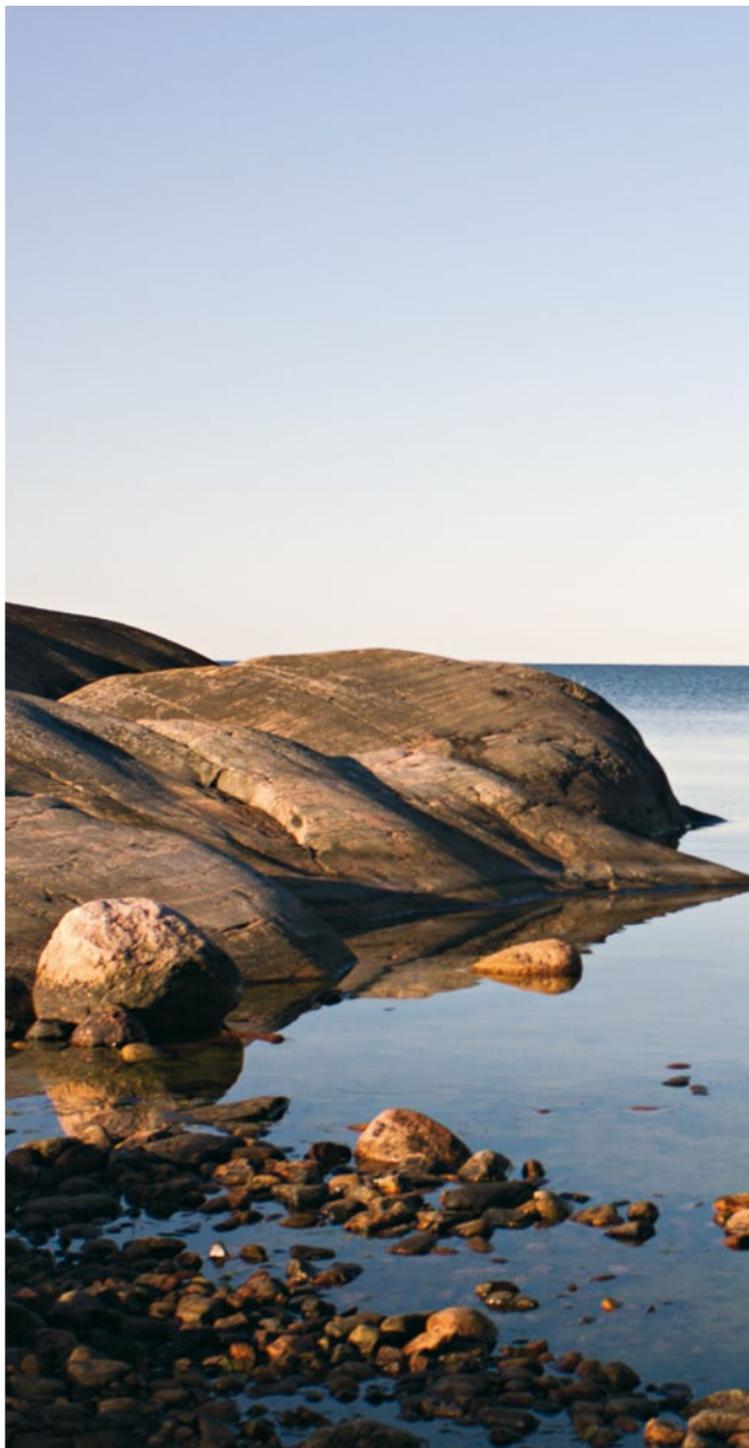


The BSAP Fund



Financing for a cleaner Baltic Sea

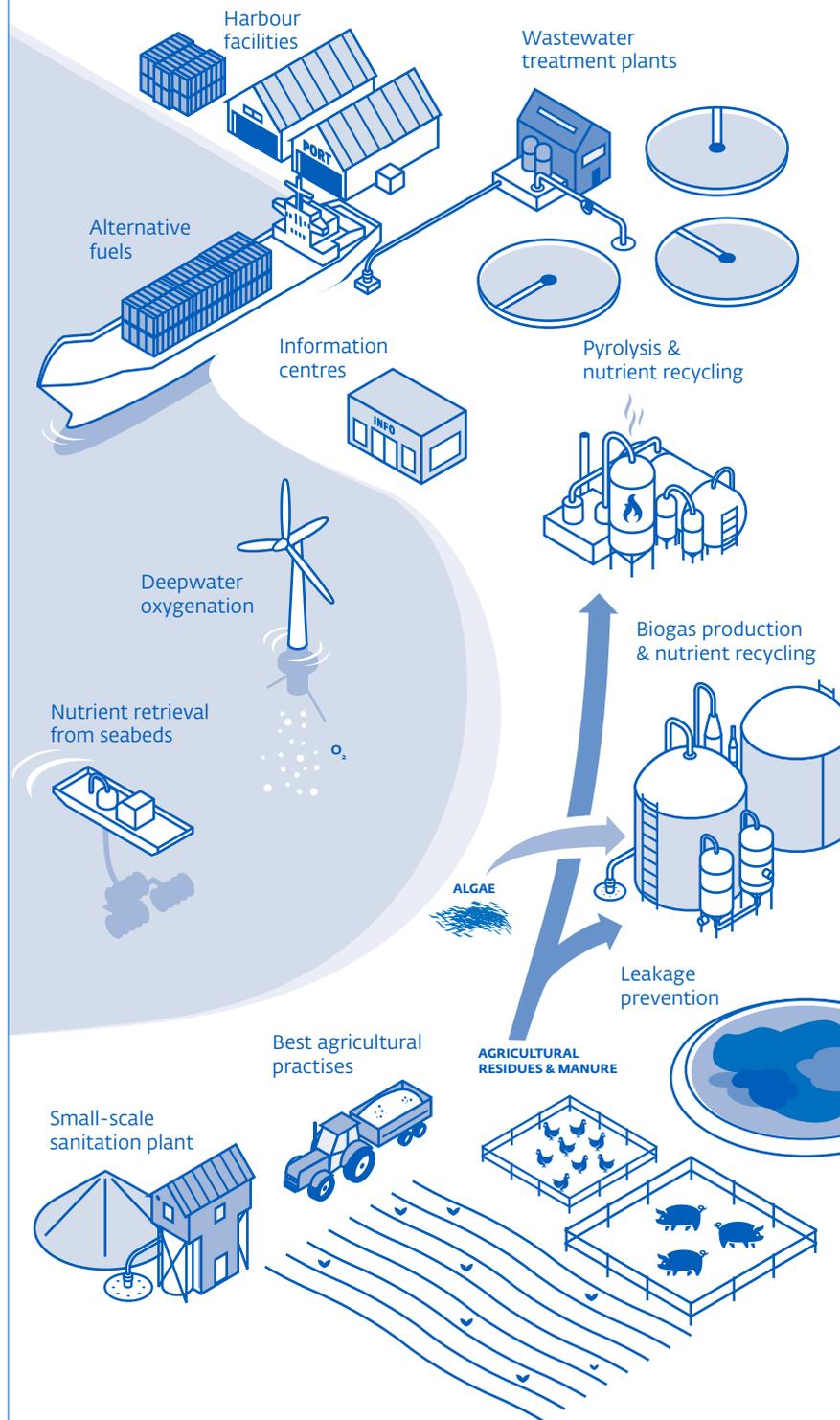
The aim of the BSAP Fund is to help restore the ecological status of the Baltic Sea. It was set up in 2010 to speed up the implementation of the Baltic Sea Action Plan (BSAP), which was adopted by the HELCOM member countries in 2007.

The BSAP Fund provides grants for project preparation, technical assistance as well as implementation to projects that support the action plan. A key purpose of the Fund is to facilitate and speed up the preparation of bankable projects. The Fund capital stands at EUR 11 million, of which EUR 2 million is provided by Finland and EUR 9 million by Sweden. As at 2015, the capital in the Fund has almost entirely been allocated.

