NOVIMAR
VESSELTRAIN

Sector experts reflections on the Vessel Train concept: invitation for a stakeholder meeting

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The Vessel Train (VT) concept has been developed and applied to three different cases. For these three cases we would appreciate an external view and reflection from sector specialist.

Because the VT concept is linked to different actors in the hinterland supply chains, we will be organizing two separate stakeholder meetings. The first one is dedicated to shippers (cargo owners) and the second one is dedicated to the operators (barge owners, terminal operators and ports (authorities)).

In these meetings we (the project partners) will present our main findings of the project with a special focus on economic viability. During these meetings, we want to learn from your insights and opinions about the results that we have obtained, and see if and how these developments could be implemented.

This document is intended to provide all participants with a common starting point.
Please follow this link to register for the meeting: www.novimar.eu/meet-up

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1. BACKGROUND AND PROBLEM STATEMENT

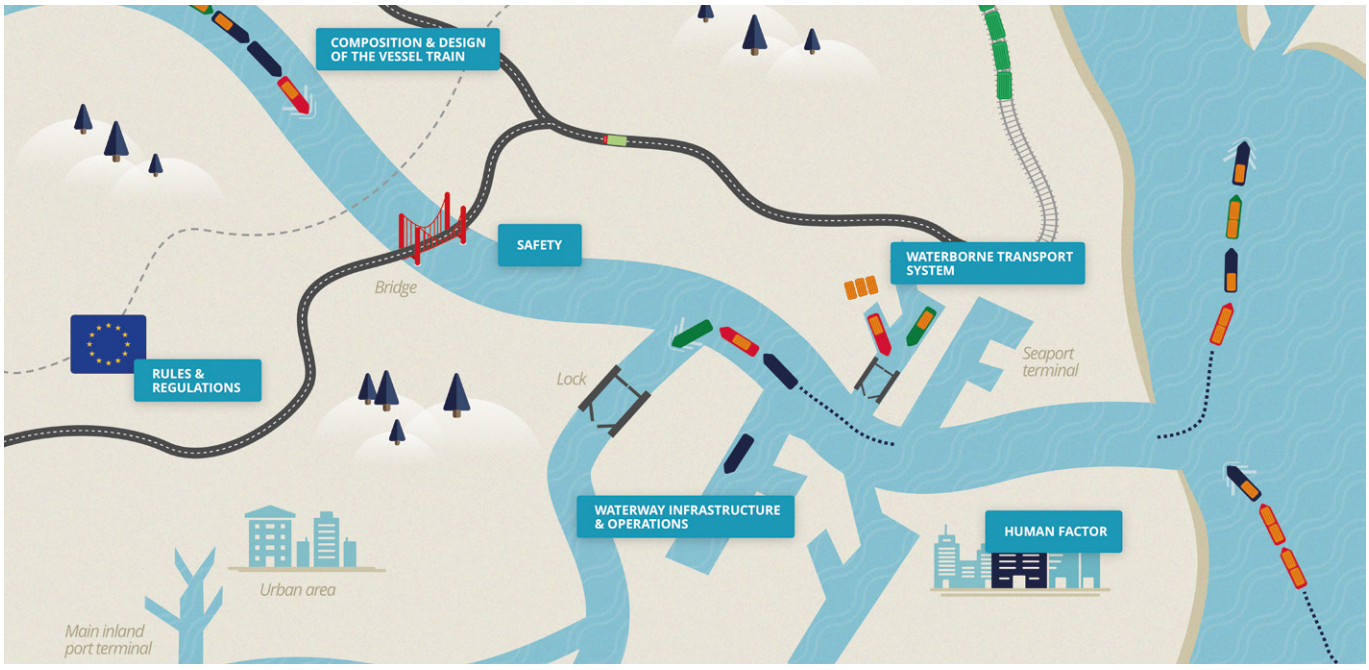
The European Commission has defined some key challenge to waterborne transportation. These challenges can be summarized as: expending the waterborne transport chain from sea to river/canal and up to the urban environment. And optimizing the waterborne transport by introducing automation, for example remotely controlled/autonomous vessels and docking systems. Next to that, an additional challenge that can be added to this list is the lack of available crew for inland vessels, especially in the Rhine region. This makes that vessels which could be operated with less crew are of great interest. In order to overcome these challenges the Vessel Train concept has been developed.

2. THE NOVIMAR VESSEL TRAIN CONCEPT

The Vessel Train (VT) concept basically consists of one crewed leader vessel. This leader vessel will be followed by a number of lowly manned follower vessels from different class sizes. The follower vessels keep their own propulsion systems but will be led by the crewed leader vessel. This enables individual vessels to sail with less personnel.

