Analysis of new vessel concepts

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Advanced, Efficient and Green Intermodal Systems

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Summary

In this report the requirements for new and advanced vessel designs as well as a whole series of existing advanced concepts are investigated.

Requirements for the vessel design arise from different backgrounds, which are found to be:

- General and regulatory requirements, e.g. the strategic goals of the EU whitepaper on transportation, the IMO greenhouse gas strategy, or national regulations of Norway
- Requirements defined in the AEGIS proposal, i.e. a green propulsion system, autonomous operation, an on-board handling system, a use-case specific design, a cargo type specific design, and the fit to economic, environmental, and social KPI's
- Requirements to achieve the use-case specific scenarios

A comprehensive literature survey reveals the current progress in advanced vessel designs. This analysis is divided into:

- Short sea ships, i.e. mother ships
- Shuttles/barges/inland waterway (IWW) ships, i.e. daughter ships
- On-board handling systems
- Green propulsion concepts
- Autonomous operation

From the literature analysis it can be concluded that none of the found vessel concepts fits the requirements to full extent. Hence, new designs need to be developed in the next steps of WP 4.

Possible concepts are considered in regard to use-case specific scenarios:

In UC-A a mother/daughter concept with LoLo transportation is analysed. Different vessel concepts as well es different modes of transhipment are discussed, i.e. ship-to-port, ship-to-floating port, and ship-to-ship. By retrofitting existing short sea ships (mother vessel), e.g. vessels of the type *Sietas Typ 168* as used by NCL, in terms of low-emission propulsion and autonomous cargo handling, short-termed solutions can be achieved. For the daughter vessel a new design is necessary to realize a zero-emission propulsion, autonomous operation, and a small size of 20–60 (max. 100) TEU.

For UC-B an IWW transportation of RoRo units is defined. Small shuttles or barges, either self-propelled or unpropelled in convoys with push boats or puller will be used. The vessel size is set to fit water ways of the CEMT Class I and II, enabling the service in smaller hinterland ports or urban city ports. A high degree of autonomy is favourable to reduce the cost, hence, making the small vessels profitable, and to increase safety and security.

For UC-C, especially for the port of Vordingborg, a high degree of autonomous cargo handling at the port and on-board the vessel, together with a sea- and inland-waterway-going "hybrid" vessel are defined. Thus, enabling a competitive waterborne transportation and overcome the limitations of a small port such as Vordingborg (e.g. operational hours). The advanced vessel needs to provide an autonomous on-board handling system, autonomous sailing (including docking and mooring), and a green propulsion system. Green electricity, supplied by the port of Vordingborg, and methanol, produced at the port area, are the favourable solutions.