Both public and private entities have received funding from the Fund and following areas are included in the project portfolio:

- Biogas production with nutrient recycling
- Best agricultural practices
- Pyrolysis and nutrient recycling
- Deepwater oxygenation
- Nutrient retrieval from seabeds
- Wastewater treatment plants
- Small scale sanitation plant
- Leakage prevention
- Alternative fuels
- Harbour facilities
- Information centres

Since the establishment, the Fund has approved nearly 40 projects. The projects are spread across the Baltic Sea Region from Russia, Poland, Estonia to Sweden and Finland as well as the Baltic Sea catchment area in Belarus.



Towards a circular economy through recycling nutrients

Phosphorus is one element in the circular economy. Resources of this element are limited, and recycling of phosphorus must be made more efficient. There is a lot that needs to be achieved, in agriculture and livestock production in particular. The BSAP Fund has financed projects in Baltic Sea coastal counties in respect of nutrient recycling, good farming practices, development of biogas crop farming, pyrolysis and dredging nutrient-rich deep sea sediment.

Converting manure produced in pig, chicken and livestock farms and agricultural residues into biogas has been put forward as a possible solution for the problem. A biogas plant without any other operations, however, is merely a location for collecting nutrients. The sludge from the plant still needs to be stored somewhere, and this could even simply be just a field. The measures that are required to decrease the amount of nutrient inputs from agriculture include optimisation of the timing and the amount of fertilisation as well as construction of safety strips in the vicinity of waterways.

The BSAP Fund has funded a range of projects regarding recycling of nutrients. For example, in Jordberga, biogas crops are cultivated with a cost and environmentally efficient method for a full scale biogas plant. The method includes selection of crops, through a seasonal cycle that is not competing with food production. An innovative project in Trelleborg collects algae from the beaches to be used in biogas production.

The Fund has also financed a study on pyrolysis for the production of bio-oil, fertiliser and energy from chicken manure by Scandinavian Enviro Systems. Successful pyrolysis could permit energy, bio-oil and biochar to be used, i.e. three products produced from manure that otherwise are stock-piled and which create a potential source of further pollution of the Baltic Sea.

In Turku, the Finnish company Biovakka integrates a pyrolysis process with an existing biogas plant in a demonstration kiln. The solution offers an opportunity to manage material flows and to close nutrient cycles from agriculture, industry and communities by providing biogas, solid and liquid fertiliser.

The BOX-WIN project, implemented by the University of Gothenburg, showed that floating wind turbines, equipped with pumps, may be used for deep water oxygenation, thereby bringing life to dead sea beds and halting the outflow of phosphorus by binding nutrients.

Recycling of nutrients to agricultural fertilisation at the TelgeNät sanitation plant



GÖSTA ANDERSSON/LFR

Reduction of internal phosphorus load

Project name: Nutrient retrieval from seabeds
Project owner: TechMarket AB
Country: Sweden
BSAP Funding: EUR 331,000

TechMarket demonstrated that dredging and retrieval of sediments from the oxygen-free areas of the Baltic Sea is possible. The main aim of the project was to remove the top layers of sediment that consume larger amounts of oxygen. By removing organic substances from the sediment surface, the internal leakage of phosphorus will decrease. Technical tests were carried out in Barnarpa lake, Småland, southern Sweden and deep-sea test waters outside Oxelösund, in the south-eastern part of Sweden.

The project has shown that it is technically feasible:

- to retrieve top layer sediments from deep waters, in this case 120 meters
- to cover large areas of seabed collecting nutrients, with a cost efficient solution at deep waters, in this case some 400 meters wide
- to separate wanted and unwanted fractions (water, mineral silt and organic material) from retrieved sediment
- to obtain drip-free separation of fresh organic sediments without using additives such as polymers
- to rot the organic sediment and produce methane

The organic matter can be used as fertiliser. Low or almost unmeasurable levels of organic pollutants were detected in the sediment in analysis by independent laboratories. Parallel projects confirm that 80% of heavy metals in the sediment can be removed.

