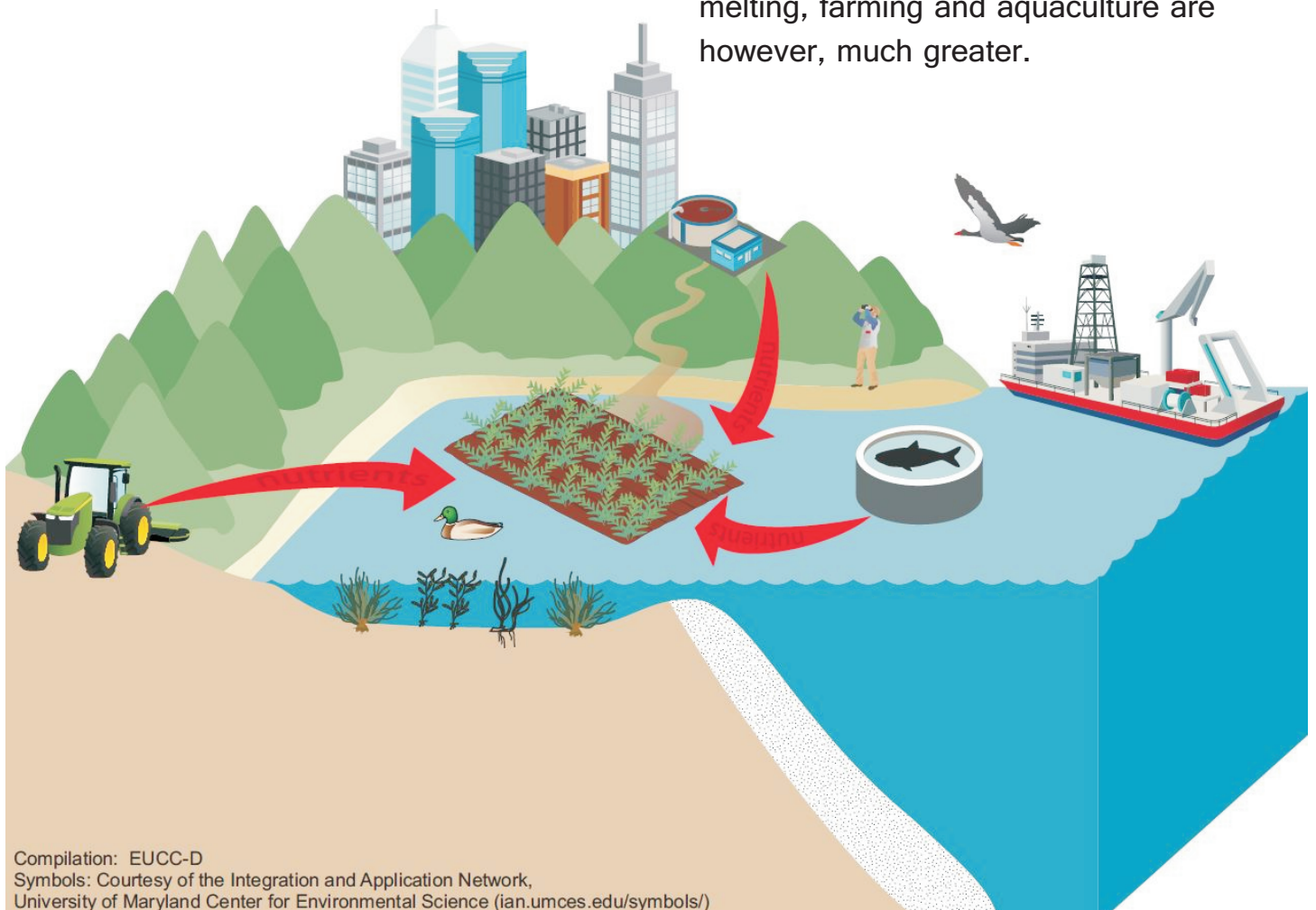


Green islands in blue lagoons: chances and research

Lagoons along the South Baltic Sea have been heavily impacted by humans for decades and too many nutrients have accumulated in the water and sediments. Therefore, actions have to be taken in order to achieve a good ecological status required by the EU Water Framework Directive. One option to remove the nutrients is phytoremediation and the use of 'active barriers' such as floating macrophyte islands.

EUTROPHICATED LAGOONS

Overly enriched water with minerals and nutrients, mainly nitrogen and phosphorus, can induce excessive growth of algae. So called eutrophication can consequently cause oxygen depletion, which can lead to a degeneration of the coastal environment with e.g. odour issues and fish kills. The origin of nutrient inputs can be natural or related to humans. Human-related inputs from e.g. wastewater treatment facilities, runoff from land during rains and ice melting, farming and aquaculture are however, much greater.



