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Opportunistic climate adaptation and public support for sand extraction in Greenland

Climate change leads to the deposition of substantial amounts of sediment along the coasts of Kalaallit Nunaat (Greenland) amid rapidly growing global demand for these resources. Yet, little is known about what the predominantly Inuit population of Kalaallit Nunaat thinks about adaptation opportunities arising from the melt of the Greenland Ice Sheet. Here we conduct a nationally representative survey (N = 939) of Kalaallit (Greenlanders') views on glacially derived sand extraction, finding that large majorities support extracting and exporting sand but oppose foreign involvement. This pattern of support persists at both the national and subnational levels. Public preferences largely align with Kalaallit Nunaat's current mineral policy mandating environmental and economic impact assessments of new resource opportunities. In addition, those aware of human-caused climate change have significantly higher odds of both supporting sand extraction and prioritizing environmental impact assessment. Our results reveal broad support for domestically involved, environmentally assessed and economically appraised opportunistic adaptation to Greenland's melting ice sheet and accumulating sand resources.

Forfatter: Mette Bendixen ; Rasmus Leander Nielsen; Jane Lund Plesner ; Kelton Minor **Type:** Article | Artikel **Årstal:** 2022 **Emner:** Greenland; Survey; Sand; Climate **Titel på tidsskrift:** Nature Sustainability **Udgiver:** Springer Nature **Udgivelsesland:** USA **DOI nummer:** 10.1038/s41893-022-00922-8

Åben publikation

Communication | Formidling > Report | Rapport

Climate mitigation and food production with glacial rock flour - A case for Danish agriculture

One potential climate mitigation solution could be to spread the fine (46 µm) glacial rock flour from Greenland on agricultural fields to enhance its weathering rate with resulting CO2-uptake from the production of alkalinity. The net climate mitigation potential of this process will depend on the weathering rate, but also the embedded greenhouse gas emissions of its lifecycle. This thesis aims to estimate the net greenhouse gas balance of application with glacial rock flour on agricultural fields in Denmark. The CO2-uptake from weathering of glacial rock flour in soil was estimated from the release rates of cations in a pot experiment with perennial ryegrass (Lolium Perenne) in Denmark. There was no significant difference in cation release rates across application rates of 10, 20, 30, 40 and 50 t ha-1 of glacial rock flour, resulting in an uptake of 5.31 kg CO2 t-1 after 8.5 months across all five treatments. The effect on plant growth by the end of the experiment was non-significant but could potentially be due to temperature limitation. The greenhouse gas emissions from the lifecycle of glacial rock flour was estimated for a hypothetical "cradle-to-field" lifecycle using secondary emission data on CO2, and when possible also CH4 and N2O, for activities which are expected to be the closest proxies. It was estimated that the most "climate-optimal" lifecycle emits 26.32 kg CO2e t- 1 or 39.32 kg CO2e t-1 for glacial rock flour extracted on-land or in-water, respectively. The lifecycle greenhouse gas emissions are therefore not balanced by CO2-uptake from weathering after 8.5 months in Denmark, but it is expected that glacial rock flour eventually will lead to a net CO2-uptake of around 215 kg CO2e t-1 and 200 kg CO2e t-1 for land-based and water-based glacial rock flour, respectively, based on its geochemical composition. There is need for more long-term experiments to estimate the continued weathering rate and thereby evaluate the role of glacial rock flour in climate mitigation in this century.

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