Waterstad, reintroducing water in Rotterdam

WATERSTAD, ROTTERDAM

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Delta Interventions

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P4-report

04-12-2012

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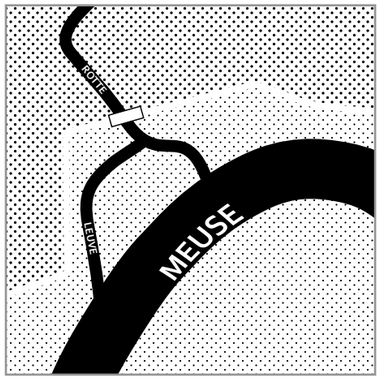

Figure 1. Rotterdam, orginal water system

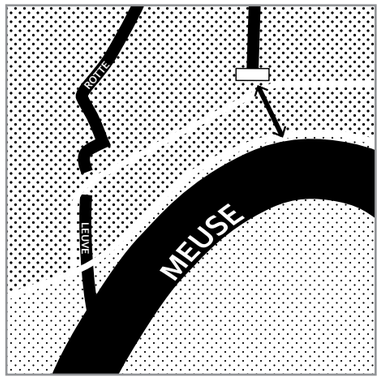

Figure 2. Rotterdam, current water system


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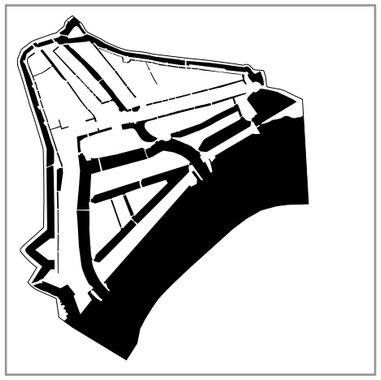
Figure 4. Rotterdam 1650, water surface


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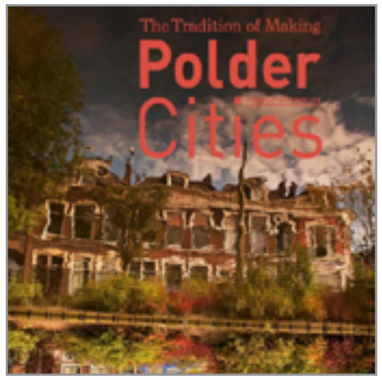


Figure 6. Fine Dutch Tradition


Figure 7. Rotterdam, pre-war aerial photo


Figure 8. Plan Witteveen, 1941


Figure 9. Plan Van Traa, 1949

Introduction

Water in Rotterdam: Rotte, Meuse, rain

Rotterdam is founded at a dam at the river Rotte. The Rotte is a relatively small peat river which flows into the large river Meuse (Figure 1). The dam at the Rotte meant two things: the control of the water level of the hinterland and a location for transshipment (mainly herring) and consequently, a marketplace (Van de Laar, P. Th. & Van Jaarsveld, M 2004). The relation between the Rotte and the Meuse made Rotterdam to what it is now, but currently this relation is marginalized: the water level of the hinterland is controlled by pumping stations located outside the city centre and the original location of the Rotte is altered and makes a dead end in the city centre, just before it can flow into the Meuse (Figure 2). This marginalized relation between Rotte and Meuse might be an important theme in the Water Task in Rotterdam. Rotterdam is increasingly threatened by flooding caused by the rising sea-level and increasing extremes in river-level. Next to the threatening water from sea and river, flooding caused by heavy rainfall is a serious problem in Rotterdam (Figure 3). Several projects in Rotterdam intend to counter the effects of heavy rainfall, for instance underground basins and water squares. The purpose of these projects is to temporarily take off pressure from the sewer system in case of heavy rainfall. Another strategy is to increase the amount of surface water and increase the surface of grass or other types of surface which are able to hold water, in order to retain water as long as possible (Greef 2005).

Reintroducing water in Rotterdam

From the perspective of the Water Task, reintroducing water in Rotterdam would serve a significant problem. As we compare the amount of surface water in Rotterdam in 1650 (Figure 4) with the current amount of surface water (Figure 5), the disappearance of water is striking. The canals were removed to make room for car traffic: cars did replace ships as means of transport. When reintroducing water in Rotterdam it should not be intended to be reintroducing ships as means of transport. It should be intended to reduce the water problem and to add spatial and recreational quality to the city of Rotterdam. Figure 4 gives strong indications as to where water should be reintroduced: reintroducing water on places where it already existed in the past would fit extremely well in this strategy, because it would take the most of soil conditions and hydrology. When the water bodies were being constructed originally, urban design and planning was a discipline inseparable connected to civil engineering. This practice is now being called the Fine Dutch Tradition, and as of its nature hydrology and urban structure were closely connected. Reintroducing water where it once was constructed according to these principles will probably increase the effectiveness of the intervention, both in terms of water management as in urban quality (Hooimeijer 2011) (Figure 6).

Urban fabric in Rotterdam: pre-war, Witteveen, Van Traa

The reintroduction of water in a city is a global phenomenon. The River Relocation Project in Providence, Rhode Island is a renown example (Breen & Rigby 1996), but also in European cities such as Breda and Gent old waterways are reopened to increase the attractiveness of the city centre (Huisman 2008). Unlike reintroducing water in historic cities as Utrecht, Breda or Gent, in Rotterdam it does not seem to be a logical urban intervention. Before the war, Rotterdam was a typical European nineteenth century metropolis, as well as a typical Dutch city (Figure 7). Rotterdam was densely built and its urban fabric was determined by the landscape and related water management (Palmboom 1987). However, before the war, Rotterdam was struggling to become a modern city. The main theme of this struggle was to make Rotterdam ready for car traffic. The bombardment of the inner city was taken as a opportunity to level the entire historic city and expropriate all land. This way Rotterdam could be redesigned to a modern city. During the war the city architect Witteveen made a rebuilding plan (Figure 8). It was a highly detailed plan and it was basically an upgraded version of the historical city: the same streets were made wider and more streamlined. However, according to a group of influential people in Rotterdam, this plan was not radical enough. After the war a new plan was made by Van Traa (Figure 9). This modernistic plan more or less deconstructed the whole idea of the traditional city. When reintroducing water in Rotterdam this radical change in the urban fabric is something which must not be overlooked.

Figure 10. Rotterdam 19th century, traffic routes and public space

Figure 11. Rotterdam 21th century, traffic routes and public space

Figure 12. Rotterdam 19th century, city-harbour relationship

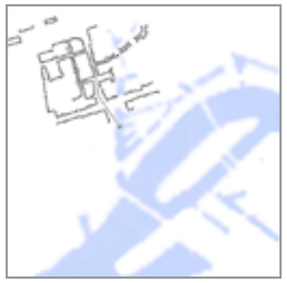


Figure 13. Rotterdam after the war, city-harbour relationship

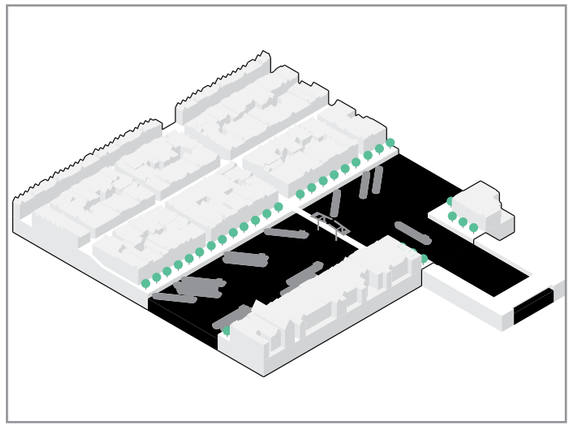


Figure 14. Rotterdam 19th century, city-water relationship

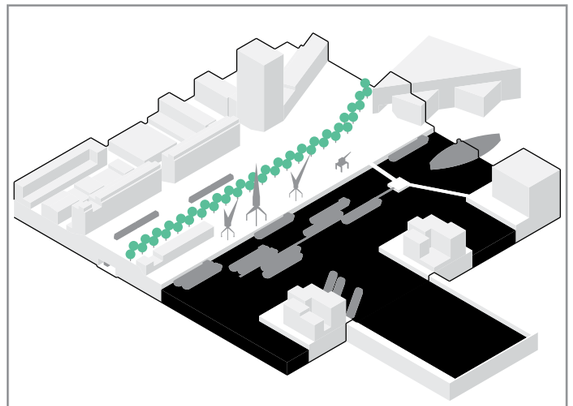


Figure 15. Rotterdam 21th century, city-water relationship

Figure 16. Rotterdam, Leuvehaven and Maritiem Museum, neglected public space

Figure 17. Rotterdam, Maritiem Museum, no relation between public space and water

Figure 18. Rotterdam, Leuvehaven, no relation between buildings and public space and water

Problem statement

Urban fabric in Rotterdam: pre-war, Van Traa

The urgency for more urban water in Rotterdam is clear and the historical position of water in the city gives strong indications as to where the water should be added to the city. However, the question rises how reintroducing water should be implemented in Rotterdam considering the radical change in the urban fabric of Rotterdam. Before the war the city centre used to be as a spider in his web (Palmboom 1987). The pedestrian areas were along the ancient defense system of the city: the singels and the Boompjes (Figure 10). This changes with the rebuilding plan, by which the city is organized by means of a super-grid system. This non-hierarchic system makes the city centre a neutral place (Vanstiphout 1995). Instead of being part of the system of public spaces, the Boompjes became part of the traffic system (Figure 11). The position of water in the city was also changed by the idea of the Window at the River: instead of a canal, set apart from the main roads (Figure 12), the Leuvehaven became positioned directly next to the main roads, forming an irregularly shaped, vast body of water (Figure 13).

Urban form in Rotterdam: walls and void

This changed relation between water and city can also be seen on a smaller scale, on the level of multiple city blocks. In the nineteenth century the Leuvehaven was a typical Dutch canal, it on the large side. On both sides of the water were dense city blocks. The Schiedamsedijk, one of the main roads of the city, is also formed by city blocks on both sides of the dike (Figure 14). Note that the main road is not along the water. Currently this situation is completely changed. The Schiedamsedijk now runs right along the water. The building blocks that used to be located between the dike and the Leuvehaven are gone. This result of this is a large open space next to the water, with a height difference in it, because of the dike. The city blocks at the west side of the Schiedamsedijk are replaced by long apartment buildings (Figure 16).

Public space in Rotterdam: lack in quality

This change in the position of the Schiedamsedijk and the Leuvehaven in the urban fabric of the city, and the change in the shape and orientation of the open space has not resulted in an appropriated public space. In the days when the Leuvehaven was a canal, with its traditional appearance (Figure 14), the type of use of the public space had a linear character: the quays are excellent for taking a stroll along the water, but to narrow for great gatherings of people hanging about. Currently the void is fit for these great masses of people, but the design of the public space does not match with this new type of use. The quays along the water are high, the same as they were when the Leuvehaven was still a canal. However, the high quays are not inviting for staying along the water (Figure 16). Moreover, the public space and the water are neglected and lack in visual quality. The type of use and the design of the public space at the Maritiem Museum does not have any relation with the water next to it; the opportunity of the height difference is not used to create a pleasant public space (Figure 17). The buildings that were added next to the Leuvehaven, when the idea of the *Window at the River* was abandoned, do not have a relation with the quays; the only entrance at the quayside is of a parking garage (Figure 18).

PROBLEM FIELD

Problem field

Dimensions of dockland development

The central problem in my graduation project is the at different scales disrupted relationship between city and water in Rotterdam. My hypothesis is that the reintroduction of water at Waterstad will restore the relationship between city and water at the different scales. The issues at stake at reintroducing water show great similarity with waterfront redevelopment in general. Breen & Rigby (1996) are not making any differentiation between riverfronts, seafronts or relocation projects. This is not surprising as most waterfront projects are about restoring the relation between city and water, and although at different scales or locations, must deal with similar issues. These issues are called the 'three dimensions of dockland development' by Hayuth (1988). The three dimension are (I) spatial, (II) economic and (III) ecological. The spatial dimension is about the geographical positioning of the waterfront, the way it is connected to its surroundings. The economic dimension is about the economic functionality of the waterfront; how it is used or supposed to be used. The ecological dimension is about how living things relate to the waterfront; the livability of the waterfront (Hayuth 1988). For the scheme of my research this subdivision is useful, however I prefer to make a small transition in the terminology. Because the project is about restoring the relation between water and city, I prefer the term 'relationships' instead of 'dimensions'. As this is an urban design project the term 'functional' will be more appropriate then 'economic': functionality is a property of the spatial layout or structure of a city, while 'economy' might eventually be a property of functionality: something I'm not able to design. For the scope of my research and design I will narrow down the ecological relationship to the aspect of public space, the livability and attractiveness of the space along the water for human users. Being an urban design project, the project is concerned with the relation of the city to the water and not the other way around. In my research I will compare two other cities with Rotterdam: Amsterdam and Hamburg (fig. 19-21). All three cities have a similar genesis: they are founded at a dam in a relative small creek that flows into a larger river. Finding a balance between safety (protection against flooding) and growth (expanding of trade activities) is a leading motive in the history of the three cities, a motive that can clearly be seen in their urban fabric (Meyer 2010). The struggle against water still determines the urbanism of the three cities. Rotterdam is in search for visions on a new urbanism that is able to cope with the problems on the long term (Greef 2005). At the same time especially Hamburg (Grossmann 2008) and Rotterdam are in search for new urban economy and perspective as their port moves away from the city.

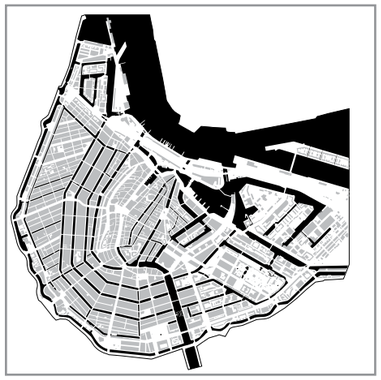


Figure 19. Amsterdam, 2010, seventeenth century city centre

Figure 20. Hamburg, 2010, seventeenth century city centre

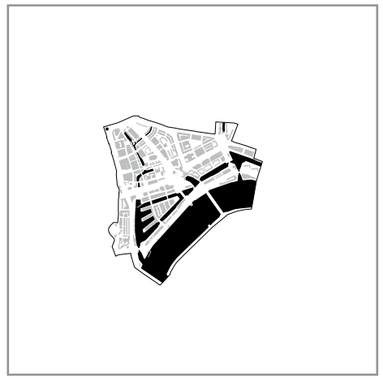


Figure 21. Rotterdam, 2010, seventeenthe century city centre

PROJECT AIMS

Project aims

Connecting city and water

The *Problem Statement* clearly shows a disturbed relationship in Rotterdam of city and water on multiple levels. The main objective of this thesis is to demonstrate how this relationship can be restored; how city and water can be connected. Consequently, the first objective of this thesis is to (i) indicate the characteristics and of the relationship between city and water on the three mentioned levels and isolate design principles. Currently, the situation in Rotterdam is disturbed, so, in order to get a useful outcome of the research, a comparison with the historical situation and the current and historical situation of comparable cities is necessary. This research will be the basis for the second objective of this thesis: (ii) a master plan for Waterstad. As shown in the *Problem Statement* and the *Problem Field*, the relation of city and water cannot be reduced to the level of the design of quays. The relation of city and water starts with the position the water has in the system of traffic routes and public spaces in the city. Therefore, a master plan is needed for the entire Waterstad, in which the characteristics and design principles of the city-water relationship found in the research will be applied to connect city and water on a higher level. The northern part of the Leuvehaven (the vicinity of the Maritiem Museum) is a crucial part in the connection of the city centre with Waterstad. Currently, several issues are making this connection difficult: the altered routing of the Coolsingel to the Schiedamsedijk, the large dimensions of the Blaak, the dead end of the Binnenrotte, the problematic position of the Maritiem Museum in the urban composition (blocking the *Window at the River* and windowless walls facing the water), the inappropriate composition of the public space at the Schiedamsedijk and the Leuvehaven and inappropriate public space along the water. Therefore, the third objective of this thesis will be (iii) a detailed design of the head of the Leuvehaven, the keystone in the connection of city and water.

(I) INDICATION OF THE CHACTERISTICS OF THE RELATION BETWEEN CITY AND WATER

(II) MASTER PLAN FOR WATERSTAD, ROTTERDAM

(III) DETAILED DESIGN FOR THE HEAD OF THE LEUVEHAVEN, WATERSTAD, ROTTERDAM

THEORETICAL FRAMEWORK

Theoretical framework

Urban fabric

I will explore the subject of urban fabric on two aspects. The first aspect is based on the idea of the *Water City*. The notion of the *Water City* is derived from the situation in Rotterdam, where there is a contrast between *Landstad (Land City)* and *Waterstad* (*Water City).* The *Land City* is the oldest part of the city, the part that is located at the safe side of the dike, the hinterland. The *Water City* is located outside the dike, built upon the marshes between the dike and the river Meuse (Palmboom 1987)[1]. However, the manifestation of a *Water City* is not unique to Rotterdam. Several Dutch polder cities have the same circumstance of a part of the city between dike and water. This situation creates a typical urban fabric, often based on the natural form of the marsh islands. Amsterdam is a notable example for this type of city. The city outside of the dike has a certain distinction in urban form and urban fabric, different from the rest of the city (De Hoog 2005).
The second aspect of the urban fabric is a spatial aspect. The difference between *Water City* and *Land City* is clear from a historical perspective, but how is the *Water City* positioned from a spatial point of view? What is the position of the *Water City* in the system of roads and public spaces in the city? In order to answer this question I will make use of the *Space Syntax* theory (Hillier 2007; Hanson 1989) and methods that have the same approach, namely the cognitive, intuitive use of public space, visualized by lines that indicate the intensity use (Garrigós e.a. 2009)[2].

1 More on the development of Waterstad (*Water City)* can be found in *Appendix 1.*

2 More on *Space Syntax* and spatial analysis can be found in *Appendix 2.*

Urban form

As demonstrated in the *Problem Statement* the orientation and character of the public space along the Leuvehaven is very much altered by the interventions of the rebuilding plan. This orientation and character is largely determined by buildings and building blocks or their absence: the height of the buildings, the length of the blocks, the amount of parcels, the size of the blocks compared to the size of the public space etc: all are important factors that determine the relationship between city and water. As can be read in *Appendix 1* this relationship in Waterstad and in particular the area around the Leuvehaven is not only determined by the buildings of the rebuilding period (1940s, 1950s and 1960s) but also very much by the redevelopment projects of the 1970s, 1980s and 1990s (Pinder & Rosing 1988; Van Dijk 1995): typically large, mono-functional buildings (e.g. Maritiem Museum, Tropicana, hotel Inntel). Although small in number, those buildings are, because of their size and mono-functionality, very dominant in determining the relation between city and water. Waterfront redevelopment projects would benefit more from lots of small scale projects (Bender 1993), ideally organized in a parcel system[3].

3 More on parcels and small projects can be found in *Appendix 2.*

Public space

There are many examples of waterfront redevelopment projects, all over the world. Most of those projects are concerned with derelict industrial waterfronts, such as the Kop van Zuid, Rotterdam and the London Docklands. Almost always the redevelopment is focused on the public accessibility of the waterfront. The design of the public space along the water is an important mean in enhancing this accessibility. Historically the waterfront has always been a significant public space for cities, reflected in specific designs, which make optimal use of the linear space of the waterfront and bring people close to the waterline (Mann 1988). The public space of historical waterfronts can best be considered as an architectural unity: space, buildings and planting in close cooperation (Samant 2004). Waterfront redevelopment should focus on the accessibility of the water, in which the design of the public space is a tool to a increase the accessibility. The design should focus on the assets of the waterfront, the linear structure and the quality of water as a meditative place (Alexander 1977), and the public space should be considered as an architectural unity[4].

4 More on the waterfront as public space can be found in *Appendix 3.*

RESEARCH QUESTIONS

Research questions

How can the relation between city and water be restored?

The issue that is central in my graduation project is the disturbed relationship between city and water in Waterstad in Rotterdam, and in particular at the Leuvehaven area within Waterstad. The question rises how this relation can be restored. Accordingly, the main research question of my graduation project is: how can the relation between city and water be restored? The research question is deliberately drafted in general terms, so the answer can be of general value. The research on water cities will be on the three, previously mentioned cities, in order to find general answers and principles. In the design process the found answers and principles will be made specific in a design for Waterstad.
To be able to give an answer to the main question I will divide the question into three sub questions. The sub questions are derived from the themes stated in the *Problem Statement* and the *Theoretical Framework*: urban fabric, morphology and public space. The first sub question will be: (I) what are the characteristics and qualities of (A) urban fabric, (B) morphology and (C) public space in water cities? The answering of this question will indicate in what way water cities are different from land cities (A), focusing on the historical growth of both types, and how this has resulted in specific, distinguished qualities for water cities, and on the position of water cities within the historic city. The relation between orientation, size, appearance etc. of buildings and building blocks and water will be object to morphological analysis (B). The appearance and quality of public space (C) will be sought in the different characteristics of the waterfront and what design elements are applied to reduce the physical and mental distance to the water in order to create a pleasant public space.
The second sub question is: (II) what design principles can be derived from the characteristics and qualities of water cities? And the third question, which relates directly to the second question is: (III) how can the principles be applied in a design for Waterstad? This research and design project is in search for the qualities of water cities. The founded qualities, will be compressed into design principles, which are in turn a guideline for the design of Waterstad.
In other words, the answering of the questions is focused on finding what is needed to make a good design for Waterstad, ‘good’ being the sum of the founded qualities.