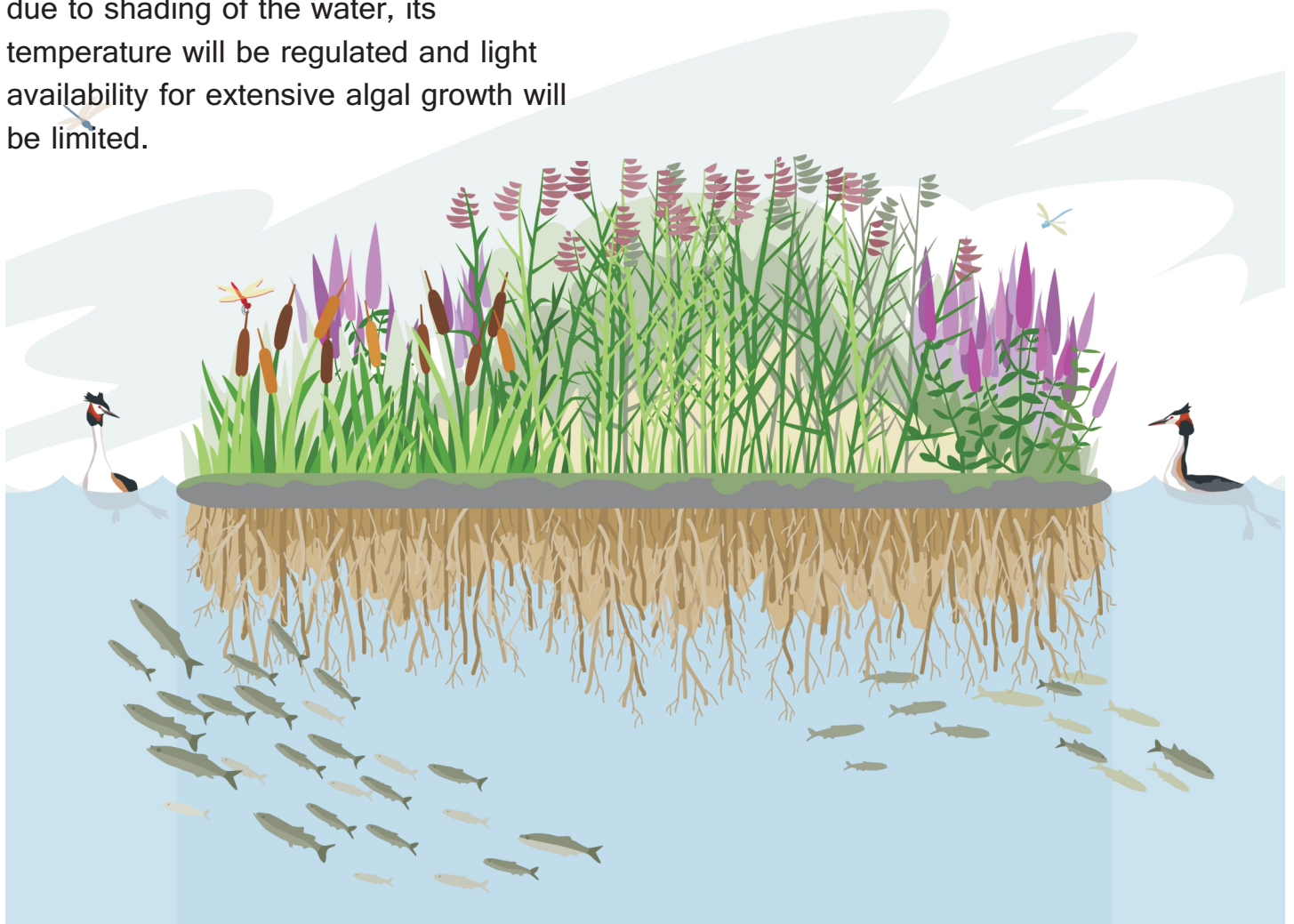
Major pathways of nutrients in a system with a floating macrophyte island

FLOATING INSTALLATIONS FOR NUTRIENT MITIGATION

At floating installations, emergent macrophytes are planted on a floating matrix. The plant roots in the water column directly absorb nutrients such as phosphorus and nitrogen and incorporate them into their tissues through biosynthesis and release oxygen into the water. Furthermore, bacteria transform nitrate to molecular nitrogen which can leak as a gas from the Baltic Sea and cannot be used directly as a nutrient anymore. Moreover, the reduction of nutrients can directly facilitate the reduction of algal biomass. Additionally, due to shading of the water, its temperature will be regulated and light availability for extensive algal growth will be limited.

FLOATING WETLANDS ARE A GENUINE ALL-ROUNDER

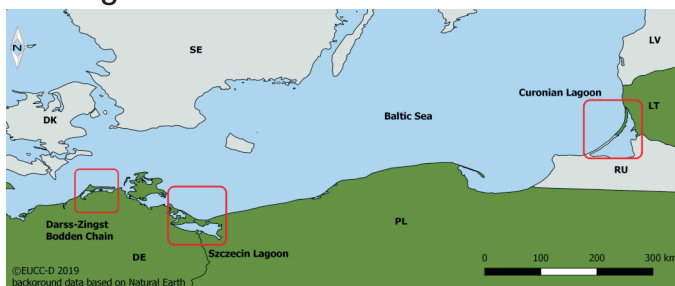
The green islands create diverse habitats for birds, insects and fish and can represent local biodiversity hotspots. There, protected red listed plant species can grow undisturbed and, at the same time, by integrating nice flowering species, the attractiveness of the location can be raised. Additionally, the islands' harvested biomass can be used as animal feed, fuel or building material (e.g. for thatched roofs or as insulating material). Also, floating islands attenuate wave energy and water flow and thus enhance particle settling and nutrient burial.



