock farming is a challenge, and measures should be taken to enhance the utilization of manure nutrients. Phosphorus stored in the soil, the so-called legacy phosphorus, makes it more difficult to reduce nutrient loads and the report suggested enhanced utilization of soil fertility data in fertilization. It was also concluded that the lack of economic viability of the farming operations reduces the interest and capacity of farmers in implementing water protection measures. The complexity of the subsidy system makes it challenging for many farmers to find measures best suited to their operations resulting in a need for targeting guidance which should be resolved to overcome this bottleneck of agricultural water protection.

25 4714b10e-dfe7-5024-cdef-989daffa5e8c (Removing the agricultural loading to the Archipelago Sea catchment area from the Baltic Marine Environment Protection Commission's (Helsinki Commission – HELCOM) hot spot list)

26 6e4f4626-0ef3-5ed2-82d0-331cafe8369e The Archipelago Sea Hot Spot Road Map Project: bottlenecks of agricultural water protection

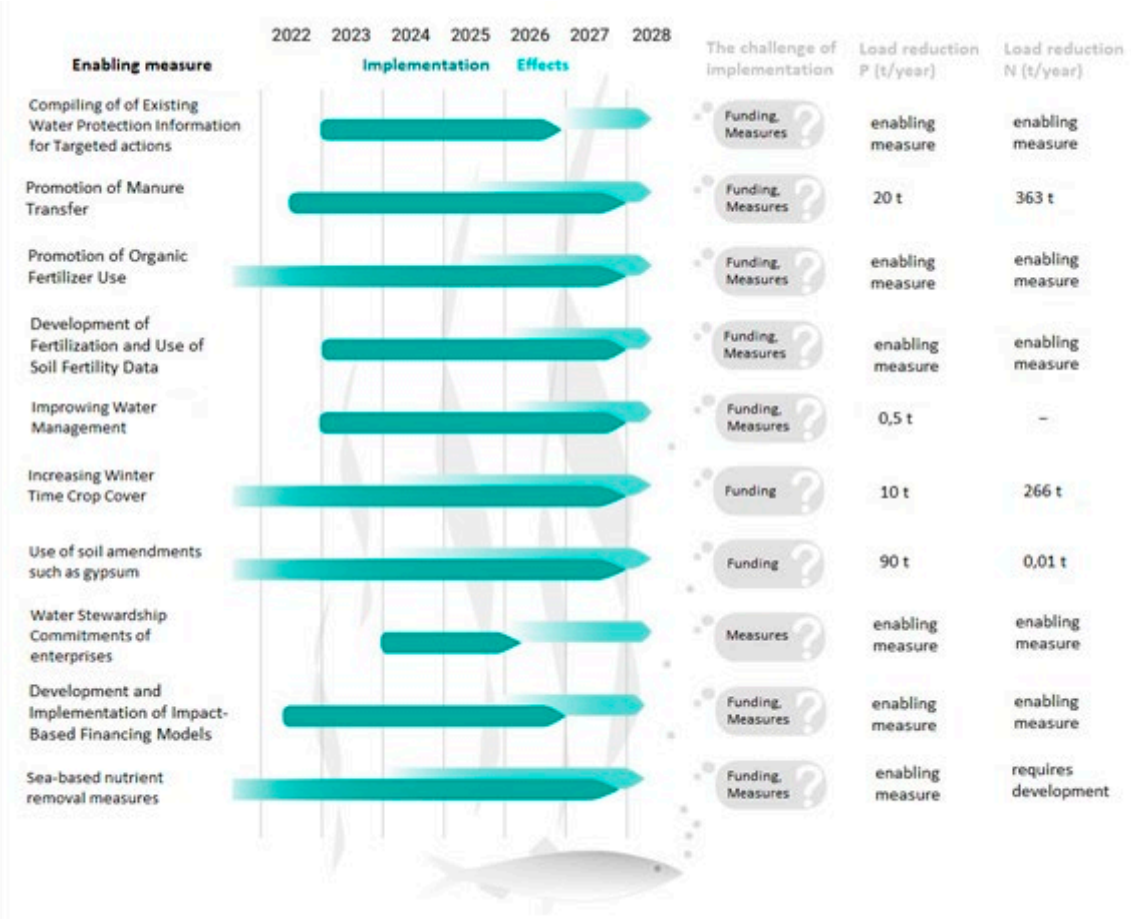
Photo: Lentokuva Vallas / Image bank of the Ministry of the Environment

Based on the prior assessment steps, in 2022, a Roadmap for agricultural water protection in the Archipelago Sea catchment was published[27]. It was developed with the participation of various stakeholders, including farmers, associations, municipalities, companies, and research institutions. The Roadmap outlines measures still needed to fulfill HELCOM Hot Spot deletion criteria and estimates the reduction of N and P load to the Archipelago Sea enabled by each measure (Figure 13). In addition, it provided a timeline for implementation of the measures and their likely effects during the period of 2022–2028. Challenges in implementing the measures were identified as needs for funding, further specification of the measures and turning the measures into action.

The measures, when fully implemented, were estimated to reduce phosphorus loading by 100–150 t P/year which is a good match to the preliminary load reduction target of 140 t P/year. Nitrogen loading was estimated to be reduced by 629 t/year, not fully covering the preliminary reduction target of 750 t N/year.

27 Saaristomeriohjelma : Maatalouden vesiensuojelun tiekartta – Doria

Figure 13. Measures in the Roadmap for agricultural water protection in the Archipelago Sea catchment (2022) together with timing of implementation and effects, expected challenges and estimated reductions in N and P loading.



In 2023, the government gave the Archipelago Sea Programme even higher priority by including a number of measures in the Government Programme. The need to enhance nutrient recycling was amplified by a request to make the Archipelago Sea catchment a model region for nutrient recycling.

Since the Government Programme further defined the priorities of the Archipelago Sea Programme and the measures in the Roadmap needed to be turned into concrete action, a Work Plan for the implementation of the Programme for

2024–2027 was prepared in May 2024[28]. The Work Plan further defines what will be done to implement the Programme as a whole and the Roadmap for agricultural measures more specifically, where, by whom, when and with what funding. The Work Plan will be updated as the work proceeds, and the implementation of the Plan is expected to reveal how it needs to be adapted and further specified.

The measures included in the Archipelago Sea Programme, its Roadmap and Work Plan for the years 2024–2027 constitute the agricultural non-point source management plan required by HELCOM deletion criteria.

5.3 Measures of the Roadmap to reduce agricultural load to the Archipelago Sea

The measures included in the Roadmap for agricultural measures are largely enabling measures that have needed further specification to be turned into action. Below is a short description of the measures and more specific plans for turning them into action as outlined in the Work Plan for the implementation of the Archipelago Sea Programme in 2024–2027.

Compiling existing information: Creating a data repository of water protection targets and measures for the Archipelago Sea catchment level

Planning of measures at all levels should be based on existing information on goals and targets agreed and measures already ongoing and planned. Currently, there are challenges related to the availability of information which is spread out to different actors and authorities at different levels (national, regional, county, municipality) or is limited due to e.g. privacy reasons. The information needs to be made more efficiently available to operators to enhance project coordination of different actions and to reduce work in compiling the information. To promote information sharing, a voluntary data repository of water protection targets and already implemented measures will be compiled at the Archipelago Sea catchment level. This repository will facilitate catchment-based planning and effective targeting of measures by collecting existing research data, water protection plans, and spatial data at the catchment level onto one platform.

28 Saaristomeri-ohjelman työsuunnitelma 2024–2027

Promotion of Manure Relocation

The livestock production in the Archipelago Sea catchment area is regionally concentrated to the western and northern parts of the area. In areas of intensive production, there is a high ratio of manure phosphorus to phosphorus fertilization needed, while in areas of less livestock, the need for phosphorus fertilization surpasses the phosphorus available in manure. This imbalance necessitates promotion of relocating part of the manure from livestock farms to fields with lower phosphorus content, often in use of plant producing farms. According to a previous rough estimate, recycling part of the manure phosphorus to nutrient-deficit areas within and/or outside the Archipelago Sea catchment could enable the removal of approximately 500 tons of phosphorus from the catchment reducing the phosphorus load to the Archipelago Sea by about 20 tons.

To promote manure relocation, efforts will be made to facilitate manure processing into more easily transportable forms, increase the use of manure in biogas production, enhance the knowledge of livestock farmers and landowners, and increase the availability of contracting services for manure transportation and application.

To promote manure relocation, a new impact-based funding form, nutrient recycling subsidy (2024–2026) has been set for biogas plants digesting manure and/or plant biomasses from nature restoration and processing the digestate into more transportable fertilizing products[29]. The amount of subsidy received is coupled with the amount of phosphorus in manure or plant biomass digested in the plant. Regions with intense livestock production, such as the Southwest Finland are given priority in the selection of beneficiaries. A technology neutral version of the funding instrument is also under development.

Promotion of Organic Fertilizer Use

Promoting the production and use of organic fertilizers can reduce the use of mineral fertilizers and enhance nutrient recycling in the Archipelago Sea catchment. To promote the use of organic fertilizers, their production and use needs to be publicly supported before achieving market-driven profitability, including promotion of research related to their use. Investment support for necessary technologies and structures, and incentives for the use of these recycled products, are essential for achieving circular economy goals. Farmers should be provided more efficiently with information and guidance on the use of these products. Both

29 Operational grants for nutrient cycles – Maa- ja metsätalousministeriö

the Ministry of Agriculture and Forestry and the Ministry of the Environment have provided grants to promote nutrient recycling of nutrient-rich biomasses, including manure,[30] since 2012.

Development of Fertilization: Establishing a plot-specific soil nutrient data repository

To reduce nutrient loads, fertilization rates should be decreased, especially in areas with high soil phosphorus content. Fertilization could further be refined by considering intra-plot variability with precision fertilization and split fertilization.

While the farms need to analyze soil phosphorus content (minimum every five years; CAP) and take it into account when planning phosphorus fertilization (Decree 64/2023), the resulting plot-specific soil fertility data is not available for environmental authorities and research due to privacy reasons. Solutions for sharing farm data, while securing data ownership are needed. That would contribute to more precise planning and targeting of cost-effective measures which has also been pointed out in a recent report by the Finnish Audit Office on the cost-efficiency of measures to decrease nutrient loading from agriculture[31].

A field plot-specific soil nutrient data repository, accessible to both authorities and researchers, will be developed on a voluntary basis to support more precise fertilization. Farmers will be trained in various fertilization methods, and the use of soil analysis results and existing fertilization calculators. Additionally, research on the fertilization needs of different plant species will be promoted.

Improving Water Management on the Fields

Improving the water management on fields in the Archipelago Sea catchment is essential. Climate change increases extreme water conditions. Flooding and increased overland flow results in increased soil erosion and nutrient leaching, and high riverine flows increase nutrient transport to the sea. Flooding but also drought and water shortage are a challenge to farmers. Water management may be improved through nature-based drainage solutions, such as restored or constructed

30 Good use of nutrients and energy – Maa- ja metsätalousministeriö

31 Steering, financing and effectiveness of the management of water resources and marine environments – Reducing nutrient loading from agriculture – National Audit Office of Finland

wetlands and floodplains with two-stage ditches, which can reduce flood and drought risks. Additionally, promoting the environmentally friendly maintenance of ditches, controlled drainage, and sub-irrigation are necessary.

To improve the overall structure and condition, including water flow conditions of fields, landowners will be informed about available support. Local drainage associations, a traditional communal way of working of the landowners, will also be activated, and landowners will be assisted with drainage planning.

Increase of Field Vegetation Cover

Increasing vegetation cover on fields reduces soil erosion and nutrient and carbon runoff into water bodies. The area of wintertime vegetation cover and cover crops will be increased in the Archipelago Sea catchment as part of the CAP. Increasing vegetation cover can help retain phosphorus bound to soil particles, and to improve soil structure. In previous years, CAP support for increasing buffer zones and wintertime vegetation cover has been available for use anywhere in the country. Since the implementation of a new data-based approach, a more effective and result-oriented spatial targeting of buffer zones has been in use.

With this measure, data and information based spatial targeting of the wintertime vegetation cover of the fields will also be tested to improve water protection using the RUSLE2015 erosion model. When increasing vegetation cover in the fields, attention will also be paid to the removal of plant biomass, thereby removing phosphorus bound to it from the field.