(I) WHAT ARE THE CHARACTERISTICS AND QUALITIES OF (A) URBAN FABRIC, (B) MORPHOLOGY AND (C) PUBLIC SPACE IN WATER CITIES?

(II) WHAT DESIGN PRINCIPLES CAN BE DERIVED FROM THE CHARACTERISTICS AND QUALITIES OF WATER CITIES?

(III) HOW CAN THE PRINCIPLES BE APPLIED IN A DESIGN FOR WATERSTAD?

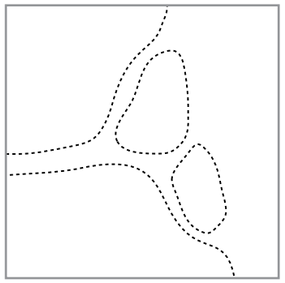


Figure 22. Before urbanisation

Figure 23. Water city, 17th century

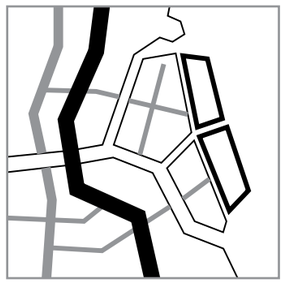


Figure 24. Water city, 19th century

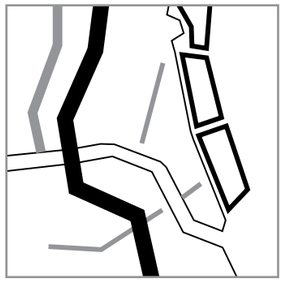


Figure 25. Water city, 20th century

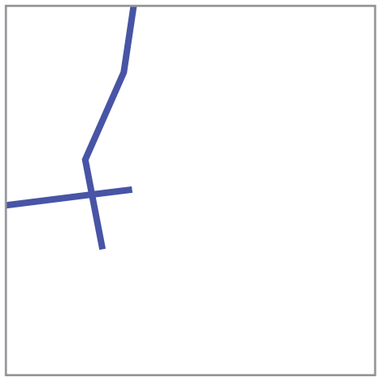


Figure 26. 3 steps analysis method, first step

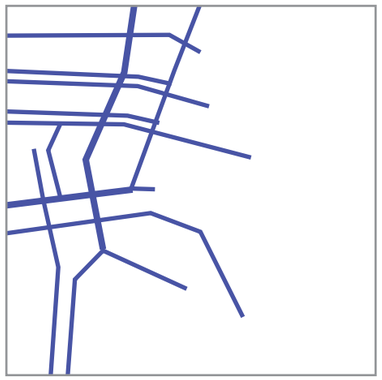


Figure 27. 3 steps analysis method, second step

Figure 28. 3 steps analysis method, third step

Figure 29. Morphology, parcels, plan

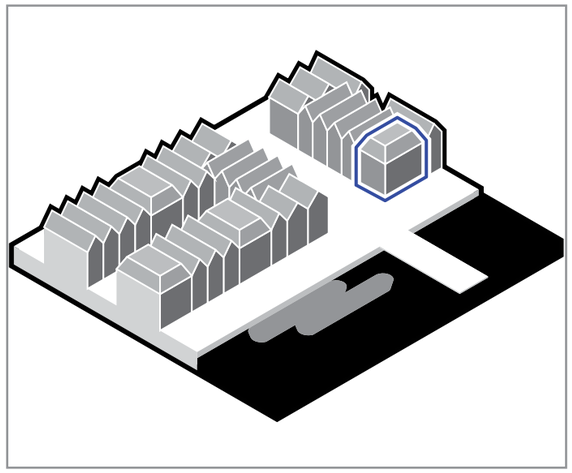


Figure 30. Morphology, buildings and anchorpoints, isometric projection

Waterstad, reintroducing water in Rotterdam
METHODOLOGY

Methodology

Urban fabric: spatial analysis (i): water city

The search for the characteristics of the water city starts with a spatial analysis of the genesis of the three cities mentioned in the *Problem Field*. The analysis consists of a series of maps that show the changing water system based on historical cartographical material. At the left page an example of a this analysis is shown by a series of maps of a non-existing situation. The different lines represent different characteristics in the city-water relationship. Figure 22 shows the situation before urbanization. The situation is drawn with a dotted line, in order to indicate the variable contours of the land when it was still a swamp, and hence could be flooded regularly. Although I have investigated this primal situation for all three cities, for the sake of conciseness I have chosen not to show the situation prior to the seventeenth century in the analysis; the docks and canals of the seventeenth century are central in this research. Figure 23 shows the situation at the end of the seventeenth century. There are some major changes in the water system: dikes (thickest line) divide the city in a part that is safe for flooding and a part that is not safe, the course of the river is fixed (solid line), artificial water (grey line) for transportation and water management is added to the water system and large defense walls in the outer dike area must protect the city from intruders from the sea (thick line). At the end of the nineteenth century (fig. 24) the isles of the natural delta are fixed (solid line) and occupied and new, artificial islands are created (thicker line). New canals are added, but there are also canals removed. At the end of the twentieth century (fig. 25) after the modernization of the city most canals are removed.

Urban fabric: spatial analysis (ii): connectivity

The previous analysis makes it possible to identify the water city. This analysis will indicate the spatial position of the water city in the whole of the city: the way the water city is connected to the city centre and vice versa. The connectivity of the water city is an important indication its spatial quality: an isolated position towards the city centre has a different spatial quality then an overlapping position. In order to identify the connectivity of the water city, I will make use of the three-steps-analysis-method (Garrigós e.a. 2009). The first step is to choose a point in the street network of the city and draw the first step in the network: lines from the chosen point as longs as the streets go, until they end or there is a Y- or T-crossing: the point where you are forced to choose a new path (fig. 26). The second step is to draw lines, in the same way as the first step, of all side streets starting from the lines of the first step (fig. 27). The third and last steps is to draw lines of all side streets starting from the lines of the second steps (fig. 28). The results is a map of places you can reach from a certain chosen point in three steps[1]. The method is different from the space syntax method (Hillier 2007) in several ways. The three-steps-analysis-method is less accurate because the paths are not computed but based on interpretation of the map by the draftsman. However this method better reflects the outcomes of the previous analysis, as it is able to show the long lines of the urban fabric (e.g. dikes, canals), while the space syntax method starts a new path after every bend. I will make a historical analysis of connectivity, choosing the same periods as in the previous analysis, in order to compare the position of the water city through the ages. For this analysis I will choose two starting points for every city, one at the outer rim of the water city and one at the land city about where the city was founded.

1 The three-steps-analysis-method is based on the assumption that people can remember or reproduce about three steps when making use of the street network. When asked for directions people will be able to explain the route in about three steps.

Morphological analysis

The point at the outer rim of the water city from the previous analysis is taken to make a morphological analysis. The point is chosen so that it contains a good representation of buildings, monuments and different types of water, large and small. The analysis is done in order to find how buildings and building blocks relate to the water: what are the morphological characteristics of all three cities and what quality does the morphology adds to the experience of the water? An isometric projection (fig. 30) is taken in order to identify size, density and variety of buildings, but also to show how the buildings relate to the public space: planting scheme, height differences, distance to water.

Figure 31. Public space, Coolsingel

Figure 32. Public space, Schiedamsedijk

Figure 33. Public space, Schiedamsedijk

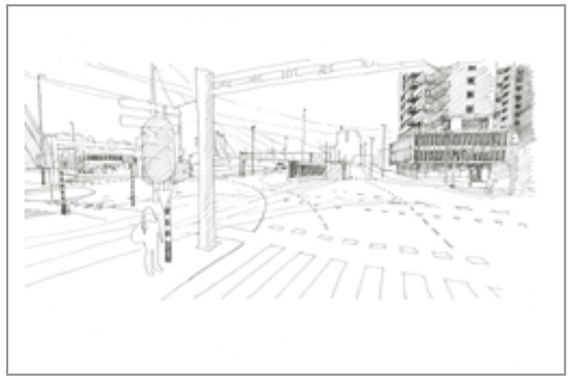


Figure 34. Public space, Erasmusbrug

Figure 35. Public space, relation to water, section

Public space: accessibility

The analysis of the public space is focused on the accessibility of the water: what elements in the design of the public space make the water more approachable? Buildings and architecture play an important role to this respect: buildings shape public space by their size, functional and architectural articulation and buildings can form an attractive skyline, enhancing the waterfront experience. For an analysis of these elements I have taken the same locations in the three cities as in the previous analyses in order to make a 360o panorama in which the whole waterfront can be experienced. The drawings made of the panorama will explore the elements that give the waterfront its appearance (fig. 31-34). The figures at the left page are made at an early stage of the project, and follow a certain path (in Rotterdam, from the Coolsingel to the landing of the Erasmusbrug) instead of a showing a 360o panorama. The benefit of choosing a path is that it reflects and visualizes the movements in the city, as fits well with the three-steps-analysis-method. However the risk of choosing a specific path is that it can be arbitrary, as can be choosing the interval of the snapshots. A 360o panorama on the other hand fits well with the morphological analysis as it gives an architectural expression to the morphological types. Moreover, the 360o panorama provides a better expression of the waterfront experience. Apart from buildings planting scheme, height differences and distance to water are important elements in public space that can increase the approachability of water. Those elements are subject to analysis in sections made from the same location as from the panorama (fig. 35).

Design principles

An important component of the research will be the design principles based on the analyses. This component will link research with design. Both research and design are processes that run simultaneously during the whole project with risk of divergent paths. By producing two or three images for each analysis that display the essence of the analysis and at the same time provides direction for design and explanation of the different interventions, I will be able keep the two paths together. The images are connected in style to express that they are not arbitrary design tools, but are part of a comprehensive research that covers multiple scales and locations (fig. 36).

Figure 36. Icon template

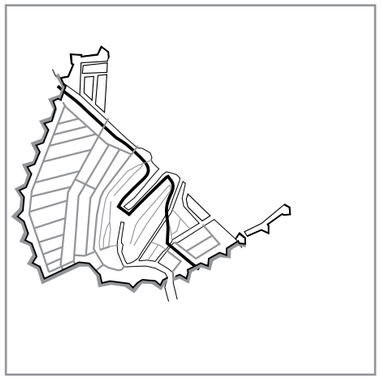


Figure 37. Amsterdam, 1700

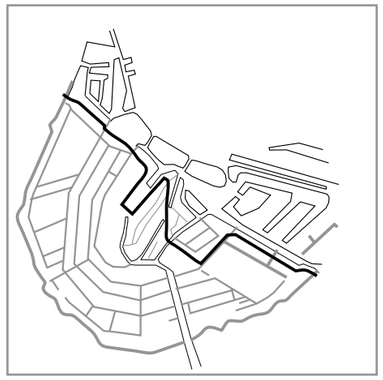


Figure 38. Amsterdam, 1900

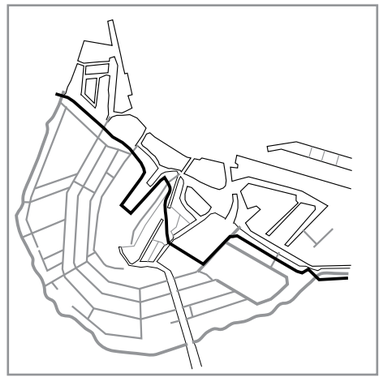


Figure 39. Amsterdam, 2000

Figure 40. Hamburg, 1700

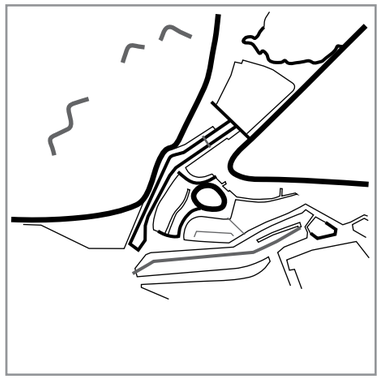


Figure 41. Hamburg, 1900

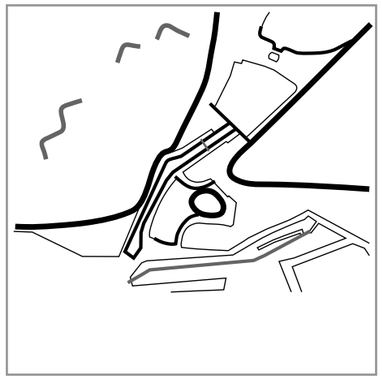


Figure 42. Hamburg, 2000

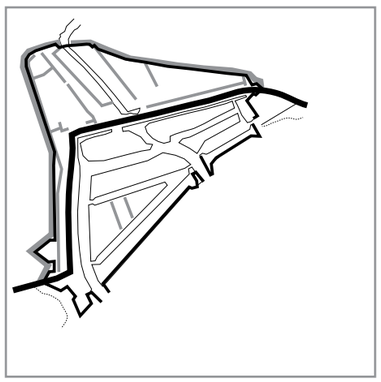


Figure 43. Rotterdam, 1700

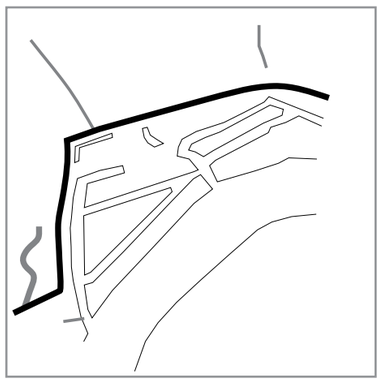


Figure 44. Rotterdam, 1900

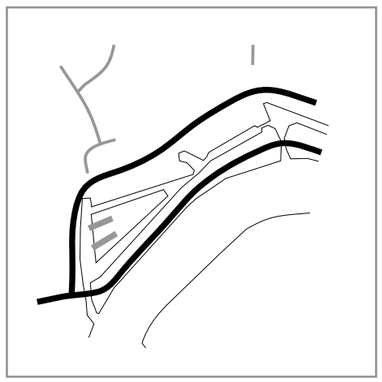


Figure 45. Rotterdam, 2000

Waterstad, reintroducing water in Rotterdam
ANALYSIS

Analysis

Urban fabric: spatial analysis (i): water city

In Amsterdam there is clear distinction between water city and land city. The dike runs through the city starting from the Dam to the east and west side of the city (fig. 37). At the west side the dike follows more or less the course of the water, at the east side however the dike follows a more erratic path. Therefore at the east side, more than at the west side, a distinct type of city came to development. The urbanized, natural islands are in contrast with the adjacent parts of the city at the other side of the dike. This land city has a grid like, linear system, based on the underlying agricultural landscape as well as on the urban theories of Simon Stevin. The urban form of the islands is based on the form of the islands itself. This contrast between land city and water city is an important principle: when it come to designing both areas should be approached in a contrasting way (fig. 46). In the nineteenth century the island system is extended into the IJ with artificial islands, hosting port activities and industry, as well as railway tracks and the central railway station (fig. 38). This situation remains more or less unchanged in the twentieth century (fig. 39).
The water city of Hamburg is determined by the natural height differences of the city. The city is founded on a foothill next to the Alster, but since then the city has been grown towards the natural islands where the Alster flows into the Elbe (fig. 40). The island are consolidated by multiple dams, city walls, and housing directly built at the water. Technically Hamburg does not have a water city, like Amsterdam and Rotterdam have, because all parts of the city were safeguarded by various types of constructions. However, the city built on the islands is distinct from the city on the foothills. As already said the island were the first to be urbanized, having ready access to trade routes and fresh water. Maps that show the pattern of the cholera epidemic in the nineteenth century demonstrate the privileged position of the islands. Although the collection of islands show an erratic form, the different islands have a similar building pattern, contrasting with the irregular building patterns on the foothills. The form of the islands has disappeared to a great extend in later centuries (fig. 41-42).
The urbanization pattern of Rotterdam shows great resemblance to the pattern of Amsterdam: the land city is determined by the agricultural landscape, while the water city forms a system on its own on several island. In Rotterdam the islands are more spacious, and thus contrasting even more with the land city (fig. 43). An important feature of the water city in Rotterdam is the defense line along the Meuse: as can be read in appendix 1, the integration of the military defense system and public space was an important quality of the water city. The integration of defense against flooding and public space can also be a meaningful design principle today (fig. 47) Rotterdam is the only city that shows a radical change in the urban fabric. The character of the water city was changed by the relocation of the primary dike to the Boompjes and by introducing a secondary dike at the Blaak (fig. 45). This creates a remarkable situation: it raises the question whether or not the water city shrinks to the new position of the dike. In line with the principle of integration of flood protection and public space I have chosen to consider the new dike as the new boundary of the water city: the dike and the accessory water system defines the water city (fig. 48).

