

#P3

Conclusion and Reflection



¹⁰² 8.2 Conclusion: Landscape beauty as a way to generate new perspectives

The harbour of Rotterdam is one of the biggest global hubs in the distribution of oil. Almost seventy percent of the total surface of the harbour is covered by oil and oil related industry. Due to the Paris-agreements this landscape of oil will change dramatically in the coming decades. The European commission agreed that the CO²-emission of the member states should be reduced by 80-95% in 2050, cutting away the foundations of viable fossil industry (Pbl, 2016). For the harbour of Rotterdam these expected developments create a large transformation assignment that can be dissected into a short- and a long-term assignment. On the short-term the problem focusses mainly on dealing with the negative effects on spatial quality by companies leaving the harbour. On the long-term the assignment focusses on giving new use to abandoned harbour territory and on creating new conditions for development.

My main goal with this research is to address the transformation assignment of the harbour of Rotterdam as a landscape architect. To this end I formulated the following goals:

- Get a grip on the impact of the oil industry on the harbour of Rotterdam and get a grip on what the consequences of the energy transition are on the harbour of Rotterdam.
- Understand how the harbour landscape functions as a system and what the relations of this system are with its context.
- Create a design for the harbour that anticipates the coming energy transition and incorporates system interests on the regional scale, using the ecological and economic dynamics.

I translated these goals into the following research question and sub-questions:

How can the harbour of Rotterdam anticipate the coming energy transition in such a way that the regional scale system interests are incorporated and that the harbour will be ecologically, economically and socially healthier, using a landscape-based approach?

Sub-questions:

1. *How should the transition of the harbour of Rotterdam be handled argued from a landscape perspective? [Ch 2]*

2. *What is the significance of the oil industry for the harbour of Rotterdam and how will this be impacted by the energy transition? [Ch 3]*
3. *How can the consequences of the energy transition for the harbour of Rotterdam be anticipated in a spatial strategy?[Ch 4]*
4. *How can the strategy be designed in such a way that it serves the interests of related systems and fits within the harbour landscape? [Ch 5,6]*

In the following part of this paragraph I first answer the sub-questions, followed by the answering of the main question.

1. *How should the transition of the harbour of Rotterdam be handled argued from a landscape perspective?*

The method used to answer this question is a literature study into landscape-based approaches in strategical planning and design [chapter 2]. From this study it can be concluded that landscape based-approaches are “open-ended strategies aimed at protecting resources, guiding developments and setting up future conditions for spatial development by means of landscape planning and design” (Nijhuis, 2017). Further characteristics of strategical landscape-based planning are that the goal is to determine the most beneficial action for sustainable development of an area and that local and regional landscape conditions form the bases on which a strategy is build (Nijhuis, 2017). The landscape-based design type that stands central in this thesis is that of Landscape Infrastructures. In this theory landscape is considered to be an infrastructure, able of setting up conditions for new developments (Bélanger, 2013).

To answer the sub-question with these findings the following can be stated: In order to deal with the effects of the transition in a ‘landscape’ way, an open-ended strategy should be created that addresses short-term problems while building a lasting landscape framework capable of organising the landscape and setting-up conditions for new developments.

2. What is the significance of the oil industry for the harbour of Rotterdam and how will this be impacted by the energy transition?

This sub-question can be dissected into two separate questions. First, what is the significance of the oil industry for the harbour of Rotterdam? And second, how will this be impacted by the energy transition? My approach to answer the first question was to trace the oil flows around the world all the way to Rotterdam. From this I learned that the harbour of Rotterdam takes a large share in global distribution of oil [Ch 3]. It also showed that on the scale of the harbour oil is an important factor. Most of the surface of the central part of the harbour covered by oil and oil related industry [Ch 3]. From this, in answer on the first question, it can be concluded that the oil industry is very significant for the harbour of Rotterdam.

To answer the second question I made a spatial translation of a scenario study conducted by Kuiper et al. (2017). In this study Kuiper et al. describe four possible scenarios for the harbour of Rotterdam in the year 2045. In order to get grip on the possible magnitude of the transition I made a precise spatial translation of the most outspoken scenario [Ch 3]. From this study we can conclude that the energy transition will impact the central part of the harbour severely. Without a strong spatial strategy the central part of the harbour will transform into a patchwork of abandoned and active facilities, potentially bringing the harbour into an negative spiral of decline.

3. How can the consequences of the energy transition for the harbour of Rotterdam be anticipated in a spatial strategy?

My approach on answering this question is based on a review of historic transitions [Ch 2], combined with the findings from the answering of the previous question. From the historic review I learned that; transitions need to be handled by a stable party [the government], that transitions have short-term problems and that transitions cause large structural long-term problems. From the answering of the previous question I learned that on the short-term the harbour has to deal with a spatial scattering of the central harbour and on the longer term the harbour has to deal with a structural vacancy throughout the harbour. All this leads to the following conclusion: The consequenc-

es of the energy transition for the harbour of Rotterdam can be anticipated in a strategy that; on the short-term mitigates the negative effects of spatial scattering of the harbour and that on the long-term provides a robust landscape framework that structures the landscape and creates new perspectives for development.

4. How can the strategy be designed in such a way that it serves the interests of related systems and fits within the harbour landscape?