Increasing the Use of Soil Amendments

Gypsum, structure lime, and pulp and paper industry fiber sludge, when spread on fields, function as soil amendments by enhancing the binding of nutrients to soil particles and improving soil structure and thus reducing the runoff of phosphorus and particulate matter into water bodies. Soil amendments can also enhance crop yields and reduce crop losses due to weather conditions. The soil amendments are derived from side streams of fertilizer production (gypsum) and pulp and paper industry (fiber) and structural lime is either prepared from lime (high greenhouse gas emissions) or as a side stream of lime production (so called LKD lime, near zero emission but low availability)[32].

32 A-Competitive-and-Efficient-Lime-Industry-Technical-report-by-Ecofys_0.pdf

Gypsum spreading has been going on in the Archipelago Sea catchment since 2020, and the goal is to apply gypsum to altogether 50 000 hectares. In September 2024, gypsum had been applied to about 27 000 hectares, and it had been estimated to have reduced phosphorus loading to the sea by 49 tons since the start of spreading in 2020. Altogether, it has been estimated that applying gypsum to the whole suitable target area could reduce phosphorus loading by approximately 90 tn/year. The effect of gypsum is quick, and it can reduce phosphorus load by almost half. The effect of application lasts for about five years, and it does not preclude the need for general and longer-term soil condition improvement measures.

Photo: Tero Pajukallio / Image bank of the Ministry of the Environment

Promoting the spreading of gypsum involves ensuring the continuity of activities and effectively marketing gypsum to farmers in the area. Farmers voluntarily accept and order gypsum which is organized and spread to their fields by the gypsum project of the state. Farmers should be provided with information about the impact of gypsum on phosphorus availability and yield to dispel some of the misconceptions.

In addition to gypsum structural lime and fiber sludge from pulp and paper industry have been applied in a similar manner to test their use. The effects of the tests are being monitored and a project testing and monitoring impacts of joint use of the three soil amendments is being carried out in 2023–2025. The ministries are exploring funding possibilities and options for supporting their use in the coming years.

Implementation of Water Stewardship Commitments

Water stewardship refers to a company's sustainable use of water, where the company takes responsibility for its water impacts and manages the water risks it causes[33]. Many companies, also those having activities in the Archipelago Sea catchment area, have scope for more sustainable water use and better management of their impacts on aquatic environments. The water stewardship model allows companies' water impacts to be examined at the catchment area level, considering the entire supply chain. The water stewardship commitments are further developed in collaboration with local entrepreneurs and their adoption of promoted. The aim is that enterprises would widely take on and implement the water stewardship commitments. Especially those food industry companies which have contract-based production in the Archipelago Sea catchment area are in focus.

Development and Implementation of Impact-Based Financing Models

Impact-based financing as a concept shifts the focus from procuring narrowly defined outputs or actions to making purchases or payments based on results and impacts[34]. This could be a cost-effective way of providing public and private financing to improving the state of the sea.

To enhance water protection in agriculture, it is important to even out the differences in soil phosphorus content across fields. On fields with high phosphorus levels, phosphorus fertilization should be reduced, and on fields with low phosphorus levels, it should be increased. One example of an impact-based financing model is the nutrient EIB (Environmental Impact Bond), which supports the spreading of manure on low-phosphorus fields based on phosphorus content, utilizing biogas as an intermediate step. To implement impact-based financing models, related research and pilot work will continue.

33 Water Stewardship Commitment | Vesi.fi

34 gaia_report: Saaristomeren vaikuttavuusinvestointiselvitys, December 2022, Gaia Consulting Oy

Since the adoption of the Roadmap, an impact based funding system has been employed for phosphorus entering biogas plants. Ministries of the Environment and Agriculture and Forestry are collaborating to start a pilot project for testing impact-based public funding for lowering the soil phosphorus content in the fields of the Archipelago Sea preferably in 2025–2026 and exchange on the matter has been initiated with DG COMP of the European Commission.

Sea-based Nutrient Removal

The eutrophication of the Archipelago Sea can also be reduced by removing nutrients directly from the sea or from lakes within the Archipelago Sea catchment area. Nutrient removal can be done by extracting nutrient-containing biomass from the water, e.g. through removal of fish or aquatic plants. Another option is to prevent the nutrients in the bottom sediment from entering the water or to remove them. Significant development work is still needed for the utilization of marine nutrients, for example, regarding the use of fish and the harvesting of common reed. Sea-based removal is much more costly than prevention of nutrient loading to the sea.

5.4 Monitoring programme

The prerequisites for the Hot Spot deletion include the preparation of a monitoring programme to be included in the agricultural non-point source management plan. Monitoring will be used in evaluating the effects of the measures taken to eliminate the Hot Spot.

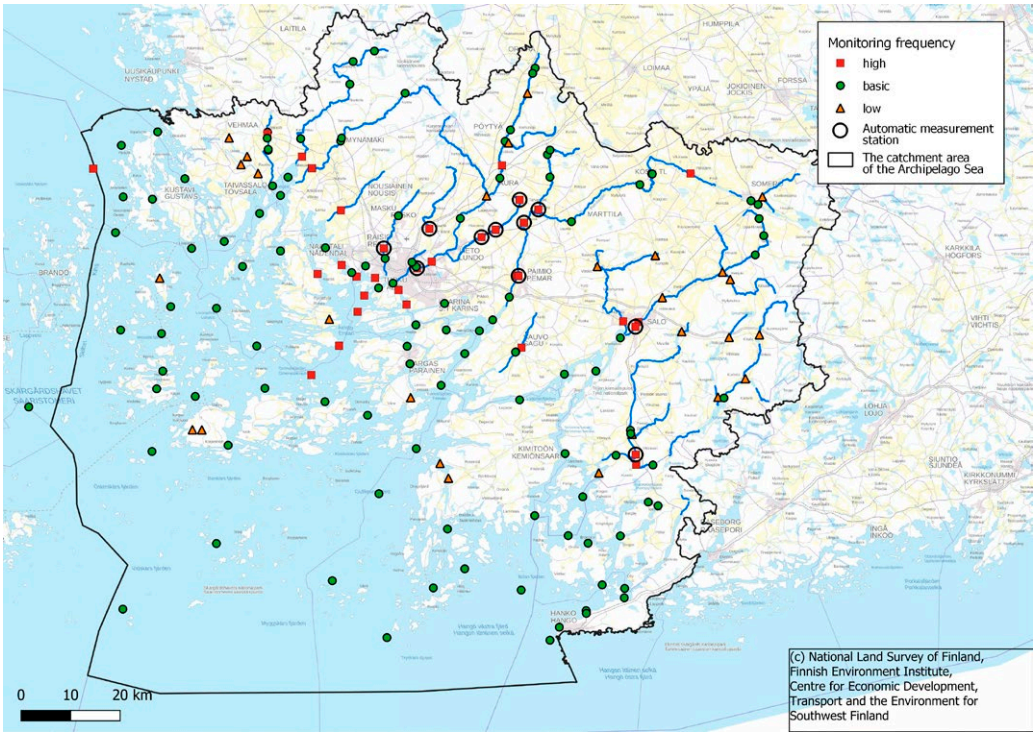
The monitoring programme of the Archipelago Sea Hot Spot consists of two parts:

1. Monitoring of the implementation of the measures and their effects and/or effectiveness and
2. Monitoring of nutrient loading and its impacts on the Archipelago Sea.

A framework for monitoring the implementation of agricultural water protection measures and their effects and/or effectiveness in the Archipelago Sea catchment has been prepared. It includes annual reporting on the progress of implementing the measures by different actors in the catchment. The information will be (as of 2025 for 2024) annually compiled into a report. This monitoring combined with the monitoring of nutrient loads and their destiny in the sea described below allows the assessment of the effectiveness of the measures.

The state of the Archipelago Sea and the nutrient load entering the sea are monitored using different methods. The basis of the monitoring is the regular monitoring of water quality and biological variables carried out by the Finnish Environmental Institute Syke and the ELY Centre funded by the Ministry of the Environment (Figure 14). It produces regular information on the state of coastal waters, rivers, lakes and groundwater and it is also part of the monitoring of River Basin Management planning and the National Marine Strategy.

Figure 14. Water quality monitoring in the Archipelago Sea area and in the rivers of its catchment area. The monitoring frequency at different sites is categorized as follows: "high" (annually 10–20 samples in the sea, over 20 samples in rivers per year), "basic" (annually 2–6 samples in both the sea and rivers), and "low" (monitoring every 2nd or 3rd year in the sea, or every 3rd year in rivers, with 2–4 samples per year). Automatic meters measure water quality every half hour.



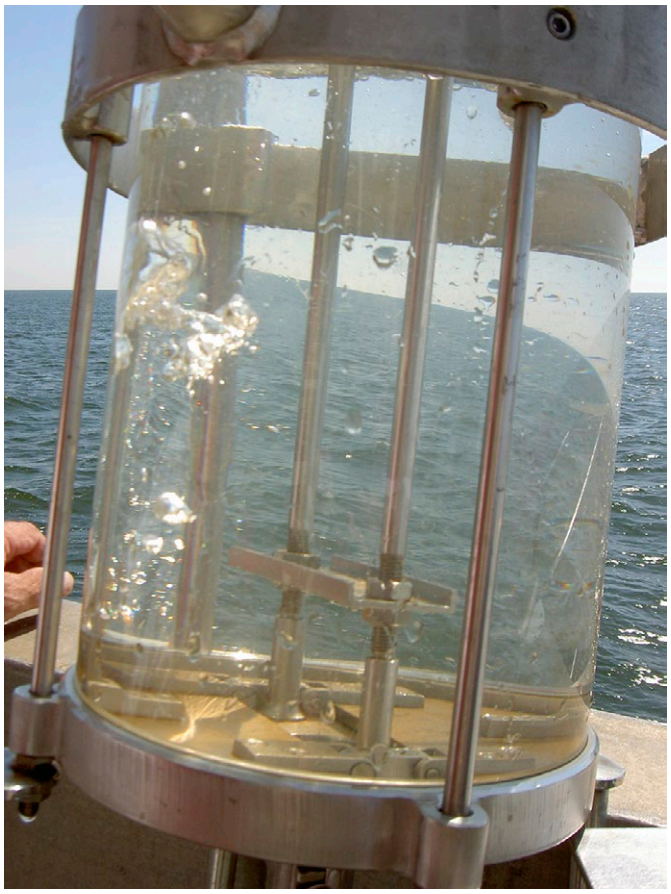


Photo: Maria Laamanen

A programme for monitoring of riverine material export was started already in the 1970s and currently it includes four biggest rivers (River Kiskonjoki, River Uskelanjoki, River Paimionjoki and River Aurajoki) draining into the Archipelago Sea, covering 39% of the total catchment area. In the updated monitoring programme (2025 onwards) the spatial coverage of the present monitoring will be remarkedly improved. Five new intensively monitored (at least 20 annual water samples) rivers will be included in the updated monitoring programme. This will increase the coverage of the monitoring to 61% of the Archipelago Sea catchment area and thus, decrease the uncertainty in riverine load estimates. In addition, five new monitoring stations in smaller rivers with intensively cultivated catchments and five stations in catchments with big animal farms will be established. This will enable more reliable estimation of changes in loads originating from agricultural activities. Investments will also be made in the development of flow measurement, and new flow measurement stations will be established in connection with the new load monitoring points.

In addition, the largest rivers flowing into the Archipelago Sea have automatic water quality stations, which provide real-time information on the nutrient and suspended solids content of the water. The stations measure water quality practically continuously, so they provide more detailed and accurate information about water quality than traditional monitoring based on water samples and laboratory analyses, which they however complement well.

The effects of gypsum application on load reduction are monitored in three rivers of the Archipelago basin and in one reference river. The most important measuring stations and stations located in the pilot catchments (River Aurajoki, River Paimionjoki, River Uskelanjoki, River Savijoki) will be renovated to better correspond to modern measurement techniques and to increase their reliability. Monitoring stations that measure the effects of gypsum and other soil amendments will be converted into permanent stations, and the measurement of diffuse pollution from agriculture will be developed further, especially in the River Savijoki catchment.