The desired outcome of the project is a validation of a test rig for retrieval of sediments from the oxygen-free areas of the Baltic Sea. The conclusions from the test rig will in a second phase dimension a full scale operation at a nominal retrieval pace of 500 tonnes per hour, corresponding to 0.5 tonnes of phosphorus per hour. The test rig design and process should also comply with regulations and requirements of the land based process, such as transportation, depository installations, biogas production, spreading on agricultural soil and leakage to recipient.

Recycled nutrients used as fertilisation

Project name: Recirculation of nutrients from small-scale treatment plants
Project owner: Telge Nät AB
Country: Sweden
BSAP Funding: EUR 411,765

Recycling of nutrients from wastewater to agriculture is important, but often hampered by the reluctance of farmers to use wastewater sludge, as it may contain harmful substances. In this project a sanitation plant for separated toilet water (black water) was built through the technical development of a new sanitisation method, which is itself based on wet composting and urea treatment for the recycling of nutrients to agricultural fertilisation. The plant has a capacity to process 1,500 tonnes of toilet water per year. All treated material is returned to agricultural land.

The results of the project:

- Construction of the treatment plant for sanitation and recycling toilet water from individual sewage to agricultural land
- Development of a new sanitation method
- Economic contribution to property owners for the installation of recycling treatment systems
- Awareness raised and knowledge disseminated
- Establishment of the system chain from property to agricultural land
- Certification system for wastewater fractions from small sewages
- Investigation of legal aspects of solitary wastewater facilities in municipal activity

The project was a pilot project for the recycling of phosphorous. A new recycling treatment system was developed, built and tested. It demonstrated a quality-assured system for the recycling of sewage from small-scale plants, both in respect of technical as well as organisational solutions. The project was also funded by the county of Stockholm, through the LOVA financing, which is granted for local actions for a better marine environment.

Speeding up the investments in the wastewater treatment sector

The largest areas of surface accumulation of cyanobacteria for ten years were detected in the Baltic Sea in summer 2014. Nutrients flow into the sea as a result of human settlement as well as industrial, agricultural and forestry activities, and have done so on a large scale for more than a hundred years. The Baltic Sea basins have become quite large stores of nutrients. In anoxic conditions, phosphorus stored in sediments is released. Autumn and winter storms lift eutrophic and phosphorus-rich water to the surface, which is great news for cyanobacteria when it is warm in the summer.

In order to reduce eutrophication in the Baltic Sea, we must radically decrease its phosphorus content, both in the external and the internal load. New methods of phosphorus reduction must be introduced to supplement traditional measures such as wastewater treatment.

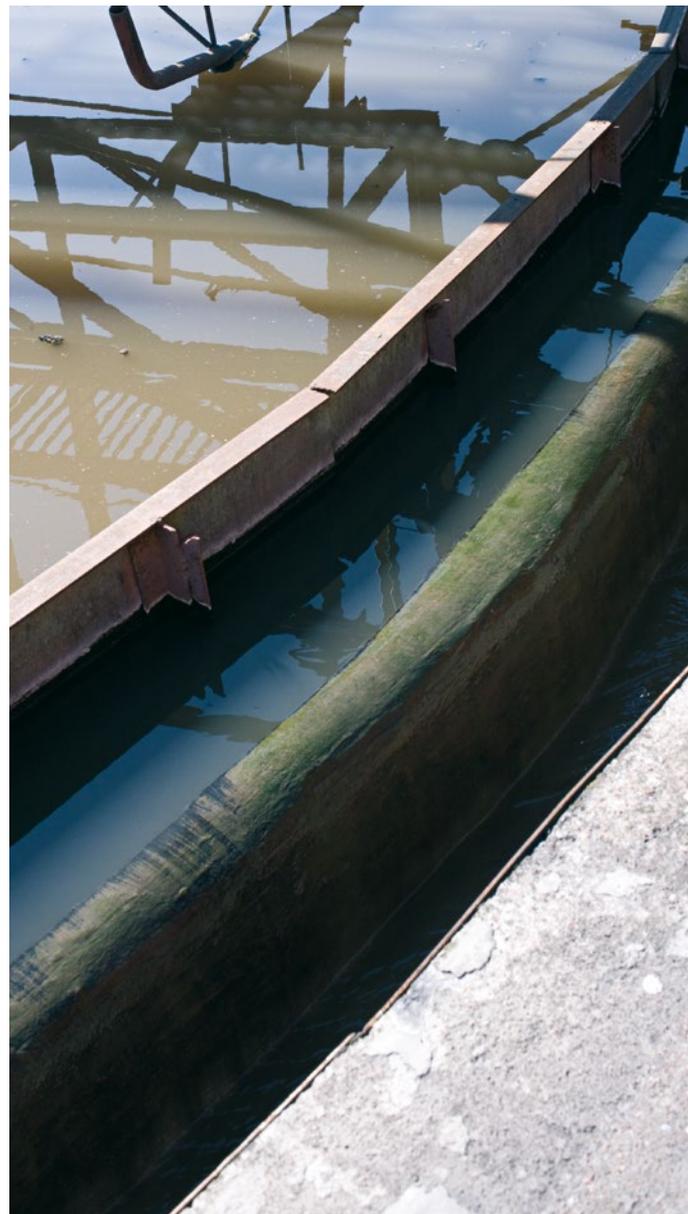
External nutrient inputs can be reduced by making old wastewater treatment plants more efficient and by building new plants in areas where one does not exist.

