THE VERY LONG TERM DEVELOPMENT OF THE DUTCH INLAND WATERWAY SYSTEM

Shipping Scenarios for the Delta Programme

Cornelis van Dorsser, Han Littekingen (1st promoter), Bert van Wee (2nd promoter), Milou Wolters (RWS)

Background
Rijkswaterstaat aims to develop a state-of-the-art proactive integrated very long term replacement strategy for its hydraulic infrastructures. The hydraulic infrastructures tend to have a very long lifetime of about 50 to 100 years. It is therefore necessary to gain basic insights in the very long term developments that can be expected on the inland waterways. For this reason we started a PhD project on the very long term development of the Dutch inland waterway transport system. The project started in 2000 and will be completed by the first quarter of 2014.

Spin-off
By 2007 the Dutch Government also launched another much larger project now referred to as the Second Delta Programme. This programme has the following two primary aims: (1) Safeguard the Netherlands against flooding (due to higher future river discharges and raised sea water levels caused by the effects of climate change); and (2) Guarantee sufficient fresh water supply. In addition to these primary aims it also needs to take into account the effects of the Proposed Delta Measures on (inland) shipping, but by the end of 2012 hardly any efforts had been put into the development of shipping scenarios.

As our main project is almost completely devoted to the development of insight in the development of transport demand on the inland waterways – and as we had already been working on a very long term probabilistic prediction for the overall port throughput in the Le Havre – Hamburg Range we have been asked to contribute to the Delta Programme by writing a full background document on the shipping scenarios for both the ports and inland waterways up to the year 2100. These scenarios have functioned as basic input to the delta programme.

The paper on: "A Very Long Term Forecast of the Port Throughput in the Le Havre – Hamburg Range up to 2100" is available on the website of the EJTIR: http://www.ejtir.tudelft.nl/nl/2012_01/pdf/2012_01_06.pdf

The (Dutch) background document on the Shipping scenarios: "Schepvaartscenario's voor Deltaprogramma, 100 jaar later..." is available on the Deltaweb: https://deltaprogramma.pleso.nl/file/download/15008522

The main scenarios document in which the Shipping Scenarios are incorporated will be published soon. It will be referred to as: Delta(s) et al. (2013) Deltascenario's voor 2050 en 2100. Nadere uitwerking 2012-2013.

Delta Scenarios
The Dutch Delta Scenarios were developed along two main dimensions being (1) the level of socio-economic growth and (2) the effects of climate change. The level of economic growth has been linked to the extended WLO-Scenarios for 2050 of the Regional Communities (RC) and Global Economy (GE) scenarios. The effects of climate change have been linked to the KNMI-OS moderate (G) and extreme (W and W+) scenarios.

The scenarios were further developed around a third implicit driver. We will refer to this driver as the transition towards a sustainable society. In all the scenarios it was implicitly assumed that a strong focus on sustainable development will lead towards a smaller effect of climate change (this is indicated at the left side cubes in the figure below).

We are nevertheless of the opinion that in case of high economic growth and strong effects of climate change the inverse causal relation may be even more likely. If strong effects of climate change are combined with high economic growth this will trigger an increased focus on sustainability. We therefore suggested an alternative set of scenarios of which the results have been presented as a sensitivity analysis. The sensitivity analysis shows that the alternative scenarios are slightly more extreme.
Cornelis van Dorsser, Delft University of Technology

Research on the Very Long Term Development of the Dutch Inland Waterway System: Shipping Scenarios for the Delta Programme

j.c.m.vandorsser@tudelft.nl

Supervisors: Han Ligteringen (1st promoter), Bert van Wee (2nd promoter), Milou Wolters (RWS)

Cornelis van Dorsser studied at two universities simultaneously. In 2004 he graduated as an Economist specialised in the field of transport economy and logistics. In 2005 he graduated as a naval architect specialised in the field of shipping. During his graduation period he worked for Vos Logistics (a trucking company) and the Mercurius Shipping Group (an inland shipping company). In 2005 he joined Royal Haskoning. The first year of his assignment he mainly worked on the development of the South Zone Industrial Port in Aqaba (Jordan) as an industrial zone and port planner. Thereafter he worked as port consultant, transport economist, and inland waterway transport (IWT) specialist on many interesting port development and IWT Projects. Mr. van Dorsser worked in various projects all over the world such as Nigeria, Gambia, Guinea, Egypt, Jordan, Thailand, Trinidad, and Costa-Rica. In 2009 he started his PhD project at the Technical University of Delft on “The Very Long Term Development of the Dutch Inland Waterway System up to the year 2100”. At the same time he remained working at Royal Haskoning. In 2011 he re-joined the Mercurius Shipping Group where he now works as a research and business developer and provides strategic advice to the management. In his new function he is amongst others responsible for expanding the services of two innovative inland container crane barges inside the Port of Rotterdam. In the meanwhile he remains working on his PhD.

