Green Inland Ports

Good Practices

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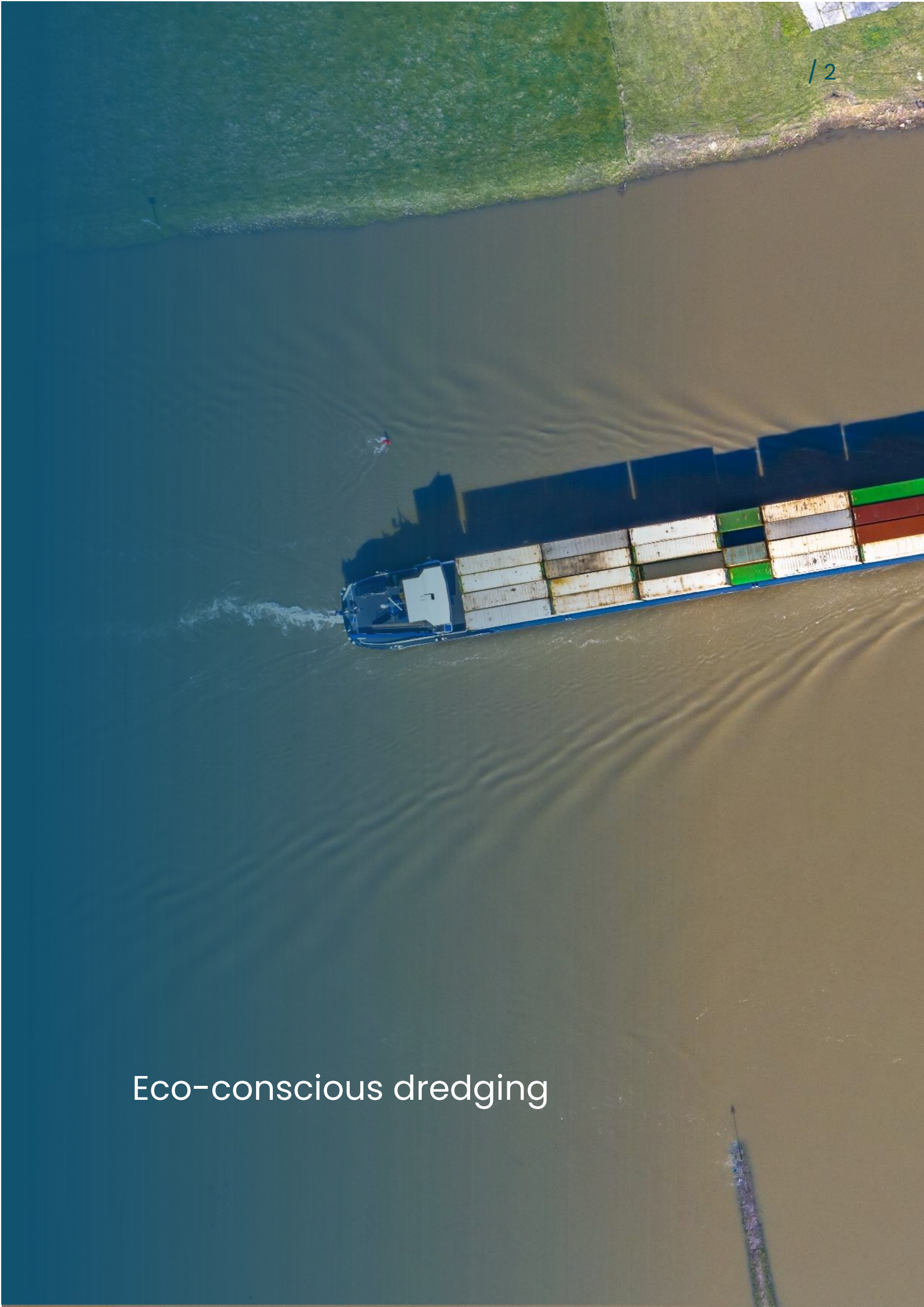

Eco-conscious dredging

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1.1 Description

Dredging takes place as part of construction work for new infrastructure, creation/maintenance of safe navigation channels or for environmental purposes. The traditional way of dredging may result in negative effects on the environment, such as (Natural Scotland & SEPA, n.d., Environment Agency, 2021):

- Destruction or altercation of habitat, such as fish spawning grounds and habitats formed on rock formations or substrate (vertebrates), can lead to a reduction in biodiversity within ecosystems.
- The natural balance of a river may change, leading to increased erosion, making riverbanks unstable. This can cause problems for land management and infrastructure that could last for decades.
- Dredging that prevents flood risk at one location could allow water to move downstream faster, leading to higher flood risk elsewhere.

