

Nutrient Retrieval from Seabeds

– Phase 2 Dredging tests

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Executive summary of the project

The project group concludes that the main objectives of the project have been fulfilled. The following main challenges have been tested or verified and confirmed:

Retrieval of sediments from deep waters

The project has shown that it is technically feasible to retrieve top layer sediments from deep waters, in this case 120 meters. This challenge has, in recent years, been presented as the primary complication by Swedish expert authorities. The project has used pressure pumps and buoyancy compensated suction nozzles.

Horizontal movement over seabed

The project has shown that it is technically feasible to cover large areas of accumulation seabed with a cost efficient solution at deep waters, in this case some 400 meters wide. This challenge yields from the conclusion that the areas of interest are large. The project has used wire actuators that create an automated and systematic movement over a larger area without losing the correct proximity to the seabed.

Minimized stirring of pollutants

The proposed system set and solutions minimize stirring and dispersion of pollutants that otherwise could pose an environmental risk due to the proposed activity. The conclusion derives from the fact that the suggested deep hollows have low energy and do not allow for natural particle movement or diffusion to other locations. The system solution itself does not add high levels of kinetic energy outside system pipes.

Density sorting of retrieved sediments

The project has shown that it is technically feasible to separate wanted and not wanted fractions from retrieved sediment in situ - in a first phase; water, mineral silt and organic material. This challenge yields from the conclusion that top layer sediments are watery and contain a larger share of mineral silt. The project has used and proposes a three chamber device and a decanter centrifuge to separate the three fractions.

Sustainable transport efficiency of organic sediments

The project has shown that it is technically feasible to obtain a drip free separation of fresh organic sediments without using additives, such as polymers. This challenge yields from the ambition to use chemical free and cost efficient raw material when transporting and processing sediment. The project has used decanter centrifuges and spinning tests.

Tracking of heavy metals and organic pollutants

The project can confirm that the top layer of sediment is relatively clean from pollutants. Low or almost not measurable levels of organic pollutants were detected in the independent laboratories that performed analysis. Parallell projects confirm that 80% of heavy metals can be removed.

Sustainable biogas yield from organic sediments

The project has shown that it is technically feasible to rot and produce methane, using top layer sediments from deep waters, which will make a substantial contribution to the process revenue stream. This challenge yields from the ambition to increase the share of micro and macro nutrient contents, by transforming carbon from solids to gas in a controlled process.

Legal issues to be decided by the Swedish Parliament

The project has shown that a decision has to be taken by the Swedish Parliament as to the right of disposition to retrieve sediment in Swedish Exclusive Economic Zone. The Ministry of Foreign Affairs is currently investigating

the matter of ownership as to organic sediment, which is considered as non-living organic material rather than mineral.

Sustainable financing of proposed system and operations

The project has shown that the retrieval of organic substances from seabeds has the capacity to form a solid base for sustainable financing schemes. By retrieving matter, at least two Swedish precedents yield that compensation of emissions is possible within the legal framework of existing Swedish Environmental Code:

Financing scheme A – The sewage community

The Swedish municipal sewage fee – notably not a tax – does not require additional legislation to be used for covering the remaining leakage of nutrients. Most Swedish municipal sewage plants reach a 97-98% phosphorus precipitation. The remaining 2-3%, roughly 2-4 metric tonnes for a Swedish city like Linköping, finally end up in the Baltic Sea. Thus, the sewage community would finance a yearly retrieval of 2-4 tonnes of phosphorus.

Financing scheme B – The industrial sector

The project has performed depth interviews with industrial sectors that emit substances that will cause organic matter in the Baltic Sea. Interviews include corporations, federations and The Confederation of Swedish Enterprise (Svenskt Näringsliv). The Swedish industrial sector has suggested compensation throughout the years, especially the forrest industry. A leakage of 60 tonnes of Nitrogen to water would finance a yearly retrieval of 60 tonnes.

Financing scheme C – The agricultural sector

The project has performed depth interviews with the agricultural sector, including farmers, federations, authorities, agencies and universities. By switching from buying imported phosphorus to a national recycled form of phosphorus, a total of 10 000 metric tonnes of phosphorus yearly will be prevented from entering the system. This way, an ultimate upstream endeavor will be achieved that will benefit the Baltic Sea.

Flexible emission fees regulate upstream versus downstream obligations

The project has studied possible circular economy schemes. The project suggests a Flexible Emission Fee System that would stimulate the market to develop more cost efficient upstream solutions and that would eventually compete with sediment retrieval. In the mean time, the sediment retrieval will unload the internal leakage of the Baltic and lakes.

Transboundary impact

The proposed system solution is likely to have transboundary impact and it is thus expected that the Espoo (EIA) Convention will apply. However, the project has shown that there are already ongoing processes that have a much more severe impact on environment than the proposed system solution. One process is the natural inflow of fresh water from the Atlantic, that evidently cause particle dispersion at a large scale. Other processes include bottom trawling operations that move sediment layers