PORT METATRENDS

Impact of long term trends on business activities, spatial use and maritime infrastructure requirements in the Port of Rotterdam

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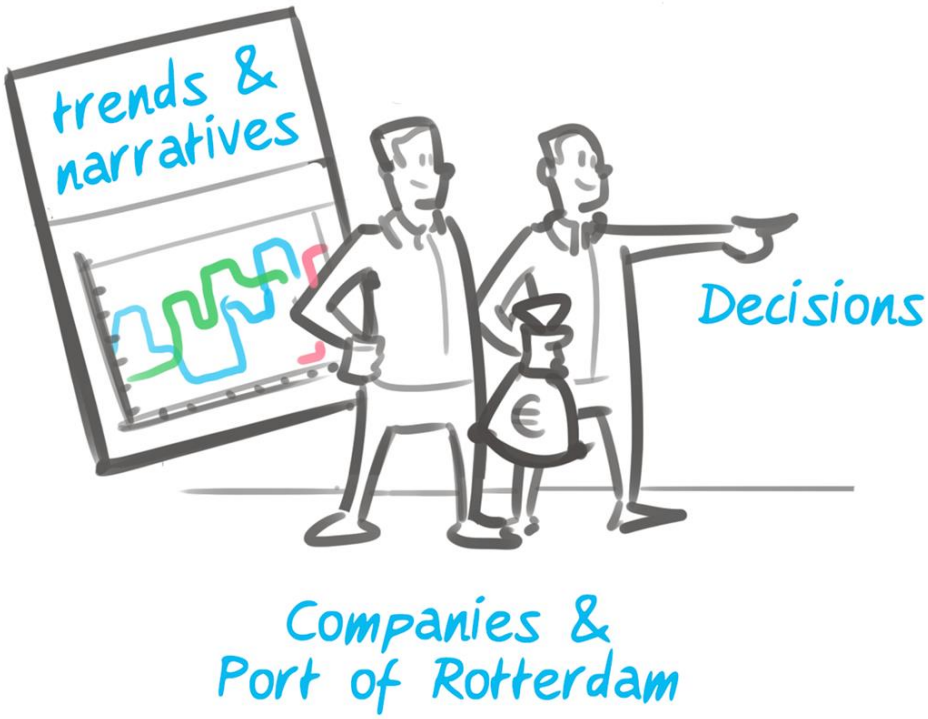
EXTERNAL EFFECTS ON THE PORT

PORT METATRENDS

Impact of long-term trends on business activities, spatial use and maritime infrastructure requirements in the Port of Rotterdam

Executive Summary

5 November 2018



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SMART PORT

Introduction

This study demonstrates that through the use of a new scientific method that analyses long-term trends by placing them in a broader 'meta'-perspective, it is possible to identify the threats and opportunities for the port of Rotterdam. In face of the energy- and sustainability transition, new sustainable industrial activities are likely to take over the dominant position of the present fossil industry by the year 2040. By then, additional space is likely to become available in the port, and sustainable activities will start to scale up. Until that time, it is essential to utilise the scarce available space in the port optimally, so that the port serves as a breeding ground for promising sustainable industrial clusters. In order to achieve this, a clear view on what developments to expect and how to cluster future port activities is required. An exhaustive trend-analysis resulting in sixteen narratives that address the threats and opportunities for the port, as well as a port layout showing the possible locations of promising, future-proof clusters for the year 2040, is presented in this report.

Background

The world is undergoing a major transition as a result of which the port of Rotterdam could lose up to 50% of its current throughput volumes, but the transition also offers many new business opportunities. To prepare the port for the future, use is generally made of forecasts and scenarios, but each of these methods has its own disadvantages. Forecasts perform well in stable times, but not in times of transition. Scenarios are well suited for analysing if the existing port activities are future-proof, but do not help in creating a shared vision that can provide guidance for seizing opportunities offered by the ongoing transition. In fact, if new investment decisions take into account a wide range of possible future scenarios, the result may be what the Dutch call 'a sheep with five legs', or a non-competitive port that can accommodate a wide range of activities at the cost of being non-competitive. The current forecasting and scenario methods are thus less suitable to adequately anticipate future developments in these times of major change, while port authorities are, especially now, in need of concrete guidelines for making investment decisions.

