Effective Use of Dredged Soil as a Base Material for Tidal Flats for Carbon Storage

(Study period: FY 2022-FY 2024)

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Keywords: Dredged soil, Artificial tidal flats, Carbon storage, Total organic carbon, Ignition loss

1. Introduction

The fixing of carbon in marine ecosystems in the ocean such as seaweed and algae is gaining attention as a means of absorbing greenhouse gases. Coastal areas are also considered locations for the storage of organic carbon since organic matter derived from phytoplankton production within coastal areas accumulates in the bottom mud. However, it is difficult to regard port areas as organic carbon storage sites because of the fact that dredging is regularly carried out in sea channels and anchorages within these areas to ensure the maintenance of port functions, making them unstable in terms of carbon fixing. Thus, it is believed that carbon could be stored by stably sealing off organic carbon as base material for tidal flats and seaweed beds.

Whether dredged sediment can be used effectively for carbon storage depends heavily on the residual trapped organic carbon rate. This study estimates the residual organic carbon rate in dredged sediment when using dredged sediment as the base material for the creation of tidal flats.

2. Study Methods

At the Hannan 2-ku tidal flats, which were completed 17 years ago, dredged soil was used as the base for the tidal flat foundation, and the residual organic carbon rate was then examined. The thickness of the sand cap layer on top of the dredged soil layer is about 50 cm.

Vertical samples were collected at two locations. A geo-slicer was used to collect the vertical samples, collecting a core of about 2 m. The vertical sample was then sliced at 10 cm intervals, and the samples were then analyzed in terms of the grain size composition, water content, soil particle density, ignition loss and total organic carbon.

3. Results

The obtained vertical sample consisted of an upper sand cap layer and a lower dredged sediment layer, and the sand cap layer had a median grain size distribution of 300-500 μm to a depth of 105 cm, and the dredged sediment layer had a grain size distribution of 9 μm from a depth of 145 cm. The ignition loss, indicating the amount of organic matter, was almost uniformly 7% in the dredged sediment layer (Fig. 1). The residual organic carbon rate was obtained from the difference between this ignition loss and the ignition loss during dredging, and the average residual organic carbon rate at the two sites was 82%. This showed that carbon could be effectively stored by using dredged soil as a base material for artificial tidal flats.

4. Future Study Issues

The quantification of residual organic carbon rates for various uses of dredged soil (seaweed beds, borrow pit,

landfill) remains an issue.

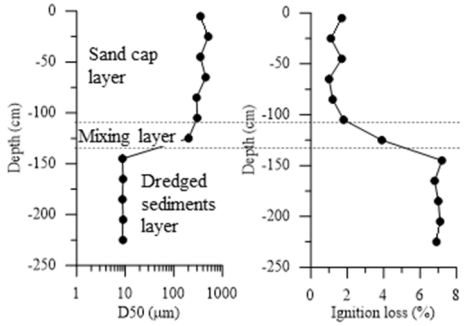

Fig. 1 Vertical Distribution of Median Particle Size and Ignition loss

☞ See here for more details

1) NILIM Materials, No.1242, pp.1-14
https://www.nilim.go.jp/lab/bcg/siryou/tnn/tnn1242.htm