The strategy can be designed in such a way by synchronising the strategy with interests of related systems and by building on the local environmental and spatial conditions of the harbour landscape. In the long-term zoning of the masterplan the integration of system interest is realised by carefully placing the permanent sea harbour, areas of divers development and areas for urban development based on the on soil pollution in the harbour and the placing of a necessary future dam for the water management of the bigger river system [Ch 6]. The shape and vegetation type of the harbour forest, the main spatial framework in the design, is based on the local soil conditions and spatial characteristics of the harbour landscape, making the intervention fit within the landscape [Ch 6].

The complete design shows that by adopting a landscape-based approach the transition can be structured in such a way that short-term spatial quality issues are converted to new qualities that grow to a permanent spatial framework capable of creating new perspectives for the harbour. With this in mind the main question can be answered:

Main Question: How can the harbour of Rotterdam anticipate the coming energy transition in such a way that the regional scale system interests are incorporated and that the harbour will be ecologically, economically and socially healthier, using a landscape-based approach?

First off all by recognising how fundamental the transition assignment is. The coming decades the harbour has to change to something completely different in order to stay relevant. With entire new relations to the city, the regional and national economy, the water system, the national energy supply and the regional landscape. All this requires

a fundamental rethink of the harbour landscape and its function. This enormous endeavour cannot be solved by one discipline with a blueprint design or vision. It requires a multidisciplinary approach with a long-term strategy that allows uncertainty. Landscape architecture as a holistic discipline can provide this connection between disciplines with its capability of making hybrid designs. The strategy that is needed should be built on the basis conditions of the landscape; the conditions that ultimately determined that the harbour developed on this very spot and not fifty kilometres north or south. On these basic conditions of the landscape a strong framework needs to be built. A landscape framework capable of organising the harbour landscape and a landscape framework that by its beauty [spatial quality] is able of pushing the landscape into a new direction of high quality developments. Generating ultimately a harbour that is ecologically, economically and socially healthier.

8.3 Specific reflection

The faculty of Architecture requires a short reflection to account for the [preliminary] results of the research and design in the of the graduation phase. In this paragraph the required reflection themes are discussed in the prescribed order.

What is the relation between research and design in my project?

Research forms an important connection within my project. Both within my theoretical framework and in the project as a combined endeavour. In the theoretical framework I use known theories to build a method for the transformation of harbour areas in the light of the energy transition. My complete design is a test of this method; the process is guided by this method. Looking back I can conclude that the proposed method resulted in a congruent design fitting within the boundaries of the theoretical framework. The process that lead to the design was however less congruent as envisioned in the method.

What is the relationship between the theme of the graduation lab and my chosen theme?

The theme of the Flowscape studio is imbedded in the theory of landscape infrastructures. In this theory landscapes are considered to be infrastructures or flowscapes which have the power to setup conditions for development. When designing with this consideration of the landscape as an infrastructure, conditions become the main design tool. The coordinating team of the Flowscape studio suggested to pick a design site and topic that fits within the theory of the Flowscape studio. As a geographic demarcation for the area from which we could select a site, the watershed of the Rhine and Danub river was selected. For the selection of a topic it was suggested to select a theme related to infrastructures. My site, the harbour of Rotterdam, meets these criteria perfectly. Harbour areas are very obvious infrastructures, strongly related to the conditions of the landscape. The harbour of Rotterdam is located on this spot because of the conditions created by the river Rhine and the North Sea.

What is the methodical relation with the graduation lab?

The theory of landscape infrastructures stands central within my thesis. This was possible because the site and topic of research have a strong relation with theory as pointed out in the previous subsection.

What is the relation between my project and the wider social context?

A last reflection topic that I have to address is the relationship of my project with the wider social context, or as I prefer to translate it; the societal relevance of my project. I think that this relevance is quite strong. In my project I address the issue of energy transition. The energy transition will transform our landscapes severely the coming decades, so much is known, but how and what is still unclear. A vast body of knowledge is needed on how to deal with the spatial consequences of this transition. With my project I contribute a little piece to this urgently needed body of knowledge.

How will I use my time until P5?

I will use the time until the P5 with three goals:

- To finish the last paragraphs and drawings of my thesis;
- To sharpen my design and research conclusions;
- To increase the visual quality of my work.

Reflection is an important step in a research process. In this last paragraph I discuss the general usability and feasibility of my solutions. At last I give my recommendations on how to proceed from here.

USABILITY OF THE SOLUTIONS

Looking back, how usable are my solutions and what part of the enormous transformation assignment does my strategy address? The proposed strategy is a spatial strategy, it is not an all-inclusive business plan. The strategy provides the basic conditions for the development of a healthy harbour landscape. It provides these conditions through a structural transformation that makes the harbour landscape more robust and equipped for uncertainties. And through the addition of a new ingredient to the harbour; landscape beauty. An ingredient capable of creating conditions for high quality development. On these altered conditions new businesses cases and activities can develop, resulting ultimately in a healthy, viable harbour landscape.

FEASIBILITY OF THE SOLUTIONS

How feasible are my solutions? The direction of my proposals is founded on the direction indicated by scenario studies. On this direction the strategy is built with a high tolerance for uncertainty. The uncertainty factors in the strategy are the extent of the energy transition and the extent of sea level rise. Only when the energy transition will have very little impact on the harbour and the sea level rise is minimal the effectiveness of the strategy is compromised. These scenarios are however highly unlikely.