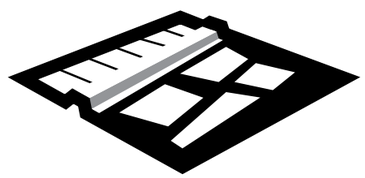


Figure 46. Water city vs. Land city

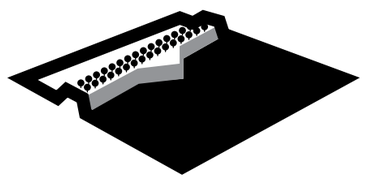


Figure 47. Integrated use of defense system

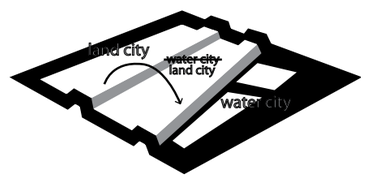


Figure 48. Moving water city

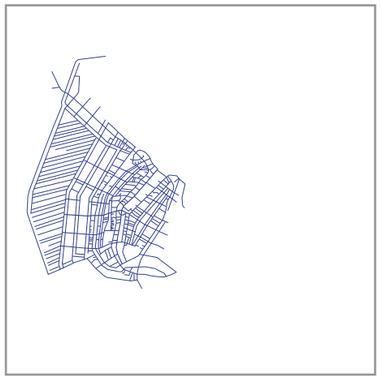


Figure 49. Amsterdam, 1700, connectivity starting from Dam

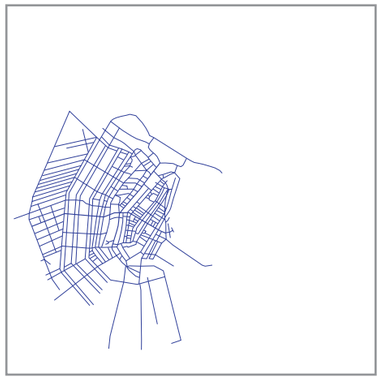


Figure 50. Amsterdam, 1900, connectivity starting from Dam

Figure 51. Amsterdam, 2000, connectivity starting from Dam

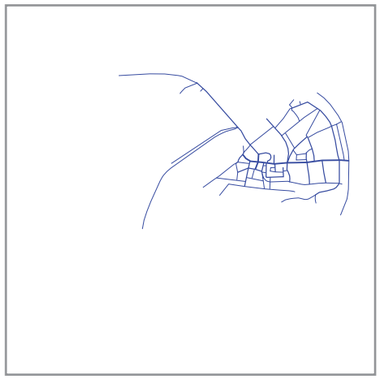


Figure 52. Hamburg, 1700, connectivity starting from Hauptkirche St. Petri

Figure 53. Hamburg, 1900, connectivity starting from Hauptkirche St. Petri

Figure 54. Hamburg, 2000, connectivity starting from Hauptkirche St. Petri

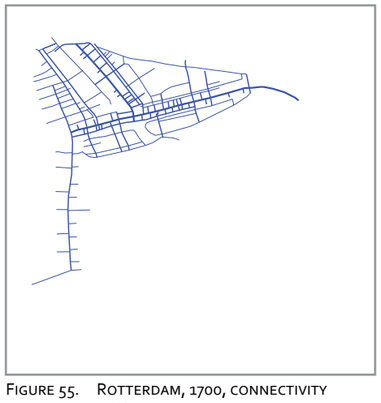


Figure 55. Rotterdam, 1700, connectivity starting from Hoogstraat

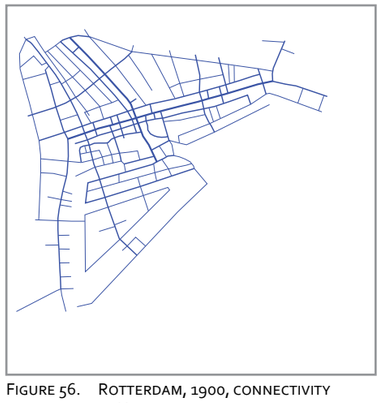


Figure 56. Rotterdam, 1900, connectivity starting from Hoogstraat

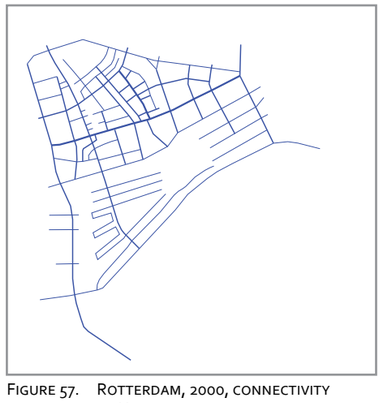


Figure 57. Rotterdam, 2000, connectivity starting from Hoogstraat

Waterstad, reintroducing water in Rotterdam
ANALYSIS

Urban fabric: spatial analysis (ii): connectivity

As already announced in the Methodology section the connectivity analysis will be made from two starting points from each city. The first will be from where the cities were founded: they are displayed on the left page. Second is the starting point from a location at the water city, displayed at the next page. The explanation by the images will be displayed on this page, as well as on the next.
The first starting point for Amsterdam is the Dam (fig. 49-51) and the second the Prins Hendrikkade (fig. 60-62). From the Dam, the western part of the city is extremely well connected because of the long lines of the Grachtengordel. This situation does not change in time. The eastern part of the city is actually almost completely disconnected from the city centre. I can identify two reasons for this: firstly all the long lines from the western part of the city get stranded at the dike: the Zeedijk, Nieuwmarkt and Sint Antoniusbreestraat, and secondly the eastern part of the city consist mainly of islands, with only few access points. From the Prins Hendrikkade the lines also get stranded on the dike. This observation demonstrates the importance of the dike as a structuring element, connecting both land city and water city (fig. 58). The island itself is well connected, but there is minimal connectivity to the other islands to the east. The relative isolation of the island determines its character: although close to the city centre, it is a quiet residential area. In the nineteenth and twentieth century all three cities are improved by long lines, connecting different parts of the city, although this is most evident in the example of Rotterdam (fig. 56, 67). This might affect the isolated character of the water city, however, at the same time it might connect attractive public space at the waterfront with the inner city (fig. 59).
The first starting point for Hamburg is the Hauptkirche St. Petri (fig. 52-54) and the second the Jungfernstieg (fig. 63-65). Hamburg shows a different connectivity pattern. Hamburg does not have the long dikes as structuring element in the city: land city and water city show a different connectivity and do not reach the complete 'domain' of the other part, however both parts have an overlapping area, which can clearly be identified today as the city centre (fig. 52-54, 63-65) . Also the islands in Hamburg show a different urbanization pattern. Both the Amsterdam and Rotterdam island are surrounded by quays, while the Hamburg islands are completely surrounded by buildings. Traveling from one island to the other gives glimpses of water, as illustrated in figure 69. This island hopping is an interesting design principle as it gives an exciting, shifting image of the city (fig. 71), especially for the connecting lines (fig. 59)
The first starting point for Rotterdam is the Hoogstraat (fig. 55-57) and the second the Boompjes (fig. 66-68)The connectivity of Rotterdam shows great similarity to that of Amsterdam: the distinction between the well connected land city and the disconnected water city. A remarkable feature of an island is the fact that you can walk along the water and return at the same location as where you were started (fig. 66, 67): the island experience (fig. 70). This experience was clearly a quality of the Wijnhaveneiland, but is completely lost in the post war urban

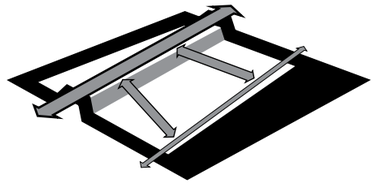


Figure 58. Dikes as structuring elements

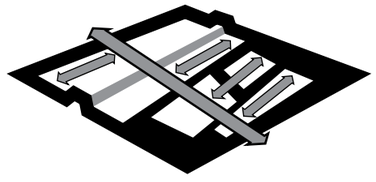


Figure 59. Additional connectors

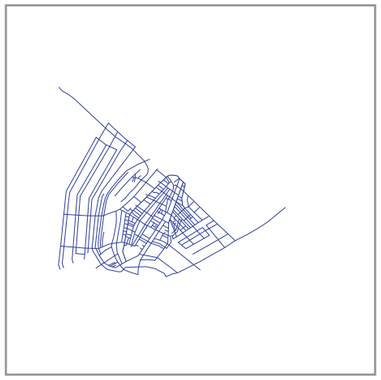


Figure 60. Amsterdam, 1700, connectivity starting from Prins Hendrikkade

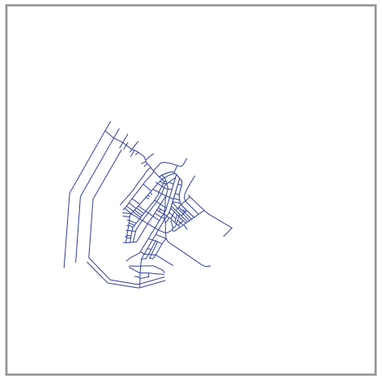


Figure 61. Amsterdam, 1900, connectivity starting from Prins Hendrikkade

Figure 62. Amsterdam, 2000, connectivity starting from Prins Hendrikkade

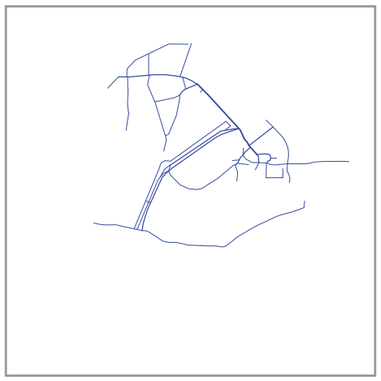


Figure 63. Hamburg, 1700, connectivity starting from Jungfernstieg

Figure 64. Hamburg, 1900, connectivity starting from Jungfernstieg

Figure 65. Hamburg, 2000, connectivity starting from Jungfernstieg

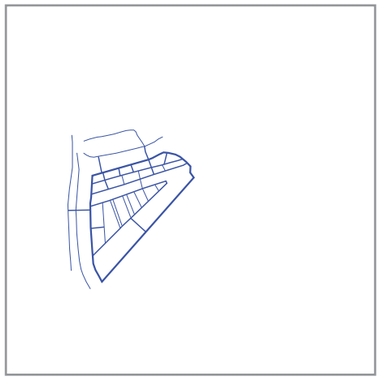


Figure 66. Rotterdam, 1700, connectivity starting from Boompjes

Figure 67. Rotterdam, 1900, connectivity starting from Boompjes

Figure 68. Rotterdam, 2000, connectivity starting from Boompjes

fabric. From the Boompjes the land city is better connected, but the actual water city is surpassed (fig. 68). Another change is the position of the Leuvehaven in the fabric of the city. Historically the west side of the Leuvehaven was very isolated. With the extension of the Coolsingel to the Schiedamsedijk and the absence of buildings at the east side of the Schiedamsedijk, the Leuvehaven suddenly is in the middle of the city. The Leuvehaven as a place cannot handle this change in the system of the city. A desirable spatial strategy for Waterstad would be to go back to the roots of the city: to restore the relative isolation of Waterstad to create a district that is very distinct from the actual city centre, instead of bringing the centre to the river, for it has never been there, let alone at both sides of the river.

Figure 69. Island hopping in Hamburg

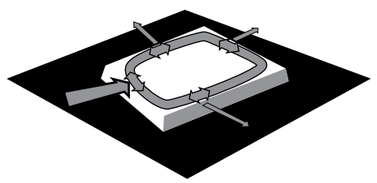


Figure 70. Island connectivity logic

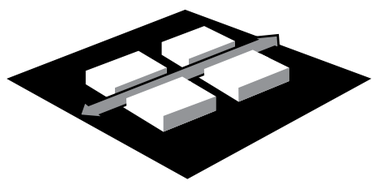


Figure 71. Island hopping

Figure 72. Amsterdam, Prins Hendrikkade, aerial photograph

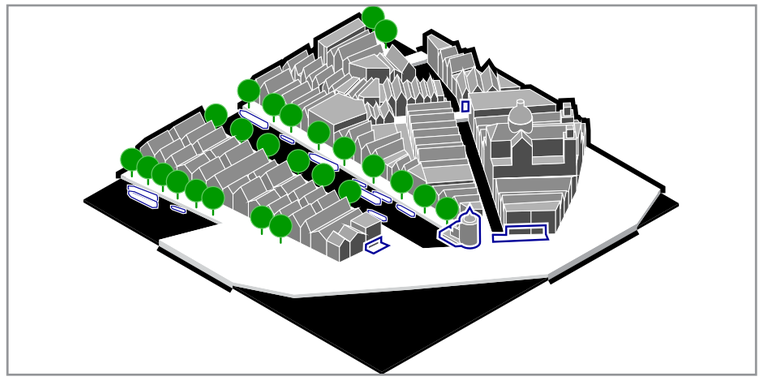


Figure 73. Amsterdam, morphological analysis

Figure 74. Hamburg, Jungfernstieg, aerial photograph

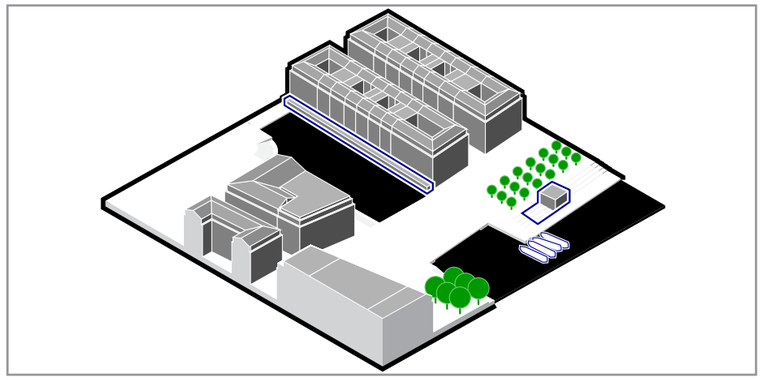


Figure 75. Hamburg, morphological analysis

Figure 76. Rotterdam, Boompjes, aerial photograph

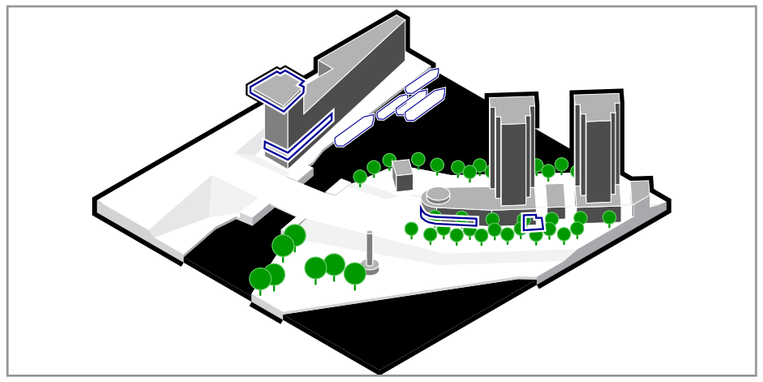


Figure 77. Rotterdam, morphological analysis

Morphological analysis

This morphological analysis intends to show the scale of the parcels and the building volume, as well as the location of social beneficial functions (e.g. bars and restaurants, museums, marinas (boats)).
Amsterdam has the finest parcel structure, combined with a high volume of buildings (fig. 73). This results in a great variety of individual buildings. Most of the buildings along the canals are residential; there are only a view shops or offices along the water. At the extremity of the canal there is a concentration of cafes with terraces, close to the water (e.g. in a guard tower). The streets along the canal are too narrow for terraces, so the structure of the city creates a natural distinction in locations suitable for cafes. The individuality and small scale of the 'canal type' morphology makes it ideal for residential purposes. This type is suitable for stretching along canals without getting boring, because of the variety that comes with the fine grain of the parcels (fig. 78).
The scale of the buildings in Hamburg is much larger (fig. 75). Unlike in Amsterdam there are no individual houses, but only apartment buildings. Also, there are many large office buildings. The mix of functions, the scale of the buildings and the size of the public space makes clear that this is the heart of the city. The bars and restaurants are deliberately located very close to the water, with the best possible view. Although the apartments buildings consist of different individual parcels, there is a strong unity in their appearance: they are part of a greater whole. This is strengthened by de arcade that runs along the water, connecting all the different parcels. This special element in the morphology gives emphasis to the water, in order to enhance the special character of the place (fig. 79).
Boompjes in Rotterdam consists of individual, mono-functional buildings. There is no uniformity in scale or form, and the upper left building covers more than hundred meters of the waterfront with only one function and no entrance at all at the water. The buildings in general make optimal use of the view on the water, and so are the bars and restaurants in the buildings. However, there is only one café with a terrace and that one is almost fifty meters separated from the water. The water experience of the cafes is just high and dry. However, the collection of skyscrapers form an attractive skyline and living in a high-rise building gives a wonderful, far stretching experience of city and water (fig. 80).
A combination of the model from Amsterdam and the model of Hamburg is needed to improve the functionality of the urban structure of Rotterdam. The model of Amsterdam gives clues of the appropriate scale for living and diversity and in the way it creates a natural distinction in functionality. The model of Hamburg shows how functionality should relate to water and public space: functionality is designed as part of the public space.

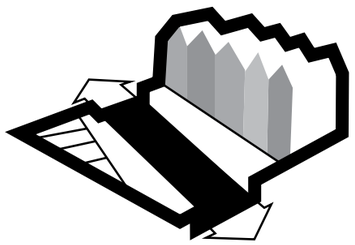


Figure 78. diversity and linearity

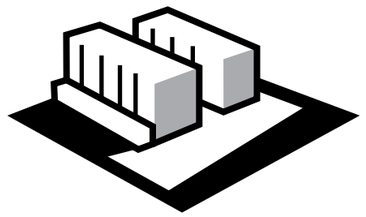


Figure 79. connective elements

Figure 80. Skyscrapers

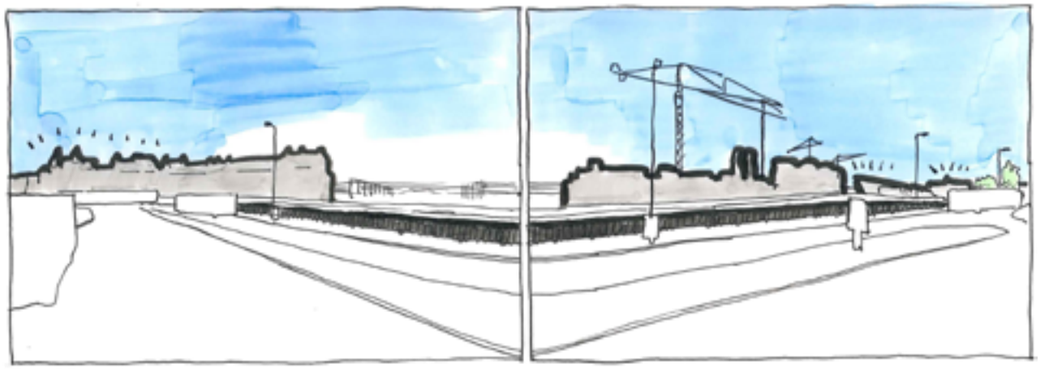


Figure 81. Amsterdam, Prins Hendrikkade

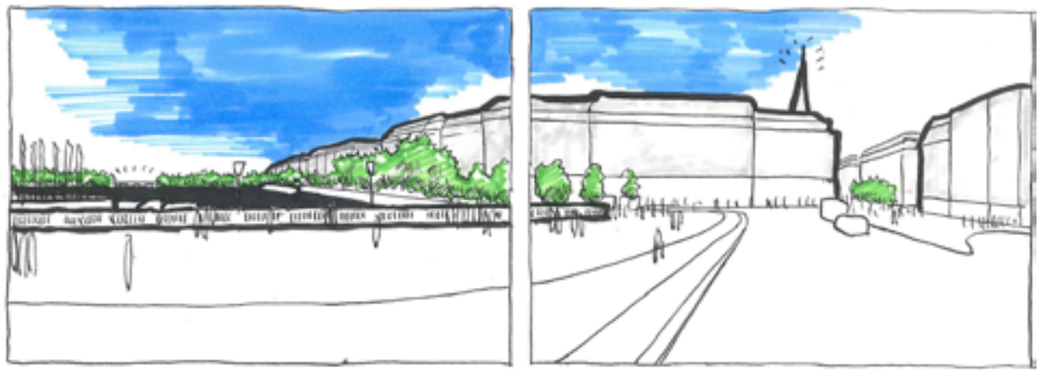


Figure 82. Hamburg, Jungfernstieg

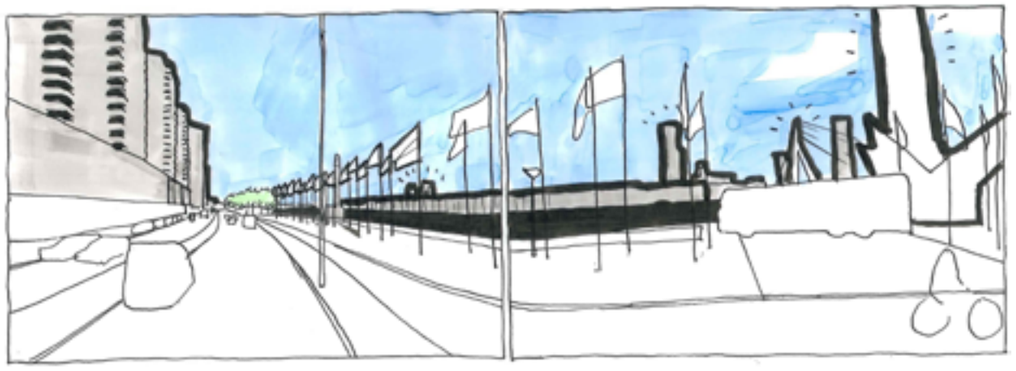


Figure 83. Rotterdam, Boompjes

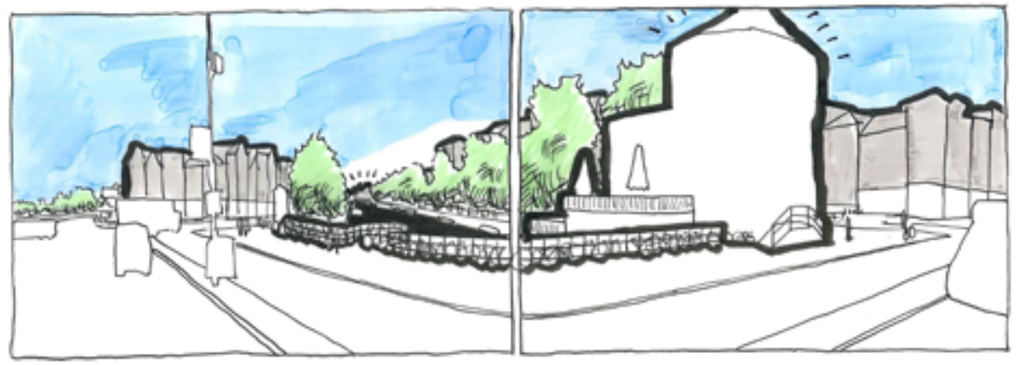


Figure 84. Amsterdam, Prins Hendrikkade

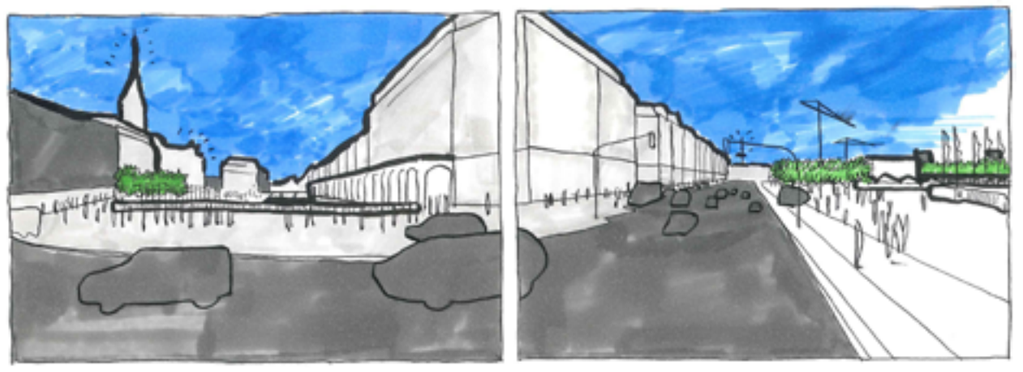


Figure 85. Hamburg, Jungfernstieg

Figure 86. Rotterdam, Boompjes

Figure 87. Amsterdam, Geldersekade

Figure 88. Hamburg, Jungfernstieg

Figure 89. Rotterdam, Boompjes

Public space: accessibility

The Prins Hendrikkade in Amsterdam used to have an unlimited view on the IJ. Currently this view is blocked by the Central Station and the islands which are built in the nineteenth century (fig. 81). The view to this part of the city is unwelcoming: the broad stretch of road, the small sidewalk and the large amounts of bicycles along the water make it an unattractive waterfront for hanging around or strolling along. When the construction site is finished, the buildings at the other side of the water might provide an enclosed atmosphere. By contrast, the other side of the view is very welcoming (fig. 84). The canal (Geldersekade) does not give it secrets away immediately: the large trees create an enclosed atmosphere and reveal just enough of the buildings to give a glimpse of variety in buildings and unity in architectural appearance. The trees and the close distance to the water are important features the 'canal type' public space (fig. 87, 90). The bicycles at the railing do add to the Amsterdam experience and there is no urgent reason to lean on the railing, because there are several terraces and the real treasure is to walk along the canal.
At the Jungfernstieg the design of the public space is completely focused on the experience of the Alster (fig. 82, 85). There are steps to the river at seating height, benches, pavilions, monumental railings and trees, arcades, flags, multiple sidewalk levels etc (fig. 88). The buildings are large and very uniform in appearance: this gives a great unity to the skyline along the water, laying focus on the water. Furthermore remarkable is the monumental size of the sidewalks: an appropriate size for a monumental view. The size of the public space, the row of trees and the steps add to a gradual waterfront experience, with different atmospheres (fig. 91). This is a great way for designing a special place at the water.