In Belarus, the BSAP Fund has financed a project identifying cost-efficient ways to reduce Belarusian discharges of nutrients into the Baltic Sea. The priority list includes wastewater treatment plants in ten Belarusian cities as well as a poultry farm. The estimated phosphorous load reduction will be about 176 tonnes annually. The priority list provides a satisfactory basis for further project development. It has also been adopted as a flagship project in EU's strategy for the Baltic Sea Region.

In Estonia, the Fund has financed technical and procurement documentation for several wastewater treatment plant renovations. Well-prepared projects have received financing from the EU Cohesion Fund and for example projects in Muuga, Võsu, Meriküla and Türi-salu have been implemented.

In Russia, the water treatment plants in St. Petersburg and Sosnovy Bor have received technical assistance through the Fund.

The discharge of nutrients and bacterial pollution from the manure storages and fields of the Udarnik poultry farm in Russia, to the surrounding water courses are reduced by constructing a filter system to treat drainage waters of the short-term manure storage area of Udarnik and ditch filters into the fields where the farm spreads its fermented manure.



PATRICK PASTERBERGER

An aeration tank at the wastewater treatment plant in Sosnovy Bor

Wastewater treatment plant meets HELCOM requirements

Project name: Sosnovy Bor municipal water and wastewater services rehabilitation
Project owner: Sosnovy Bor Vodokanal
Country: Russia
BSAP Funding: EUR 89,978

The Sosnovy Bor wastewater treatment plant serves about 64,000 inhabitants. The objective of the investments is to fulfil the HELCOM recommendations for municipal wastewater treatment set for the year 2015. The plant has already fulfilled the recommendations from 2010, with earlier improvements in the process.

The investment phase II is envisaged to include the following components:

- Reconstruction of aeration tanks to provide biological nutrient removal process
- Construction of the sludge final treatment unit
- Reconstruction of primary and secondary sedimentation tanks

The investment reduces pollution load to the Gulf of Finland by enhancing the wastewater treatment process and by correctly treating the dewatered sludge. The environmental impacts (i.e. load reductions) are as follows:

- | | |
|-------------------------|-------------------|
| • Total nitrogen load | 72.4 t tot-N/year |
| • Total phosphorus load | 5.7 t tot-P/year |

The above pollution reduction figures refer to the load to be reduced from the wastewater process. Furthermore, the pollution load from sludge treatment is reduced but the amount is difficult to estimate.

The technical design financed by the BSAP Fund ended in 2014 leading to the investment.

Nutrient load and health risk minimised in Muuga

Project name: Muuga wastewater treatment plant renovation
Project owner: AS Viimsi Vesi
Country: Estonia
BSAP Funding: EUR 170,000

Before the project start-up, there was no proper wastewater treatment on the eastern side of Viimsi, northern Estonia. The wastewater loads on the west side of the town were also considerably higher compared to the capacity of the existing network. Due to the geological structure of the ground, consisting mostly of limestone, the water source is not protected. Therefore pollution of groundwater from wastewater was a considerable health risk in the area.