However, there are also alternative approaches to consider the impact on the environment. There are five main ways how dredging activities can become more eco-conscious (Rijks, D., 2023):

- Port designs can be implemented to benefit the environment. For example, creating riverbanks where birds can nest, using diverse herbs instead of regular grass, and incorporating artificial reefs that serve as resting places for fish while reducing the need for dredging.
- Use of more eco-friendly equipment. Dredging work can be executed by vessels, trucks and other machinery which have a lower carbon footprint. This includes employing vessels, trucks, and other machinery powered by hydrogen or electricity
- Origin of the materials. The goal is to re-use as much as possible. This can be within the same project, but also from other projects, ideally in the vicinity.
- Alternative water maintenance techniques involve regular treatment in order to stop re-solidification of fluid mud at the bottom of port waters.
- Take the social impact into account by involving as many relevant (local) parties as possible. When this happens in the planning stage, it prevents further obstacles in the future. It is important that dredging and modification of port infrastructure fits within the environmental plans.

An interesting example is the development of the overnight stay port at Spijk in the Netherlands as inland skippers were lacking a place to rest on a busy river between Tiel and the German border. Within the project, an electric dredging machine has been used. This has multiple benefits, as a traditional dredging machine is powered by diesel engines and needs 200 to 300 m^3 gasoil, which needs to be supplied by ships or trucks. Electric dredging machines only need a cable, and electricity

is much more sustainable than gasoil. Electric dredging machines are also much more silent than their diesel counterpart, which has a positive effect on the environment, personnel and inhabitants/recreationists (Rijkswaterstaat, 2022).

A share of the port authorities in Europe are already using eco-conscious dredging. Such as, only carrying out dredging work that is necessary for the safety of shipping and making sure that historical contamination of removed dredged material is removed when dredging. Thisguarantees a better ecological quality of water and ground andsoil. Some countries have legal requirements with which dredging activities have to comply. For example the Netherlands, Belgium and Germany have specific rules and regulations with regard to dredging. New dredging techniques may also be incorporated, such as water injection dredging and improvement in the management of sediments, which falls partly under the good practice “re-use of sediments” as well.

1.2 The aim of eco-conscious dredging

First of all, the goal is to reduce the environmental impact. This can be realised by executing all activities in the most sustainable way possible, which includes using sustainable equipment, but also a sustainable way of handling dredged sediments. The second goal is to make sure that all activities and results serve more purposes than one in favour of the (social) environment. This is primarily relevant for design. For example, artificial reefs can limit the need for dredging activities but can also serve as a resting place for fish. Dredged materials can be used in other projects or can be used in a way to stimulate biodiversity (islands where birds can breed, specified in good practice ‘re-use of dredged materials’).

1.3 Ports that apply eco-consious dredging

- Niedersachsen Ports
- Port Spijk (overnight stay port)
- Compagnie Nationale du Rhône (Port of Lyon)
- Port of Stuttgart
- HAROPA Port
- Port of Rotterdam
- DeltaPort (Wessel)
- Port of Mannheim
- Port of Seville

1.4 Stakeholders

- Port authority: The port authority is responsible for the quality of the port infrastructure. This means that they are also responsible for the way dredging is being executed within the port. The degree of sustainability that is possible within a dredging project depends heavily on the budget that is available.
- Dredging company: The possibilities of how sustainable a dredging project can be executed depends on the equipment that a dredging company has (are electric or hydrogen alternatives available?) and the experience they have with sustainable designs of port infrastructure projects.