Source: http://glennvanderburg.nl/wp-content/uploads/2015/03/schaap-met-vijf-poten-lores.jpg

Trend-based narratives
Source: author based on smart port visuals

To secure its position as a leading port in Europe and to ensure it in an uncertain future, the port of Rotterdam needs a clear and widely shared future vision, that recognises the threats and opportunities confronting the port.

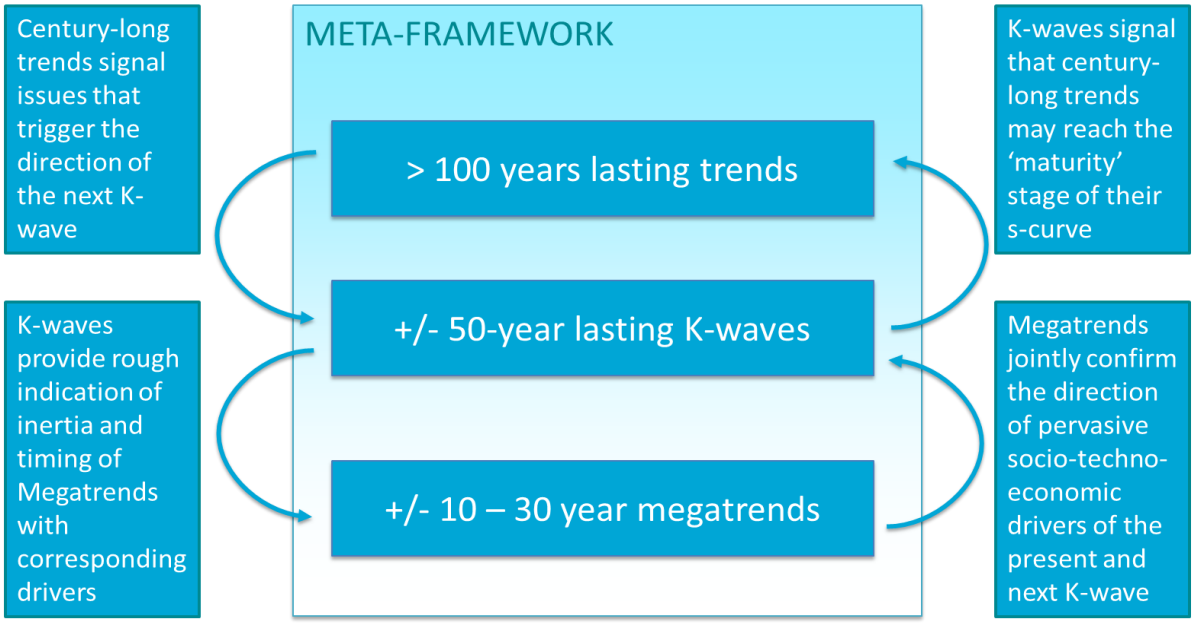
Three step approach

This report presents a new three step approach for developing a shared vision on the future development of the port. The first step concerns a novel three layered framework for analysing future developments. In this step relevant trends are identified and placed in a broader 'meta'-perspective of a three layered framework, whereby different layers relate to trends of varying inertia (or duration). This multi-layered approach results in a sharper view of the future, which narrows down the 'plausible' future space. The second step concerns a new approach in which trend based narratives are used to identify threats and opportunities for the port. The insights from the three layered trend analysis are translated into sixteen well-structured storylines or 'narratives', that take the strengths and weaknesses of the port of Rotterdam as a starting point and thus address threats and opportunities specific to the port. The narratives indicate which activities are likely to claim scarce space in the port over the next two decades. They help to form ideas about a future-proof clustering of activities, the required space in the port, as well as the required infrastructure and utilities. The third step concerns creating a spatial development strategy based on the insights provided by the narratives.

Framework for analysing trends

The future is uncertain and nobody possesses a crystal ball. However, by placing trends in a broader 'meta'-perspective, insights into plausible future developments and their implications, can be improved. The challenge is to reduce the set of futures that is considered plausible by improving our understanding of the dynamic behaviour of pervasive long-term trends and key uncertainties. To this end we introduce a novel three layered framework for assessing the course of future trends (see Figure 1).