Scheme of a floating macrophyte island

PILOT INSTALLATION SITES

Floating islands with emergent macrophytes such as sedges, cattail, reed, yellow and sweet flag or purple and yellow loosestrife have been installed, maintained and harvested in different lagoons along the South Baltic. According to the different site characteristics different types of floating islands were chosen.



Floating macrophytes islands sites in Live Lagoons

Juodkrante and Nida (Lithuania)

In the Curonian lagoon close to Juodkrante, two islands each of approximately 32 m² were installed. Both islands' floating matrixes are made of recycled and UV-resistant hollow plastic (HDPE) pipes, which are covered with coconut coir fiber and fastened using a



Installation sites in Lithuania

plastic (PP) mesh. Macrophytes like Common rush, Narrowleaf cattail, Flowering rush or Great manna grass were planted individually between extra hollow pipe spaces. Additionally, a net was placed as an active barrier in a small bay between two piers in Nida. The net, a custom-made floating rig with mesh size > 11 cm, 200 m length and 1 m height, placed at 1 m depth has its structure disposed at whole cross-section of the water column. Indigenous plants, such as Common reed (in flower ponds) and willow, were fixed to the net at a minimum spacing of 0.5 m. The floating barriers are expected to protect swimming areas from debris, seaweeds, erosion, excessive silt and sediment concentrations.

Wolin National Park (Poland)

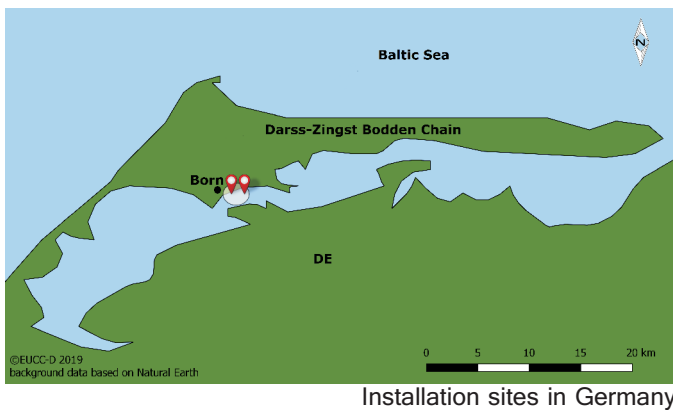
The floating island in Poland is located in a marina on Wicko Lake, in Wolin National Park in the Szczecin lagoon. This floating, 24 m² matrix is of a similar construction to the island in Lithuania: Hollow HDPE pipes are covered with coconut coir fibres and a mesh of PP holds everything together. Emergent macrophytes like Lakeshore bulrush, *Carex riparia*, Broadleaf cattail and *Iris pseudacorus* were planted in the determined hollow spaces.



Installation site in Poland

Born (Germany)

Two islands of 4 m² were installed in Born within a drainage channel of an aquaculture pond. The drainage flows into a shallow lagoon, the so called bodden water, which only has one connection to the Baltic Sea in the east. One island's floating matrix is made out of thermowood. With this thermally modified spruce wood the durability and buoyancy is enhanced. The other island is made of a stainless steel mesh which is filled with dry reed stems and hollow stainless steel buoys to enhance the buoyancy effect. Macrophytes such as the beautiful flowering Purple loosestrife and Yellow flag, but also Lesser pond-sedges and Lakeshore bulrush were pre-grown on coconut coir fibers mats and were laid on the floating matrixes.



Installation sites in Germany

ABOUT THE PROJECT

This factsheet has been created by the LiveLagoons project. The aim of this three year project is to improve water quality using floating wetlands and to help create bathing conditions inside the South Baltic lagoons, where algal blooms and sediment resuspension prevent recreational bathing. Coastal municipalities are supported by our project experts to find the best installation sites for the floating wetlands in order to maximize nutrient removal, gain additional aesthetic benefits to boost tourism and prevent spatial conflicts of use. Cross-border co-operation along the South Baltic coast will allow us to test both technological and socio-economical methodologies in different environments. LiveLagoons is supported by the Interreg South Baltic Programme 2014-2020 and co-financed by the European Regional Development Fund.

Lead partner:

Klaipeda University (Lithuania)

Contact: Dr. Arturas Razinkovas-Baziukas

Project partners:

EUCC - The Coastal Union Germany e.V. (Germany)

IBW PAN - Institute Of Hydro-Engineering Of The Polish Academy Of Sciences (Poland)

Curonian Spit National Park (Lithuania)