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TITLE: Barriers and Bridges in Abating Coastal Eutrophication

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ABSTRACT:

Over the past 30 years concerted campaigns have been undertaken to reverse nutrient-driven eutrophication in coastal waters in Europe, North America, Asia and Australia. Typically, eutrophication abatement has proven a more recalcitrant challenge than anticipated, with ecosystem improvements only recently beginning to emerge or falling short of goals. Reduction in nutrient loads has come mainly from advanced treatment of wastewaters and has lagged targets set for diffuse agricultural sources. Synthesis of the major campaigns?varying in terms of physical settings, ecosystem characteristics, nutrient sources, socio-economic drivers, and governance?identified barriers inhibiting eutrophication abatement and potential bridges to overcome them. Actionable science can be advanced by: application of the well-established and emerging knowledge and experience around the globe, client-responsive strategic research, and timely and conclusive adjudication of scientific controversies. More accountable governance requires: enduring engagement of high-level officials of the responsible governments; effective communication of the causes, risks and benefits to the public and stakeholders; quantitative and accountable allocation of responsibility for nutrient load reductions; and binding requirements, as opposed to simply voluntary actions. Effective reduction in nutrient loads requires: reduction strategies for both nitrogen and phosphorus; inclusion of actions that reduce atmospheric emissions of nitrogen in addition to direct inputs to waterways; efficacious regulations; public subsidies based on performance; limitations on biofuel production that increases nutrient loads; and enhancing the sinks and losses for legacy nutrients retained in soils and groundwater. Outcomes must be measured and strategies appropriately adjusted through: sustained monitoring of essential indicators and processes, the use of multiple models, truly adaptive management, and the precautionary interventions within the coastal ecosystem. The changing climate must be taken into account by reassessing achievable future conditions and seeking alternatives for mitigating and adapting to climate change that also reduce nutrient loads.

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