The view from the Boompjes is the most grand: the Boompjes is really washed by water (fig. 83, 86). In contrast to Amsterdam and Hamburg you can actually see water and ships passing by. Also, the view towards the Meuse has a double skyline: the classic, uniform skyline of Noorderleiland and behind the skyscraper skyline of the Kop van Zuid. The size of the buildings along the Boompjes itself is enormous, they form a impressive row of buildings. However, the size of the roads and sidewalks is not appropriate to the size of the buildings and the trees are not large enough to cover up the buildings (fig. 89). The buildings are too close to the water to create a pleasant atmosphere. The same goes for the hotel along the Leuvehaven: it is a wall without elements in the architecture or at the public space around it that creates a convenient distance to the water (fig. 18, 77, 86). The waving flags along the water are an excellent idea to emphasize the openness of the place, with the wind blowing freely. However the poles are not close enough together to form a unity in the waving of the flags, and the poles itself are very ordinary. Lastly, there is no contrast between the magnificent openness of the Meuse and the not quite so magnificent openness of the Leuvehaven. The Leuvehaven is not enclosed enough to be a pleasant place for staying and not open enough to compete with the Boompjes.
In Rotterdam there should be a greater differentiation between enclosed and open; a differentiation which is most evident in Amsterdam. The Leuvehaven should be made smaller, more veiled, by means of trees and a smaller distance to the water. For the design of the Boompjes most can be learned from the model of Hamburg. The openness should be emphasized by a monumental approach to scale and design.

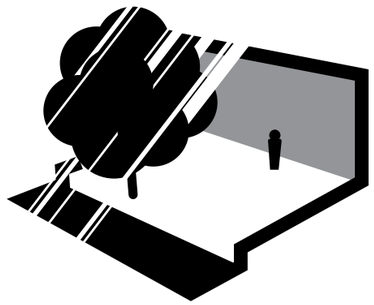


Figure 90. Enclosed atmosphere

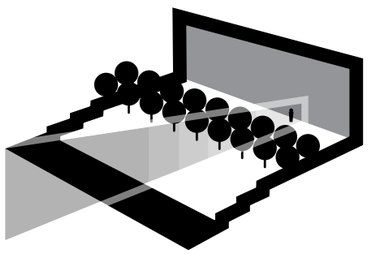
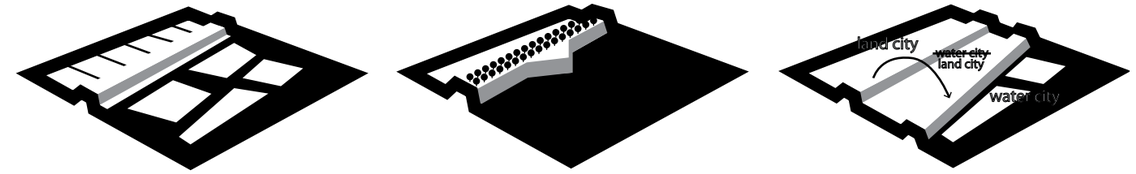


Figure 91. Steps to the water

DESIGN PRINCIPLES



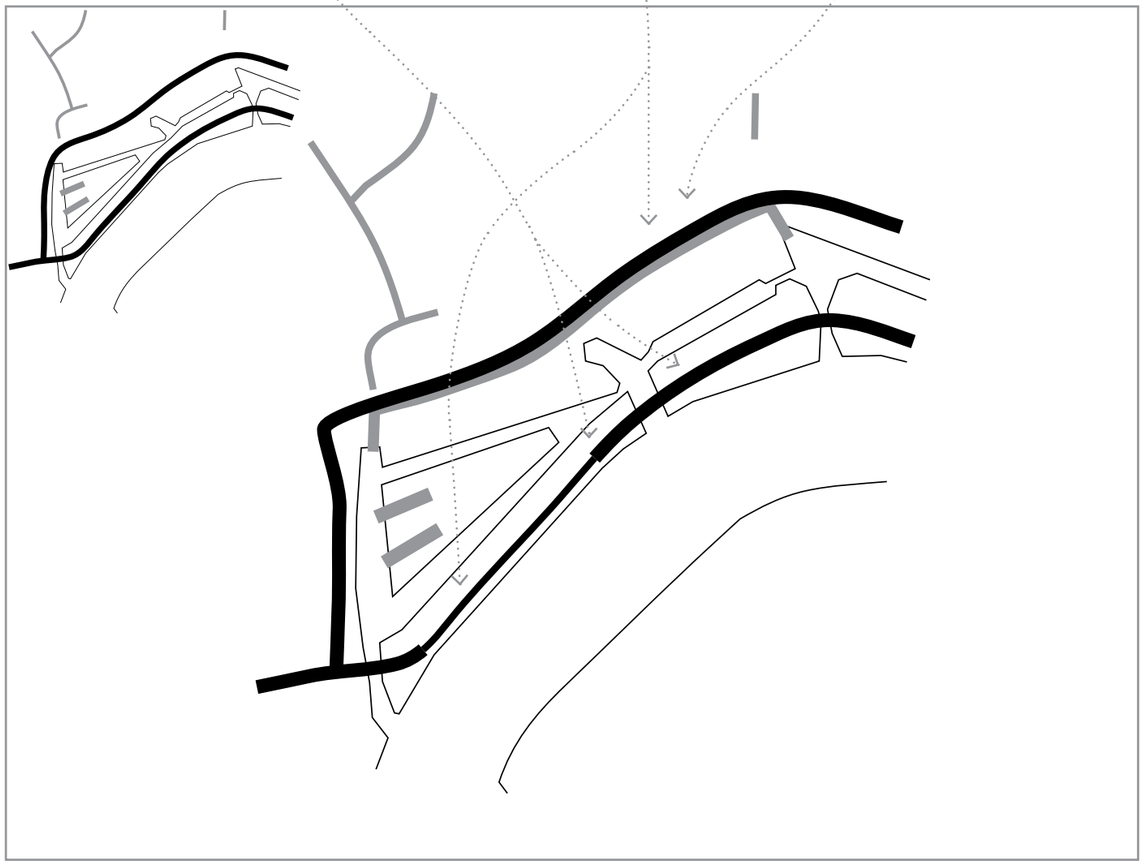


Figure 92. Rotterdam, plan Waterstad, interventions on the urban fabric

DESIGN PRINCIPLES

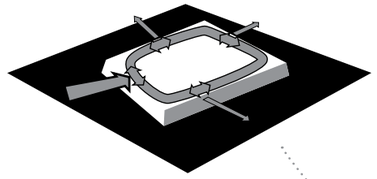


Figure 93. Connectivity Model 1, Hoogstraat

Figure 94. Connectivity Model 1, Boompjes

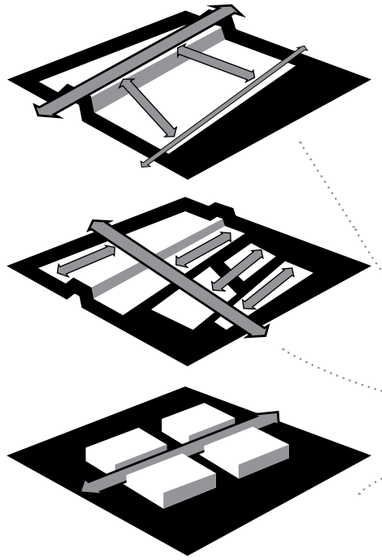


Figure 95. Connectivity Model 2, Hoogstraat

Figure 96. Connectivity Model 2, Hoogstraat

Design principles

Urban fabric: dikes, islands, lines

The dikes are defining the boundaries of the new Waterstad (fig. 92). It is a new Waterstad, because originally the dike was running along the Hoogstraat making the outer dike area a bit larger. The new dike along Blaak will be in my plan, much more than it is now, a spatial element: the canal at Blaak will be reintroduced, making the water defense system a much more visible element in the urban fabric of the city. It will also enhance the image of Waterstad being a collection of islands, being a real water city: you actually have to cross water to get to Waterstad. Reconnecting the Oudehaven with the Meuse will also add to this effect. At the same time the reintroduction of water will create new possibilities for recreational use. When it comes to connectivity I compared two slightly different models, of which I have chosen model 2. Although model 1 makes optimal use of the feature of islands to walk along them in an endless loop, model 2 creates an attractive route from the Markthal (at Binnenrotte square) to Boompjes, connecting different parts of the city.

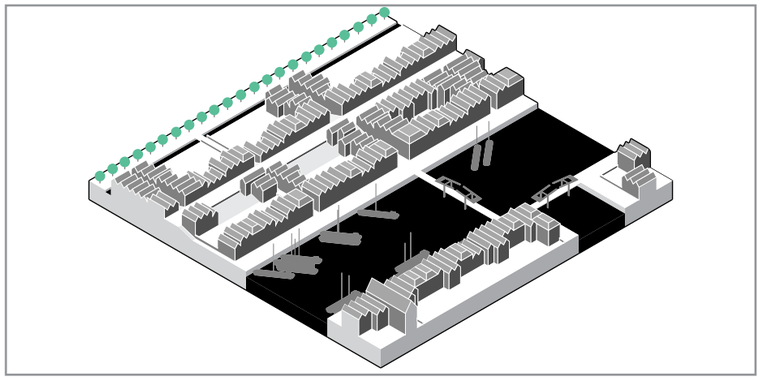


Figure 97. Leuvehaven, 1700

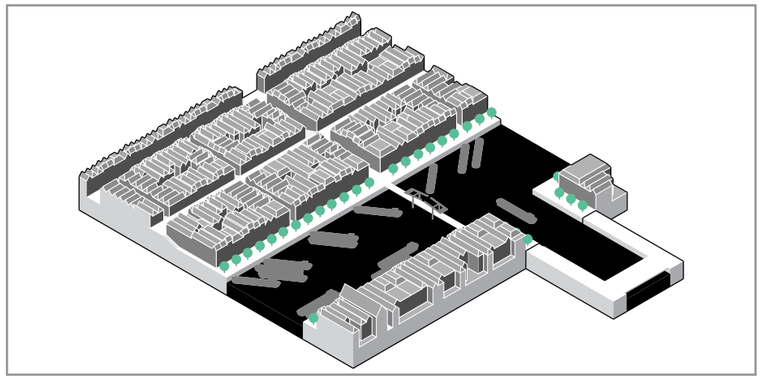


Figure 98. Leuvehaven, 1900

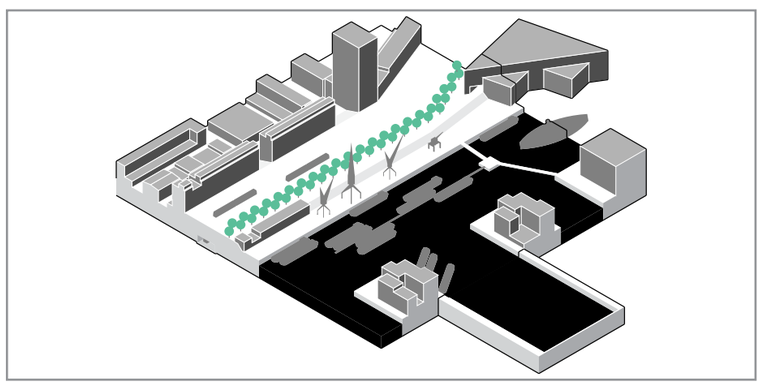
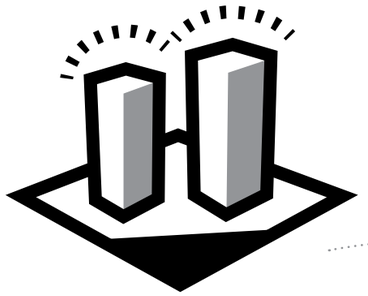
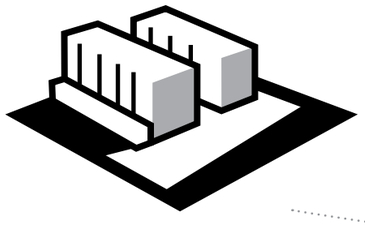
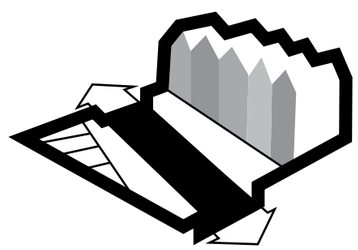


Figure 99. Leuvehaven, 2000







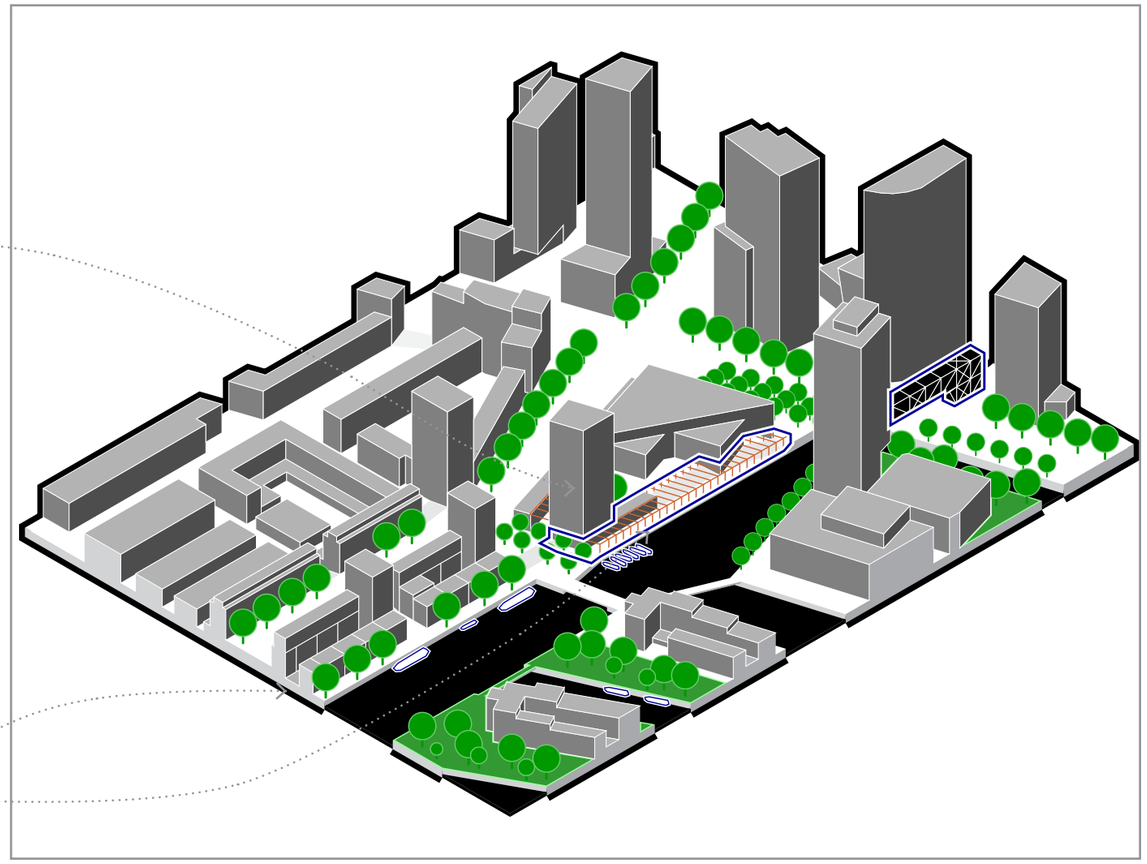


Figure 100. Head of Leuvehaven, Plan Waterstad

Morphology: parcels, blocks and skyscrapers

The traditional morphology of the Leuvehaven shows great resemblance with the Amsterdam type (fig. 97, 98). This morphological study confirms the flexible character of this type. The parcel structure of the seventeenth century (fig. 97) is gradually filled in until the extremely dense situation of the nineteenth century (fig. 98). The morphology of the twentieth century is characterized by void (fig. 99). In order to get a present-day morphology, that fits into the existing situation, a combination of the Amsterdam, Hamburg and Rotterdam types is sought. The Amsterdam types emphasizes the linear character of the Leuvehaven, and brings a small scale close to the water. At the side of the Schiedamsedijk the block represents the Hamburg type, giving the street as sense of unity as it connects to the long blocks at the other side of the street. A unifying arcade is also projected at the head of the Leuvehaven, to give this water a special atmosphere. Small skyscrapers at the end of the blocks react on the skyscrapers at Blaak, creating a sloping effect towards the water.