In a technical sense the strategy is relatively uncomplicated in executional possibilities. The whole purpose of the strategy was to create a plan that fits the characteristics and qualities of the harbour landscape. For this reason the construction ingredients are cheap or common available in the harbour. Also the scale able and phase able properties of the plan make the strategy technical feasible.

LOOKING FORWARD

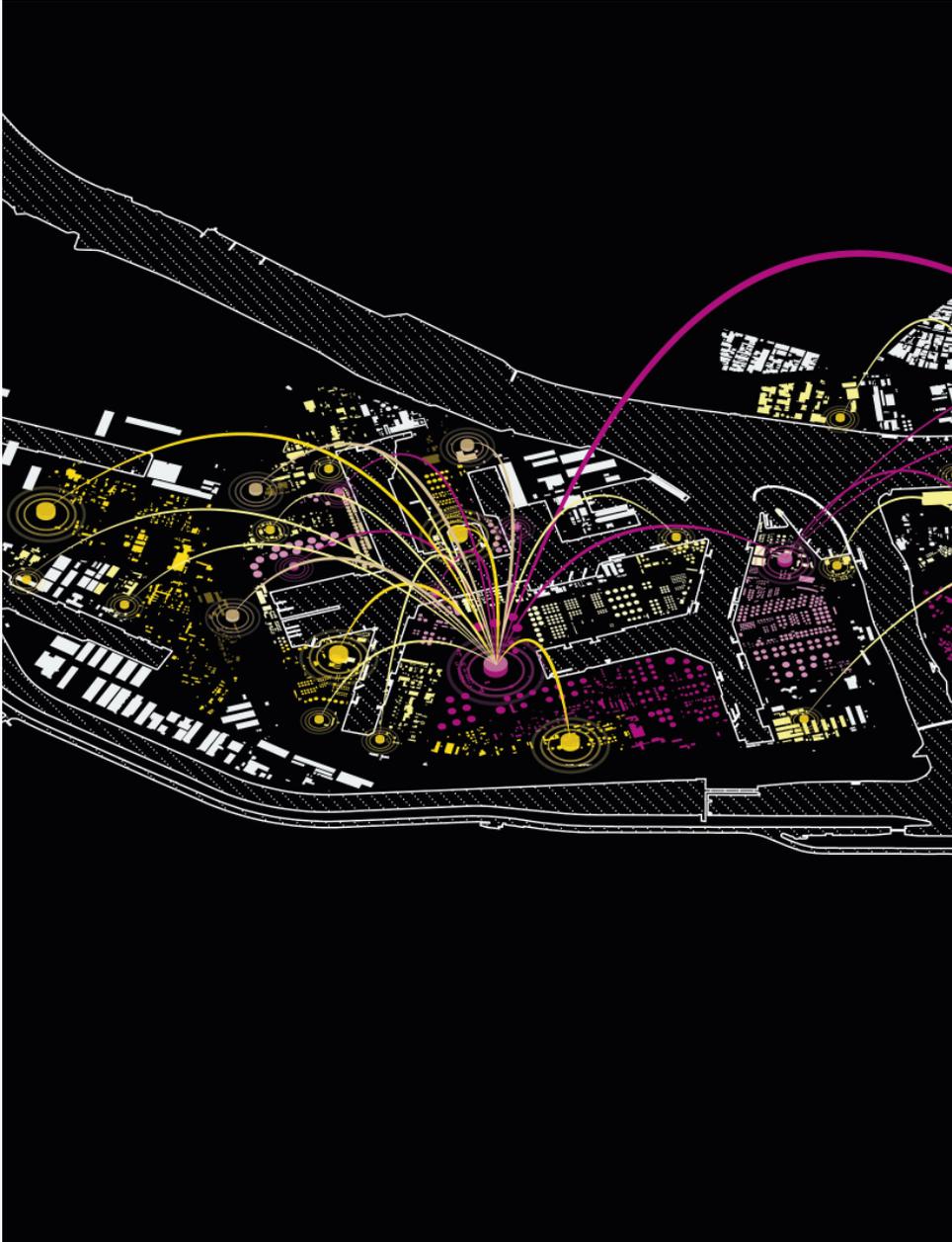
If you would visit the harbour today or even the coming years, you will encounter a busy harbour full of activities. It will be hard to imagine that this liveliness will disappear from major parts of the harbour. This reality does raise the question how one should implement and start building a strategy that envisions such fundamental transformations? First of all; we are still early, the energy transition still has to start, or just started. Expectedly the first real effects of the energy transition will began to be really visible after a decade. In this in-between time the strategy can be sharpened, adjusted and be made more specific. Next to this the time can be used to build a clear vision preparing stakeholders and the public for the new direction of the harbour. With the ultimate goal to enthuse both public and stakeholders with the opportunities of the new green harbour.

SOURCES:

- Bélanger, P. (2013). *Landscape infrastructure. Urbanism beyond engineering*. Wageningen: Wageningen University.
- Het doel voor 2050: veel lagere CO₂-uitstoot: PBL. (2016). Retrieved from <http://themasites.pbl.nl/energietransitie/>.
- Kuipers, B., Langerak, L. & Manshanden, W. (2017). *Scenario's voor het maritieme cluster in Zuid-Holland en Werkendam*. Rotterdam: Erasmus University.
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#P4

Conclusion and Reflection



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- Create a design for the harbour that anticipates the coming energy transition and incorporates system interests on the regional scale, using the ecological and economic dynamics.