The objective of the project was to prepare documentation to enable a procurement process for the construction of a wastewater treatment plant. The document preparation also secured the financing of the project from the EU Cohesion Fund.

The project has made it possible to construct and renovate the existing wastewater treatment plant in Muuga and to solve the wastewater treatment in a sustainable way for over 18,000 inhabitants of the Viimsi peninsula. The BSAP Fund has partly financed the design of the reconstruction.



AS VIIMSI VESI

Construction of the Muuga wastewater treatment plant

Cleaner shipping

Wastewater reception facilities in ports

The most of the excess nutrients in the Baltic Sea are from land activities and especially from the anoxic sea bottom, but a small fraction also comes from shipping activities. To reduce the load from shipping, the Baltic Sea has been designated as a Particularly Sensitive Sea Area under the International Convention for the Prevention of Pollution from Ships, which bans sewage discharge at sea from cruise ships and ferries. However, in order for this special area designation to become effective, a sufficient number of ports must provide reception facilities to receive and treat the sewage on land. With all ferries and cruisers leaving their sewage water in the ports, the polluted water releases from ferries at sea will come to an end.

In the port of Trelleborg, a pilot type sewage wastewater reception facility for Ro-Ro ferries was built. In Tallinn the BSAP Fund has financed the design of the port facilities. The system was later constructed in 2014. The Port of Tallinn was considered a priority port for this purpose due to the high traffic of ferries and cruise ships.

Less airborne emissions from shipping

Airborne emissions from shipping contribute to air pollution and environmental problems. The Baltic Sea Action Plan has identified emissions from shipping as one of the inputs of nitrogen to the Baltic Sea area which contributes to the eutrophication problem. The Baltic Sea is a designated Sulphur Emission Control Area (SECA), and there are also upcoming regulations for reductions of nitrogen dioxide emissions from shipping. Switching from the heavy fuel oils conventionally used in shipping to cleaner alternatives is, from an environmental perspective, a sound solution for reducing emissions.

Methanol and dimethyl ether (DME) are very interesting alternative fuels that should enable ships to comply with the upcoming sulphur dioxide and nitrogen dioxide guidelines without any further exhaust gas after treatment. The BSAP Fund has partly financed the SPIRETH project, where these fuels were tested in marine engines.



JONAS HÄGGBLOM

Alternative fuels for shipping – SPIRETH

Project name: Alcohol (spirit) and ether as marine fuel (SPIRETH)

Project owner: SSPA AB

Country: Sweden

BSAP Funding: EUR 650,000

Methanol and dimethyl ether (DME) are very interesting alternative fuels that should enable ships to comply with the upcoming sulphur dioxide and nitrogen dioxide guidelines without any further exhaust gas after-treatment.

The SPIRETH (Spiriths and ethers as marine fuel) project was developed to test the use of alcohol and ether as marine fuel alternatives. Methanol and dimethyl ether were the two fuels investigated and demonstrated.

The project had two main test streams as follows:

- Developing an onboard process for the conversion of methanol into a mix of methanol, water and dimethyl ether, which then was tested as a fuel in an adapted diesel auxiliary engine on board the ropax vessel Stena Scanrail. The vessel operates between Gothenburg, Sweden and Frederikshavn, Denmark. The technology that was used is called “On Board Alcohol To Ether” (OBATE™).
- Converting a full scale marine engine to run efficiently on methanol and conducting laboratory testing.

The main project findings show that it is feasible to convert ships to operate on methanol and DME-based fuels, and these fuels are viable alternatives for reducing emissions. Methanol and DME fuels can contribute to a more environmentally sustainable shipping industry, through lower emissions levels and the potential for fuel production from renewable feedstock and energy sources.





The BSAP Fund is jointly managed by the Nordic Environment Finance Corporation (NEFCO) and the Nordic Investment Bank (NIB).

Watch our videos

Learn more about the BSAP funded projects by watching our videos at youtube.com/nefcofinland

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