The reduction of labor costs by sailing with lowly manned vessels will strengthen the overall competitiveness of the sector and, more specifically, improve the economic potential for smaller vessels. The concept of platooning incorporates the idea of short sea and inland waterways chain integration, through the development of innovative concepts for vessels and cargo handling, adding even further to the foreseen logistical flexibility. The full scope of the project can be seen in the figure below (for a short introduction see also: https://novimar.eu/animation).

This short note will provide more detail about the different developments made in the project and the application of these developments in 3 different business case: 2 IWT cases (Rhine and Danube) and a short sea case.



3. PROJECT INNOVATION DEVELOPMENTS

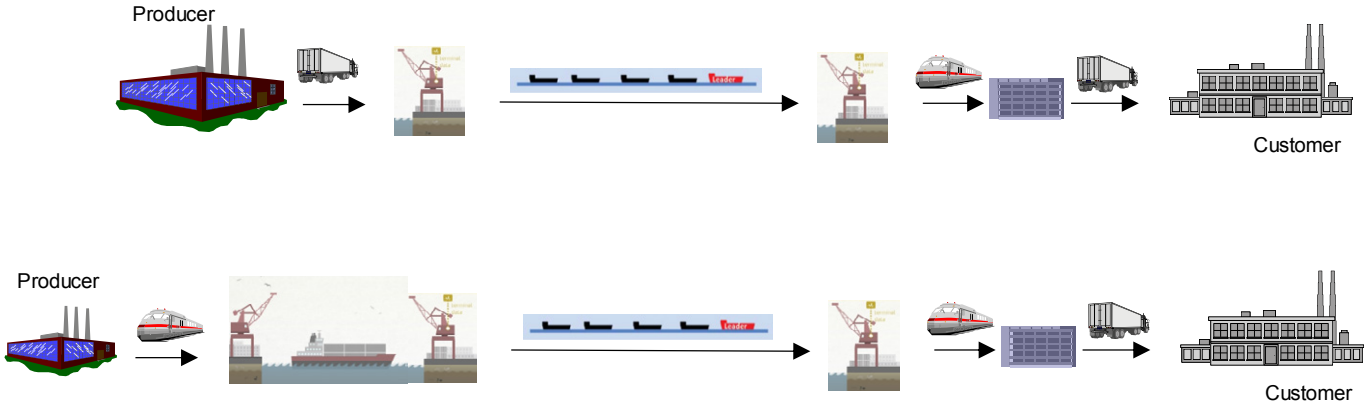
In this Novimar project there are several innovations developed. These innovations are cargo reconstruction, new cargo handling systems and new vessel types. All of these innovations are presented below.

a. Cargo reconstruction

In Novimar we also consider the overall logistics point of view (see figure below). This overview is the basis of describing the various capabilities needed to properly manage the relevant door-to-door transport operations where Vessel Trains are being used for intra-European movement of freight on water.

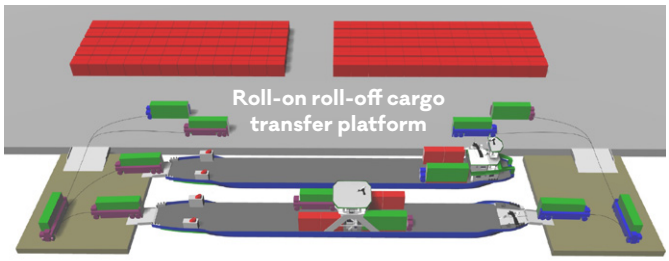
To exploit the flexibility offered by the Vessel Train concept, the cargo consolidation needs to be developed in such a way that cargo shall not have to wait unnecessarily for other cargo to be loaded or unloaded. To achieve this, a special consolidation (or sorting) process need to take place in all loading ports, such that "all cargo in one vessel has the same discharge port".

However, when allocating cargo to vessels in the Vessel Trains, we need to make sure that all vessels are properly utilised. We therefore developed capabilities which are added to the consolidation process, such that some cargo may be kept in the port terminal in order to ensure that vessels serving a special port are filled as much as possible before entering a Vessel Train.



B. New vessel types

Next to the cargo handling vehicle also a new concept design has been made. This new vessel concept is best described as an inland RoRo vessel. On these vessels, along with the cargo handling vehicle, cargo can be (un)loaded quite fast. Also, the vessels can be low-manned and coupled to the VT as a following vessel.



c. Cargo handling

Next to the cargo consolidation innovation, also a new development has been made with respect to cargo handling. With this cargo handling system (see figure) two containers could be picked up by a small vehicle and move the containers to a vessel. By applying this concept along with a new vessel type, containers can be cross docked directly between different vessels excluding the deepsea terminal. This new concept should lead to both a reduction in the handling time and handling cost.