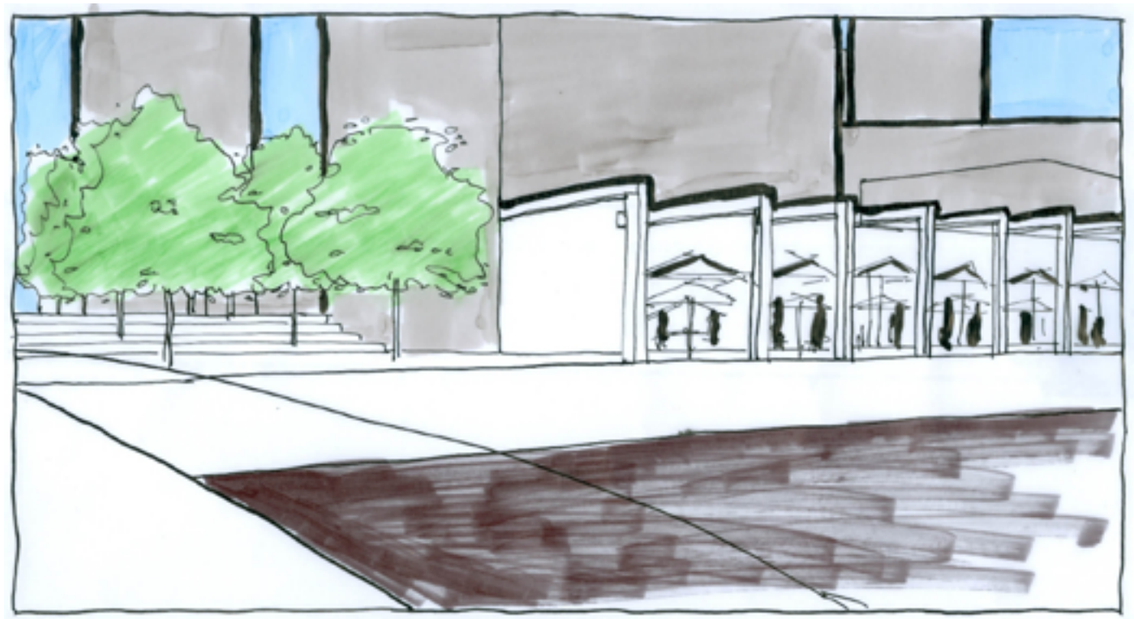


Figure 101. View towards Maritime Museum

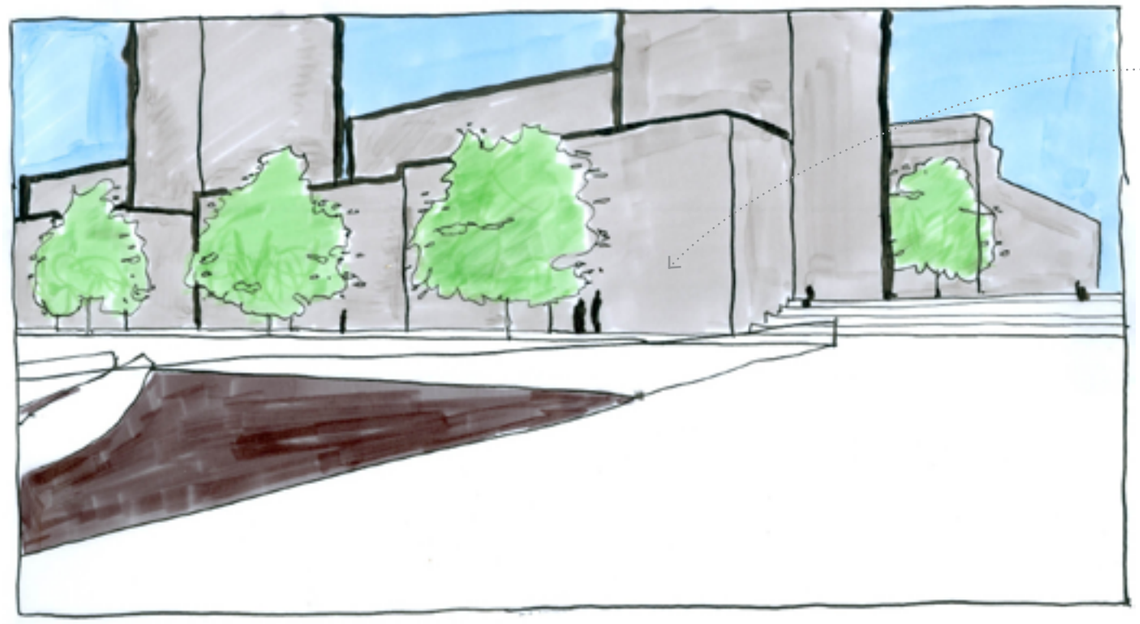
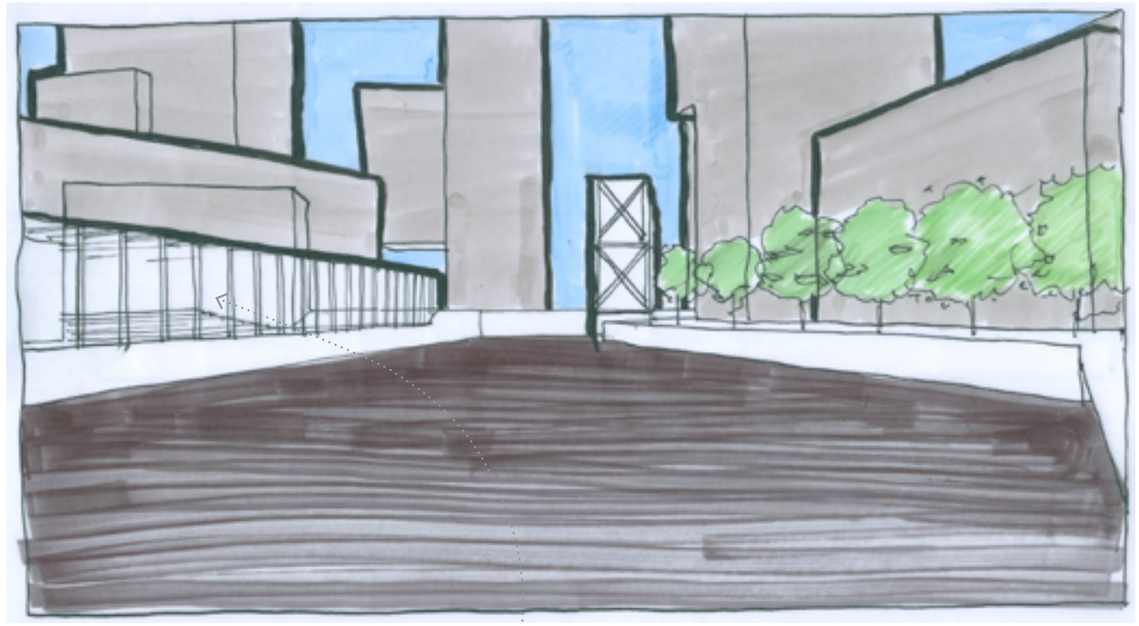
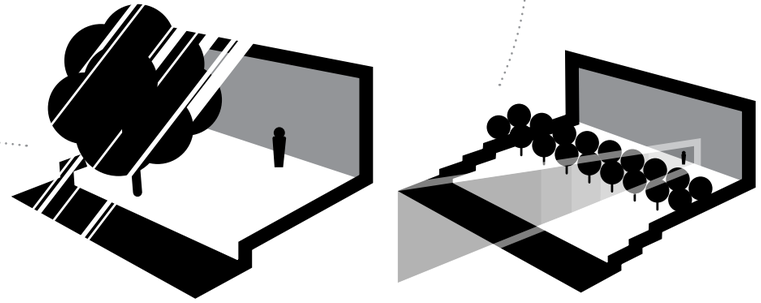


Figure 102. View towards Schiedamsekade

Waterstad, reintroducing water in Rotterdam
DESIGN PRINCIPLES





Public space: down to the waterline

Along the Leuvehaven there will be two types of public space. The head of the Leuvehaven has a special character, as it is the location of the Maritime Museum and the boat elevator. The special character is emphasized by the arcade along the water, under which there is room for terraces. Making use of the height difference created by the dike, there will be a stair with a gentle slope towards the Leuvehaven (fig. 101, 106). This way you can experience the water gradually. The other type of public space is south of the Maritime Museum, and will resemble the typical canal atmosphere (fig. 102, 107). To create a compact atmosphere the housing will be close to the water. The water will be lined with trees. The quay will be ideal for taking a stroll along the water.

Figure 103. Maritime Museum, section

Figure 104. Schiedamsedijk, section

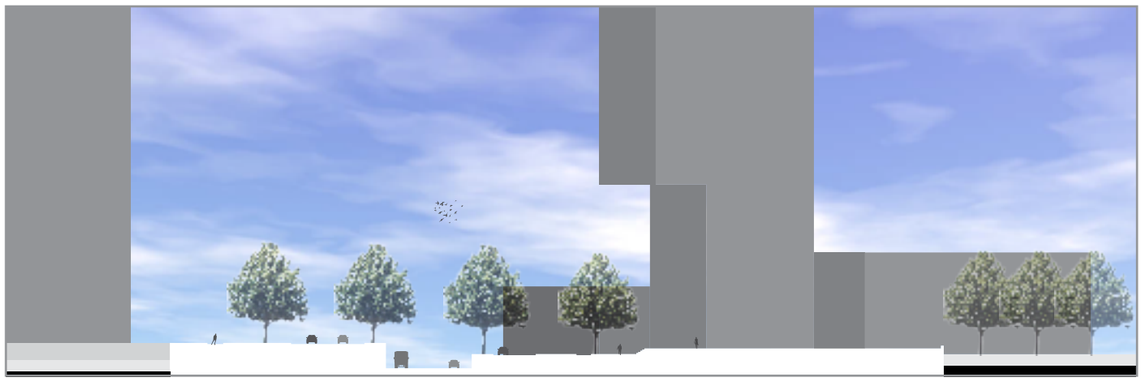


Figure 105. Blaak, section

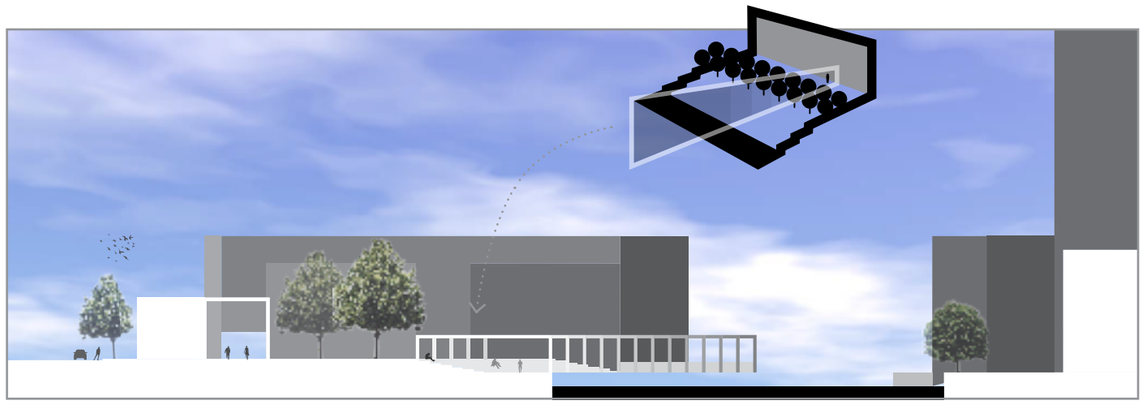


Figure 106. Maritime Museum with arcade and steps to the Leuvehaven, plan Waterstad

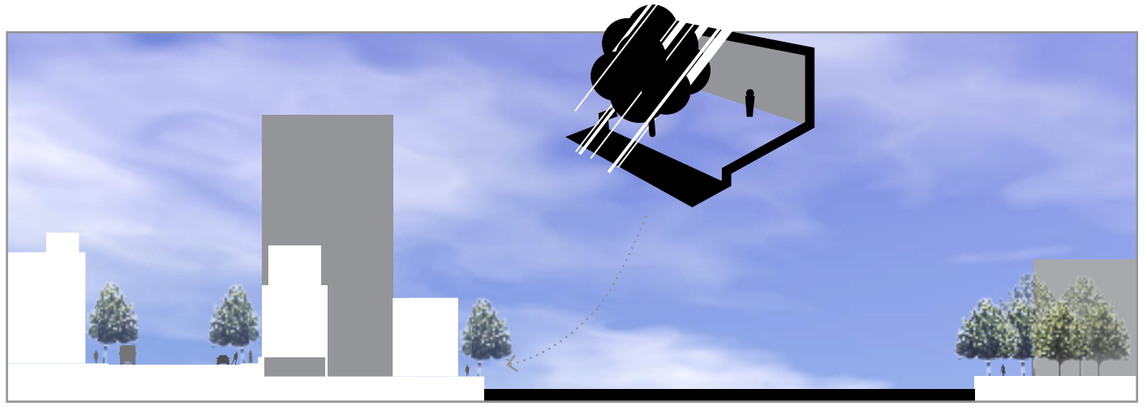


Figure 107. Schiedamsedijk and Schiedamsekade, plan Waterstad

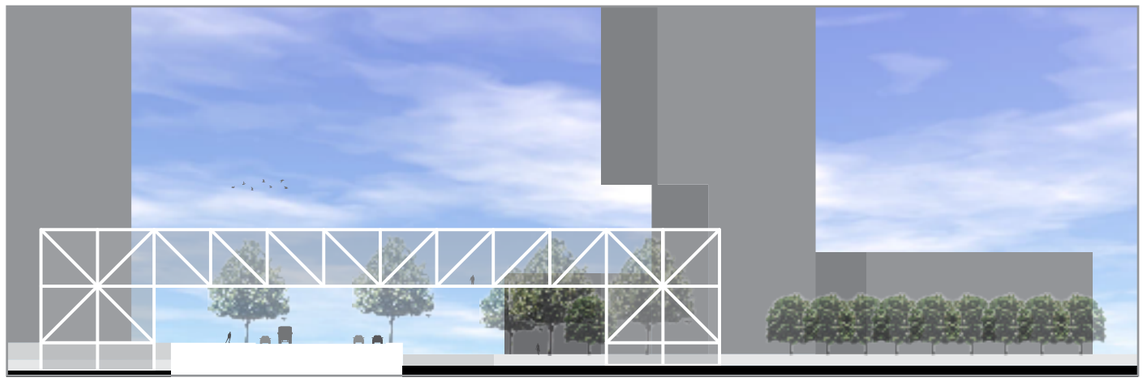


Figure 108. Blaak with boat elevator, plan Waterstad

Figure 109. Masterplan Waterstad

Waterstad, reintroducing water in Rotterdam
DESIGN

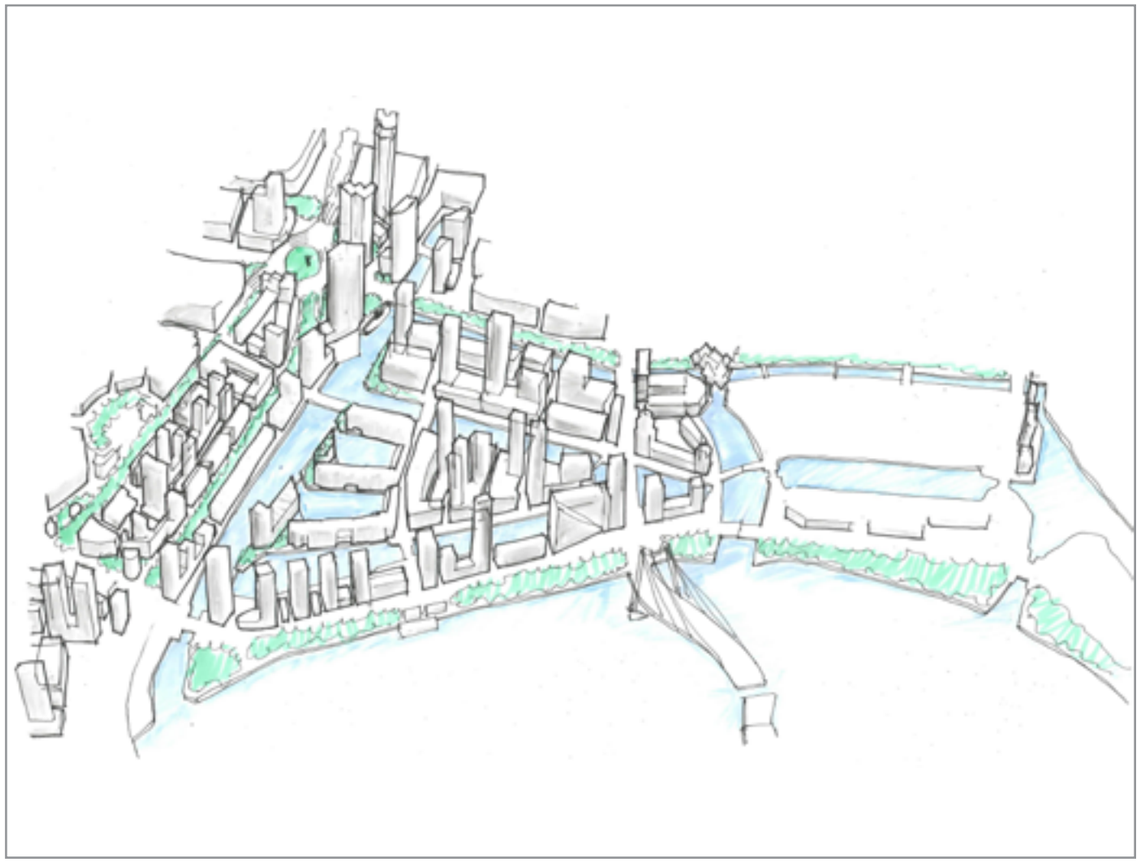


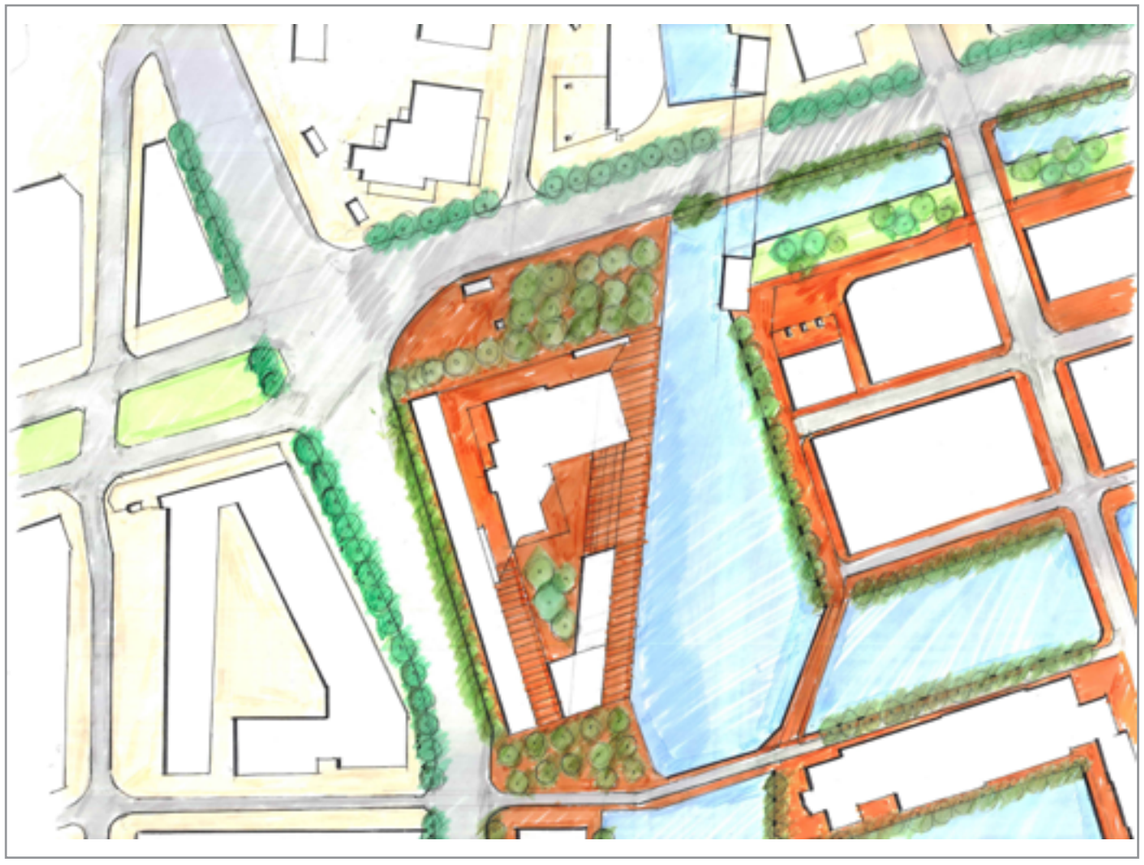
Figure 110. Masterplan Waterstad, birds-eye perspective

Design

Masterplan

In my masterplan for Waterstad, the different design principles are combined and applied to the whole of Waterstad, in order to get a consistent plan. Although the design principles are derived from the different analyses and thus reflect a certain scale or issue, the principles are highly interrelated, as they are all based on the idea of the water city: the urban fabric of islands, correspond with a certain morphology and public space. This interrelation comes together in the masterplan.
The boundaries of Waterstad are emphasized by the design of the public space: there is a belt that runs along Waterstad, and also the default design of Waterstad, inside the belt, differs from Landstad.
Special attention is paid to the Leuvehaven, as this is a central area in the routing from the Markthal to the river.