- Governmental parties: When a project is not directly connected to an (inland) port, a project needs to be initiated and financed by a governmental party. This was also the case of the overnight port at Spijk. There were insufficient overnight accommodations at this busy stretch of river, so an overnight stay port has been developed by Rijkswaterstaat (Dutch executive agency of the ministry of Infrastructure and water management) more information can be found at Construction of overnight stay port Spijk.

1.5 Voluntary or mandatory

Partly voluntary, partly mandatory. According to Mink, F. et al., (2017), conventions no longer play a role within fresh water dredging, but the Waste Framework Directive (classification and procedures of dredging materials), Habitats/Birds Directive (conservation of natural habitats and wildlife), and Water Framework Directive (aiming for good ecological and chemical status in all water bodies) apply.

The main impact results from the Landfill Directive. However, the extent of this impact varies significantly based on how each member state incorporates the legislation into national law, which can include diverse requirements and specific rules for dredging operations. When looking more closely to the project, the client that initiated the dredging project plays a large part. The client can be a private party or a governmental party. If a governmental party has the ecological situation in order and pollution barely plays a role, the would be able to focus more of their budget on a reduction of emissions of the project. If the client does not have the situation in order, it is likely that a larger share of the budget must be spent on implementing ecological values within the design and even on mitigating pollution.

1.6 Realised/potential impact

The frequency of dredging differs a lot for each port and depends on sediment suspension rate which is affected by the speed of the river. Estimates are that rivers need to be dredged out once every 7 to 15 years (Waternet, n.d.). The low frequency of dredging activities means that the impact would be relatively limited. The impact depends largely on the type of project and the budget. If there is a lot of time and budget and unpolluted dredging materials that can be re-used, the emissions within the dredging operations can be reduced significantly by implementing machinery that run on electricity/hydrogen/biodiesel .

1.7 Possible obstacles

- The type of client and their budget play an important role within the process of making dredging less harmful. Eco-conscious dredging comes with higher costs, and it depends on the grade of eco-consciousness how high the additional costs will be.
- Sufficient electricity capacity is necessary to make use of sustainable (electric) equipment.
- Also, the type of sediments/dredging materials is important. If materials are contaminated more time and effort needs to be put in clean up (polluter pays, but finding the polluter is not always easy).

- The type of project and waterway also make a difference. For example, when dredged materials cannot be re-used within the same project or within projects in the vicinity, the options of circularity become very limited. When the ecological/environmental circumstances are already poor, more budget needs to be allocated to the project design, leaving less available for emission reduction effort.
- Inland ports do not want to be closed, as this leads to lower income. Designing the dredging process to minimize hinder for vessels will lead to a longer and more expensive dredging process.
- It is not always common to look further than the port area. River basin management can work more efficiently than separate jurisdictions where responsibilities have been split up, as chances and opportunities become much more limited in a smaller area (Rijks, D., 2023).
- It is important to take a look at turbidity after dredging. Marine species are accustomed to variability in turbidity, but a significant increase in turbidity can disrupt the natural environment and hinder growth of flora and fauna (IADC Dredging, 2017). This is why "De Vlaamse Waterweg NV" mentions that monitoring of turbidity should be part of dredging activities.
- Inland ports have indicated that eco-conscious dredging is seen as relatively difficult. However, many ports that have not yet put it in practise consider it as an interesting option.

1.8 Key learnings

- There is not one solution for everything, and choices need to be made. To make a large impact, a wider view than just the borders of the port area is needed. This differs per country, as some countries work more with jurisdictions than others and oftentimes inland ports will not look further than their own borders. River Basin Management plans are important.
- The type of client and their budget are important within the possibilities of eco-conscious dredging. The higher the sustainability requirements, the greater the cost. However, if the ecological or environmental conditions are already well-developed, more budget can be allocated to reducing emissions during the dredging process.
- Eco-conscious dredging is a broad topic, as it concerns ecological standards within the design and sustainable machinery and everything in between.
- Compliance to the NOx emission legislation is necessary. To reduce NOx emissions, lower combustion temperatures are needed, which means that through additional equipment and increases exhaust back-pressure lead to 10% higher fuel consumption when emissions need to comply with Tier II (Wasim, J. & Nine, A. K. M., 2017)..

1.9 Sources

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