The water quality and nutrient load model of the Finnish Environment Institute (VEMALA) is used to estimate the origin of nutrient loads, their export to watercourses and the effectiveness of the water protection measures. The VEMALA model is an operational, national scale nutrient loading model for Finnish watersheds[35]. It simulates nutrient processes, leaching and transport on land and in rivers and lakes. The model simulates nutrient gross load, retention and net load from Finnish watersheds to the Baltic Sea. Background data related to agriculture and the part of the model dealing with agriculture aspects (ICECREAM) will be updated and improved in 2025-2026 with funding provided by the Ministry of the Environment.

In the monitoring of the Archipelago Sea area, in addition to the monitoring stations of the environmental administration, monitoring paid for by license holders (wastewater treatment plants, industrial plants, fish farms) plays a key role. Through that monitoring, the effects of the plants' operations on the state of the sea are monitored.

35 Huttunen, I., Huttunen, M., Piirainen, V., Korppoo, M., Lepistö, A., Räike, A., ... & Vehviläinen, B. (2016). A national-scale nutrient loading model for Finnish watersheds – VEMALA. Environmental Modeling & Assessment, 21, 83–109.

Monitoring is also carried out in coastal waters. In 2022, the monitoring program was renewed to a source-to-sea type. The main focus of the monitoring is on the climate and eutrophication parameters of the water column and sediment, on the monitoring lines from river mouths to the open sea. The main objective of source-to-sea monitoring is to produce observational data for assessing the effects of eutrophication load and climate change in the land-sea continuum. Finland's coastal waters are under pressure from land and the open sea, and the effects of the reduction measures are not directly visible in time or spatially. The renewed monitoring produces essential information for the needs of coastal models, strengthening the knowledge base on the resilience and internal load of coastal areas.

Satellite images (Sentinel-2, Landsat) are also used to assess the state of the sea area. Satellite observations are used to calculate monitoring station- and water-specific observation data. Station-specific satellite observations are collected from the locations of the environmental administration's monitoring stations. Status database. There is a total of 48 such stations in the Archipelago Sea area. In addition, statistical data based on daily observations is calculated for almost all water bodies in the Archipelago Sea, e.g. chlorophyll a, turbidity and temperature. Linear observations from the river discharge point to the open sea will also be added to the current satellite monitoring. These observation lines for turbidity and total phosphorus illustrate the dispersion and impact areas of the most essential river waters in the surface layer of coastal waters. Satellite observations will be further refined with new high-resolution satellite images.

In addition, continuous monitoring stations have been installed at the mouths of three rivers (Halikonlahti, Paimionlahti and Mynälahti) in 2024, which measure water turbidity, electrical conductivity and a-chlorophyll every half hour. Their results are also used to develop satellite image interpretation.

5.5 Demonstrated adequate funding

The HELCOM Hot Spot deletion criteria require there to be demonstrated funding which will be adequate for a sustained incremental programme of on-farm activities including improved agricultural practices, investments in manure, urine and slurry handling, and the establishment of buffer strips.

The cost of full implementation of the Roadmap for water protection measures in agriculture of the Archipelago Sea Programme's Roadmap for agricultural water protection measures was estimated to approximately 72 M € between 2024 and 2027 (roughly 18 M € per year).

With the Archipelago Sea Programme, increasing funding has been directed to the implementation of the Archipelago Sea Programme. Most of the funds are state aid or grants targeted to measures by farmers, entrepreneurs, associations and citizens. A minor fraction of the funding is used for coordination and administration of the Programme.

Most of the funding is not earmarked to the Archipelago Sea catchment but can be applied for anywhere in mainland Finland. Many funding programmes providing state aid or grants have nevertheless given preference to funding projects and activities in the Archipelago Sea catchment area. Due to the voluntary nature of applying for funding and carrying out projects it is possible to estimate only afterwards the spending on the Archipelago Sea Programme.

The only earmarked funding allocated by the government for the period of 2024–2027 is 15 M € for the Archipelago Sea Programme. This funding is used to support local actors in implementing the measures and to a lesser degree for financing of state agencies or entities, such as the Regional Centre and Syke for monitoring of the environment and nutrient loads, an management and administration of the Programme.

Photo: Maria Laamanen

In addition to the earmarked Archipelago Sea Programme financing, the Ministry of the Environment estimates that up to 10 M € can be allocated to actors in the Archipelago Sea catchment as state aid or grants in 2024–2027 through the national Ahti Water and Marine Protection Programme, the final figure depending on uptake. The funding includes support for actors to implement water protection

measures, including fully state paid gypsum application to fields, grants for enhancing R&D and investments for nutrient recycling, aid to aquatic restoration projects and implementation of water protection structures.

The funding from the Ministry of Agriculture and Forestry includes significant financing possibilities through the national CAP plan and other national funding programmes. A total of approximately EUR 345,4 million will be available in 2023–2027. The uptake of these funds is voluntary and dependent on the willingness of the local actors in the Archipelago Sea catchment.

For CAP measures, including agricultural start-up and investment grants and environmental payments, organic production, advisory services and non-productive investments, a total of approximately EUR 328.7 million will be available in the CAP Plan period 2023–2027. These measures respond in many ways to the need for measures in the Archipelago Sea. They include several water protection measures, such as riparian zones, winter vegetation cover, catch crops, good soil management, accurate use of nutrients and promotion of recycling. In addition, advisory (Neuvo2030), funded by CAP plan, will increase knowhow on the importance of implementing the measures.

The experimental Pilot Programme for Nutrient Recycling extensively supports biogas production, manure processing, nutrient recycling and carbon sequestration activities from testing innovations and product development to production scale activities. A total of EUR 8.4 million will be available in 2024–2027.

Operational Grant for Nutrient Cycles is granted based on competitive tendering. The grant is targeted for biogas plants digesting manure and/or plant biomasses from water restoration. The idea is to promote recycling and further processing of phosphorus into recycled fertilizer products on a commercial scale, in particular to encourage the transfer of nutrients from nutrient surplus areas to deficit areas. The total funding for the support in 2023–2026 is EUR 9 million.

In addition, there are various subsidies granted by the Ministry of Agriculture and Forestry for the use and improvement of the aquatic environment and for water management and flood protection as well as funding for development of fisheries, logistics and product development contribute to efforts to improve the state of the Archipelago Sea and the utilization of marine nutrients.

Due to the significant scale of different financing possibilities, especially through the national CAP plan, it is possible to conclude that the 18 M € per year cost estimate of implementation of the Roadmap has been covered in recent years and it will be covered in the following years at least up to 2028.

In addition to public finance, there are private investments and initiatives that enhance nutrient recycling in the catchment. Public-private cooperation is expected to bring in increasing private funding. As the first step agri-food sector companies active in the Archipelago Sea catchment are asked to take on Water Stewardship Commitments and be involved in water protection. The two involved ministries are also developing new financing tools, e.g., by piloting impact and results-based state financing in the Archipelago Sea catchment with the objective of extending to private sector in the future. As described above, competitive tendering is already used for supporting the use of manure in biogas plants and a similar funding model is under preparation for the use of manure with other nutrient recycling technologies.

The private sector is planned to be increasingly involved also through direct donations to certain activities. An Archipelago Sea Programme Implementation Monitoring Group established by Minister of the Environment and Climate Sari Multala in January 2025 and involving numerous enterprises as members will start looking into this in 2025. In addition, there is an increasing interest in the start-up community to contribute to the protection of the Archipelago Sea and a new entity A'Pelago Accelerator has been set up to enhance these activities[36].

5.6 Fulfillment of the conditions of Annex III Part 2 of the Helsinki Convention

The Annex III of the Helsinki Convention concerns criteria and measures for the prevention of pollution from land-based sources. Part 1 concerns prevention of pollution from industry and municipalities and Part 2 under consideration here concerns prevention of pollution from agriculture.

To delete an agricultural Hot Spot, the requirements in Part 2 should be fulfilled. Below is an assessment of fulfillment of each of the regulations and criteria in Part 2 for the Archipelago Sea catchment area.

36 A'Pelago

Regulation 1: General provisions

> *"In accordance with the relevant parts of this Convention, the Contracting Parties shall apply the measures described below and take into account Best Environmental Practice (BEP) and Best Available Technology (BAT) to reduce the pollution from agricultural activities. The Contracting Parties shall elaborate Guidelines containing items specified below and report to the Commission."*

Status

This criterion has been fulfilled.

Explanations

Annex II of the Helsinki Convention determines the criteria for BEP and BAT in the HELCOM context. BEP is described as the application of the most appropriate combination of measures, while BAT includes the latest stage of development (state of the art) of processes, facilities or methods of operation which indicate the practical suitability of a particular measure for limiting discharges. In addition to this Regulation 1 in Annex III, HELCOM has prepared a new Recommendation on Best Available Technology (BAT) and Best Environmental Practice (BEP) to reduce nutrient inputs and greenhouse gas emissions from manure. Other BAT/BEP documents for agriculture are not available. Finland was active in the preparation of the Recommendation.

Finland is a member of the European Union, and the revised Industrial and Livestock Rearing Emission Directive (2010/75/EU amended by 2024/1785/EU) applies and gives the legal framework for the BAT of intensive rearing of pigs and poultry (IRPP). For IRPP installations falling under the scope of the Industrial Emissions Directive (IED), emission limit values (BAT-AELs), monitoring requirements, and other permit conditions must be based on BAT conclusions to ensure compliance with the Best Available Techniques (BAT) requirement. The BAT conclusions are derived from the BAT reference document (BREF), which is the result of an information exchange between EU Member States on BAT.

Due to recent updates to the IED, the Commission has launched a process that does not involve a full update of the IRPP-BREF document but instead aims to establish uniform operational conditions for livestock production, as defined under the IED, through a lighter procedure. Finland is actively participating in this process, which is ongoing at the time of writing.

Finland has applied the content of the related BAT reference document (IRPP-BREF) through relevant national legislation and is actively participating the updating process ongoing at the time of writing. No other EU-level BAT documents are available for agriculture.

Finland has also an updated (2023) national report for BAT in livestock production[37] which is applied to all animals reared/kept, i.e. cattle, pigs, poultry, sheep, goats, horses and fur animals. The report contains descriptions of the livestock production methods from feeding and housing technologies to manure management and lists the BAT of each stage in the production. The document is used especially in the environmental notification and permission procedures of animal houses.

Below, legislation, policies, guidelines, possible strategies elaborated and measures and actions to implement the criteria of the Annex III, Part 2, as well as a concluding assessment of each criterion's status (fulfilled/not fulfilled), are explained starting at point 3.

Regulation 2: Plant nutrients

1. Definitions

Not relevant here.

2. Introduction

> *"The Contracting Parties shall integrate the following basic principles into national legislation or guidelines and adapt them to the prevailing conditions within the country to reduce the adverse environmental effects of agriculture. Specified requirement levels shall be considered to be a minimum basis for national legislation."*

This criterion is considered separately for each of the more specified criteria below.

37 Paras käyttökelpoinen tekniikka kotieläintaloudessa – Valto

3. Animal density

"To ensure that manure is not produced in excess in comparison to the amount of arable land, there must be a balance between the number of animals on the farm and the amount of land available for spreading manure, expressed as animal density. The maximum number of animals should be determined with consideration taken of the need to balance between the amount of phosphorus and nitrogen in manure and the crops' requirements for plant nutrients."

Status

This criterion has not been fulfilled.

Explanations

The regional concentration of livestock farms to the western and northern part of the catchment area poses a challenge to the protection of the Archipelago Sea (Figures 4 to 6). The overall balance between manure phosphorus produced and phosphorus fertilization needed is slightly in deficit in the Archipelago Sea catchment, i.e. when accounting for the whole area, there is a little less phosphorus in manure than all plant production ideally requires. Still, within the catchment area, livestock production is concentrated to the western and northern parts with manure surplus in comparison to the field area benefitting from phosphorus fertilization. In addition, single farms in the catchment may have too little field area for their manure. While it is known that in practice manure is mostly applied on the fields of the livestock farms, relocation to neighboring farms or delivery to larger manure processing plants and then further to a larger area are needed to fulfil this criterion.