DESIGN



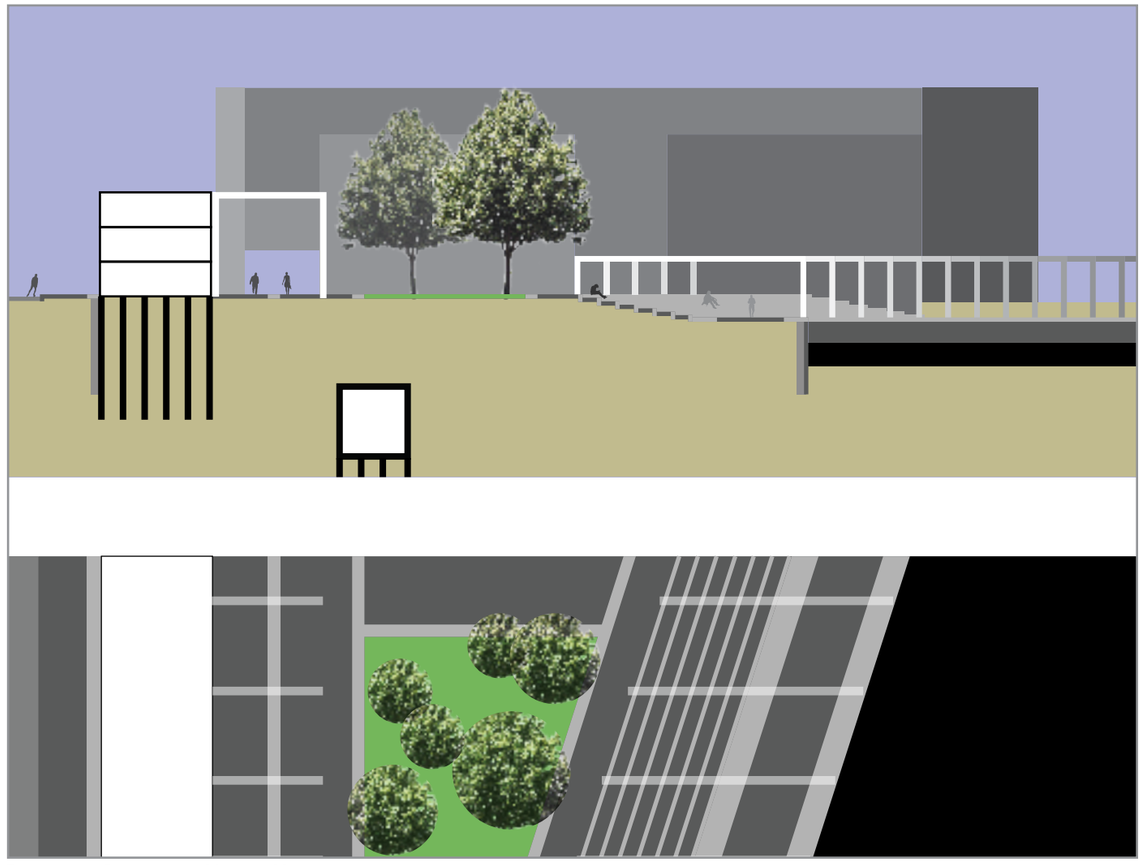


Figure 111. Public space, Martime Museum square, section

Maritime Museum square

The routing from the Markthal to Waterstad and the river reaches a summit at the combined boat elevator and pedestrian bridge crossing Blaak. The boat elevator will be suitable for small boats (that can pass the numerous bridges downtown), such as canal hoppers and water taxis. Except for its functionality the bridge also has a great symbolic value, as it connects Landstad and Waterstad and marks the route to the river. Much like the Erasmusbrug was more than just a bridge. Currently the area south of the Maritime Museum, the head of the Leuvehaven, is an undefined void. This location however is the perfect place for a high quality public space. Both when going from the Markthal to the river, as well as when going to from the Coolsingel to the river, it is the first place you see when entering Waterstad. The two new bridges enclose the water of the head of the Leuvehaven en form a stand to view historical ships and/or performances on the water. The void south of the museum is enclosed by an extension of the museum at the west and an arcade at the east, facing the water. The void is now is now divide into compartments, each with its own atmosphere. A green area will be completely enclosed while a gentle stair faces the water, spanned by the arcade (fig. 111). The stair is facing the spectacle of boats and/or performances on the water. Along the quay, under the arcade, there is room for terraces.
The design of the public space has to have a maritime character, as opposed to the Landstad. Cobbles might be the obvious choice, however in the choice of a certain pavement the ease of use must not be forgotten. Strips of a lighter stone (or tarmac) must give a visual accent, emphasize the routing and must contain different element in the public space, such as lampposts, drainage and trees.

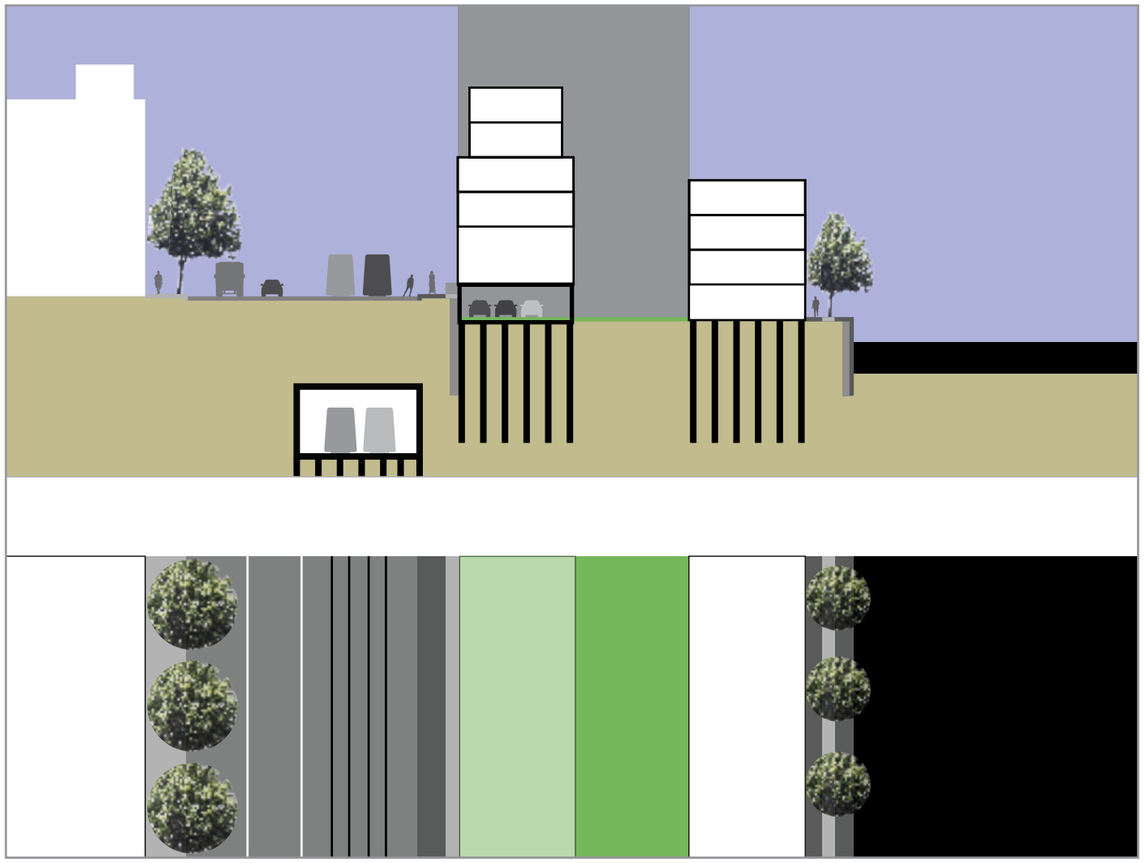


Figure 112. Public space, Schiedamsedijk and Schiedamsekade, section

Schiedamsedijk

The Schiedamsedijk will have buildings at both sides of the dike again, as it used to have before the bombing. It will not be just a line of pavilions, as is the current situation, but a proper building blocks, with parcels facing the Schiedamsedijk, and parcels facing the water (fig. 112). As the available space between the existing road and the water is rather narrow, the road will be narrowed down. The block will reach as far as the metro tube. Still the block is not very deep, only thirty meters, so the parcels will be only ten meters deep. The lack in depth will be compensated by a longer façade. The height difference create by the dike is used to facilitate a commonly used parking space underneath the buildings facing west. The common courtyard is at least partly (to accommodate car parking) made of a combination of grass and pavement (halfverharding). The parking garage will be a bit higher than the dike, so the parcels facing the Schiedamsedijk will need a small stairway to reach the entrance. This will create a more prestigious image to the houses, and at the same time it will increase the sense of privacy, as people passing by will not be able to look inside the house.

Waterstad, reintroducing water in Rotterdam
DESIGN

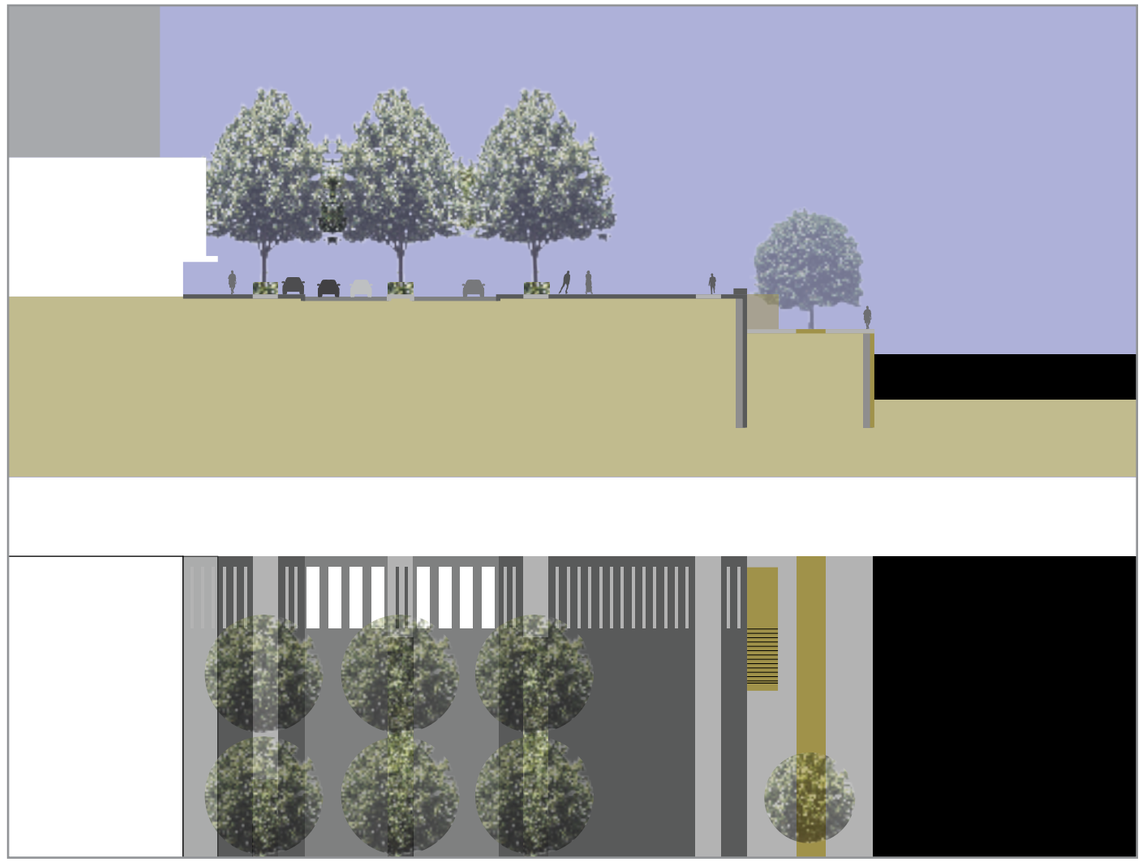


Figure 113. Public space, Boompjes, section

Boompjes

Currently Boompjes is lacking the quality and monumentality its deserves, being the best place to watch the river. Nowadays it is mainly designed to accommodate car traffic, so the car lanes have the appropriate size. However the rest of the public space needs to be scaled up and cleaned up. In order to do so the steep stairs have to be removed: this way lots of space is acquired, so the new Boompjes will only stretch a bit farther into the Meuse (fig. 113). The dike is now replaced by a large concrete structure. The form of the new public space reminiscent of a rampart, which reflects the historical use of Boompjes. The lower part of the rampart has a different, although similar design. This stroke forms a rim around the entire Waterstad. At Boompjes, the strips of a different color, are broader and they are partially planted with low hedgerows. The parts that are not covered with hedges can be used for small terraces. The obvious choice of trees is lime: originally Boompjes was planted with lime trees. Lime trees have the habit to form twigs at the stem, which can be used for growing hedges. However, this might take a long time, so a choice of different hedges, or a choice for one specific hedge, such as hawthorn or hornbeam, might be better. Instead of lime, robinia is also an option. The choice of tree for the outer rim is preferably pollarded chestnut.

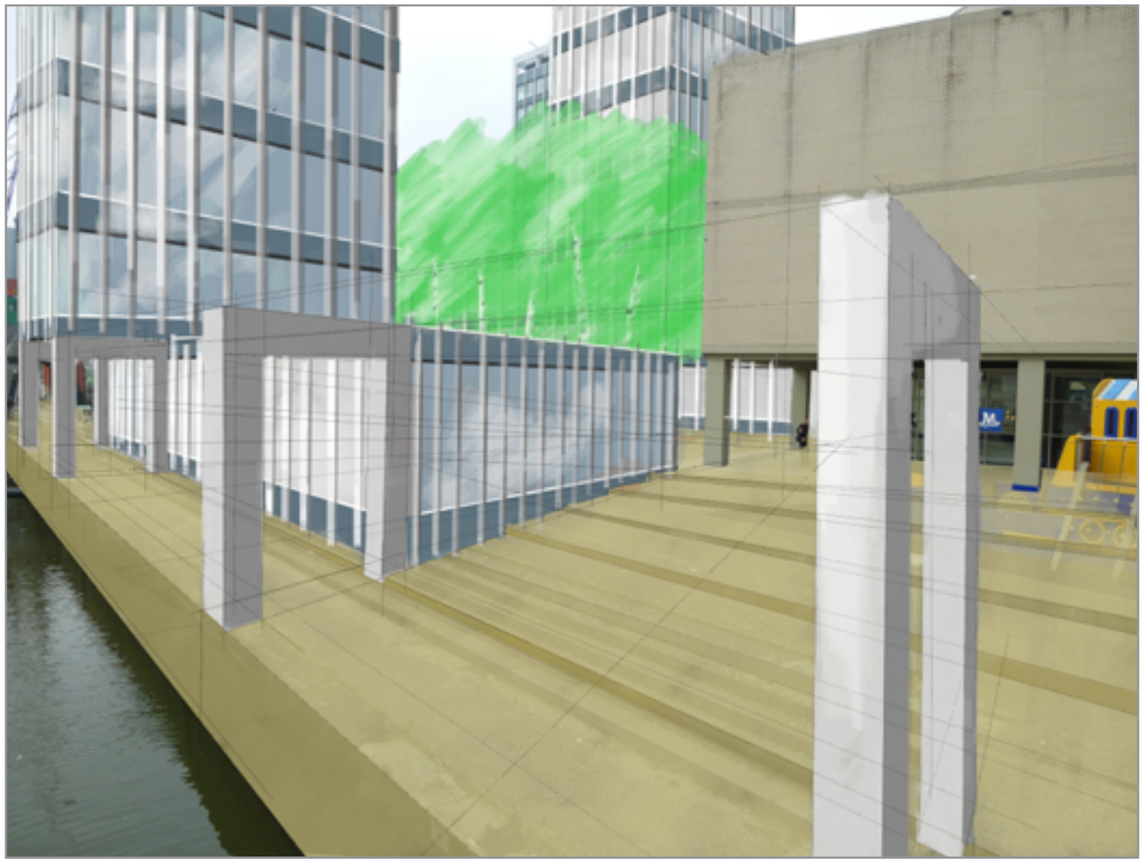


Figure 114. Public space, Maritime Museum, eye-level perspective

Architecture

The architecture in Waterstad should have a present-day appearance, but it should also reflect it surroundings. The materials of choice would be dark brown bricks, as in the post-war reconstruction architecture, and transparent glass, as in the (modernistic) office buildings. Because of its special position, the architecture of the extension of the museum should be distinct and distinguished.

Reflection

Diverging and converging paths

From the start of my graduation project I intended to create a seamless, almost organic, connection between my research and design. However this appeared to be a difficult task. First of all, right from the beginning I had detailed perceptions of what I was going to design. This preoccupation was obstructive in forming an clear argumentation about why the suggested intervention was needed. The argumentation was based on the opinion that the Leuvehaven was a disgrace to the city of Rotterdam. By making the first sketches and doing some study about the project area the first reasoning for an intervention did came up: the disconnection between the Meuse and the Rotte, the lack of quality in public space, and the absence of an attractive program. The reading and writing for the purpose of an article on waterfront development brought structure in the argumentation: the problems could be brought back to three issues: urban fabric, program and public space.
My initial hypothesis was that with restoring the connection between the Rotte and the Muese the spatial network of the water could be improved, stimulating tourism and recreational boating, and giving reason and structure to the improvement of the public space. Therefore I wanted to apply Space Syntax at the water system of Rotterdam to prove that by restoring this connection enormous opportunities could come up. By applying Space Syntax to the water systems of Amsterdam and Hamburg and comparing it to Rotterdam I thought I could confirm my hypothesis by demonstrating that successful use of water is supported by a good water system. However, in spite of my expectations, the Space Syntax analysis did not produce the results I hoped for.
The mistake I made was to think in terms of a water system instead of an urban system. This mental leap immediately produced results. By applying Space Syntax and the Three-Step Analysis to the water city and the land city, the great spatial distinction between these cities could be identified, creating a clear assignment for Waterstad in Rotterdam. Again, I was brought at this idea by reading and writing for the purpose of an article, this time on the history of Waterstad. This research made clear to me that the position of Waterstad in the city was changed radically by the Wederopbouwplan. Therefore a fourth issue came in to the assignment: the position towards the historical city of Rotterdam and the rebuilding plans by Witteveen and Van Traa. The importance of this issue was confirmed with an interview I had with Bram Ladage, an urbanist at the urban planning department of Rotterdam, engaged in the planning of Waterstad.
Until then my research and design were two separate lines. This was strengthened by the fact that I did not had an idea about how to analyze the public space and program. Once again the literature study gave me clues about how to analyze these issue, but change in perspective brought design and research together. From a retrospective the design and research do fit really well: in the end I think the relation between research and design in my project is almost seamless. However, in order to make the process seamless as well, the organic relation I had in mind does not match reality: it has to be a structured, scientific process. In order to get this structure in my research and design process my second mentor, Henco Bekkering, advised me to make a story board. This was also a change in perspective, in the sense that it made a non-linear process visually and mentally linear. It helped me a lot to structure my process.
I used to have my doubts about my project being a true Delta Interventions project, for it is not involved in the big issues of flooding and delta scenarios. However I think that my findings on the spatial identity of the water city are a contribution to the idea of the studio and the research on water in the city. In my project I have tried to give a spatial dimension to the engineering tasks of water management and reintroducing water: the combination of engineering and urban design.

Four centuries Waterstad

The role of urban planning and design in the transformation of urban water in Rotterdam

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Delft University of Technology, Department of Urbanism
June 29, 2012

Abstract - This article demonstrates through a historical exploration the fundamental qualities of Waterstad in Rotterdam, and the design principles that have contributed to that quality. The pragmatic construction, spacious design, flexible plot structure, its location on the river and secluded position relative to the inner city were crucial qualities. These qualities were disrupted by the modernistic design doctrine after the bombing of 1940. The position of Waterstad became central in the city, without a mixed urban program being realized. To reclaim the qualities of Waterstad there must be sought for design methods that recognize the area as an extraordinary city typology.
Key words - Waterstad; design doctrine; transformation; downtown urban water

Introduction

Waterstad is a port from the sixteenth century in the center of Rotterdam. The name Waterstad suggests a urban wetland. Water is indeed very prominent in the urban structure, but a lively urban area is hardly noticeable. The water is visible part of the urban structure of the district, but its physical presence does not seem to be enough to provide spatial quality for the area as a whole. Historical sources, in both image and text, show that Waterstad once was a popular and lively area. The presence of large water was seen as a great quality. In particular, the Boompjeskade on the Meuse is praised in various sources as a fantastic place and a prime example for a promenade along water (Meyer 1999; Duursma 2001, Van de Laar, P. Th. & Van Jaarsveld, M 2004). However, everything that could remind of that period is almost completely obliterated by the bombing of the city in 1940, and despite all efforts the following decades, one has failed to bring back the same degree of liveliness. This is remarkable, since the water in the water is to a large extent remained intact, and therefore the cityscape. The assumption that this urban form and the presence of water provides sufficient inherent quality as guarantee for lasting vibrancy is proved incorrect. Through a historical exploration this article intends to show the reasons for the success of Waterstad, and thus the fundamental quality of this area and the role urban design and planning played in the creation of that quality. Subsequently the article wants to show the role of different planning and design doctrines applied in the transformation of Waterstad. The article concludes with statements about the spatial dna Waterstad, the infection by reconstruction plans and which model is promising in restoring this DNA.

Genesis of Waterstad

Watarstad was contructed in the sixteenth century as the first major port expansion of Rotterdam. Waterstad had to accommodate the expanding port and trading activities of Rotterdam. This increase in activity was made possible by several factors that affected Rotterdam's position as a Dutch trading city. The Dutch trading cities along the major rivers were increasingly important in international trade and took over this leading position of the Dutch cities in Zeeland. By persistent flooding and silting of ports the cities of Zeeland became increasingly isolated (Rutte 2008). The center of trade shifted to the north, to Holland. The strong position of the Dutch cities and the obtained freedom from the Spanish-Habsburg domination was, for the Seven Provinces of the United Provinces the Golden Age. In this period of unprecedented growth and wealth, fueled by international trade, large hydraulic works and works of town planning were done. In light of this context, the expansion of the Rotterdam Waterstad can be understood. But even in the Golden Age the expansion was exceptional. With the construction of Waterstad the size of the city was more than doubled. Of all Dutch cities only Amsterdam made greater growth. Under the Dutch towns in the south Rotterdam had a very prominent place. As with other cities in the region the original wealth of Rotterdam was mainly due to the herring fishery (Van de Laar, P. Th. & Van Jaarsveld, M 2004), however Rotterdam was during the eighty years war chosen by the Board of the United Provinces as the main port, since Amsterdam at that time was on to friendly terms with the Spanish king (Meyer 1999). The strong growth of trade led to the construction of Waterstad.

