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Dredged sediments: A new source of nutrients as a plant-growing substrate

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Dredging activities are carried out worldwide to increase water levels in harbours and bays or restore the aquatic ecosystem. As a result, a large amount of extracted sediments are produced, and the material is widely disposed of at open seas or landfills. Legal and environmental regulations constrain traditional sediment disposal methods due to their potential contaminant pathways, lack of long-term stability, and limited space capacity. Finding new disposal routes for sediments becomes a challenge. Implementing beneficial uses for dredged material represents a proper way to eliminate sea dumping and embodies adequate disposal, reducing the extraction of raw materials. Around the world, several beneficial uses of sediments have been implemented. Productive and positive uses of dredged material include incorporation in construction, agriculture, land reclamation and habitat restoration, among others.

The recycling of dredged sediments depends on their composition. The material typically contains nutrients, metals and organic compounds, according to the discharges to water bodies since sediments are the final sink of discharged compounds. Sediments with a high organic matter content and nutrients and low pollution concentrations are feasible for soil conditioning purposes. Nutrients are essential for life, and elements such as phosphorous receive high importance since the element is limited on Earth. Additionally, phosphate mines are only located in a few parts of the world, potentially causing shortages due to geopolitics. Hence, investigating new sustainable sources of nutrients is required, and dredged sediments could be employed as an option. This study aims to present dredged material as a plant-growing substrate to cultivate lettuce (*L. Sativa*), tested under greenhouse conditions. Moreover, another objective was to assess the risk of metal pollution related to vegetable consumption. The case study is in Kalmar, southeast of Sweden. The dredged material comes from Malmfjärden bay. The water body is currently shallow, and its biodiversity is threatened by eutrophication and continuing siltation. Therefore, a dredging project was initiated to recover the bay.

Sediments from the dewatering system of the project were extracted to be employed in the greenhouse experiment. The material presented high content of nutrients and organic matter and medium-low content of metals. The sediments were mixed with compost to improve the physical conditions since they were mainly clay and silt (90%). The selected substrates were (1) 100% compost and (2) 50% sediments - 50% compost. The seeds were pre-germinated and transplanted into pots. The experiment was carried out for 3 months in stable conditions. The obtained lettuces

(leaves and roots) were analysed to measure their metal content. The results showed that the plants grew in both substrates, and the harvested lettuce had leaves of a medium length. The metal contents in the vegetables were below critical levels detrimental to human health. The study concluded that the sediments were a potential source of nutrients, using the material as a plant-growing substrate. However, mixing with other organic materials (like compost) is recommended to improve the physical properties of sediments and improve their nutrient distribution and availability.