The Environmental Protection Act (2014/527)[38] regulates environmental permitting of livestock buildings in Finland. A livestock building requires an environmental permit if it houses a minimum of 300 dairy cows, 500 heads of beef cattle or 600 suckler cows, or over 750 sows, 2,000 fattening pigs, 40,000 laying hens or 40,000 broilers. With any other animals or combined production of different animals, a permit is required on farms with at least 3,000 livestock units (NOTE: national coefficients are used). All livestock buildings with 50–299 dairy cows, 100–499 heads of beef cattle, 130–599 suckler cows, minimum 60 horses or ponies, minimum 250 ewes or goats, 100–750 sows, 250–2,000 fattening pigs, 4,000–40,000

38 Environmental Protection Act (527/2014): https://www.finlex.fi/en/laki/kaannokset/2014/en20140527_20200905.pdf

laying hens or 10,000–40,000 broilers (or over 250 livestock units of other animals or combined production of different animals) require an environmental notification decision from the municipality. Additionally, large livestock buildings are subject to an Environmental Impact Assessment (EIA) procedure. The permit, notification, and EIA procedures address the requirements related to manure storage and handling.

Photo: Maria Laamanen

The amount of nutrients that can be applied to fields is limited by the Phosphorus Decree (64/2023) and the Nitrates Decree (1250/2014), which align the amount of nutrients applied to fields considering the nutrient needs of the cultivated plants. However, especially phosphorus has accumulated in the soil due to the high phosphorus fertilization in the past, restricting the current fertilization. As manure use in fertilization has often maintained the high phosphorus content in soils, the need for phosphorus fertilization is low particularly in areas with concentrated livestock farming (Figures 4 to 6).

The Archipelago Sea Roadmap includes a measure on processing and relocating excess manure to areas in need of phosphorus fertilization and its implementation is underway. Manure processing and recycling is supported, for instance, by

investment subsidies for biogas plants. While noting that the biogas plants often do not concentrate the nutrients in digestate to support transporting longer distances, a separate nutrient recycling subsidy for biogas plants digesting manure has been established. Plant location in the Archipelago Sea catchment is given priority in the subsidy. Also, the national CAP plan includes a measure for promoting circular economy, offering support for using manure and other recycled fertilizer products on farms. To further promote manure relocation, training is offered to enhance livestock farms' expertise in manure management and to foster cooperation between livestock farms and crop production farms.

The main challenges identified in fulfilling this criterion are:

- There is not enough manure relocation from livestock farms to plant producing farms to simultaneously apply the manure nutrients on a larger field area and replace mineral phosphorus fertilization in the catchment.
- Transportation of manure for longer distances (radius dependent on manure type) is rarely economically feasible, which limits cross-regional cooperation in nutrient recycling. While state aid incentives have been adopted to incentivize processing and relocating manure-based nutrients across different regions, there are limited options for devising national support schemes directly for transportation of manure due to EU state aid rules. Part of the manure should also be processed to concentrate, especially phosphorus, to a form which can be transported over longer distances from the region of surplus to those of deficit.
- The environmental permitting procedure is not optimal since the environmental authorities do not have all the information necessary to conclude on whether there is a sufficient area of land that is either in balance or has a deficit of soil phosphorus. Environmental authorities also have not had an optimal amount of resources for monitoring and controlling the implementation of permits.
- The interest in biogas plants in the area has increased, but large manure-based biogas plants being planned have not indicated enough interest in processing the digestate and thus ensuring efficient nutrient recycling. The permission process does not forcefully require sustainable management of the digestate and its nutrients.
- The Phosphorus Decree includes an exemption on limits to spread more manure phosphorus than allowed for other phosphorus fertilizers in certain situations for a period lasting until the end of 2026. The derogation is not in line with the objectives of promoting nutrient recycling in manure to reduce emissions into water bodies. The

derogation slows down the decrease of the phosphorus content of fields compared to fertilization without a derogation.

4. Location and design of farm animal houses

"Farm animal houses and similar enclosures for animals should be located and designed in such a way that ground and surface water will not be polluted."

Status

This criterion has been fulfilled.

Explanations

The requirements for the location of livestock buildings are included in the Environmental Protection Act (2014/527). In addition, regulations by the Ministry of Agriculture and Forestry regarding subsidized building of animal houses give further requirements[39].

Animal houses require an environmental permit or notification depending on the number of animals. When granting an environmental permit, permit regulations oblige prevention of environmental pollution. These permit regulations may concern, among other things, the number of animals, the placement of the livestock buildings, the structure of the house or manure storage, the storage of manure and waste, the timing and areas for manure application, incorporation of manure into the soil, and other emission reduction measures.

Animal houses must be located at a sufficient distance from sensitive areas, and their placement must consider the potential environmental impacts. Additionally, the area's overall load and cumulative impacts with other possible activities must be considered. According to the Environmental Protection Act, activities that pose a risk of environmental pollution must be placed in such a way that pollution or the risk of pollution is avoided and pollution prevention is possible. When planning the location, the nature and timing of the activity, the significance of the environmental impacts, and the sensitivity of the affected area must be considered.

39 https://mmm.fi/rakentamismaaraykset

According to the Nitrates Decree (1250/2014), storage facilities for manure and unpackaged organic fertilizers, livestock exercise areas, and feeding and watering places in outdoor enclosures must not be in groundwater areas unless soil surveys prove that such placement does not cause pollution or the risk of pollution to groundwater. Additionally, animal houses, manure storages, or outdoor areas must not be in flood-prone areas or within 50 meters of a water body, well, or spring used for drinking water. Furthermore, the municipality can issue orders on the placement of animal houses and guide their placement through legally binding plans.

5. Construction of livestock manure storage

"Livestock manures must be stored in environmentally friendly way and should be handled in such a way that it promotes as high utilisation efficiency as possible. Co-operation among farmers in the use of livestock manures has to be encouraged.

Storage capacity shall be at least 6 months and sufficiently large to store livestock manures that accumulate during the longest period when land application is prohibited. Livestock manure processing, and/or transfer to other farms for immediate application or for sufficient storage when land application is prohibited, may be taken into account when required capacity is determined.

Livestock manure storage facilities should be constructed and regularly inspected to safeguard against spillages and be of such a quality that prevents losses. With regard to different types of livestock manures, the following principles should be considered:

- *solid livestock manure should be stored in places with watertight floor and side walls;*
- *liquid livestock manure should be stored in containers whose bottoms and walls are made of material impermeable to moisture and resistant to impacts of livestock manure handling operations;*
- *manure storages should preferably be covered to prevent emissions.*

It is possible to temporarily store solid livestock manure directly on utilised agricultural area, but it requires a set of coherent mitigation measures on site, which prevents nutrient losses under specific local conditions. The interim storage of livestock manure cannot be a part of required storage capacity of the farm.

These storage requirements should preferably be considered also for other types organic fertilizers."

Photo: Sari Luostarinen

Status

This criterion has not been fulfilled.

Explanations

The requirements for the structures of manure storages are included in the Nitrates Decree (1250/2014). Manure storages must be large enough to store the manure accumulated over at least 12 months. Additionally, farms receiving manure must have storage facilities large enough for the manure they receive. Manure storages must be watertight, and liquid manure storage facilities must also be protected from rainwater to ensure that no liquids can leak into the environment. Both liquid and solid manure storages are subject to requirements for coverage and watertightness. The Decree also regulates the durability of the base structures, and the construction materials used. The Decree on subsidized building (606/2023) gives further specifications to the structures of manure storages, required for receiving investment support.

In addition, there still appears to be some challenges related to older – and often small – farms which have been permitted under previous regulations, but which don't necessarily always fulfil current requirements. The significance of this challenge is not well understood.

The main challenges identified in fulfilling this criterion are[40]:

– Many of the existing liquid manure storages are not covered. Moreover, environmental permits have sometimes still allowed new storage tanks without cover, often assuming a natural crust is formed despite the manure type stored. However, Nitrates Decree allows natural crust as a cover only for cattle slurry due to its floating fibrous material forming a proper crust, and environmental permits should thus oblige the tanks of all other types of manures to use at least a floating cover despite their drawbacks. Fixed covers, which stay intact in the Finnish conditions, are expensive due to the large spans of the liquid manure storages.

6. Agricultural wastewater, manure and silage effluents

"Wastewater from animal housing should either be stored in urine or slurry stores or else be treated in some suitable manner to prevent pollution. Effluents from manure or from preparation and storage of silage should be collected and directed to storage units for urine or liquid manure."

Status

This criterion has been fulfilled.

Explanations

The regulation of waste management for animal houses is included in the Waste Act (646/2011)[41] and the Waste Decree (179/2012)[42]. The operator must primarily aim to reduce the amount and harmfulness of waste. In many cases, wastewater is subject to a permit or notification, requiring the operator to provide a report on wastewater treatment. Generally, wastewater must be stored in sealed containers. Types of sludge and sealed sludge tanks include wastewater sludge from dairy parlors, toilet wastewater, and wastewater from social facilities. Wastewater from dairy parlors can also be treated in a treatment plant or discharged into the sewer system.

40 The assessment is based on an unpublished farm survey by Natural Resources Institute Finland Luke and information provided by authorities controlling the permits.

41 Waste Act (646/2011): https://www.finlex.fi/fi/laki/kaannokset/2011/en20110646_20220494.pdf

42 Waste Decree (179/2012): https://www.finlex.fi/fi/laki/kaannokset/1993/en19931390_20040988.pdf

Decree on subsidized building (606/2023) forbids mixing the wastewater from the social premises of animal houses into liquid manure storages. The wastewater must be directed to municipal or local wastewater treatment plant or separately treated in a decentralized sewage system onsite. In addition, the water from washing and disinfecting poultry houses must be collected into sealed containers.

Nitrates Decree (1250/2015) requires silage effluents to be recovered and stored in watertight tanks unless they are separately treated. Decree on subsidized building (606/2023) gives further rules for managing silage effluents, including the need for a collection well from which the effluent is directed to a watertight tank or liquid manure storage.

7. Application of organic fertilizers and organic residual materials

"Organic fertilisers and organic residual materials are valuable sources of nitrogen, phosphorus, potassium and organic carbon which are required for the replenishment of nutrients and humus in soil.

In addition to the amount of these nutrients, amounts of harmful substances, phyto-/ bioavailability and mineralisation rate of different organic fertilisers types should also be considered in order to ensure the optimal supply of the plants and to avoid eutrophication and contamination.

In order to facilitate high utilization efficiency, the best available application technique should be used, depending on the type of fertilizer, crop and location characteristics.

Organic fertilisers and organic residual materials should be incorporated as soon as possible after spreading and always in case of application on bare soils.

The nutrients should be available to the plants during the growing season taking into account the turnover rate of different fertilisers. If soils are frozen, water saturated, flooded or covered with snow no application of organic fertilisers and organic residual materials is permitted. Further periods with high risk of leaching shall be defined when no application is accepted."

Photo: Sari Luostarinen

Status

This criterion has not been fulfilled.

Explanations

Manure application is regulated by the Nitrates Directive, and nationally the Nitrates Decree extends the regulation also to other organic fertilizer products. According to the Decree, manure and organic fertilizer products must not be spread between 1 November and 31 March and at any time on snow-covered, frozen or overly wet soil. In the case of applying them after 1 September, the allowable amount of soluble nitrogen is maximum 35 kg/ha. Additionally, the Decree stipulates that manure and organic fertilizer products must be incorporated into the soil within 24 hours when applying them on soil surface.

Phosphorus fertilization is regulated with Phosphorus Decree applying to all phosphorus containing fertilizing products, including manure and organic fertilizing products. On many occasions the limit for applied phosphorus is reached

before that of nitrogen, making the Phosphorus Decree especially important for restricting the dose of organic fertilizing products used and thus ensuring minimal losses to waters.

In addition, the quality of organic fertilizing products, such as digestates, composts and other processed recycled products, is regulated by the Decree on Fertilizing Products. The Decree contains limit values for different contaminants, such as heavy metals and impurities (plastics, glass and metal).

The Environmental Protection Act includes BAT for manure spreading[43].

The main challenges identified in fulfilling this criterion are:

- Manure application takes place mostly in spring, but also summer and autumn. Autumn application of manure can increase the risk of nutrient losses. The risk can be decreased by application for autumn-sown crops or other vegetation for the winter.
- According to a farm survey (Luke 2022, unpublished), broadcast application of liquid manure is still used on livestock farms despite it not being BAT.

8. Application rates for nutrients

"The application of nutrients in agricultural land shall be limited, based on a balance between the foreseeable nutrient requirements of the crops and the nutrient supply to the crops from the soil and the nutrients with a view to minimise eutrophication.