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The seventeenth century

The name Waterstad (water city) indicates the contrast with Landstad (land city) (Palm 1987). Landstad was the original old city: behind the dike which protected the city against flooding. Waterstad was constructed in the outer dike area, on the water side and was therefore unprotected against flooding. This area south of the dike was swampy, uncultivated, an area consisting of wasteland, creeks, orchards and bleaching fields. Waterstad was gradually developed between 1575 and 1615. The docks were very pragmatic, built at the original creeks, such as the Leuve and Rotte (Van de Laar, P. Th. & Van Jaarsveld, M 2004). It is important to realize that Waterstad is compared to the original city a peripheral area, on the 'wrong' side of the dike. This was reflected in the idea of the city planners that the shipbuilding should be located at the southernmost rim of Waterstad, next to the river Meuse. Shipbuilding was a nasty branch of industry, causing lots of nuisance and was preferred on the outskirts of the city. It turned out differently. Almost immediately after the transformation from marsh to harbor and industrial area, there was a new, unplanned transformation. In 1615 a double row of lime trees was planted along the quay, reason for the inhabitants to the call the quay 'Boompjes' (small trees) (Meyer 1999; Duursma 2001). The trees along the quay had different functions. Planting was an important part of the Dutch fortifications theory. Trees and plants could hide the position of the cannons for the enemy and the root system gave strength to the walls, making it more difficult for the enemy to undermine the fortifications. Moreover, according to city planning theory cities should be self-sufficient for three months. The trees on the fortifications could serve as firewood in times of peril. But plants also had an additional effect. For the crowded medieval city centers the fortifications were lush green windows at the countryside (Hooimeijer sex & Hoff 2008). For the locals, the Boompjes was more than a window at the countryside, it was a window at their beautiful river, and above all it was a window at distant, exotic worlds (Meyer 1999). At the quay the local network of the city came in contact with the infinitely large network of international trade, made visible in the activity of shipment and enlisting seamen. The quay on the river became a popular promenade. The spatial quality of Boompjes also was reason for businesses to establish offices at the quay. The VOC was the first company to establish its office at Boompjes. This was against the principle of the city planners, but the construction of the VOC office was reason for the municipality to let go of this principle. Despite being at the periphery of the city, there was a lively area with offices, hotels, cafes and restaurants. The most important offices of the city stood at Boompjes (Meyer 1999; Duursma 2001). The seventeenth-century urbanism of the Water is characterized by a natural integration of utility and beauty, a great flexibility in the implementation of the planned structure and an intensive mixing of functions. The spacious layout of the city expansion could accommodate large warehouses and mansions. It became a popular place to live for wealthy people. Perhaps the relatively isolated location of the harbor islands compared to the busy main roads of downtown Rotterdam could have contributed to this quality.

The ugly city

Since the construction of Waterstad in the sixteenth century until the bombing of Rotterdam in World War II, a number of changes to Waterstad were performed that affected the district. In the seventeenth and eighteenth centuries, there were hardly any changes. The growth of the Golden Age was over and the growth of the Dutch cities stopped completely. Only at the end of the nineteenth century Rotterdam took great advantage of the industrial revolution and became the transit hub for the German industrial cities in the Ruhr area. Rotterdam is then known as an ugly, dirty city, lacking the elegance that suits the growth and prosperity of the city. Interventions were made to created space and grandeur: spacious roads were constructed to meet the growing mobility of people. The interventions also had influence on the appearance of Waterstad. At the end of the nineteenth century and the beginning of the twentieth century much of the water in the center of Rotterdam was filled in to accommodate the increasing traffic (Provoost 1995). In Waterstad, part of the Blaak was filled in. With the construction of the Regentessebrug in 1898 an important connection to the road network of the Landstad was made, making Wijnhaveneiland and Boompjes more accessible. Also, the Willemsbrug constructed, the first jump to South, the first permanent connection to the city center with Noordereiland and the South of Rotterdam. The connection of Rotterdam on the rail network had perhaps

a greater spatial impact. The construction of the track towards Antwerp in 1877 cut Waterstad, and especially Wijnhaven, into two (Groenendijk et al 2009). The railway station was between Landstad and Waterstad, at the northern rim of Waterstad. On the far east side of Waterstad was the train track to Gouda located, with the railway station directly positioned on the quay. Despite these interventions, the appearance of Waterstad had not changed much; one cannot speak of a major transformation. The target of the interventions was the Medieval Landstad, and the effects of the interventions on Waterstad are especially visible at the rims of the area. The spatial structure of Waterstad was basically unchanged to the bombing in 1940. Waterstad did not need interventions needed for the polluted, overcrowded downtown, the Landstad, to make it ready for the modern era. The same qualities that made the port area successful in previous centuries, was still present in the twentieth century. Despite the huge port expansion on the Southbank, the wide canals and embankments of Waterstad remained in full use for port activities, especially inland shipping activities. Also, Boompjes had not lost its attraction.

Reconstruction

Vanstiphout (1995) argued that even before the bombing, at the end of the nineteenth century and the beginning of the twentieth century, the people from Rotterdam had already embraced the emptiness of their city, by the reckless way in which the physical form of the city was affected by major projects. The bombing demonstrated to the locals that the city still existed, despite the absence of its physical form. For the city architect Witteveen it was as if the burden of the urban form was finally shaken off so that the reconstruction could begin with a clean slate. Despite this attitude the plan from 1941 by Witteveen strongly stuck to the original urban form; in fact his plan was little more than a wider version of the old city. The Basisplan 1946 by Van Traa actually embraced the void. The city was reduced to lines in a grid over the landscape, between which apparently accidental stains represented the individual functions of the city (Vanstiphout 1995). This view on the city had a strong impact on Waterstad. One of the interventions needed for the rectangular grid of the city was to allow shifting the Coolsingel from the Schiedamsevest to the Schiedamsedijk. Part of this intervention was to create a "window at the river." The east side of the Schiedamsedijk should remain unbuilt, so one would have an unobstructed view from the Coolsingel through the Leuvehaven, at the river (Barbieri 1981; Vanstiphout 1995). The idea was to bring the river and the port to the center of city. In this idea Leuvehaven played an important role, since the view of the harbor activities were in fact the main component of the window at the river. Leuvehaven would be the center of the inland shipping. Witteveen had already had the idea to connect the Leuvehaven with a widened Binnenrotte in the center of the city. Binnenrotte and Leuvehaven were thus opened for inland shipping in general, and more specifically for the removal of war debris by boats (Barbieri 1981). This is one of the few aspects of the plan Witteveen already been achieved during the war, before the Basisplan 1946 was executed. For Witteveen the widening and connecting of the canals was more than just a functional intervention, it also brought an element of beauty in the cityscape (Barbieri 1981). This idea was alien to the creators of the Basisplan 1946: the dramatic effect of the view at the harbor was only designed to give the harbor a central location in the city, so that the locals would not forget the only reason for the existence of their city. The presence of the inland shipping would not be limited to the water of the Leuvehaven. A wide blob in the schedule of the Basisplan 1946 covered the entire Waterstad and indicated the function of inland shipping (Vanstiphout 1995). In Waterstad, and especially in at Wijnhaveneiland this resulted in the construction of many office buildings. These offices were certainly not only occupied by port companies; striking is that many large architectural companies resided in these cheap, boring offices (Groenendijk et al 2009).

Sociability

The Basisplan did not result in a city appreciated by the locals. The strict segregation of functions and the abundance of emptiness was characterized as "unsociable". Therefore, from the late sixties to the mid eighties, a 'sociability revolution' broke out in the city (Van Dijk 1995). In this revolution alderman Hans Mentink played a crucial role. Under his leadership, a complete stop on the construction of offices was proclaimed, while the construction of housing in downtown was propagated. Also numerous pavilions were constructed that encouraged 'urban happening'. This period is characterized by the absence of architects and urban planners in the process of urban planning (Van Dijk 1995). One of the few projects in which architects and urban

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designers have played an important role was the study "Waterverband" (water connection) from 1976 (Barbieri 1981, Van Dijk 1995). A project in which the Leuvehaven had an important role to play. In the Basisplan 1946 the leading idea regarding to water had been to bring the water to the city. The execution of this idea did not lead to the desired result. Inland shipping disappeared more and more from the city, and with that the visual effect of visible port activities. The idea of the sociability revolution was the opposite: the city had to be brought to the river. The Waterverband consisted of a route with homes, boats flowers, squares and various facilities along the Binnenrotte in the city, through the Leuvehaven, to the Meuse (Barbieri 1981, Van Dijk 1995). Prior to these plans were plans for a World Trade Center (WHC) in the middle of the Leuvehaven. The WHC can be seen as the favorite special project of the port authority, which liked to see a trading center like the New York model be constructed in Rotterdam, in which the port authority itself would have a prominent position. For the WHC were different designs. The first and most ambitious was made by the U.S. Bureau Skidmore, Owens and Merryl (SOM). This plan was not considered feasible by the investors, and even later, a slimmed design did not materialize. Eventually, the piers in the Leuvehaven were designated for housing (Barbieri 1981). The economic crisis of the eighties threw spanner in the works: the luxury of an office stop was over. Of the Waterverband the housing program was mainly achieved but the necessary connections were not made. It is noteworthy that in the plans of the Waterverband the spatial idea of the window at the river was completely abandoned: the buildings were planned within the vista of the Coolsingel to the river. Regardless of the disappearance of the inland shipping, the reason for the window, also the visual effect, the vista, turned out badly: too many elements in the public space of the city disrupted this effect. There was no reason to keep the vista free of construction. In fact, the idea of the window at the river was transformed into a perception of the river that does not begin on the Coolsingel, but from where the Rotte flows into the inner city, and which constantly opens new windows until reaching the final window: Boompjes.

Key Projects

The planning-free period from mid sixties ended about mid eighties. The economy began to scramble and Rotterdam was looking admiringly at the successful revitalization of the docks of Baltimore and Boston (Tilman 1995). The redevelopment of the port areas of Baltimore and Boston can be seen as the beginning of the international phenomenon of waterfront redevelopment. Many western cities were faced with disappearance of industry and port activities from locations near the historic center. Worldwide, these degraded areas were transformed into attractive additions to the inner city (Breen & Rigby 1996, Davidson 2009). Having a large port Rotterdam had enough areas that were eligible for a transformation. The strategy of the Rotterdam planners was substantially different from the international examples. Usually the port areas were transformed into exclusive residential or office areas, but in Rotterdam along the river mainly social housing was built (Pinder & Rosing 1988). An exception was made for Waterstad. For the redevelopment of Waterstad was sought to copy the success and charisma of cities like Boston and Baltimore (Pinder & Rosing 1988). As already mentioned, Waterstad was designated mainly for offices. This had resulted in a mono-functional and unattractive area. The Waterverband plan had earlier tried to pull this area to the city center and bring the city to the water. Instead of adding a link to different parts of the city, now an isolated strategy was made for the entire Waterstad. This strategy was indeed part of a vision of the whole city, but the different areas have their own character, hence the term "isolated". Because of the complicated real estate ownership in Waterstad a comprehensive development plan for the whole area could not be made (Groenendijk et al 2009), however, at that time such was not the intention of the municipality. According to the prevailing planning doctrine several key projects had to revitalize the area, without the need for a comprehensive plan (Roberts & Sykes 2000). At strategic locations were different crowd pullers planned: on the extreme west of Waterstad, at the northern tip of the Leuvehaven, the Maritime Museum (in accordance to the Waterverband plan), at the southern tip the Econo Center in conjunction with an IMAX theater, central in Waterstad the Central Library, cube houses, terraces at the Oudehaven and the inland shipping museum, and at the extreme east side of Waterstad tropical paradise Tropicana. Also, a housing program was planned, mostly owner-occupied. An important element of this program was the iconic housing on the piers in the Leuvehaven. The architect Rem Koolhaas had designed a residential building at a prominent place at Boompjes, but instead

the prestigious office Willemswerf was built. The Boompjes was designated as an office promenade. Instead of the planned Econo Center a hotel was built, but otherwise everything was built according to the original assumptions (Groenendijk et al 2009).

An urban design

Despite the fact that almost everything was built according to plan, the aforementioned projects were not successful. Perhaps as an individual project, but certainly not as a catalyst for the urban renewal of Waterstad. The Imax theater and Tropicana are now bankrupt, and the success of the Maritime Museum and the terraces at the Oudehaven radiates not from the immediate area. The only project that was really successful was the library, but it is too far from Waterstad to have an effect on the area. Meanwhile, the problem of the mono-functionality stayed unresolved. The residential building were as enclaves between the offices, without the existence of an urban mix. In addition, the popularity of the offices dropped sharply. The offices of the reconstruction period were outdated and could not compete with new offices. The boring offices of Wijnhaveneiland were literally put in the shade by the office Willemswerf (Groenendijk et al 2009). The decline of Waterstad, despite the large investments at the end of the eighties, are explained by Meyer (1999) by the fact that at the beginning of the nineties, the plans were made for the 'leap to South': the link that should connect Rotterdam on the north bank with Rotterdam of the south bank. On the 'Kop van Zuid' was a continuation of the center to be built. The physical connection between north and south, the Erasmus Bridge, was simultaneously the symbol of the union of two alien cities. The river Meuse came lie at the center of the city, at least on paper. Meyer argued that it is in fact a leap from the Coolsingel to the Southbank, and thus a jump passed Waterstad. The enormous effort to connect the two cities surpassed Waterstad (Meyer 1999). In terms of problems Wijnhaveneiland is most representative of Waterstad. Results from studies show little hope of a glorious future for Wijnhaveneiland; especially the complex, fragmented ownership and the shading of the Willemswerf made the area virtually unsuitable for large-scale development of housing and office development would never be able to compete with the prime locations at the Southbank and around Central Station (Groenendijk et al 2009). The problem of unpopularity and declining prices of office space were seen by urban planner Bram Ladage as opportunities instead for start-ups and other small functions (Groenendijk et al 2009). Indeed, more and more offices are transformed to new functions such as educational institutions and student residences. Commissioned by the municipality KCAP Architects made a master plan in 1993 for Wijnhaveneiland that made opportunistic use of the fragmented ownership. The plan offered developers the option to built high-rise dwellings on the layer of offices under certain spatial conditions. The spatial conditions would provide a highly unpredictable and interesting urban image. The input of housing could provide a revival of Wijnhaveneiland (Groenendijk et al 2009).

Conclusion

Waterstad was built according to pragmatic principles, which in combination with the large, flexible design of embankments and canals gives the plan a strong quality. But the position at the Meuse offered a, for the original planners, unexpected quality: a vibrant public space. This combination of qualities of Waterstad has long remained unchallenged and untouched. The interventions of modernization from the nineteenth and twentieth century passed to Waterstad. It was not until after the bombing of 1940 that the structure of the city was changed dramatically by the planners of the Basisplan 1946, which also changed the character of Waterstad dramatically. Two interventions were of major influence on Waterstad. First, there is the idea of the window at the river. Not only was the system of roads changed, by keeping the east side of the Schiedamsedijk free of buildings, the spatial perception of the water became entirely different. Waterstad came out of his relative isolation and the Schiedamsedijk was used as carrier of the spatial structure instead of the Leuvehaven. Secondly, the designated mono-functionality of Waterstad made a flexible, mixed use of space impossible. In different ways is tried to fight the fundamental weaknesses of the Basisplan to fight, but no method has so far succeeded in giving Waterstad the special position in the city center it once had. Too many projects tried to make Waterstad a part of Landstad, downtown Rotterdam, while the history and urban structure illustrate that Waterstad had a distinct position. De Hoog (2005) recognizes for Amsterdam a similar type of city, typically made out of artificial land in the outer dike area. The artificial island are characterized by a particular architecture and urban structure, and this character is used as a starting point for new interventions. This line of thought seems promising for the development of Waterstad. A path that has already been set out by creating an urban residential area on Wijnhaveneiland, in relative isolation from the city. Breaking the present mono-functionality proved less difficult than originally thought, witness the success of the residential towers on Wijnhaveneiland.

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Structure and Productivity

Urban fabric and morphology as part of the intuitive and diverse development of the waterfront

Introduction

This articles intends to show how morphology and urban fabric are important issues when it comes to waterfront redevelopment. Morphology and urban fabric are highly interrelated as they form respectively the cells and veins of the city; they fuel and sustain each other. But how does this relation work and how can it be analyzed? In the first part of this article I will explore the spatial analysis method 'space syntax' in order to get grip on the logic of urban fabric. Then I will relate this to the waterfront and how this knowledge can be used to create meaningful places. This in turn will be related to the morphology created by small scale development and how this development relates to waterfront redevelopment. Finally in a concluding part the knowledge will be applied to the situation in Rotterdam, questioning the current urban fabric of Rotterdam.

Spatial analysis

There are several methods to analyze and evaluate the spatial configuration of the city. See for example the article by Hanson (1989) on the difference between order and structure in the city. To explain this difference Hanson makes use of Space Syntax. According to Hanson, structure develops itself in the minds of people. Urban structure is the result of the way people making use of the city for a long time; how they make choices and recognize and experience the city. Space Syntax pretends to predict that cognitive structure of cities solely based on the street pattern. Space Syntax is a theory that defines space, in which persons are moving. The theory assumes that space can be divided into components, which together form a network. The position of each component relative to all other components in the network determines the integration of this component in the whole of the network. This position of one component in respect to the others, is based on choice. When a person moves through space, in order to get from one to the other spatial component, he make one or more choices for the path to be followed. In order to be able to use the theory as a method for the analysis of the spatial configuration of, for example a city or district it is necessary to define the components of which is space is composed. There are various definitions, associated with the different views for describing space (Hanson 1989). Hillier (2007) defines space as axial, space being a collection of straight lines of sight. A path is based on the lines of sight. The pattern of streets of a city, according to this method is divided into a network of line segments. The position of the one segment with respect to all the others, the relative integration, is determined by the amount of bends, or choices that are needed to go from one segment to all the other segments, using the shortest path. This is done for all the line segments. The segments which need the least bends to reach any other is the most integrated. The theory assumes that the most integrated street segments are also the most used. A city with a good structure is a city where all the streets are more or less well integrated (Hillier 2007). The space syntax method predicts how people move through the city, by assuming that people, if they move from one space to another they choose the shortest route. These movements form the structure of the city, without the need of order, or regularity, repetition and hierarchy in the streets. Almost always is order the result of a design, but order is by no means a guarantee for structure. To illustrate this Hanson uses a Space Syntax analysis of the medieval street plan of the city of London. This maze of narrow streets and alleys, has seemingly no order. Yet London was a very readable city for its residents and visitors. In other words, for the users of the city, the city had a clear structure. This structure is confirmed by the space syntax analysis. If the street plan of London, is divided into segments connected to each other, it is demonstrated that some of these segments are better connected with the rest of the segments than others. These segments in reality were, according to historical sources, the most integrated indeed. In 1666, however, London was destroyed by fire. There were several plans made for the rebuilding of London. A total of five plans were presented and all five plans were characterized by a certain degree of order. In one plan more explicitly, or more rigid, than the other, but each plan follows a certain method to bring order to the city. Presumably all with the unspoken intent to provide the city with structure. If, however, the plans are object to a space syntax analysis no plan succeeds to get the same degree of integration of the whole street pattern as there was in London before the fire. In many cases the means used to bring order were counterproductive in creating structure. Different parts of the city became segregated by measures addressed to promote structure. The constant human interaction with city and space ensures the development of structure in the city. The prolonged use of space allows for collective recognition of structure in that area, but the use of that space creates also new structures. In the course of time people adapt the space to their needs and abilities, allowing structures to be strengthened and added.

Pattern Language

The character of a place will not be visible through a Space Syntax analysis, while that is what I'm interested in for my design project. The analysis can at best predict which place is the most used, and thus might be an important place in the city. However, the nature of the spaces that are used is not made visible. According to Alexander (1977) the space of the city is meaningful through human interaction. People give a place meaning. Designing the city, must aim at supporting meaningful existence. In the view of Alexander space is created by human interaction and human occupations. This human interaction falls apart into a number of distinct, but nevertheless coherent patterns. The patterns are in fact the result of human nature. By designing to the nature of the pattern, a city can by created that is close to human nature. The city must be shaped around the places that are most central to the lives of people, the places that are most widely used and the most meaningful (Alexander 1977). The productive character of the city, however, is in my view not sufficiently emphasized by Alexander. The city that Alexander describes is a place for human companionship and not as a center for human production. But is productivity not also part of human nature? The city as a production machine is underlined by various authors. Jacobs (1962) insists on the power of cities to generate new human enterprises. Geoffrey West (Lehrer 2010), accurately mapped the tremendous productive power of cities. An example of the omission of Alexander in this field is the lack of artificial water as a pattern in human settlement. The manipulation of water is probably one of the major patterns in settlements. Water, as a condition of human life, is not only the reason for all the settlements in the world, but also often the catalyst for productivity and the reason why the settlements have become cities with an abundance of meaningful patterns. Channels, canals and docks are a convincing proof of the combination of productivity and a meaningful place. Is the pattern language of Alexander suitable to identify the urban fabric of Waterstad, as an example of a city that is almost entirely focused on productivity? Today that productivity is no longer present and is productivity no longer a prerequisite for a successful water city, witness the success of the Amsterdam harbor islands as residential area. So I think especially for the transformation of Waterstad the pattern language is useful. One of the strongest statements on the waterfront is that long main roads should be at odds: the waterfront should be a destination and is not intended to pass by (Alexander 1977). In this perspective, the position of Meyer (Duursma 2001) is remarkable, namely that Boompjes should be an expressway.