I translated these goals into the following research question and sub-questions:
How can the harbour of Rotterdam antici-

pate the coming energy transition in such a way that the regional scale system interests are incorporated and that the harbour will be ecologically, economically and socially healthier, using a landscape-based approach?

Sub-questions:

1. *How should the transition of the harbour of Rotterdam be handled argued from a landscape perspective?*
2. *What is the impact of the energy transition on the developments of the harbour of Rotterdam and what other spatial factors are of influence on the development?*
3. *How can a strategy be designed in such a way that it deals with the uncertainty of the landscape system and fits within the harbour landscape?*

In the following part of this paragraph I first answer the sub-questions, followed by the answering of the main question.

1. How should the transition of the harbour of Rotterdam be handled argued from a landscape perspective?

The method used to answer this question is a literature study into landscape-based approaches in strategical planning and design [chapter 2]. From this study it can be concluded that landscape based-approaches are "open-ended strategies aimed at protecting resources, guiding developments and setting up future conditions for spatial development by means of landscape planning and design" (Nijhuis, 2017)². Further characteristics of strategical landscape-based planning are that the goal is to determine the most beneficial action for sustainable development of an area and that local and regional landscape conditions form the bases on which a strategy is build². The landscape-based design type that stands central in this thesis

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2. What is the impact of the energy transition on the developments of the harbour of Rotterdam and what other spatial factors are of influence on the development?

This sub-question can be dissected into two separate questions. First, what is the impact of the energy transition on the development of the harbour of Rotterdam? And second, what other spatial factors are of influence on the development of the harbour? To answer the first question I made a spatial translation of a scenario study conducted by Kuiper et al.⁴. In this study Kuiper et al. describe four possible scenarios for the harbour of Rotterdam in the year 2045. In order to get grip on the possible magnitude of the transition I made a precise spatial translation of the most outspoken scenario [Ch 3]. From this study we can conclude that the energy transition will impact the central part of the harbour severely. Without a strong spatial strategy the central part of the harbour will transform into a patchwork of abandoned and active facilities. In the longer-term resulting in a strong shortage in program.

In order to answer the second question I made a system analysis of the harbour and its context. This analysis showed that the

working of the harbour and the management of the river system are highly intertwined. It also showed that in the future, due to climate change the Nieuwe Waterweg probably needs to be closed off with a dam (the river system). This dam would decrease the connectivity of the harbour. Another factor of influence on the development of the harbour is soil pollution. Half of the harbour territory (eastern part) is heavily polluted.

3. How can a strategy be designed in such a way that it deals with the uncertainty of the landscape system and fits within the harbour landscape?

The strategy can be designed in such a way by synchronising the strategy with interests of related systems and by building on the local environmental and spatial conditions of the harbour landscape. In the long-term zoning of the masterplan the integration of system interest is realised by carefully placing the permanent sea harbour, areas of divers development and areas for urban development based on the on soil pollution in the harbour and the placing of a necessary future dam for the water management of the bigger river system [Ch 4]. The shape and vegetation type of the harbour forest, the main spatial framework in the design, is based on the local soil conditions and spatial characteristics of the harbour landscape, making the intervention fit within the landscape [Ch 5].

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2. What is the impact of the energy transition on the developments of the harbour of Rotterdam?

In order to answer this question I made a spatial translation of a scenario study conducted by Kuiper et al.⁴. In this study Kuiper et al. describe four possible scenarios for the harbour of Rotterdam in the year 2045. In order to get grip on the possible magnitude of the transition I made a precise spatial translation of the most outspoken scenario [Ch 3]. From this study we can conclude that the energy transition will impact the central part of the harbour severely. Without a strong spatial strategy the central part of the harbour will transform into a patchwork of abandoned and active facilities. In the longer-term resulting in a strong shortage in program.

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The strategy that is needed should be built on the basis conditions of the landscape; the conditions that ultimately determined that the harbour developed on this very spot and not fifty kilometres north or south. On these basic conditions of the landscape a strong framework needs to be built. A landscape framework capable of organising the harbour landscape and a landscape framework that by its beauty [spatial quality] is able of pushing the landscape into a new direction of high quality developments. Generating ultimately a harbour that is ecologically and economically healthier.

7.3 Design conclusion

Central in this thesis stands the transition of the harbour of Rotterdam as a result of the energy transition. Next to this main assignment this thesis addresses also several other spatial assignments. In this paragraph an overview of the different assignments addressed in this thesis and how the strategy deals with these assignments.

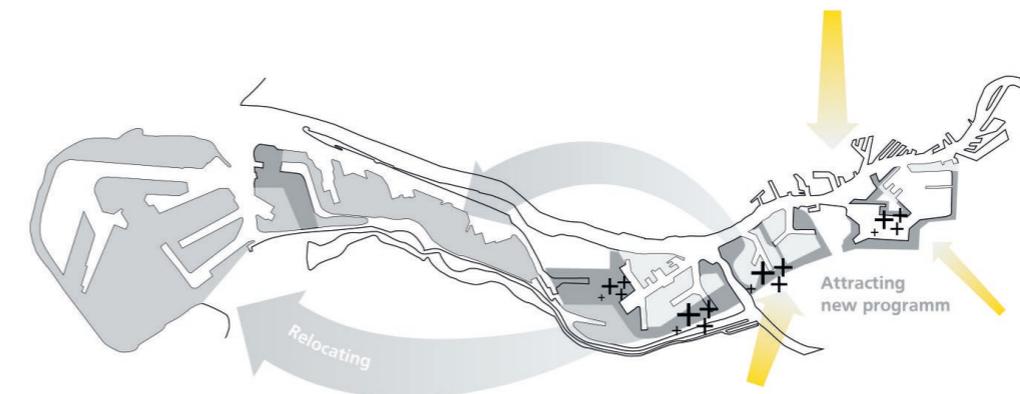
THE ENERGY TRANSITION

Assignment:

With the energy transition most fossil related industries will leave the harbour [Ch 3.5] new industries will likely consume less space than the current fossil industry. As a result about half of the harbour will be vacant [Ch 3.5]. Without an intervention there will be major vacancies throughout the complete harbour.

Solution:

Viable industries are [during several decades] moved to the west part of the harbour. This is the best part of the harbour. The soil is not polluted and this part will also in the future have direct connection with the sea. As a result the east part of the harbour will be empty. With investment in landscape quality [harbour forest] and connectivity [metro] new types of program [housing, offices, high-tech agriculture etc.] are attracted to this part of the harbour.



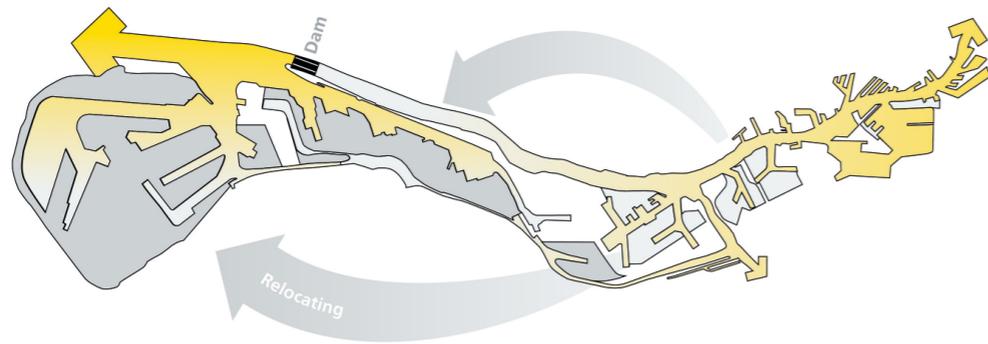
WATER SAFETY

Assignment:

The Nieuwe Waterweg is the only branch of the Rhine-Meuse river system that has an uncontrolled access with the North Sea. Because of effects of climate change this direct access causes already considerable water quality and water safety issues. Experts say that in the longer future a dam in the Nieuwe Waterweg is needed in order to deal with the increasing effects of climate change [Ch 3.4]. If a dam is placed in the Nieuwe Waterweg the harbour of Rotterdam loses direct access to the North Sea. This is negative for the harbour.

Solution:

In the strategy the dam is placed in such a way that about half of the harbour will lose direct access to the North Sea. In the decades before the dam is placed, companies that require a direct access to the North Sea [such as container terminals] are relocated to the west side of the dam. In this way the placing of the necessary dam causes minimal negative consequences to the functioning of the harbour.



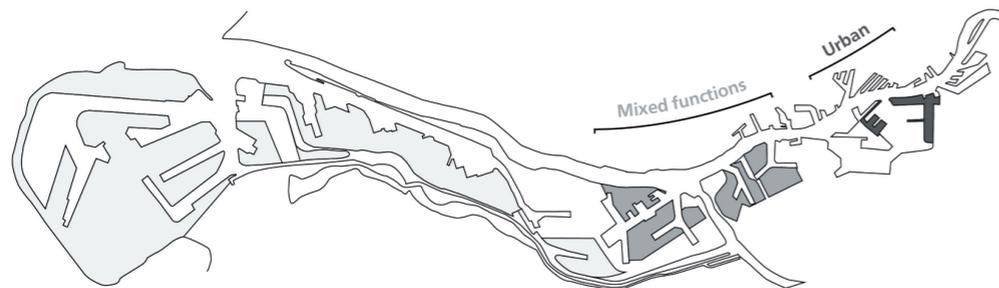
URBAN GROWTH

Assignment:

Until at least 2040 Rotterdam will have a strong demand for new housing [Ch 3.4]. The city harbours close to the city centre are naturally the first harbours that will be transformed into urban areas. On the longer term the municipality will however [probably] also have to look to harbours a little more distant from the city centre. The harbour areas east from Pernis are in the longer future logical areas for urban redevelopment.

Solution:

The masterplan provides two zones for urban development. The most eastern part of the harbour [east from Heiplaat] is reserved for urban development. The larger area east from Rozenburg is reserved for a mixed development. In this zone also the development of urban program is possible.