National guidelines should be developed with fertilising recommendations and they should make reference to:

- *soil conditions, soil nutrient content, soil type and slope;*
- *climatic conditions and irrigation;*
- *land use and agricultural practices, including crop rotation systems;*
- *all external potential nutrient sources*

The amount of livestock manure applied to the land each year including by the animals themselves should not exceed the amount of manure containing:

43 https://urn.fi/URN:ISBN:978-952-361-263-1

– *170 kg/ha nitrogen*
– *25 kg/ha phosphorus*

with a view to avoiding nutrient surplus, taking soil characteristics, agricultural practices and crop types into account."

Photo: Sari Luostarinen

Status

This criterion has not been fulfilled.

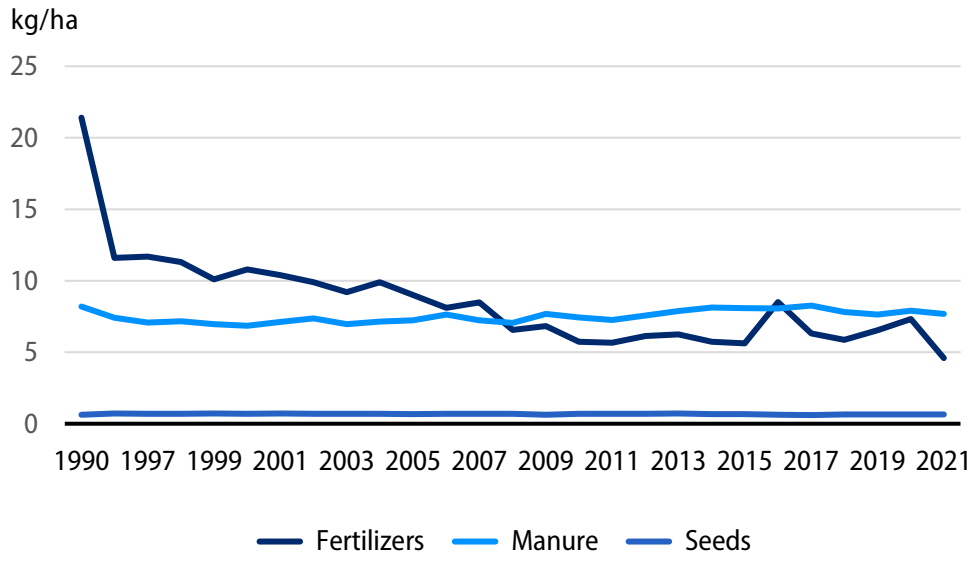
Explanations

The amount of nutrients applied to the fields is regulated by the Phosphorus Decree (64/2023) and the Nitrates Decree (1250/2014) which ensure that the amount of nutrients applied is proportionate to the nutritional needs of the crops being grown. The Nitrates Decree contains limitations to the amount of soluble nitrogen applied in manure and organic fertilizer products in addition to the maximum allowed total nitrogen of 170 kg/ha. The limits are given separately for organic and mineral soils and for different plants. The Phosphorus Degree sets maximum allowable phosphorus fertilization amounts considering soil type, soil phosphorus content (fertility), plants grown and yield expected. The regulation applies to all phosphorus fertilization, including manure.

The Nitrates Decree considers also climate conditions, for example by restricting fertilization in flood-prone areas. Application is forbidden within five meters from a waterway, surface application is forbidden on the next five meters range and limitations are given to fields with a slope of 15% or higher.

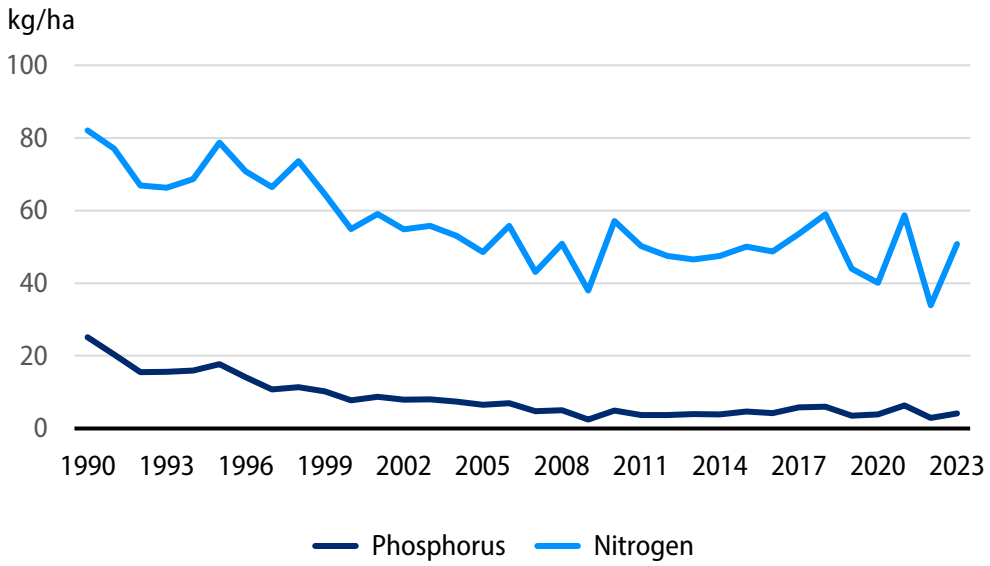
The application of mineral fertilizers has significantly decreased since the beginning of the 1990s in Finland (Figure 15). As a result, the nutrient surplus of agricultural soil has decreased in the whole country and the share of high soil fertility classes is decreasing in all Finland, including the Archipelago Sea catchment, but the change is slow. (Figure 16). However, the high phosphorus fertilization rates in the past have resulted in legacy phosphorus stored in the field soil.

Figure 15. The amount of phosphorus applied on fields (kg/ha)[44] as mineral fertilizers, manure and seeds in Finland between 1990 and 2021.



44 Maatalousmaan ravinnetase | Luonnonvarakeskus

Figure 16. Nitrogen and phosphorus balance in agricultural soil[45] in Finland indicates the difference between the amount of nitrogen or phosphorus that has been applied to the field using fertilizers, livestock manure, and sowing seeds, and the amount of nitrogen or phosphorus that has been removed from the field with the harvest between 1990 to 2023.



Assessment of this criterion was possible only at a rather general level since the information on soil phosphorus content is available only at a higher geographical scale, such as the level of municipalities.

The information on how the fertilization has been conducted on farms in practice is also not available for evaluation. There is furthermore a discrepancy between identified manure surplus regions and the information on how much manure is being delivered to plant producing farms and/or centralized processing plants. More manure should be relocated among the farms of the surplus region, e.g. from animal farms to plant growing farms, and/or transported further away from the surplus region than is currently done.

45 https://statdb.luke.fi/PxWeb/pxweb/fi/LUKE/LUKE__08a%20CAP-indikaattorit__06%20Tehokas%20ymp%c3%a4rist%c3%b6nhoito%20ja%20suojelu__03%20Maatalousmaan%20ravinnetase/01_Typpi_fosforitase.px/table/tableViewLayout2/?loadedQueryId=f97a50d9-a5e8-4d19-a0be-d26f

The main challenges identified in fulfilling this criterion are:

– The Phosphorus Decree has included an exemption on limits to spread more manure phosphorus than allowed for other phosphorus fertilizers in certain situations for a period lasting until the end of 2026. The exemption is not in line with the aims of reducing higher soil phosphorus contents and promoting recycling of manure nutrients to reduce emissions to waters. In the absence of adequate practical solutions for farmers, the derogation has been necessary for farm economy.

9. Winter crop cover

"In relevant regions the cultivated area should be sufficiently covered by crops in winter and autumn to effectively reduce the loss of plant nutrients."

Status

This criterion has been fulfilled.

Explanations

In the River basin Management Plan for the River Kokemäenjoki-Archipelago Sea and Bothnian Sea catchment, the target for winter crop cover has been set at 136 730 ha. This target has been achieved for both green cover and total vegetation cover which were 201 157 and 234 790 ha, respectively, in 2023 (Table 2).

Some of the fields in Southwest Finland remain covered over the winter and crop cover has been at a sufficient level since at least 2015, but the area has further increased in recent years.

Table 2. Change in the winter crop cover over the years 2015 to 2023[46].

Year	Green vegetation cover (ha)	Lightly plowed (ha)	Total vegetation cover, ha (%)
2015	141 231	49 029	190 261 (65)
2016	127 101	49 247	176 348 (60
2017	130 035	36 431	166 466 (57)
2018	136 644	48 411	187 055 (64)
2019	140 863	39 587	180 450 (64)
2020	143 770	44 566	188 336 (65)
2021	155 707	38 146	193 853 (66)
2022	151 282	48 177	199 459 (68)
2023*	208 028	32 192	240 220 (82)
2024*	209 168	34 066	243 234 (83)

* The national CAP plan was reformed in 2023, and the data approach for total vegetation cover for 2023 and 2024 is slightly different in comparison to previous years. In the numbers for total vegetation cover (ha), in 2023 96,266 ha and in 2024 94 350 ha is stubble. For previous years this information is not available.

A large part of the fields with winter crop cover are lightly tilled which as such does not represent the optimal form of crop cover. Therefore, increase in the green cover is promoted by informing and educating farmers.

Additionally, a dataset containing information on the areas most at risk for soil erosion and nutrient losses to waterways to be used for optimal geographical positioning of winter crop cover is under development. The data informed approach will ensure that CAP funding is targeted to the most impactful fields. A similar targeted dataset is already in use for buffer zones.

If winter crop cover and other measures are implemented on as many plots as possible, an annual reduction of up to 10 tn/year of phosphorus runoff and 0.5 tn/year of nitrogen runoff can be achieved in the Archipelago Sea area.

46 https://www.doria.fi/bitstream/handle/10024/187614/Raportteja%2039%202023.pdf?sequence=3&isAllowed=y (data covering years 2015–2022).

10. Water protection measures and nutrient reduction areas

"Protection measures should be established to prevent nutrient losses to water particularly as regards:

- *Surface water: buffer zones, riparian zones or sedimentation ponds should be established, if necessary.*
- *Groundwater: Groundwater protection zones should be established if necessary. Appropriate measures such as reduced fertilisation rates, zones where manure spreading is prohibited and permanent grassland areas should be established.*
- *Nutrient reduction areas: Wetland areas should be retained and where possible restored, to be able to reduce plant nutrient losses and to retain biological diversity."*

Photo: YM kuvapankki

Status

This criterion has been fulfilled.

Explanations

The CAP promotes and funds measures to increase vegetative cover, such as buffer zones and the use of cover crops. Thanks to these support measures, the area dedicated to important buffer zones and protective strips for surface waters has increased. In 2024, the Archipelago Sea catchment area had 2,594 ha of buffer zones. In the Archipelago Sea catchment, fields are primarily concentrated along rivers and, in some places, on steep slopes. This increases the risk for erosion of riverbanks and consequently nutrient load to the river.

To enhance the effectiveness of buffer zones in preventing nutrient losses, their geographical targeting has been improved using the buffer zone targeting dataset introduced in 2024. The data supports the establishment of buffer zones only on erosion-prone fields and near water bodies. In order to advance the implementation of CAP measures, a project is underway in the Archipelago Sea catchment area to provide farmers with guidelines on how to implement these measures in the way that best suits their farms.

Measures for protection of groundwater against pollution are prescribed in the Environmental Protection Act. Substances or micro-organisms shall not be deposited at, or discharged to, or energy conducted to a site, or these shall not be handled in such a way, that in groundwater areas important to water supply or otherwise suitable for such use, a change in groundwater quality may cause hazard or harm to health or the environment or groundwater quality may otherwise materially deteriorate.