Figure 1: Three-layered meta-framework



Each layer in this framework relates to trends with a different level of inertia and duration. The first layer concerns trends that have existed for more than a century, for which the direction is relatively clear. The second layer contains the movement of the so-called Kondratieff waves (or K-waves), that reflect an about 50 years long cyclical movement in the world economy. The

third layer contains the remaining (mostly technology driven) megatrends such as autonomous sailing and 3D printing, of which the drivers are often closely linked to the pervasive drivers of the K-waves. The essence of analysing trends at three distinct levels of inertia is that by placing different layers of trends in a broader 'meta'-perspective of an overall framework, each layer provides added insights at the level of adjacent layers. This creates a sharper ‘picture’ of the future and improves our ability to anticipate on future developments.

Impact of trends on the port

The systematic trend analysis offers clear insight in the direction of plausible future developments and their anticipated impact on the port.

In total, nine centuries-long trends have been identified, each having an effect on the port of Rotterdam. On balance, these trends indicate a substantial reduction of future throughput volumes, including a stagnation and possible decline of future container volumes. Operational performance and port competitiveness are mostly affected in a negative way by climate change and benefit from the long-term trend in connectivity towards further connecting and optimising systems by means of data applications and the creation of the internet of things (IoT).

The transition from the 5th K-wave to the 6th K-wave is reflected by a shift in its two primary drivers, namely: (1) a shift from globalisation to sustainability; and (2) a shift from ICT to IoT. Based on these drivers, the next 20 years are expected to be dominated by innovation and the development of new sustainable- and data driven technologies and business models. In the subsequent 30 years, the more successful technologies are expected to become dominant.

The remaining megatrends tend to cluster around the primary drivers of the K-waves, i.e., data-driven developments and sustainable developments, with the data-driven developments acting as an enabler for the development of sustainable data-driven technologies.

Threats and opportunities

The extensive trend analysis performed in this study makes it possible to anticipate future developments and their expected impact on the port of Rotterdam. To this end, we have deliberately not used scenarios, but constructed a number of well-structured trend-based narratives that contribute to the creation of a shared future vision for the port. While constructing these narratives, a distinction is made between 'opportunities and threats’ for the port-related activities and 'enabling technologies’ that can serve as an enabler for improving the competitiveness of the port of Rotterdam. In total, the following sixteen trend-based narratives have been drafted:

Threats to existing activities:

1. Major decrease in fossil fuel throughput;
2. Possible decline in raw material throughput;
3. Stagnation or decline in deep-sea container transport;
4. Future loss of container cargo as a result of 3D-printing;
5. Possible loss of market share due to climate change.

Opportunities for new activities:

6. Create production and blending area for renewable fuels, including the production of synthetic fuels from imported hydrogen and captured carbon;
7. Create recycling and dismantling area for offshore rigs and ships;
8. Strengthen supply base for offshore energy production at sea;
9. Opportunity to increase short sea container transport;
10. Develop dedicated inland barge facilities at deepsea container terminals to increase the market share for deep-sea containers;
11. Develop aquaculture and fish farming in the port and at sea;
12. Expansion of the cruise market for both maritime and inland shipping;
13. Increased navy presence to counter increased threats.