Cargo handling vehicle

4. APPLICATION DEVELOPMENTS

The Vessel Train concept, along with the developed Novimar innovations, has been researched by applying the Novimar transport model. This model has been applied to three different cases: one short sea case, an IWT Rhine case and an IWT Danube case). The results of these three cases are presented below:

a. Short sea shipping case

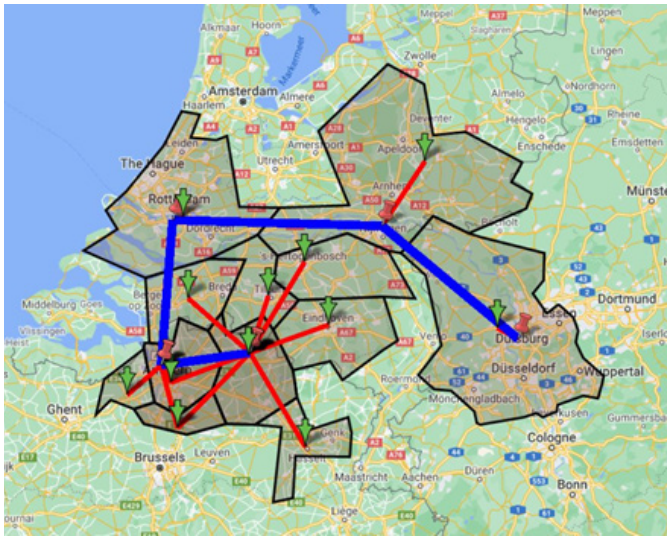
The research performed on the short sea case study concluded that the automation of navigational tasks is able to reduce the crew size by three crew members. It can be concluded that the VT concept is most beneficial for VT users with fast vessels. However, operators of fast vessels need to be flexible to adapt to slower VT operating speeds (3-8kn slower). Smaller vessels that use the VT, do not need to be as flexible, as their vessels operate in their intended environment. Nevertheless, the benefits for slower vessels are significantly smaller, as no fuel savings are achieved on top of the crew savings.

The short sea application has been developed for the Hamburg – Le Havre range (see figure). It is most beneficial to use the VT services for longer routes because waiting times have a smaller impact on productivity. Even though the slower operating speeds may cause a productivity drop for the faster vessels, the fuel savings outweigh any other operating cost created while waiting for the VT. The case study did conclude that without monitoring crew needed on the lead vessels, all assessed vessel types have viable conditions for a distance of 500 nm. The benefits created are however fairly small and given the uncertainties in waiting times and the variation in crew wages, cannot guarantee beneficial conditions for all vessel.

Conclusion: the results suggest that mixing different vessel types in the same train is possible, but naturally poses more options for the faster vessels than the smaller ones. It can also be concluded that while the main initial focus of the concept was set on the reduction of the number of crew, a much larger benefit for this concept can be created by effectively adapting the slow-steaming principle in the VT service for the short sea shipping sector.

b. Rhine (inland) case

For the Rhine case the Novimar transport model has been applied and the following case was developed: Turnhout, Antwerp, Rotterdam, Nijmegen, Duisburg. In this case following vessels are used which are manned by only one crew member. The Lead vessel is fully manned.



In this case a specific VT business model has been applied. This business model is one where there is a platform that will organise and manage the compositions of the VT. This means that a new actor is introduced in the market. That is the VT organiser. This VT organiser needs a yearly fee of €9,800 per year per vessel in order to stay in business.

In this case, we can conclude that the average benefits for the vessel owner (the one that transforms his vessel to a following vessel) are €55,000 per year per vessel. Also, the cargo owner benefits are lower, but they are also still positive. The VT organiser (platform) has a positive net benefit.

This design of the VT concept is also suitable for the Rhine area as there are many small inland shipping companies in the IWT sector. This intermediate VT organiser can create the scale needed to set up the VT system, while the small and medium sized enterprises aren't able to set up a VT system. It would be good if the platform could also offer a freight booking service.

From the analysis of the developments of the cargo consolidation software and the new cargo handling system it can be concluded that both of them are contributing to a better business economic VT performance. If it is needed that at least two crew members need to be present on each FV then the MMMS in combination with the WP4 (new ship designs) developments are needed, otherwise the business economic evaluation of the VT is negative.

c. Danube (inland) case

For the Danube case, we have developed a new VT application. In this application we have taken into account the more concentrated inland market. This means that the business model of the VT concept is now not an independent VT organiser (as it was in the Rhine case), but it will be a business model where a large shipping company can create VTs with its own vessels. The potential cost savings by reducing crew members in the Danube region is less than on the Rhine case. This is mainly due to the fact that the wages of crew members in the Danube region are significantly lower than in the Rhine region.

The best VT application is a VT that will sail between the following regions: Regensburg, Passau, Somovit, Ruse, Silistra (see figure). For this VT, the business economic evaluation for the cargo owner is positive in all considered scenarios. This VT is also one with a very long sailing time of the FV in the VT, which makes that a lot of benefits are obtained (reduction of crew cost).

The capability of new cargo systems such as the Novimar cargo handling vehicle and the cross-transfer platform has a positive impact on the business economic viability of the VT from the perspective of the cargo owner for the Danube case.

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