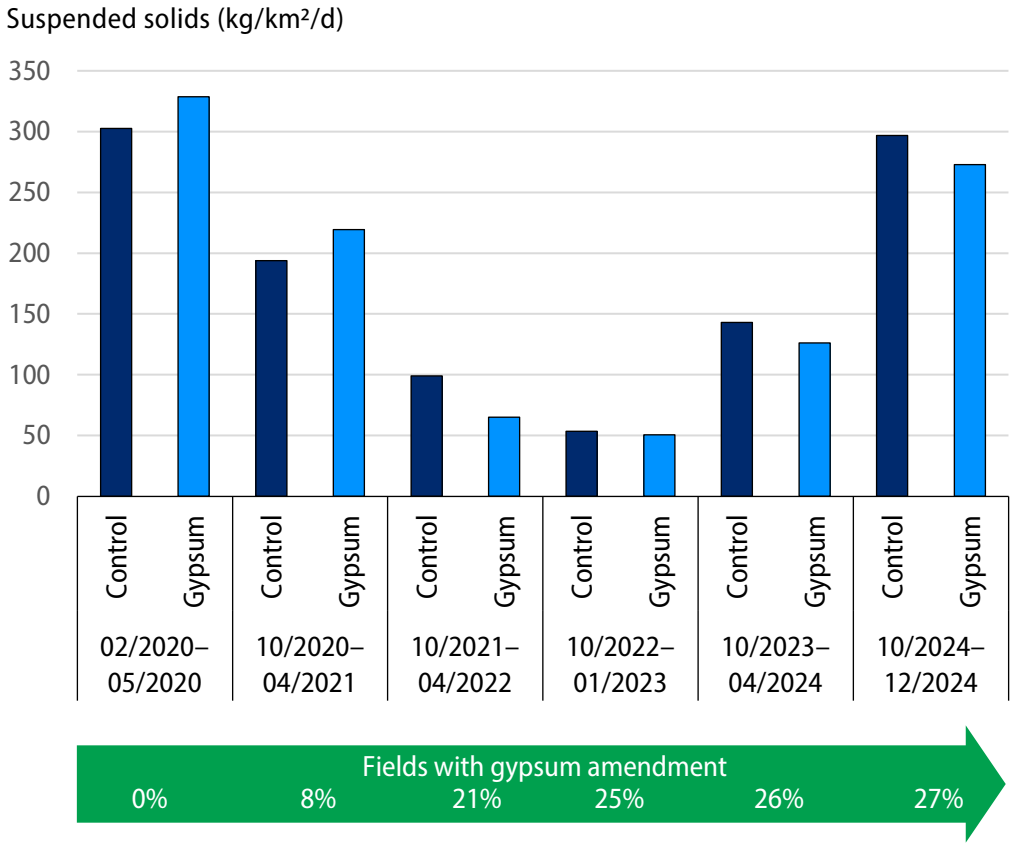
Photo: Sari Luostarinen

The Government Decree on Limiting Certain Emissions from Agriculture and Horticulture states that storage spaces for manure and unpackaged organic fertilizer products, exercise areas for farm animals, and the feeding and watering points of exercise yards may not be placed in a groundwater area unless a soil survey has been conducted indicating that placement in this area will not cause groundwater pollution or any risk of it.

Gypsum application to agricultural fields is a cost-efficient method to reduce nutrient runoff. Since 2020, farmers in the Archipelago Sea catchment have had the opportunity to apply for free gypsum amendment for their fields since 2020 through the ongoing GYPSUM-project (Finnish KIPSI-hanke). The project is coordinated by the Centre for Economic Development, Transport and the Environment in Southwestern Finland and the aim is to have 50,000 hectares of fields amended within the catchment area before the end of 2025. So far about 27,000 ha of fields have received gypsum within the catchment area. According to modeled estimates, gypsum amendment has prevented approximately a total of 49 tons of phosphorous loading from entering the Archipelago Sea since the application started in 2020.

The effects of gypsum application are monitored in different river catchments in Southwestern Finland. The effect of the application is clearly visible in the water quality of the River Tarvasjoki, a tributary to the River Paimionjoki, where approximately 27% of fields have been amended between 2020 and 2024. Water samples have been collected regularly during the GYPSUM-project. Before the gypsum application started in the autumn of 2020 the runoff of suspended solids was approximately 9–14% higher in the River Tarvasjoki compared to the River Paattistenjoki gypsum reference area. The runoff of suspended solids exhibited a decline in both rivers immediately following the initial monitoring period in spring 2020. Gypsum amendment was applied to 21% of the total area of the Tarvasjoki River catchment fields, as suspended solids runoff decreased to a lower level in comparison with the Paattistenjoki reference catchment. The monitoring conducted in autumn 2024 revealed that the suspended solids runoff in the Tarvasjoki River remained at a lower level in comparison to the control site (Figure 17). The results from the River Tarvasjoki show that gypsum amendment will result in less turbid and nutrient-rich waters if the share of amended fields is high enough within the catchment area.

Figure 17. Runoff of suspended solids (kg/km^2/d) from the River Tarvasjoki catchment area (Gypsum) and the River Paattistenjoki reference (Control) area between spring 2020 and autumn 2024. The percentage values denote the share of fields amended with gypsum in the River Tarvasjoki catchment area. © Maria Kämäri, Syke



In addition to gypsum, pulp and paper industry fibresludge and structure lime soil amendments are also tested. The government has expressed the wish to add structure lime and paper mill sludge to the selection of those soil amendments to be supported by the state.

11. Ammonia emissions

"In order to reduce ammonia emissions from animal husbandry, a surplus of nitrogen in the manure should be avoided by adjusting the composition of the diet to the requirements of the individual animal. In poultry production, emissions should be brought down by reducing the moisture content of the manure or by removal of manure to storage outside the housing system as soon as possible.

Programmes including strategies and measures for reducing ammonia volatilisation from animal husbandry should be developed.

Urine and slurry stores should be covered or handled by a method that efficiently reduces ammonia emissions."

Status

This criterion has not been fulfilled.

Explanations

Finland has set Action Plan to Reduce Ammonia Emissions from Agriculture for the years 2021–2027. The technologies and practices to reduce ammonia emissions are also an integral part of the national BAT-report for livestock production[47]. Additionally, a guidebook for farmers is available[48].

The diets of animals are guided with Finnish feed tables and nutrient requirements[49] offering information on optimal feeding of cattle, pigs, poultry, horses and fur animals from the perspective of their growth and production. Advisory is available as part of CAP and via the food processing industry advising their contracted farms. The emphasis is on the importance of reducing protein overfeeding to decrease nitrogen excretion and subsequent ammonia emissions during manure management and use.

Efforts to reduce ammonia emissions during manure storage are implemented through the permitting and notification procedures for livestock farming, where specific orders to reduce ammonia emissions can be issued. The national CAP plan encourages farmers to apply liquid manure by injection via financial support for the measure and Nitrates Decree requires incorporation of manure within 24 hours. Investment subsidy is also available for the purchase of equipment improving the environmental performance of a farm (e.g. covered storages, injection application equipment).

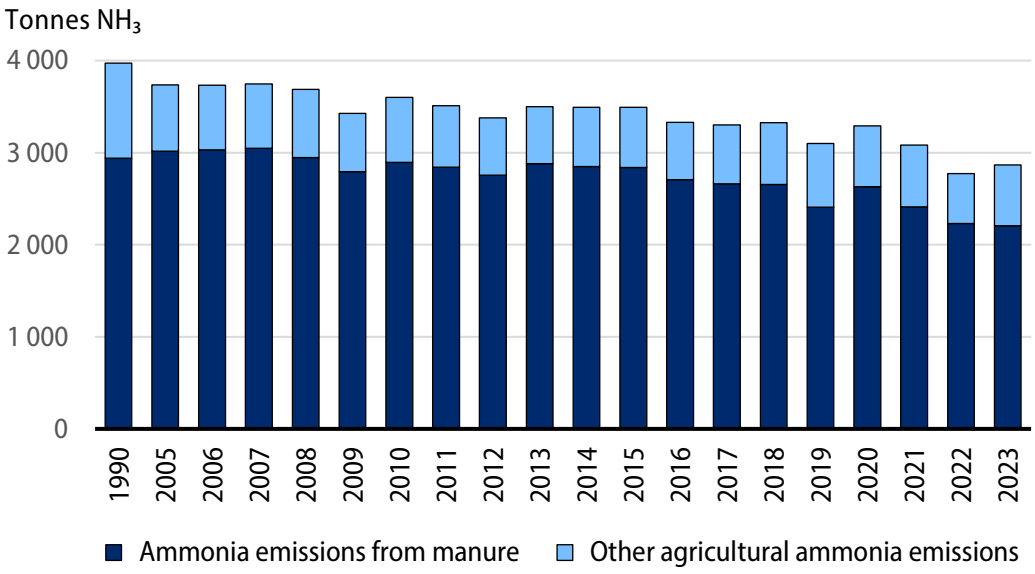
A reduction in agricultural ammonia emissions has been observed from year 1990 to 2023 (Figure 18).

47 Paras käyttökelpoinen tekniikka kotieläintaloudessa – Valto

48 Maatalouden ammoniakkipäästöjen vähentäminen : viljelijäopas – Valto

49 Finnish Feed Tables and Nutrient Requirements | Natural Resources Institute Finland

Figure 18. Development of agricultural ammonia emissions (tons) in 1990–2023. Ammonia emissions are divided into manure-based emissions and other agricultural emissions, including emissions from other organic fertilizers and mineral nitrogen fertilizers. Data from Syke (2025)



The main challenges identified in fulfilling this criterion are:

- There are too many uncovered manure storages to fulfil this criterion. Covered manure storage capacity should be increased (see also criterion 5).
- Slurry is still too often broadcast applied to fulfil this criterion. The use of emission-reducing application methodsin line with the BAT should be increased (see also criterion 7)

12. Nutrient recycling

"In order to reduce nutrient loss to the Baltic Sea and to achieve nutrient saving, efficient use of nutrient resources in agriculture and recovery of nutrients from various flows in society back to agriculture, countries are encouraged to design and implement national nutrient recycling plans, which should include:

- *current sub-national level information about production of organic residual materials, especially livestock manure and sewage sludge;*

- *current sub-national level information of the nutrient status of fields, and national soil maps particularly in regard to phosphorus;*
- *enabling the development of markets for recycled organic fertilizers with the aim of promoting sub- and/or transnational level reallocation of nutrients, including replacement of mineral fertilizers;*
- *developing actions for improved recycled fertilizer production, including information of product safety, usability, production technologies and logistical solutions;*
- *encouraging close cooperation between livestock and crop producers to use nutrients efficiently and to secure soil fertility."*

Photo: Sari Luostarinen

Status

This criterion has been fulfilled.

Explanations

Nutrient recycling has been promoted in Finland since 2011, and activities have been organized within the framework of several parallel government programs of different ministries, in close cooperation and coordination, as well as through strong stakeholder activities. Successful results have been achieved, but continued efforts and new measures are still needed. Many of the measures listed in this

criterion have been fulfilled, but systemic change to achieve efficient nutrient recycling and create a profitable market for organic fertilizers in practice will take time.

In 2019, the Monitoring Group on Nutrient Recycling, represented by the Ministry of the Environment, the Ministry of Agriculture and Forestry, the Ministry of Finance, the Ministry of Economic Affairs and Employment, as well as Business Finland, prepared the Action Plan for Nutrient Recycling 2019–2030. The cross-cutting principle of the Action Plan was the balanced recycling of nitrogen and phosphorus of organic origin, as well as carbon. The emphasis was on the policy measures that can promote nutrient recycling and availability of competitive recycled fertilizers in Finland. The Action Plan identified several measures and assigned responsibility to different actors. The related additional funding needs have been discussed as part of the General Government fiscal Plan and the budget procedure.

The Action Plan has been implemented, for example, through the nutrient recycling programmes of both the Ministry of the Environment and the Ministry of Agriculture and Forestry. The Nutrient Recycling Program of the Ministry of the Environment has funded investments as well as research, development, and innovation (RDI) that utilize nutrient-rich biomasses and side streams from communities and create conditions for a profitable market for recycled nutrients. The Programme's water protection measures are particularly targeted at the Archipelago Sea catchment. So far, nearly 200 projects have been funded with more than EUR 70 million.

The Nutrient Recycling Pilot Programme of the Ministry of Agriculture and Forestry aims to promote processing of manure, sewage sludge, and other similar nutrient-rich biomasses so that the nutrients necessary for agriculture can be recovered for example, by developing organic fertilizer products or other higher-value products. The Programme funds both RDI and investment projects. The RDI projects have received funding for activities that promote biomass processing, production of recycled fertilizing products and product development, nutrient recycling logistics and service solutions, and development of value-added products. The Programme may also finance plant, equipment and construction investments related to starting up production of fertilizing products or other advanced products, when the raw materials for the production are manure or digestate. Other investments in nutrient recycling and carbon sequestration can also be financed. So far, the total funding has been over EUR 20 million for a total of around 80 projects.