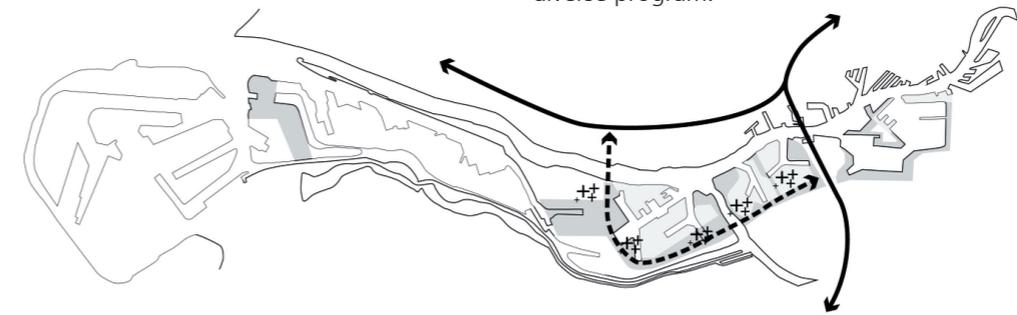
PUBLIC TRANSPORT

Assignment:

In the current situation the harbour of Rotterdam almost completely lacks public transport infrastructure. Nowadays strong public transport is seen as an important driver of high quality program, such as housing and offices [Ch 3.4]. In the future the harbour will have a shortage in program. In order to attract more program to the harbour good public transport can function as a strong catalyser.

Solution:

In the masterplan viable [heavy] industries are moved to the east part of the harbour. As a result the east part of the harbour is empty and needs to attract new program. Here an extra attractiveness through strong public transport would be very positive for the attraction of new program. In the masterplan a new metro line is developed on top of existing rail ways from Pernis, along Rozenburg to the metro line Hoek van Holland-Rotterdam. This projected metro line would increase the attractiveness of the eastern harbour as settlement location for a diverse program.



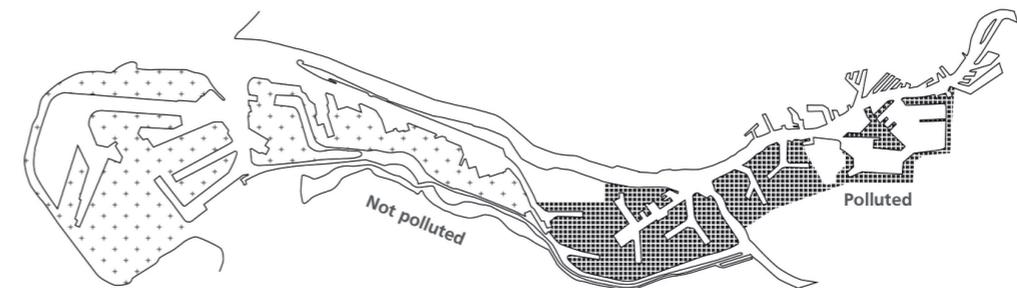
SOIL POLLUTION

Assignment:

The eastern part of the harbour is heavily polluted [Ch 3.4]. In order to develop new program in this part of the harbour, first the soil needs to be cleaned [to some extent].

Solution:

Cleaning polluted soil is very expensive. Especially if all parcels are cleaned separately. For this reason the masterplan proposes to clean the complete polluted area at ones using phytoremediation [using vegetation to clean soil pollution]. In this way the top soil is cleaned to levels that most program can develop. Only for the most sensitive program types [urban functions] additional technical measures are necessary.



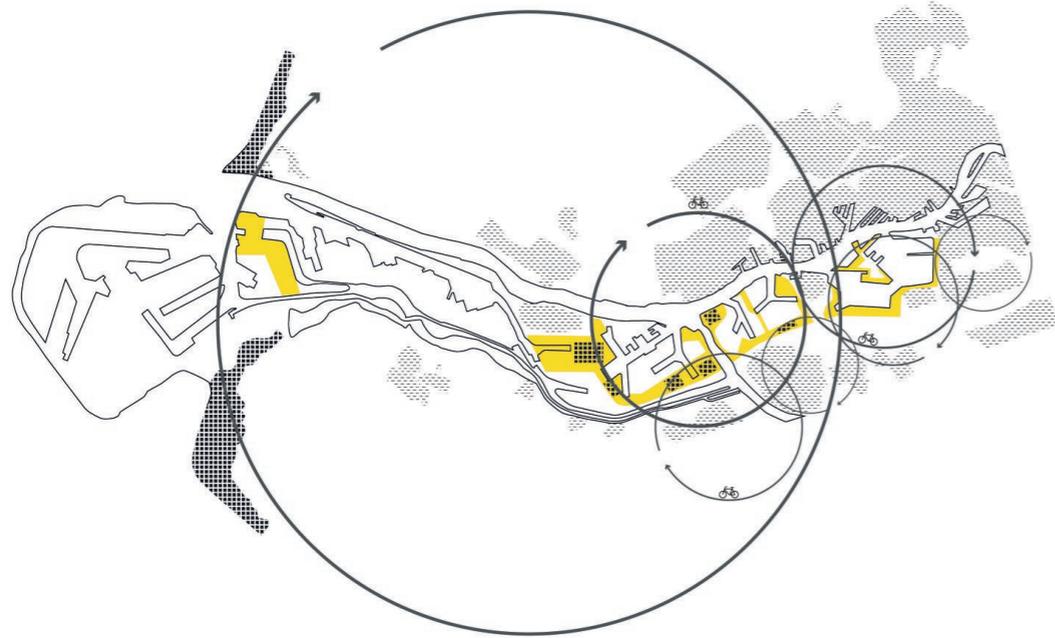
ACCESS TO NATURE

Assignment:

Rotterdam has relatively little urban green. The green areas around Rotterdam are spatially scattered and lack a high recreational capacity. Also Rotterdam lacks a direct connection to a large landscape of quality [Ch 3.4]. This general lack of access to nature is negative for the overall attractiveness of Rotterdam as a city.

