

# Project Description

## Electrification of TB105: Feasibility Study for Zero-Emission Port Logistics in Vlissingen

### Current Situation and Challenge

The Vlissingse Bootliedenwacht (VLB) currently uses pontoon vessel TB105 for daily port operations in the Port of Vlissingen, including mooring assistance, delivery of provisions and spare parts, and other essential maritime support services. At present, TB105 is powered by a conventional diesel-driven push boat, resulting in significant CO<sub>2</sub>, NOx, and particulate emissions within the port area.

Reducing emissions from maritime operations is becoming increasingly urgent, particularly in coastal and port regions where environmental impact is most concentrated. The Port of Vlissingen is located near sensitive Natura 2000 areas, where nitrogen deposition remains a major challenge. Electrification of port vessels offers a promising pathway toward emission reduction, but also introduces substantial technical, logistical, and financial challenges.

TB105 presents a unique case: it operates 24/7 and performs short, frequent missions with limited downtime. While this operational profile makes the vessel particularly relevant for electrification, it also creates complex requirements for battery capacity, charging windows, and operational reliability.

### Project Objective

The objective of this project is to determine whether it is technically, operationally, and financially feasible to convert TB105 into a fully battery-electric vessel and enable zero-emission port services in Vlissingen.

This feasibility study will provide a robust foundation for a go/no-go decision regarding the vessel's electrification and the development of the required charging infrastructure. The project specifically investigates three core dimensions:

- **Technical feasibility**

Assessment of electric propulsion options, battery configurations (fixed or swappable), onboard safety systems, energy consumption, and required motor power.

- **Operational and logistical feasibility**

Evaluation of charging concepts, charging locations, charging windows, and the availability of sufficient grid capacity within the port.

- **Financial feasibility**

Analysis of investment requirements, operational costs, return potential, and overall business case viability.

## Project Approach

The feasibility study is carried out by a consortium of complementary partners, each contributing specialized expertise.

- **Vlissingse Bootliedenwacht (VLB)** provides operational data, vessel usage profiles, and practical insights from daily port operations.
- **Marine Development Holland (MDH)** leads technical design, engineering studies, and certification preparation for the electric vessel configuration.
- **North Sea Port** investigates charging infrastructure requirements, spatial integration, and grid capacity within the port environment.
- **Scalda** supports research validation and knowledge development through applied research and student involvement.
- **Zeeland Connect** ensures knowledge sharing, stakeholder engagement, and regional embedding within broader zero-emission logistics initiatives.

The project combines practical operational data with technical modeling and infrastructure analysis to create an integrated assessment of feasibility.

## Innovation

The innovative nature of this project lies not only in electrifying a single vessel, but in developing an integrated ecosystem approach to zero-emission port logistics.

The project combines:

- **Product innovation** through the development of an electric vessel configuration
- **Process innovation** through smart charging and energy management in a congested grid environment
- **Service innovation** through the creation of a scalable operational model for emission-free port services

While electric inland shipping solutions exist elsewhere in the Netherlands, the TB105 case is highly distinctive due to its intensive 24/7 operational profile, short and frequent sailing movements, and the specific infrastructure constraints of the Port of Vlissingen.

This makes the project a pioneering case for Zeeland and a highly relevant testbed for future electrification of workboats, tugboats, and other port-related maritime assets.

## Expected Impact

The project aims to generate actionable insights that support the transition toward zero-emission maritime logistics in Zeeland and beyond.

Expected impact includes:

- Reduction of CO<sub>2</sub>, NO<sub>x</sub>, particulate emissions, and noise pollution
- Improved air quality and reduced environmental pressure on nearby Natura 2000 areas
- Creation of strategic knowledge for future vessel electrification projects
- Acceleration of sustainable innovation within the regional maritime sector
- Development of scalable charging infrastructure for broader port electrification

For North Sea Port, this project aligns directly with the ambition to accelerate port decarbonization and facilitate sustainable logistics infrastructure. The knowledge generated will extend beyond TB105 and help create a blueprint for wider electrification of port operations.

This feasibility study therefore represents a critical first step toward making zero-emission port logistics technically viable, operationally reliable, and economically scalable.