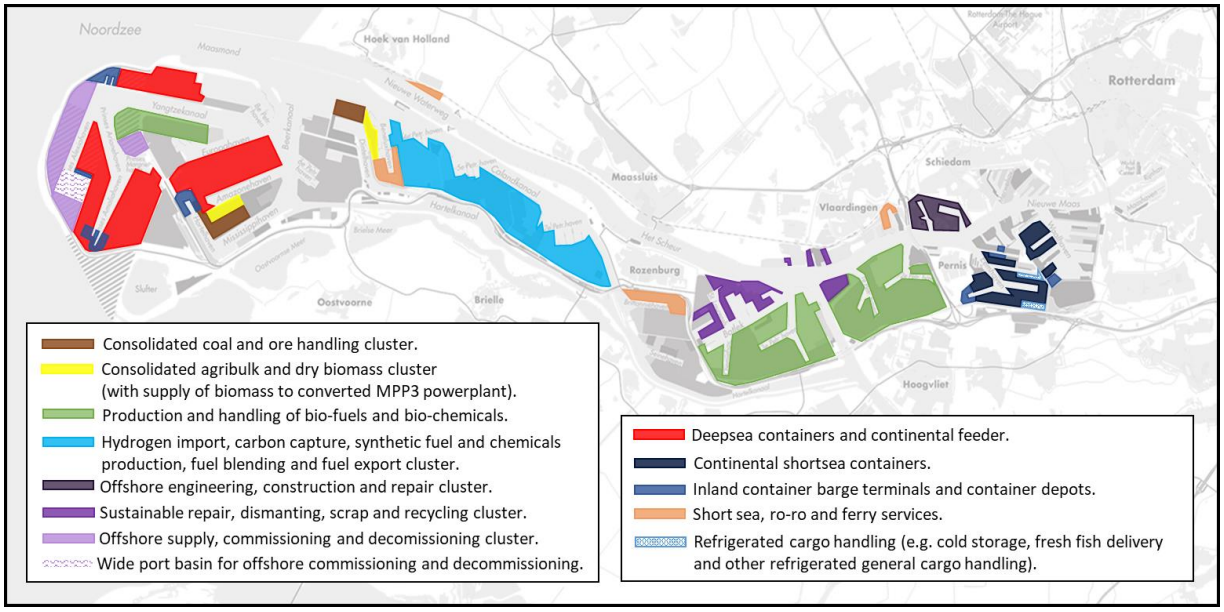
Enabling technologies:

14. Synchromodality as a catalyst for a more efficient hinterland connection;
15. Autonomous shipping changing maritime infra requirements, which enables the port of Rotterdam to gain market share if it acts as a first mover;
16. Optimization of port- and fairway infrastructure through the use of big-data and sensor technology.

Space and clustering

It is expected that available space will remain scarce over the next 10 to 20 years despite the recent expansion at Maasvlakte 2. This is because the fossil industry may require another 10 to 20 years to phase out, while space is already required for new activities that are gradually starting to develop in line with the sustainability driver of the 6th Kondratieff wave. It is desirable for the port to facilitate these activities in order to ensure that it is ready for the future around the year 2040, when new sustainable activities take over the dominant position of the fossil industry and begin to scale-up.

Figure 2: Outlined clustering of activities as suggested for the year 2040



Through confronting the current port layout and location of activities with the future demand for space (indicated by narratives following from our trend analysis), a suggestion for possible clustering of future activities around the year of 2040 has been sketched (see Figure 2). Such a sketch can contribute towards formulating a successful spatial transition strategy for the port.

Conclusions and recommendations

The world has entered a transition period that is characterised by a shift from an economic system driven by globalization and fossil raw materials to a sustainability-based system. As a result, the port of Rotterdam can lose up to 50% of its present cargo volumes, but the transition also offers plenty of new business opportunities. As it will take another 1 to 2 decades before the renewable system takes over the dominant position of the fossil-based system, the port is faced with a challenge to use the available space as efficiently as possible. This to achieve a smooth transition over the next 20 years and to create promising port clusters that are able to compete in a new more sustainable environment from 2040 onwards. Such a challenge requires a clear, practical and feasible strategy for spatial planning.

This study shows that by placing trends in a broader 'meta'-perspective and analysing them in a structured way, it is possible to better anticipate future developments. By translating insights from trends into well-structured storylines (or narratives) and by taking into account the intrinsic strengths of the port, the future opportunities for the port can be made to surface. Based on the drafted narratives, a sketch indicating how the port can evolve to a new spatial layout, which anticipates on new future-proof industrial clusters is included.

This suggests keeping the existing infrastructure in use for another 10 to 20 years through refurbishment where required in order to buy time until the future structure and clustering manifests itself more clearly in the port so that new investment decisions can be made with less risk involved.

Repurposing infrastructure for a less demanding use (e.g. lower draught vessels and lighter quay loads) can be an effective way to extend the lifetime of existing infrastructures. Especially when it fits within the spatial framework.

Additional studies are required to determine more specifically the use of space in the port and the required infrastructure investments. Such studies include:

- New methods to forecast the expected stagnation in deepsea container transport;
- New methods to forecast the expected impact of the energy transition on the fossil throughput volumes;
- New insights into sustainable harbour clusters, the possible transition pathways towards the creation of these clusters, and the required port infrastructure;
- New insights on how to prepare the port for the impacts of climate change;
- Conceptual designs and business cases for new (more sustainable and climate proof) terminals and industrial production activities.