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Vulnerability and Importance of Arctic Wetlands as large-scale nature-based solutions for Sustainability in a Changing Climate

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Wetlands as large-scale nature-based solutions (NBS) provide multiple ecosystem services of local, regional, and global importance. Knowledge concerning location and vulnerability of wetlands, specifically in the Arctic, is vital to understand and assess the current status and future potential changes in the Arctic. Using available high-resolution wetland databases together with datasets on soil wetness and soil types, we created the first high-resolution map with full coverage of Arctic wetlands. Arctic wetlands' vulnerability is assessed for the years 2050, 2075, and 2100 by utilizing datasets of permafrost extent and projected mean annual average temperature from HadGEM2-ES climate model outputs for three change scenarios (RCP2.6, 4.5, and 8.5). With approximately 25% of Arctic landmass covered with wetlands and 99% being in permafrost areas, Arctic wetlands are highly vulnerable to changes in all scenarios, apart from RCP2.6 where wetlands remain largely stable. Climate change threatens Arctic wetlands and can impact wetland functions and services. These changes can adversely affect the multiple services this sort of NBS can provide in terms of great social, economic, and environmental benefits to human beings. Consequently, negative changes in Arctic wetland ecosystems can escalate land-use conflicts resulting from natural capital exploitation when new areas become more accessible for use. Limiting changes to Arctic wetlands can help maintain their ecosystem services and limit societal challenges arising from thawing permafrost wetlands, especially for indigenous populations dependent on their ecosystem services. This study highlights areas subject to changes and provides useful information to better plan for a sustainable and social-ecological resilient Arctic.

Keywords: Arctic wetlands, permafrost thaw, regime shift vulnerability, climate projection