Solution:

In the masterplan the harbour forest is introduced as a solution to this. The goal is to develop the harbour forest into a large landscape park of quality; a new icon for Rotterdam. The combination of nature, industrial heritage and thematic parks should create a landscape with regional or national attraction. Through the direct connection of the harbour forest with the centre of Rotterdam and several adjacent towns, the harbour forest has the potential to become a major recreational asset for Rotterdam. On top of this the harbour forest links Rotterdam to the larger coastal landscapes.



7.4 Specific reflection

The faculty of Architecture requires a short reflection to account for the [preliminary] results of the research and design in the of the graduation phase. In this paragraph the required reflection themes are discussed in the prescribed order.

What is the relation between research and design in my project?

Research forms an important connection within my project. Both within my theoretical framework and in the project as a combined endeavour. In the theoretical framework I use known theories to build a method for the transformation of harbour areas in the light of the energy transition. My complete design is a test of this method; the process is guided by this method. Looking back I can conclude that the proposed method resulted in a congruent design fitting within the boundaries of the theoretical framework. The process that lead to the design was however less congruent as envisioned in the method.

What is the relationship between the theme of the graduation lab and my chosen theme?

The theme of the Flowscape studio is imbedded in the theory of landscape infrastructures. In this theory landscapes are considered to be infrastructures or flowscapes which have the power to setup conditions for development. When designing with this consideration of the landscape as an infrastructure, conditions become the main design tool. The coordinating team of the Flowscape studio suggested to pick a design site and topic that fits within the theory of the Flowscape studio. As a geographic demarcation for the area from which we could select a site, the watershed of the Rhine and Danub river was selected. For the selection of a topic it was suggested to select a theme related to infrastructures. My

site, the harbour of Rotterdam, meets these criteria perfectly. Harbour areas are very obvious infrastructures, strongly related to the conditions of the landscape. The harbour of Rotterdam is located on this spot because of the conditions created by the river Rhine and the North Sea.

What is the methodical relation with the graduation lab?

The theory of landscape infrastructures stands central within my thesis. This was possible because the site and topic of research have a strong relation with theory as pointed out in the previous subsection.

What is the relation between my project and the wider social context?

A last reflection topic that I have to address is the relationship of my project with the wider social context, or as I prefer to translate it; the societal relevance of my project. I think that this relevance is quite strong. In my project I address the issue of energy transition. The energy transition will transform our landscapes severely the coming decades, so much is known, but how and what is still unclear. A vast body of knowledge is needed on how to deal with the spatial consequences of this transition. With my project I contribute a little piece to this urgently needed body of knowledge.

Reflecting is an important step in a research process. In this last paragraph I discuss the general usability and feasibility of my solutions. At last I give my recommendations on how to proceed from here.

USABILITY OF THE SOLUTIONS

Looking back, how usable are my solutions and what part of the enormous transformation assignment does my strategy address? The proposed strategy is a spatial strategy, it is not an all-inclusive business plan. The strategy provides the basic conditions for the development of a healthy harbour landscape. It provides these conditions through a structural transformation that makes the harbour landscape more robust and equipped for uncertainties. The strategy creates the conditions on which new businesses cases and activities can develop. So with the implementation of the strategy basic conditions for development are created. Not the developments themselves.

FEASIBILITY OF THE SOLUTIONS

How feasible are my solutions? The direction of my proposals is founded on the direction indicated by scenario studies. On this direction the strategy is built with a high tolerance for uncertainty. The main uncertainty factor in the strategy is the extent of the energy transition and the extent of sea level rise. Only when the energy transition will have very little impact on the harbour and the sea level rise is minimal the effectiveness of the strategy is compromised. These scenarios are however unlikely. In a technical sense the strategy is relatively uncomplicated in executional possibilities. The whole purpose of the strategy was to create a plan that fits the characteristics and qualities of the harbour landscape. For this reason the construction ingredients are cheap or common available in the harbour. Also the scale able and phase able properties of the plan

make the strategy technical feasible.

MINIMAL INTERVENTION

An effective way to reflect upon the effectiveness of the strategy is to answer the question, what the minimal intervention would be to make the strategy work? In my strategy I introduce two ingredients to attract new program to the harbour; landscape quality and connectivity. The precise question would be how much can be eroded of these strategical ingredients to make the strategy as a whole work? First of all it is quite difficult to make a precise quantification of what can be left out of the strategy to make it work. In abstract to make the strategy work, the harbour needs to be a healthy green landscape with spatial quality. In order to reach that goal at least major parts of the harbour forest need to be developed, including major parts of the bicycle connection and some of the thematic parks. The proposed metro connection can be left out. But of course, this is not ideal.

LOOKING FORWARD

If you would visit the harbour today or even the coming years, you will encounter a busy harbour full of activities. It will be hard to imagine that this liveliness will disappear from major parts of the harbour. This reality does raise the question how one should implement and start building a strategy that envisions such fundamental transformations? First of all; we are still early, the energy transition still has to start, or just started. Expectedly the first real effects of the energy transition will begin to be really visible after a decade. In this in-between time the strategy can be sharpened, adjusted and be made more specific. Next to this the time can be used to build a clear vision preparing stakeholders and the public for the new direction of the harbour. With the ultimate goal to enthuse both public and stakeholders with the opportunities of the new green harbour.

