Maritime Transport System Development

MANAGING RISK DNV

Make an Impact

generation sustainable maritime transport systems – integrated ship, fleet, and chain design

Why?

The maritime industry constantly faces a number of commercial, technological and societal challenges. Many current challenges are linked to greater value chain complexity, and to new and demanding maritime operations in harsh environments. Combined with a sharper focus on developing more efficient and robust value chains, this leads to ever stricter requirements being made on the sustainability of the maritime transport systems. This may be demands regarding ability to deliver, cost and energy efficiency, and the environmental profile of the transport system. New vessels represent a considerable investment for an often highly uncertain future, and the consequences of making the wrong decision are often severe. Thus, it is important to understand the implications of alternative design characteristics, both for the vessel as such, for the fleet design, and for the transportation system in which the vessel operates.

In order to develop maritime transport systems capable of dealing with greater uncertainty, complexity, and performance requirements, a precondition will be that developing vessel concepts, fleet design and chain design must be considered in a wider context.

How can we help you?

By taking a holistic view of the maritime transport system our aim is to assist you in developing new sustainable maritime transport systems. Our holistic approach means that we can identify key performance parameters for the entire maritime transport system and identify the potential effects of changes in these parameters on the overall performance of the system, e.g. the impact of choices such as type, speed, and size of vessels and fleet size and mix. This way the likelihood of introducing sub-optimal, non-sustainable solutions is dramatically reduced.

Which competence can we draw upon?

When developing new maritime transport system we draw from an extensive pool of highly qualified naval architects, marine engineers, economists, and logistics engineers within DNV. These resources possess an extensive experience in developing new and redesigning existing maritime transport systems.

In addition we can draw from an extensive external competence network of high standing academic and R&D institutions in the subject area of marine systems design and logistics optimization.

Which tools are employed?

We possess a unique combination of methods and tools that cover all phases of the design of maritime transport systems, fleet design and conceptual ship design which enables us to adopt a holistic and integrated approach to the whole design process. The extensive toolbox of methods and decision support tools includes both state-of-the-art commercial tools and advanced decision support tools developed in-house based on extensive R&D activities. Main categories of tools employed in the analysis are:

- Fleet scheduling and routing tools
- Chain optimization and simulation tools
- GEEC (Greenhouse Gas Emission and Energy efficiency) calculation tools including state of the art protocols on land, sea and road emission
- Benchmarking tools for vessels designs
- The DNV proNavis strategic transport optimization model

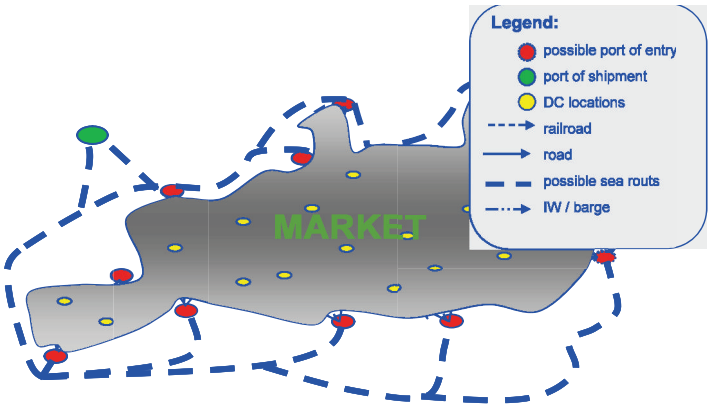
What do we deliver?

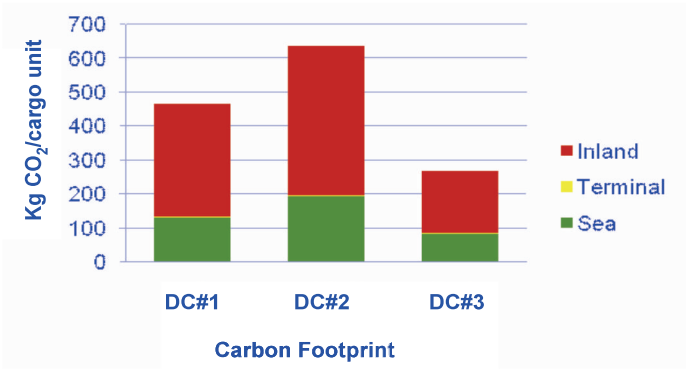
Our deliverables may consist of a proposed design of a total maritime transport system, or elements of a system, with a thorough sensitivity evaluation including descriptions and evaluation of for instance:

- The maritime routes that are needed for the transport including optimal port/terminal configuration
- The number, size, and brief outlines of the vessels needed to operate the transport system including vessel and fleet utilization
- The frequency (days between port calls) for each route that has to be served
- Total system costs and costs per unit transported to different locations
- Total GHG emission and energy consumptions of the proposed transport system and for each mode and node included in the system

How do we work?

Industry Case - Strategic Transport System Optimization





Case requirements

The client was invited to tender for a new multimodal transport system. The new transport system should serve new volumes of unitized cargo from a new Greenfield plant into an existing market with an existing distribution network from DCs (Distribution Centres) to end customers. I.e. the tender required the development of a new transport system from the plant to local DCs. The main operational requirements sated by the cargo owner were:

- Annual volume of approximately 400.000 units and limited seasonal variations, i.e. even delivery distribution of cargo over the planning period
- Delivery to approximately 25 DCs with location and annual volume defined
- Preferred ports of discharge (could be changed). Each loading and unloading port were given a maximum and minimum volume that could be loaded and unloaded
- Demand was given per regional DC, and not per port, i.e. the port was to be treated as a transhipment point facilitating the required throughput capability
- Time and frequency requirements

Environmental performance to be included

The cargo owner had started to focus on the environmental performance of its operations so the bidders were also asked to include an estimation of the "carbon footprint" for the proposed logistics systems in addition to the costs calculations.

The transport system

The system included in the analysis comprised the following main elements:

- Cargo handling in port of shipment (loading of vessels)
- Sea transport from port of shipment to ports of discharge
- Cargo handling in ports of discharge (unloading of vessels, cargo handling at ports, loading on trucks for distribution to DCs)
- Transport from discharge ports to DCs in various markets

Deliverables

Based on the operational requirements defined in the tender document DNV provided the client with the following analysis:

- Description of alternative transport systems (port of loading to local DCs) fulfilling the requirements set by the cargo owners
- Total system costs for alternative solutions
- Potential cost reductions due to operational changes in the transport system, e.g. choice of ports of unloading
- Total CO2 emission and energy consumption for alternative transport systems
- Sailing patterns - routes, types and number of ships, frequency and volume distribution to each port
- Costs per ton reduction in GHG emission for alternative transport systems
- Carbon Footprint for transport from port of shipment to each DC [kgCO2/unit]

Through these analyses our client could provide the cargo owner both with a recommended system based on the pure cost optimization and an evaluation of the environmental performance of the proposed system and the cost associated with improving the systems environmental performance. The most promising solution turned out to include a bigger share of sea transport than first anticipated, i.e. the client could argue for a solution that would increase the revenue while cutting costs for the cargo owner.

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