His research project is funded by Rijkswaterstaat (RWS). RWS is responsible for the development and maintenance of the Dutch inland waterway system. Most hydraulic infrastructures have an expected lifetime of about 50 to 100 years. In the near future many of those infrastructures will have to be replaced. Current practice is to replace structures one by one, but one by one substitution is like: “Replacing all parts of an old car and obtaining a good as new old timer”. Rijkswaterstaat therefore desires to develop an more proactive integrated replacement strategy that considers the replacement of hydraulic structures as an opportunity for reorganising the network at a systems level. Such a strategy should be able to answer questions like: “is it sensible to replace all seven weirs in the river Meuse individually or should we restructure the system into 5 weirs”. Planning processes related to changes of the system take a long time (say up to about 20 years) and methods to look more than a few decades into the future are often lacking. The development of a very long term proactive replacement
strategy does however require insight in very long term developments of (and on) the main inland waterways. This research project therefore aims to develop the means required to look far into the future of IWT on the Dutch Waterways. It thereby addresses the direct needs of the asset managers of Rijkswaterstaat.

The results of the project are not only relevant for the asset managers of Rijkswaterstaat. They can also contribute to the needs of other stakeholders that deal with other very long term issues such as port authorities that want to look beyond the scope of the current long term visions (e.g. beyond the horizon of the port vision 2030 recently published by the Rotterdam Port Authority) and the Delta Project. In order to support West-European port authorities we have published a very long term probabilistic prediction of the overall port throughput in the Le Havre – Hamburg range. The paper is referred to as:


The Second Delta Programme was launched after the publication of the Delta report by the Delta Committee in 2008. The primary aim of the Delta Program is to safeguard the Netherlands against flooding and to guarantee sufficient fresh water supply. With respect to flooding the project deals with both the effects of changing precipitation levels on high river discharge volumes as well as the effects of the raising sea level. In addition to these primary aims the Delta Programme also need to take into account the effects of the proposed measures on logistical users in the affected areas. However, by the end of 2012 hardly any efforts had been put into the development of shipping scenarios. Given the background of our research project we were asked to contribute to the development of the Shipping Scenarios of the Delta Programme. In response we were able to provide the Delta Committee with a full background report in which all relevant preliminary results of our very long term research project have been discussed. Based on these insights we also provided a detailed qualitative description of the scenarios as well as a full quantitative ramification for the most relevant commodity groups (Bulk and Break Bulk, Conventional Containers, Continental Containers, and Pallet Shipments). The last two items refer to new types of transport that have not yet been fully materialised but for which there are sufficient indications that they may develop into an important future transport category. The Dutch report is available on the Deltaweb (https://deltaprogramma.pleio.nl/file/download/15938322) and referred to as:

The main scenario document in which the Shipping Scenarios are incorporated will be published soon as:

- Deltares et al. (2013) *Deltascenario's voor 2050 en 2100 Nadere uitwerking 2012-2013.*

The aim of the Dutch Delta Scenarios is to investigate the corner points of likely future scenarios. For this reason they were developed along two main dimensions being: (1) the level of socio-economic growth and (2) the effects of climate change. The level of economic growth has been linked to the extended WLO-Scenarios for 2050 of the Regional Communities (RC) and Global Economy (GE) scenarios. The effects of climate change have been linked to the KNMI-06 moderate (G) and extreme (W and W+) scenarios.

We argue that that the scenarios were also developed around a third implicit driver which we will refer to as: (3) the transition towards a sustainable society. In all currently developed Delta Scenarios (Warm, Pressure, Peace, and Steam) it is implicitly assumed that a strong focus on sustainable development will lead towards a reduced effect of climate change. This view is indicated by the left side cubical in the Figure 1.

Figure 4: Applied and suggested choice of Scenarios

We are nevertheless of the opinion that in case of high economic growth and strong effects of climate change the inverse causal relation may be more likely. If strong effects of climate change are combined with high economic growth this will trigger an increased focus on sustainability. We therefore suggest an alternative set of scenarios for which the results have been presented as a sensitivity analysis in the background study report (refer Figure 1, right). These scenarios will be referred to as (Steaming-on, and Water Pressure).

For each of these six scenarios an extensive qualitative and quantitative ramification was made and the output was discussed amongst certain stake holders such as the Port of Rotterdam. The expectations turned out to be in line with the long term vision of the Port of Rotterdam and may also help to think of developments beyond the year 2030 port.
vision (e.g. questions like should we ever need a third Maasvlakte?). In addition they are likely to be used for the evaluation of measures proposed in the framework of the Delta Programme.

The results of the four scenarios developed on behalf of the Delta Programme are presented in Figure 2.

A comparison with the alternative scenarios shows that the alternative scenarios are slightly more extreme than the standard scenarios (refer Figure 2). One can therefore question if the Delta Scenarios sufficiently address the variation in possible futures as they were intended to. We still see some room for improvement.

Acknowledgement: This PhD project is supervised by Han Ligteringen (1st promoter), Bert van Wee (2nd promoter), and Milou Wolters (daily supervisor from Rijkswaterstaat). We thank Rijkswaterstaat for providing the funding.