#annex

Interviews with specialists

For my thesis I had several meetings with specialists in many different disciplines. Below summarized transcripts of the most important meetings with external specialists.

Meeting 1

Specialist: *Dirk Koppenol | Port of Rotterdam*

Date: *02-03-2017*

Summarized transcript:

- Costs to clean up pollution are significant, the value of this soil is negative;
- The harbour is very large. Too large to transform completely to urban functions;
- The harbour is a Landlord port, they own the land;
- The harbour company is 66% owned by the municipality and 34% by the central government;
- Quay walls are for 80% outdated, to restore them is very expensive;
- 80% of the income of the harbour comes from oil (related) industry;
- Wind energy is a big thing, 80 GW possible. The harbour uses 8 GW > production of biofuels.

Meeting 2

Specialist: *Bart Kuipers | harbour professor Erasmus university*

Date: *03-03-2017*

Summarized transcript:

- The harbour or the industrial area is larger than the extent of the properties owned by the harbour company; there are also significant industrial complexes in shipping etc. near Werkendam and Spijkenisse;
- We need an entrepreneurial government to deal with challenges like the energy transition;
- Shell and Exxon will be around for 20+ years. These big companies build often different branches that can take over the main branch;
- There needs to be a shock in order to get a fast change, otherwise it will more or less continue [energy transition];
- The harbour of Rotterdam is emitting ever more CO₂ – the harbour is very weak on this subject, they have a lot of ambitions, but no actions, the municipality/harbour company should do more concrete things;
- The refineries in Rotterdam are relatively strong through the integration with technology;

- What should happen is that the harbour should invest more in knowledge ... make it visible ... really invest in a kind of infrastructure ... make a new kind of landscape that can attract activities;
- Rotterdam is at the moment, different then the new buildings show you, quite a weak region. The Chemical industry is too important for Rotterdam; that is dangerous. At the moment there is no good alternative for these industries;
- On the other hand he expects that the energy transition and the transformation of the harbour can go much faster ... the progress of windmills and battery life is improving faster than expected. These developments can mean a sudden transformation of the harbour, or if large protests on climate change ... etc. China is for instance proceeding much faster, but on the other hand if Trump holds power 8 years things can slow down much.

Meeting 3

Specialist: *Marcel Koeleman | DCMR | specialist soil pollution*

Date: *10-03-2017*

Summarized transcript:

- A central question is; who is responsible for the pollution, this is probably hard to determine, because old;
- Pollution probably metals plus oil related;
- A question is whether you have to clean the soil completely. To the multifunctional levels; not always necessary. If the pollution is old you could consider it part of the soil + with some types of use it is not a problem;
- Two stakes: goal (economic) and law (juridical)
- Dig it all away is also possible, but really expensive
- Usually you isolate the pollution
- Seepage water is an issue, it spreads the pollution to the adjacent areas;
- You can make the harbour into a polder to stop the seepage (pumping up);
- To determine who is responsible for the pollution is really important in order to claim the costs of the cleaning of the soil;
- There is a change that companies keep the soil unused, because the costs of cleaning are higher than

to just rent it for 'eternity'.

Meeting 4

Specialist: *Matthijs Kok | Tu Delft| professor water safety*

Date: *20-03-2017*

Summarized transcript:

- In general professor Kok was really relaxed about water problematique related to sea level rise. In his opinion sea level rise is not too big of an issue. Even if the sea level rises with five metres the Netherlands can handle this rise with dikes. The costs will be considerable but in comparison with the costs is of for instance healthcare the costs are limited;
- A dam in the Nieuwe Waterweg would be very helpful to increase water safety and to help solve issues with fresh water supply;
- If you make a dam you don't have to raise the dikes until Dordrecht;
- The biggest problem of a dam is the ecological loss ... it will kill curtain brackish/tide ecosystems.

Meeting 5

Specialist: *Tiedo Vellinga | Tu Delft| professor Ports and Water*

Date: *12-04-2017*

Summarized transcript:

- Don't close the dam permanently, keep it partly open for ecological reasons;
- Take also in account the new Blankenburg tunnel and the Oranje tunnel, near Hoek van Holland;
- There are a lot of seagull colonies in and around the harbour;
- The Beer is an old natural area;
- Recycling will be a big thing and renting pipelines too.

Meeting 6

Specialist: *Timo Heimovara | Tu Delft| professor soil mechanics*

Date: *01-09-2017*

Summarized transcript:

- Everything in the soil below 2 meters and everything that happened to the soil before 1990 is considered 'soil own' for the law;
- Almost everywhere in the harbour the complete soil is polluted It even in parts that are marked as 'clean';
- Source, path, object; it is important to cut the path.
- It is possible to clean soil pollution with natural processes, but it take a lot of time to clean the soil completely;
- It is almost best to keep the polluted areas free of building, make it nature, live next to it, on the water.

Meeting 7

Specialist: *Four specialists | DCMR| specialists on soil pollution in the harbour*

Date: *11-09-2017*

Summarized transcript:

- The area is not so polluted. Because the area is so high it is easy to deal with. The only thing I have to do is to bring up a 'life layer' of about 2 metres, after this most uses are possible;
- Seepage water is a problem, but I can't deal with it;
- Putting mildly polluted soil in the harbour is not a good idea. But is can be done.