In 2024, the Ministry of Agriculture and Forestry introduced a new type of operational (performance-based) grant for biogas plants producing advanced nutrient products from manure or waste from the management of aquatic vegetation. The aim is to create a market for recycled fertilizer products and respond to profitability problems, as well as promote the transfer of nutrients from areas with a phosphorus surplus to be used in areas where such a surplus does not exist. The grants are awarded through a competitive tendering procedure where the applicant submits a tender including the price for processing one kilo of phosphorus. The tenders are ranked from the lowest to the highest and priority is given to biogas plants located in regions with a phosphorus surplus, plants using high value-added technologies (dry matter content >80%) and plants where the status of the surrounding waters within a 25 km radius from the plant is satisfactory or worse. The first auction was organized in 2024, awarding EUR 5.3 million for the processing of 500 tons of phosphorus by the end of 2026.

To support and monitor the progress of nutrient recycling, Finland collects sub-national level information both of production of organic residual materials (potential for nutrient recycling[50,51] and nutrient status of fields (phosphorus content). The information is also regularly updated.

The Phosphorus Decree supports separation of phosphorus from liquid manure by allowing to apply a small dose of phosphorus in the nitrogen-rich fraction on fields with high phosphorus content, while the phosphorus-rich fraction is applied only on fields with lower phosphorus content. This is seen to encourage slurry separation and relocation of manure phosphorus to longer distances and/or to the fields of plant producing farms, while the livestock farm can take better advantage of manure nitrogen.

CAP measure "Enhancing circular economy" gives support for using recycled fertilizing products. Support is given to 1) application of slurry, urine, separated liquid fraction of slurry or other liquid recycled fertilizing product using injection or other incorporation, and 2) application of organic materials with a dry matter content of minimum 20%, such as solid manure received from other farms or digested in own farm-scale biogas plant, organic fertilizers, organic soil improvers, mixtures of organic fertilizers and soil improvers, and separated solid fraction of

50 Fosforin kierrätyksen tarve ja potentiaali kasvintuotannossa : Synteesiraportti – Jukuri

51 Ravinteiden kierrätyksen indikaattori | Luonnonvarakeskus

slurry. Maximum amounts per hectare and type of recycled fertilizing products are given in addition to rules on environmentally sound application practices and timing.

Despite, the significant progress made with nutrient recycling, a systemic change, where both production and demand for organic fertilizers exist, has not yet been achieved and new policy measures should be introduced in addition to the existing ones to ensure higher overall efficiency of nutrient recycling. We, however, consider the requirements of this criterion fulfilled.

Regulation 3. Plant protection products (all criteria considered together)

"Plant protection products shall only be handled and used according to a national risk reduction strategy which shall be based on BEP. The strategy should be based on an inventory of the existing problems and define suitable goals. It shall include measures such as:

1. Registration and approval

Plant protection products shall not be sold, imported or applied until registration and approval for such purposes has been granted by the national authorities.

2. Storage and handling

Storage and handling of plant protection products shall be carried out so that the risks of spillage or leakage are prevented. Some crucial areas are transportation and filling and cleaning of equipment. Other dispersal of plant protection products outside the treated agricultural land area shall be prevented. Waste of plant protection products shall be disposed of according to national legislation.

3. Licence

A licence shall be required for commercial use of plant protection products. To obtain a licence, suitable education and training on how to handle plant protection products with a minimum of impact on health and the environment shall be required. The users' knowledge regarding the handling and usage of plant protection products shall be updated regularly.

4. Application technology

Application technology and practice should be designed to prevent unintentional drift or runoff of plant protection products. Establishment of protection zones along surface waters should be encouraged. Application by aircraft shall be forbidden; exceptional cases require authorisation.

5. Testing of spraying equipment

Testing of spraying equipment at regular intervals shall be promoted to ensure a reliable result when spraying with plant protection products.

6. Alternative methods of control

Development of alternative methods for plant protection control should be encouraged."

Status

All of the criteria under Regulation 3 have been fulfilled.

Explanations

The Plant Protection Products Act (2011/1563) stipulates that plant protection products made available on the market must be approved by the Finnish Safety and Chemicals Agency (Tukes). These products must also be used appropriately based on identified needs. Tukes has established use restrictions and conditions for plant protection products.

The Act mandates that special caution must be exercised when handling and storing these products, and they must be kept in proper storage facilities, separate from food and feed. The law also regulates the equipment used for applying plant protection products, their testing, and the necessary training for their use. Plant protection products may only be applied using safe and well-maintained equipment. Sustainable use of plant protection products is promoted through advice and training, with an emphasis on using control methods that pose the least risk and following the general principles defined for integrated pest management.

Regulation 4. Environmental permits

"Farms with livestock production above a specified size should require approval with regard to environmental aspects and impacts of the farms.

Installations for the intensive rearing of poultry, pigs and cattle with more than 40,000 places for poultry, 2,000 places for production pigs (over 30 kg), 750 places for sows or 400 animal units cattle shall have a permit fully co-ordinated by the relevant authorities.

The permits must take into account the whole environmental performance of the enterprise, covering e.g. emissions to air, water and land, generation of waste and prevention of environmental accidents. The permit conditions must be based on BAT.

The competent authorities, in determining permit conditions, can take into account the technical characteristics of the enterprise, its geographical location and the local environmental conditions.

These large animal enterprises shall be considered as point sources and shall have adequate measures.

For installations with more than 100 AU the Contracting Parties shall put in practice general rules or a system corresponding to a simplified permit system to ensure the implementation of the requirements in this Annex.

Both of these permit systems shall be applied to existing installations and new installations and existing installations which are subject to substantial changes by 2012."

Status

This criterion has been fulfilled.

Explanations

The regulation of environmental permits and notifications in Finland is incorporated into the Environmental Protection Act. The need for a permit is determined based on the number of animals in the livestock facility. A permit is required, for example, for poultry farms with over 40,000 places, pig farms with over 2,000 places, and cattle farms with over 500 places. An environmental impact assessment may also be conducted to support the permit process for large livestock facilities.

According to the Environmental Protection Act, operations requiring a permit must utilize the best available techniques (BAT). In their application or notification, the operator must assess the applicability of the best available techniques. The permit application must also include an environmental assessment as required by the law, and depending on the natural values, an assessment under the Nature Conservation Act may also be required. However, demonstrating the use of the best available techniques and conducting an environmental impact assessment is not sufficient to obtain a permit if the location is unsuitable for the livestock facility. In addition to the Environmental Protection Act, the municipality can issue regulations to prevent environmental pollution based on local conditions.

The principle of best environmental practice (BEP) underlies agricultural environmental protection legislation and guidelines, which aim to utilize the best available techniques (BAT). The principle of best environmental practice is embedded in the Environmental Protection Act, which mandates that operations posing a risk of environmental pollution must follow appropriate and cost-effective combinations of measures to prevent environmental contamination.

Regulation 5: Monitoring and evaluation

> *"The Contracting Parties shall describe the implementation and monitoring of measures in this Annex in their national programmes.*
>
> *To evaluate the effectiveness of the measures, the Contracting Parties shall develop projects to assess the effects of measures and the impacts of the agricultural sector on the environment."*

Status

This criterion has been fulfilled.

Explanations

See the explanations under each of the criteria and of the monitoring programme.

Regulation 6. Education, information and extension service

"The Contracting Parties shall promote systems for education, information and extension (advisory service) on environmental issues in the agricultural sector."

Status

This criterion has been fulfilled.

Explanations

To promote water protection in agriculture, information dissemination and training are organized by various stakeholders. The NEUVO2030 service of the current CAP plan has been established to support farmers, allowing them to order farm-specific advice on topics such as production efficiency and environmental protection. Additionally, many training sessions and other events are organized for farmers and livestock operations to spread information about water protection measures.

A challenge in education and advisory is that it is difficult to reach farmers, and with agricultural productivity being low, maximizing financial output becomes a priority. Farmers are encouraged to implement water protection measures by informing them about the multiple benefits of such measures and highlighting their effects on field levels and preparedness for extreme weather events. Furthermore, there is close cooperation with agricultural interest organizations in the implementation of training and information dissemination.

6 How far are we from fulfilling the requirements for deletion?

The main prerequisites set by HELCOM for applying for the deletion have been fulfilled:

1. formal definition of the Hot Spot geographical area,
2. establishing of long-term environmental goals,
3. establishing a non-point source management plan,
4. securing funding for a sustained incremental programme and
5. establishing a monitoring programme.

Altogether, 17 out of the 23 requirements for the deletion of the Hot Spot have been fulfilled, while 6 have not been fulfilled (Table 3). One criterion that has not been fulfilled is repetitive of five other criteria addressing the area available for manure spreading, manure storage and ammonia emissions. Hence, there are actually only five criteria that have not been met and require further work.

Table 3. Summary of the assessment of meeting the HELCOM criteria for deleting the Hot Spot on reduction of pollution from agriculture in the Archipelago Sea. Please note that in this table all prerequisites and criteria have been given a running number for the ease of reference and the different numbering used by HELCOM and in the previous chapters in indicated in parentheses.

HELCOM deletion prerequisites or criteria (Chapter, Ch.)	Assessment of fulfillment	Explanations and deficiencies in meeting the criteria	Ful-filled yes/no
1. Formal definition of Hot Spot (Ch. 3)	The geographical area of the Hot Spot has been defined to include the Archipelago Sea and its catchment area. The Hot Spot is considered one unit although three pilot areas within the area have also been defined.	-	YES
2. Long-term environmental goals (Ch. 4)	The goal has been set. It is to achieve a decrease of N and P loads from agriculture towards the preliminary reduction targets of the national Marine Strategy. When considering reaching the goal, the delaying effects of climate change and other potential factors that may hinder the achievement of the objective will be taken into account.	-	YES
3. Agricultural non-point source management plan (deletion criterion i, Ch. 5.2 and 5.3)	Archipelago Sea Programme with its Roadmap for water protection measures in agriculture (2022) and Workplan for 2024–2027. The cost of implementing the Roadmap was estimated at 18 M € per year.	-	YES
4. Funding for sustained incremental programme (deletion criterion i, Ch. 5.5)	Due to the significant scale of different financing possibilities, especially through the national CAP plan, it is possible to conclude that the 18 M € per year cost estimate of implementation of the Archipelago Sea Programme's Roadmap for agricultural water protection measures has been covered in recent years and it will be covered in the following years at least up to 2028.Development of impact and results-based funding will be tested in the catchment.	-	YES

HELCOM deletion prerequisites or criteria (Chapter, Ch.)	Assessment of fulfillment	Explanations and deficiencies in meeting the criteria	Fulfilled yes/no
5. Monitoring programme (deletion criterion i, regulation 5, Ch.5.4)	A framework for the follow-up of the implementation and effects of the Archipelago Sea Programme has been developed and is implemented with annual reporting from 2025 onwards. Monitoring of the state of the sea and nutrient loading has been carried out for decades. In 2025–2027, the monitoring programme will be modernized, complemented and upgraded to provide more accurate data on nutrient loading according to the source-to-sea approach. This Monitoring programme also fulfills regulation 5 Monitoring and evaluation.	-	YES
6.–18. Annex III, part 2 (deletion criterion ii, Ch.5.6)			
6. General provisions (regulation 1)	HELCOM's provisions on BAT and BEP to reduce pollution from agricultural activities have been fulfilled e.g. through implementing EU legislation and related BAT of intensive rearing of pigs and poultry (IRPP).	-	YES
7. Definitions (regulation 2, criterion 1)	Not relevant	-	YES
8. Introduction (regulation 2, criterion 2)	Considered separately for each of the criteria below.	-	YES

