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Eco-development response to climate change and the isostatic uplift of southwestern Finland: Case study of the Nordsund area

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Remediation of climate change induced by anthropogenic emissions of greenhouse gasses and its precursors is the main focus today. However, less known is that the environment may also be subjected to relatively fast geological dynamical phenomena such as the isostatic uplift of Fennoscandia, parts of Canada and northwestern Russia. This uplift affects the archipelago along the coast of southwestern Finland and Sweden and causes the relocation of human activities.

In this study we investigate the on-ground observed regression of the Gulf of Bothnia on the coasts of southwestern Finland and its implications on the country-side activities in the framework of the eco-development paradigm. We focus our study on the neighbourhood of the Nordsund peninsula (60°40'30"N, 21°37'14"E) between Keikvesi and Katavakarinselkä, representative for the whole Finnish archipelago with an average local isostatic uplift of 9 mm per year (5 mm in the South and 14 mm in the Merenkurkku area. The Nordsund peninsula contains a former bay of the Bothnia Sea, called Mustalahti, which is reduced to a lake since the direct way out of inner land precipitation to the open sea disappeared in the 1980s. We show that remotely sensed data on vegetation and surface wetness confirms this fast sea regression and the silting-up of the nearby lakes that drain precipitation to the Gulf. The changing of the Mustalahti over time and its vegetation is expressed in terms of Normalized Difference Vegetation Index (NDVI) and the Normalized Difference Wetness Index (NDWI), derived from Landsat 7 data for May, 12 th 2000 and for Landsat 8 for April, 23 rd 2019 characterized by a 30 m x 30 m pixel resolution. We discuss this changing coastline in the framework of the Eco-Development paradigm which may rebalance nature, environment, humans and culture. This paradigm is a valid alternative against the past and present-day socio-economical dominant approach that contributed to the accelerated change of the Earth's climate.