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Contribution of Seaweed farming to mitigating current marine environmental issues

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Oceans and marine ecosystems serve as critical components for the global carbon cycle, yet their sequestration capacity is increasingly threatened by multiple, interlinked anthropogenic stressors. Microplastic pollution for instance is now pervasive across blue-carbon ecosystems, including mangroves, salt marshes and seagrass systems, influencing sediment characteristics, biological activity and reducing carbon-storage efficiency. Such disruptions act alongside climate-driven stressors, particularly ocean acidification and warming, further diminishing ecosystem productivity and resilience. At the same time, nature-based and engineered approaches using seaweed cultivation (e.g. in Indonesia) are gaining attention for their potential to enhance oceanic carbon uptake. Seaweeds exhibit rapid CO_2 assimilation, nutrient removal capacity, and high-value biomass production. Life-cycle assessments stress the need for robust monitoring and verification frameworks to ensure that seaweed-based systems deliver genuine net carbon benefits. Integrating insights across these strands of research, this review underscores the need for ecosystem-based management linking blue-carbon conservation, microplastic reduction with respect to the chances responsible seaweed cultivation poses in sustaining ocean carbon-sequestration capacity under accelerating climate change.

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