HELCOM deletion prerequisites or criteria (Chapter, Ch.)	Assessment of fulfillment	Explanations and deficiencies in meeting the criteria	Ful-filled yes/no
9. Animal density (regulation 2, criterion 3)	The handling of nutrients and manure in livestock production is regulated by legislation (e.g. Environmental Protection Act, Nitrate Decree and Phosphorus Decree) and environmental permits.	Relocation of manure nutrients from surplus areas within the catchment and away from it requires development. There are challenges related to economic feasibility and practical processes of relocation of manure. Environmental permitting authorities deciding on animal houses do not have all necessary information related to the availability of suitable land for manure spreading. Large biogas plants should process better the digestate but the permission process does not require this.	NO
10. Location and design of farm animal houses (regulation 2, criterion 4)	The requirements for the location of livestock buildings are included in the Environmental Protection Act. Design of livestock buildings receiving investment support is regulated in the Decree on Subsidised Building of the Ministry of Agriculture and Forestry.	-	YES
11. Construction of livestock manure storage (regulation 2, criterion 5)	The requirements for the structures of manure storages are included in the Nitrates Decree and Decree on Subsidised Building. New solid manure storages are usually covered.	Covering of manure storages is not at an adequate level. There are still many existing slurry storages which are not covered. Environmental permits have still allowed new storages without cover assuming natural crust is formed although that is not the case for pig slurry, while pig rearing facilities are abundant in the catchment.	NO
12.Agricultural wastewater, manure and silage effluents (regulation 2, criterion 6)	The regulation of waste management for animal houses is included in the Waste Act and the Waste Decree, Nitrates Decree and Decree on Subsidised Building	-	YES

HELCOM deletion prerequisites or criteria (Chapter, Ch.)	Assessment of fulfillment	Explanations and deficiencies in meeting the criteria	Ful-filled yes/no
13.Application rates of organic fertilizers (regulation 2, criterion 7)	The amount of nutrients applied to fields is regulated by Phosphorus Decree and Nitrate Decree and the quality of organic fertilizing products, such as digestates, composts and other processed recycled products, is regulated by the Decree on Fertilizing Products.	Autumn application of manure can increase the risk of nutrient losses. The risk can be decreased by application for autumn-sown crops or other vegetation for the winter. The use of emission-reducing manure application methods in line with the BAT should be increased.	NO
14. Application rates for nutrients (regulation 2, criterion 8)	The amount of nutrients applied to fields is regulated by Phosphorus Decree and Nitrate Decree. Fertilization should be closely based on nutrient requirements of the plants. The application of mineral fertilizers has significantly decreased since the beginning of the 1990s in Finland. High phosphorus fertilization rates in the past have resulted in legacy phosphorus stored in the field soil.	The Phosphorus Decree includes an exemption on limits to apply more manure phosphorus than allowed for other phosphorus fertilizers in certain situations for a period lasting until the end of 2026. The exemption is not in line with the aims of reducing higher soil phosphorus contents and promoting recycling of manure nutrients to reduce emissions to waters. In the absence of adequate practical solutions for farmers, the derogation has been necessary for farm economy.	NO
15. Winter crop cover (regulation 2, criterion 9)	The objective for winter green cover included in the Riverbasin Management Plan for the area has been achieved.	-	YES
16. Water protection measures and nutrient reduction areas (regulation 2, criterion 10)	Buffer zones and the use of cover crops are promoted and funded through the national CAP plan funding. The targeting of buffer zones to erosion-prone areas is being enhanced using geospatial data on soil erosion and nutrient loss risk. Farmers can apply for free gypsum soil amendment. Other soil amendments, structural lime and paper and fiber sludge are being tested and intended for wider use.	-	YES

HELCOM deletion prerequisites or criteria (Chapter, Ch.)	Assessment of fulfillment	Explanations and deficiencies in meeting the criteria	Fulfilled yes/no
17. Ammonia emissions (regulation 2, criterion 11)	Nitrate Decree requires to cover the liquid manure storages and storage facilities for liquid organic fertilizers. Animal feeding practices are influenced by guidance and advisory measures of the CAP plan.	Covering of manure storages and the use of emission-reducing manure application methods in line with the BAT should be increased.	NO
18. Nutrient recycling (regulation 2, criterion 12)	Nutrient recycling has been promoted in Finland since 2011 and the Action Plan for Nutrient Recycling 2019-2030 has been prepared. Funding for investments and RDI projects are available via two separate funding programmes, competitive tendering for biogas plants digesting manure and the national CAP plan. Good progress has been made but a systemic change, where both production and demand for organic fertilizers exist has not yet been achieved.	-	YES
19. Farms with higher animal densities or large animal farms have demonstrated that fertilizers and manure are adequately stored and are applied on an appropriate area and according to guidelines (deletion criterion iii)	See points 9, 11, 13, 14 and 17 (criteria 3, 5, 7, 8 and 11 of Annex III) as explained above.	See points 9, 11, 13, 14 and 17 (criteria 3, 5, 7, 8 and 11 of Annex III) as explained above.	NO
20. Vulnerable areas (deletion criterion iv, Ch. 5.1)	The entire country is designated as a nitrate-vulnerable zone according to the Nitrates Directive which is implemented through the Nitrate Decree. The Nitrate Decree addresses and reduces emissions from the use, storage, and handling of fertilizers into water bodies, soil, and air. The protection of areas that are valuable or sensitive in terms of natural values is considered in the Environmental Protection Act and in River Basin Management Plans and the national Marine Strategy.	-	YES

HELCOM deletion prerequisites or criteria (Chapter, Ch.)	Assessment of fulfillment	Explanations and deficiencies in meeting the criteria	Ful-filled yes/no
21. Plant protection products (regulation 3)	The safe and proper use of plant protection products is ensured by The Plant Protection Products Act. The act regulates the use, storage and handling of the products.	-	YES
22. Environmental permits (regulation 4)	The regulation of environmental permits and notifications in Finland is incorporated into the Environmental Protection Act.	-	YES
23. Education, information and extension service (regulation 6)	Farmers are offered farm-specific consultancy services as well as many training sessions. Training is provided at the national level as part of agricultural policy and at the local level through project activities.	-	YES

Challenges in meeting the requirements relate to the criteria of Annex III, Part 2 of the Helsinki Convention (Table 3). The unfulfilled criteria relate somehow to livestock production, mostly to manure storage and application. Also, measures to relocate part of manure nutrients within the catchment and/or outside the catchment are still needed.

Photo: Maria Laamanen

Legislation is in place for all requirements, but the exemption in Phosphorus Decree allowing application of more manure phosphorus than allowed for other phosphorus fertilizers in certain situations is not in line with the aim of reducing higher soil phosphorus contents. In the absence of adequate practical solutions for farmers, the derogation has been necessary for farm economy. Environmental permitting procedures are in place but permitting authorities authorizing livestock facilities and biogas plants do not have all the necessary information on land available for manure spreading, e.g. soil phosphorus content. So far, permits for biogas plants have not sufficiently addressed nutrient-rich digestates and their proper management from the perspective of nutrient recycling and water protection.

Although a separate consideration of fulfilling the remaining unmet criteria should be carried out, important things that should be considered to make progress include:

- Resolve the challenge of manure relocation both between livestock and plant producing farms and over longer distances from surplus areas to deficit areas. This includes promotion of manure relocation between neighboring farms and making part of the manure nutrients more transportable also longer distances by processing especially manure phosphorus into more concentrated fertilizing products.
- Make available all the information necessary to conclude on whether there is a sufficient area of land for manure application to livestock production permitting authorities to all the information necessary to conclude on whether there is a sufficient area of land for manure application. For example, investigate and test a voluntary national soil nutrient data repository including plot-level information on soil fertility and ensuring consideration of data ownership.
- Make larger biogas plants increasingly part of the solution to the surplus of manure nutrients by making the permitting process to require sustainable management of the digestate and its nutrients. Provide further incentives to biogas plants to ensure the processing of the digestate and efficient nutrient recycling. Promote the use of other manure processing technologies capable of improving nutrient recycling.
- Ensure that manure storages, whether for solid or liquid manure, will be covered. In case of existing uncovered manure storages, requirements for covering will be considered when significantly changing the operations. The number and significance of such manure storages is unknown and should be further investigated.
- Encourage manure application in autumn to autumn-sown crops or other vegetation for the winter.
- Remove the exemption from the Phosphorus Decree allowing application of more manure phosphorus in certain situations than allowed for other phosphorus fertilizers for a period until the end of 2026. The exemption is not in line with the aims of reducing higher soil phosphorus contents and promoting recycling of manure nutrients to reduce emissions to waters. In the absence of adequate practical solutions for farmers, the derogation has been necessary for farm economy.
- Increase the use of precision farming techniques.

– Continue promoting nutrient recycling. Finland could, in principle, be self-sufficient for 90% of its phosphorus fertilization need. A systemic change, where both production and demand for organic fertilizer products has been balanced, and which would allow this national asset to be better exploited, has not yet been achieved.

7 Conclusions

A lot has been done in the Archipelago Sea catchment and good progress is underway in addressing the agricultural non-point source pollution and meeting the deletion requirements. Most of the deletion criteria have already been fulfilled (17/23). Still due to the six criteria not yet fulfilled, the Archipelago Sea agricultural pollution Hot Spot is not yet ready for a deletion and an application to HELCOM is not timely.

The achievement of fulfilling 17 out of 23 criteria highlights the persistent and hard work done in agriculture to improve its environmental and water protection performance. The investigation, however, also exposes the challenges in the sector. Measures to reduce high soil phosphorus content with more precise phosphorus fertilization, improved nutrient recycling and some improvements in manure storage and application practices are still needed. Also, regulation can be fine-tuned, including the exemption on manure application in the Phosphorus Decree. A positive signal, despite this, is that the highest soil phosphorus contents are declining. Solutions to sharing farm data, e.g. plot-level soil fertility data, while securing data ownership, are needed. Enhanced data availability and use could assist in designing more targeted and cost-effective public funding.

A key challenge in managing agricultural loads is to combine ambitious environmental objectives with the need to produce food as a profitable business activity. Food production is a key basic function of society, which inevitably causes changes in the environment. The aim must be to make food production as sustainable as possible, while ensuring the profitability of farms and the well-being of the entrepreneurs.

Agri-environmental measures must be effective and targeted, and they must also be feasible in the framework of agricultural production so that they support the farming business. The measures must be affordable and applicable to different types of farming.

Photo: Riku Lumiaro / Image bank of the Ministry of the Environment

The Finnish governments have done a lot in the past 15 years to improve nutrient recycling. Good progress has been achieved but a systemic change required for a full overhaul to a nutrient-conscious society is still lacking. In its mid-term policy review in 2025, the Finnish Government decided to launch the preparation of a roadmap for nutrient recycling and the security of fertilizer supply. The aim is to link existing and ongoing measures to promote nutrient recycling and to strengtheng self-sufficiency of agricultural inputs, which supports the achievement of systemic change. The Archipelago Sea catchment has all the means to be a pioneering region showing how the systemic change can be done. Funding to support the transition should also be secured for the long term to maintain secure conditions for investments on farms and in business.

Several criteria were assessed as being fulfilled. Based on best available information at the time of writing it was concluded that the regulation relevant to the criteria well as implementation of the regulation was estimated to be at a level fulfilling the criterion. The assessment is made at the level of the whole catchment, sometimes basing on information collected at national level. This does not preclude there being single cases or smaller areas that do not fully comply with the criterion.

Nutrient loading to the Archipelago Sea is still too high and the preliminary load reduction targets of the National Marine Strategy have not been achieved, although total loads of both nitrogen and phosphorus to the Archipelago Sea are declining. The long-term environmental goal Finland sets for the deletion of its HELCOM Hot Spot is a decrease of N and P loads from agriculture towards the preliminary reduction targets of Marine Strategy.

What will be more challenging to comprehend and explain to the public is that the state of the Archipelago Sea will not improve very quickly or easily. The good environmental status as described in the National Marine Strategy will not be achieved in the next twenty to thirty years with the current measures. Climate change with mild, rainy winters exposing fields to erosion and nutrient losses, as well as accelerated growth of plants, i.e., eutrophication in the sea, is making things harder. We are dealing with a so-called wicked problem when we are dealing with eutrophication and anoxia that maintain release of phosphorus from sediments. Finland alone cannot make the Archipelago Sea healthy, and we need from our neighbors and countries around the Baltic Sea similar action and adherence to HELCOM and EU rules and regulations to cut the nutrient load to an acceptable level described in the Baltic Sea Action Plan.

This assessment and the gaps in meeting the criteria as well as the state of nutrient loading will be reviewed annually until it can be concluded that the criteria have been met and it is possible to submit the deletion application to HELCOM. The report is intended to provide the justification to the eventual deletion application. The status of the criteria assessed as unfulfilled in this report, will be reviewed again in 2026 with a view of applying the deletion of the Hot Spot in 2027 at the latest.

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