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TITLE: Exploring variability in environmental impact risk from human activities across aquatic ecosystems

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ABSTRACT:

Aquatic ecosystems are under severe pressure. Human activities introduce an array of pressures that impact ecosystems and their components. In this study we focus on the aquatic domains of fresh, coastal and marine waters, including rivers, lakes and riparian habitats to transitional, coastal as well as shelf and oceanic habitats. In an environmental risk assessment approach, we identified impact chains that link 45 human activities through 31 pressures to 82 ecosystem components. In this linkage framework >22,000 activity-pressure-ecosystem component interactions were found across seven European case studies. We identified the environmental impact risk posed by each impact chain by first categorically weighting the interactions according to five criteria: spatial extent, dispersal potential, frequency of interaction, persistence of pressure and severity of the interaction, where extent, dispersal, frequency and persistence account for the exposure to risk (spatial and temporal), and the severity accounts for the consequence of the risk. After assigning a numerical score to each risk criterion, we came up with an overall environmental impact risk score for each impact chain. This risk score was analysed in terms of (1) the activities and pressures that introduce the greatest risk to European aquatic domains, and (2) the aquatic ecosystem components and realms that are at greatest risk from human activities. Activities related to energy production were relevant across the aquatic domains. Fishing was highly relevant in marine and environmental engineering in fresh waters. Chemical and physical pressures introduced the greatest risk to the aquatic realms. Ecosystem components that can be seen as ecotones between different ecosystems had high impact risk. We show how this information can be used in informing management on trade-offs in freshwater, coastal and marine resource use and aid decision-making.

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