



## **Biochar application for the decontamination of dredged sediment: an integrated chemical characterization and ecotoxicological assessment using microcosms**

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The remediation of contaminated aquatic environments represents a crucial challenge for achieving sustainable development goals and for protecting ecosystem health including biodiversity, and, within a *One Health* perspective, human health as well. In this context, sediment dredging is a key intervention for contaminant removal, but it requires the adoption of innovative, low-impact strategies capable of ensuring long-lasting benefits.

Biochar is a carbon-rich material, obtained from the pyrolysis of biomass, characterized by high economic value and wide applicability. Its applications are diverse: in agriculture, it contributes to carbon sequestration mechanisms; in engineering, it can be used as an additive in concrete formulations for structures in aquatic environments. Moreover, its effectiveness as an adsorbent material in aqueous and gaseous matrices is widely recognized. These properties are mainly due to its highly porous structure, which provides biochar with a high adsorption capacity for organic and inorganic contaminants.

This study explores the application of biochar as a natural material for the remediation of contaminated dredged sediment. Remediation interventions contribute to improving the quality of environmental matrices and mitigating the toxic effects associated with contaminants, with positive implications for ecosystem functionality. Reducing the mobility and bioavailability of contaminants limits their transfer along trophic chains and within aquatic systems, thereby lowering exposure risks for human populations.

The experimental design was based on the establishment of microcosms of contaminated marine sediments, aimed at evaluating the effectiveness of biochar in the remediation of PAHs, organotin compounds, and metals. This approach involved chemical characterization integrated with ecotoxicological tests (solid-phase bioassay using *Aliivibrio fischeri*), with the aim of monitoring biological responses and the potential reduction in toxicity. However, no significant effects were observed, since the increase in sediment toxicity was uniform over time and independent of the treatment applied.