



Holocene carbon storage and historical carbon emission in The Netherlands

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A large part of the shallow subsurface in the western Netherlands consists of Holocene fluvial and coastal deposits, which are rich in organic matter. On longer time scales, such as the Holocene, these deposits form a more or less permanent carbon sink. Even though carbon accumulation rates in these environments are generally low, over large areas and long time spans they can yield a sink that is large (globally) and permanent, making them potentially important fixates of carbon. However, the magnitude of this terrestrial carbon sink is so-far not well known, due to the high variability of the amount of carbon in sediments and soils.

The Netherlands are a very suitable location to quantify carbon storage, as thick Holocene deposits are present and extensive earlier works provide a framework of sediment budgets, 3D subsurface models, and palaeo-geographic studies. This study exploits these results to calculate total carbon storage in the coastal and deltaic deposits of the Netherlands and the rates in which this accumulated. This helps to evaluate the preservation and conditions of carbon storage in coastal and estuarine environments over longer time scales, and identifies large-scale spatial patterns of permanent terrestrial carbon storage.

The carbon storage in the shallow subsurface has been directly impacted by past and present land use. Former peat bogs and marshes in the Netherlands have undergone large scale pumping, dewatering and excavation since the 1100's AD. As a result, an unknown amount of carbon was released to the atmosphere. This study also quantifies the historic (pre-industrial) carbon emission from the shallow subsurface due to embankment, pumping and excavation. Eventually, this will improve our understanding of the impact of longer term land use in coastal areas on carbon emission and provides a reference for future interventions in the landscape. Once the potential of natural sedimentary basins and landscapes as carbon storage component is known and recognised, this can be taken into account in future spatial planning.