Small scale development

In the redevelopment of old harbor districts, the loss of productivity is an important issue. At Aker Brygge in Olso, there was a loss of as many as 2,000 blue collar jobs before redevelopment. However, after large scale redevelopment the area currently hosts 5,000 white collar jobs (Breen & Rigby 1996). Apparently in Oslo the planners and designers succeeded in creating a place for work at the waterfront, as well as for living and recreation. They brought the city to the waterfront. Aker Brygge is an example of diverse development, and that is a remarkable avchievement. Most other projects in The New Waterfront (Breen & Rigby 1996), are large, mono-functional key projects. Probably this is one of the reasons why the relation between the development area in its context are not shown: the projects are generally to fragmented and episodic for doing so. In The New Waterfront there is a strong emphasize on flagship projects, which in the 1980s and 1990s was believed to be a strong tool in redevelopment or regeneration (Roberts & Sykes 2000). In this vision it is believed that the regeneration of old harbor areas can be accomplished by a single building, usually of magnificent architecture and with a strong, usually cultural program. A renowned example is the Guggenheim Museum in Bilbao, but waterfronts all over the world also knows their museums, restaurants, convention centers and aquariums. Bender (1993) criticizes the increasing scale of the urban projects and their sub-projects and the increasing level of monofunctionality. He compares this kind of developments with trying to ride a sledge with an elephant. The elephant, the large, mono-functional project, will not be able to adapt the delicacy of

the underground, when the elephant is sick or injured the journey has to stop, a considerable amount of the load on the sledge would be food for the elephant, and probably the ice will break because of the concentrated weight of the elephant. The dozens of legs of sledge-dogs, on the other hand, will easily adapt the difference in terrain, each dog will seek its own path, when one or two of them are sick or injured the rest of the pack will be able to go on, over time the dogs will reproduce, maintaining the size of the team. What Bender (1993) suggests is that we should use 'sledge-dogs' in waterfront projects: a large amount of different, varied, small scale projects, with numerous stakeholders. This will not guarantee that some projects fail, but it will guarantee that the overall project its viable and will stand the test of time. This complexity, in contrast to the simplicity of large scale, mono-functional project, might be the nightmare of planners and builders, according to Bender it is the key to success.

Harbor typologies

The issue small scale development advocated by Bender can be reduced to the issue of the parcel. The parcel is used by planners and designers (e.g. Leonard Schenk at Tübingen) for creating a flexible urban structure, which is able to provide identity and historical memory. The parcel can be compared with a cell in a cell structure; the dying of one cell does not affect the structure as a whole. The parcel stimulates diversity and strengthens public space. Of course the idea of the parcel is not new; on the contrary, it is the way all historical cities are build. The idea of the parcel is closely related to the issue of the changing relation between city and port. The relation between city and port is, due to an increase of scale in activities and technology meant to facilitate this increase of scale, continuously changing. In general can be said that since the industrial revolution city and port have grown apart. Most of the time the old harbors could not be adapted to host new activities: the increasing size of ships and warehouses did ask for new harbor basins and harbor facilities instead of the reuse of the old ones. This process can clearly be seen in the development of the port of Rotterdam: the distance between the city centre and the remotest harbors is enormous and the size of the port is multiple times the size of the city itself (Lap e.a. 1982). At the same time this process created a residual landscape: derelict harbor basins, docks, canals and warehouses. Structures that became useless. The industrial harbor districts did not adapt new functions all by itself. Waterfront transformation is a global phenomenon, and generally means an enormous, costly effort has to be taken to restore the relation between city and water. In the case of pre-industrial harbors this is completely different. The parcel structure along the pre-industrial harbors and the continuous canals have effortlessly adopted new uses. In fact, already when these kind of harbors were build, the related district demonstrated a great variety in uses.

Rotterdam

In 1940 Rotterdam was bombed by the Nazi. The city center was almost completely destroyed. The remains of buildings were demolished and even the foundations were removed, so that the city could start with a clean slate. Already in 1941, city architect Witteveen presented a plan for the reconstruction. (Palmboom 1987)However, due to a lack of building materials almost nothing of the plan was executed. The plan of Witteveen was regarded as not innovative enough, and so, in 1944 a new plan was made by the new city architect Van Traa: the Basisplan, adopted in 1946. Did the plan of Witteveen follow still the pattern of the original street plan to a large extend, the Basisplan changed this pattern dramatically. The position of the city center was both physically and conceptually changed. The center was shifted to the west, making the Coolsingel the cental boulevard. Also, a strict separation of functions was used, whereby the center was to house offices. Wide roads served to connect this central business district. The structure of this city was substantially altered. The concept of the city triangle, where the center of the city lay wedged between the Coolsingel, Schiedamsevest, Goudsesingel, Hofplein and the River Meuse, was abandoned. The city was now crisscrossed with wide roads representing a major, comprehensive urban grid (Palmboom 1987). Several order concepts were applied in order to improve the functioning of the city and to make it ready for the modern age. The result was a completely different city than before the war. Certain principles were released only thirty years later, in particular the strict functional segregation. Since the city began to show serious defects (Van Dijk 1995), housing was added to counter the mono-functionality. The street pattern clearly created order, as was the intention in the plans for London, but could the order replace the structure that was present for centuries in Rotterdam?

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The Renewed Waterfront

Regaining its role in public life.

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August 30th 2012

Abstract – The subject of my graduation project is the positioning of Waterstad in the city of Rotterdam in the system of public spaces of the city. This article is a review about the role of a waterfront as a public space in a city, intending to be useful for my graduation project. The article demonstrates the great symbolic value of a waterfront, and the importance of that value for a waterfront as a public space in a city. The symbolic value of a waterfront has been apparent for as long as cities on water exist, but was temporarily being lost when the waterfront was claimed for industrial uses. Currently many cities have reclaimed their waterfront, making it accessible for public use. The interventions needed for making a waterfront accessible are the improvement of the public space and adding public functions that benefit from the assets of the improved public space and the location at the water (e.g. marinas, bars and restaurants). These interventions have a beneficial effect on the direct surroundings of a waterfront, even if they are not close to water. The improvement of a waterfront will generate spillover, greatly increasing land value. The revival of a waterfront as a public space will benefit from the current social trends. People tend to appreciate their environment increasingly and want to improve the quality of their lives. A waterfront can be the perfect spatial manifestation of this social trend, provided that it is public.

Key words – waterfront; symbolic value; accessibility; spillover; social trends;

Introduction

Many cities around the world have reclaimed their waterfront. As a waterfront is considered an important public space in a city, a valuable public asset, 'reclaiming' can often be read as 'giving it back to the people of the city'. But what is the value of a waterfront as a public space? This question is specifically relevant to the situation of Waterstad, in Rotterdam, the location for my graduation project. Currently this area does not play a significant role in the public life of Rotterdam. It is literally surpassed by the policy of decision makers to give emphasis to the development of the Kop van Zuid, at the other side of the river Meuse (Meyer 1999). In the eighteenth and nineteenth century this used to be completely different. Waterstad was a vibrant part of the city, both in terms of economic activity as in terms of public life. The Boompjes, the quay directly fronting the river Meuse, was called 'the pride and joy of Rotterdam' (Ravesteyn 1974, p.47).

The contrast between the lively harbor district from the past and the marginalized position of this district today is not a situation unique to Rotterdam. London, Baltimore and Boston are just a few of the many possible examples in which attempts were made to restore or revitalize the old harbor areas (Meyer 1999; Breen & Rigby 1996). These attempts resulted in significant physical transformation, but how successful were they in respect to the enhancement of public life? What issues should be taken into account when addressing the public character of a waterfront: how does a waterfront of an inner city regain its role in the system of public spaces?

This article will demonstrate the value of a waterfront as a public space in a city, first by showing its significance for public life from a historical perspective. Subsequently Waterstad, Rotterdam, is taken into closer study. Waterstad being a fairly large area, raises the question if a waterfront generates spillover, favoring its direct surroundings. Having elaborated on the value of the waterfront from a historical and a spatial perspective, the next question will be on the value of a waterfront as a public space today and how it will likely develop in the future. Current social trends affecting waterfront redevelopment and thus its possible value for public life are placed into context. Based on the findings in the foregoing, the article concludes with suggestions on the possible role of a waterfront as a public space in a modern city, and what is absolutely vital for a successful transformation.

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1 Symbolic Value

1.1 The Public Waterfront

Most people on earth live in delta areas and most cities on earth are founded near rivers, lakes or seas and oceans. The proximity of water means fertile soil, fresh drinking water and often good transportation possibilities. Water means life, but next to that also the prospect of many economic activities and prosperity. The position of a city next to a body of water is the reason of existence of many cities around the globe both in terms of provider of food and water as in terms of economic viability.

On top of that, the water has proven to be also of vital importance for the public life of cities. In ancient Egypt, Phoenicia, Greece and Rome, but also in ancient Asian and American civilizations the waterfront was a place considered of great ceremonial and aesthetic value, given form in different, inventive ways (Mann 1988). However, in the Middle Ages many, particularly European cities were walled to protect the city against invasions and to control commerce. During the Renaissance open market squares were designed next to rivers, in Venice for example (Mann 1988; Hooimeijer & Vrijthoff 2008). The Renaissance people became again aware of the river as an open space in the city, and were in search for specific design solutions that could bring beauty and usefulness together at the river's edge (Mann 1988). The Renaissance concept of open space at the river was thus new compared to the Middle Ages. From the seventeenth century onward continuous promenades were designed, such as the Cours La Reine in Paris, which can be marked as the beginning of the riverfront park and promenade in France. The beautification of the waterfront took a high flight in next centuries. Notably is the Beaux Arts movement and its American equivalent, the City Beautiful movement which influence caused the design of magnificent riverside parks and boulevards all over the world (Mann 1988). Today the design and appearance of the public space at the waterfront is considered very important in the redevelopment of old harbor areas, as can be seen in numerous examples all over the world, such as River Relocation Project in Providence, Rhode Island and Darling Harbour in Sydney, Australia (Breen & Rigby 1996).

Therefore, apparently a waterfront still represents a symbolic and cultural value for public life today, as much as it did in the past (Norcliffe et al. 1996). Water can improve the quality of live because it is an important place for public life; water provides a spatial form for rituals, leisure and gathering (Alexander 1977).

1.2 The Accessible Waterfront

Physical access to the water and the waterfront is of vital importance in generating public life. For the symbolic and cultural value of water Samant (2004) refers to the Indian phenomenon of the ghat. The word ghat originates from the Sanskrit word "Ghatta", meaning steps on the river. The ghat is the most important public space of Indian cities, mainly because of the religious importance of rivers for ritual bathing. Samant describes the general architectural appearance and characteristics of the ghat, and its current deplorable state in many Indian cities. He suggests to consider the ghat as an architectural unity which is part of the system of public spaces in a city. These public spaces must be assessed and evaluated together in order to be able to restore the ghat to its original state (Samant 2004). The (architectural) form of the waterfront does not only provide spatial identity, but also provides physical access to the water.

In the course of the nineteenth century in many cities the access to the waterfront was blocked, claimed by industrial estates, railroad tracks and warehouses. After being lost temporarily, the public function of the waterfront was rediscovered from the 1970s onwards (Hoyle et al. 1988). The major challenge for the restoration of the waterfront was making it accessible again. Exemplary are the riverfront revitalizations of German cities along the river Rhine. Long stretches of land along the river were occupied by industrial estates and highways. Today those riverfronts are transformed into pleasant public spaces (Hölzer 2008). Remarkably, the transformed riverfronts, but also transformed riverfronts in cities all over Europe bear a strong resemblance to the ghat. The steps on the river are providing an access and spatial form for public life at the waterfront.

2 Spillover Effect

2.1 Waterstad

As already mentioned in the introduction, the scope of this article is on the level of a district, since the scope of my graduation project is on Waterstad. The English translation of Waterstad is

'water city'. This expression implies that the relation between city and water in the case of Waterstad is not limited to the thin stretch of land marking the boundary between land and water (e.g. quay, waterfront promenade). The relation between water and land in the case of Waterstad, Rotterdam is spatial: the district is located between the river Meuse and the original dike, where Rotterdam was founded. This area is relatively unsafe compared to the Landstad (land city), the area behind the dikes, as it is not protected against flooding (Palmboom 1987).

The spatial distinction between a 'land city' and a 'water city' is not limited to Rotterdam. Although differing in spatial characteristics and form, the same phenomenon can for instance be found in Amsterdam. In Amsterdam the water city, the area between river and dike, has been extended continuously and is still extending (e.g. IJburg). In Amsterdam the water city is made out of artificially created islands with a specific urban form, contrasted to the urban form of other parts of the city (De Hoog 2005). Although the form of the water city of Amsterdam might be more spatially articulated than the water city of Rotterdam, both water cities used to have a strong functional relationship between city and water, generating a specific type of urban, public life. Much of the economic activity in the district was directly water and harbor related, such as warehousing, transshipment and fishing. Because of this, other, indirectly water related functions could thrive: rope manufactures, bars and restaurants, seamen churches et cetera (Meyer 1999; Duursma 2001).

The Waterstad of Rotterdam was a popular place visit and to live; the spacious layout and the view at river and canals made it attractive as a location for expensive houses and prestigious offices. De Boompjes quay at the river Meuse was a very popular public space (Meyer 1999; Duursma 2001). At the water city the public character of the waterfront was taken to another level. Not only became the waterfront itself more attractive by the constant bustle of the port, the bustle was drawn into the entire water city, making it an exciting district to visit.

2.2 Sailor Town

In Amsterdam and Rotterdam the functional relationship was certainly being fuelled by the form of the city: the abundance of docks and canals gave room to all kind of harbor related activity. However, a functional relationship between city and water is not restricted to the specific spatial form of harbor districts of Dutch cities, with its water cities. This functional unity between city and water exists in many port cities all over the world, where the spatial relationship between city and water is less obvious. This type of urban area is called 'sailor town' by Hilling (1988). The sailor town is a historic phenomenon. According to Hilling the character of the historic sailor town is manifest in the functional linkage between port and city. A sailor town contains numerous boardinghouses, bars, brothels, slop shops, rope manufactures, seamen churches et cetera: commercial or public facilities to provide in the needs of the seamen passing by. As already mentioned a sailor town does have a functional linkage between city and port with many port-related economic activities, and you can consider the sailor town as a functional unity (Hilling 1988). Also, the sailor town had a specific urban culture. The docklands of London (Meyer 1999) the Bute district in Cardiff (Hilling 1988) or the St. Pauli district in Hamburg (Rudolph 1980) cannot be described as tourist areas, as can be said of the Waterstad district, but the exotic, tough world of seamen, dockworkers and prostitutes certainly had its own attraction on visitors (Meyer 1999; Hilling 1988).

Although the spatial association between water and city is not specifically articulated in the article of Hilling, the water related economic activity of a sailor town shows great similarity to Waterstad. It is likely that redevelopment strategies that address the restoration of the district will benefit in the same way from the historic activity and position of the district, regardless of its specific spatial structure. This is confirmed by the example of the Bute district in Cardiff. In Cardiff effort has been made to counter the demise of Bute district. An important strategy in the redevelopment process was the creation of a marina. The marina created new jobs and opened up the waterfront for new users, not only from Cardiff but also from sailors far beyond. Although the regeneration of the district was not spectacular in terms of job creation (the massive loss of blue collar jobs could hardly be countered), it did succeed in generating diverse public life, uplifting the district as a whole. The regeneration benefitted from the existence of a residual landscape of old, restored warehouses, providing the right atmosphere (Hilling 1988). The effects of waterfront regeneration were even bigger in Newport, Rhode Island. The building of a marina in this former fishing and navy town transformed it into a prominent yachting town. On the relatively small town of Newport the effects of tourism were enormous, changing the dynamics of the town radically, issues varying from an increase in property value to a lack of parking space (Krausse 1995). The effect of waterfront redevelopment on it surrounding is demonstratedby the model of West (1989). His model shows a direct relation between environmental improvement at the waterfront and rent changes at the neighboring district.

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3 Social Trends

3.1 Social Benefits

The examples of waterfront redevelopment in Cardiff and Newport both focused on generating tourism. The importance of tourism in waterfront development is discussed by Huang et al. (2011). Huang applies the 'three waves' concept of Toffler (1980) for port-city developments.

The first wave began 10 000 B.C. when people began to raise crops. Because of this agricultural production they could stay at one place and this affected greatly their way of life. This way of life is characterized by Huang et al. (2011) as 'Happy Life', or in other words, the focus on 'making a living'. This development stage is called 'added-value labor', and in waterfront development it is characterized by three activities: living environment, fishery and shipping.

The next stage is the industrial revolution or manufacturing age. The way of life associated with this phase in history is 'diverse production', and the economic system is one based on 'added-value production'. Goods distribution, process and transit, international trade and commercial exhibition are the four activities that take place at the waterfront.

The third stage is the 'Information Revolution Era'. The way of life in this era is care for ecology and living a sustainable life, and the industry type belongs to 'added-value service'. Entertainment, tourism, specialized study, cultural heritage and enjoying the ecology are the five new activities that take place at the waterfront (Huang et al. 2011). The model intends to show the increase of social benefits in waterfront development in time. This increase in social benefits is demanded by the dominant way of life. The type of economy or industry, and the associated activities, is driven by this demand. Huang et al. (2011) recognizes six types of port-city developments: traditional fishery, business transaction, storage transportation and processing, delivery and logistics, tourism and city life.

The development associated with the first and the second stages are of course still relevant: all economic activities mentioned are still needed in modern society. However, these activities have a completely different position today, both geographically and socially. The types of port-city development relevant for inner city waterfront regeneration are tourism and city life. The types of economic activities associated with this development are already mentioned: entertainment, tourism, specialized study, cultural heritage and enjoying the ecology. This type of development will greatly increase social benefits for people living in and around such port-cities.

3.2 Postmodernism and Neo-Liberalism

The waterfront transformations of Cardiff and Newport have, like many large waterfront projects, their origin in the 1970s and 1980s. They reflect the trend described by Huang et al. (2011) but there is more to be said. These waterfront developments of the 1970s and 1980s are described by Norcliffe (Norcliffe et al. 1996) as a postmodern phenomenon. Waterfront regeneration is not only explained by technological change, the so called containerization, or change in economic structure, but also the postmodern culture that arose in the 1970s and 1980s. This culture is linked to a change in economic structure: the shift from Fordism, a production based economy, to a consumption based economy. In postmodernism economic structure and culture go hand in hand, as consumption is both an economic and cultural manifestation. Of course this postmodern culture also exists in landlocked cities, but the spatial manifestation of postmodernism can best be seen in the formerly redundant docklands of port-cities all around the world (Norcliffe et al. 1996). Those areas became redundant due to technological change and the economic shift mentioned above (Hoyle 1988; Norcliffe et al. 1996) and were filled in by postmodern culture. This culture is characterized by a strong focus on the individual, the 'self', the search for an individual style and the appropriate way of showing this. The status symbols can be found most evident in individual housing style. A house at the waterfront in a former dockland district can be considered as the ultimate individual style. Moreover, in many countries in the 1970s and 1980s there was a shift towards neo-liberalism and neo-conservatism, and with that a tendency to privatization and more

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room for the free-market. As a consequence the gap between the rich and the poor became bigger: cities not only experienced an increasing population of young urban professionals (yuppies), also the population of young urban failures (yuffies) grew (Davidson 2009; Norcliffe et al. 1996). The result of this political, demographical and cultural shift was also the selling of the waterfront to the highest bidder. In cities all over the world waterfront developments are characterized by luxurious apartment buildings, the waterfront being made a very exclusive place. In a sense the waterfront was being privatized, the post-modern era found a new way of capitalization of the waterfront (Davidson 2009; Pinder & Rosing 1988; Norcliffe et al. 1996).

This type of development – a privatized, thin line at the waterfront - is the direct opposite of what waterfront development should be. People tend to have more spare time and spare money to spend, and are seeking to improve the quality of their lives. The waterfront plays an important spatial role in this trend, as can be seen proven in numerous waterfront projects all over the world.

Conclusion

It is of great importance to improve the accessibility of the waterfront and to improve the quality of the public space. The positive effects of such efforts are not limited to the waterfront itself, but exceed to the level of the water city. Although there is not much attention in the literature for this effect, the correlation between waterfront development and the improvement of its neighboring water city is made clear in the model of West (1989) and in the examples of Newport (Krausse 1995) and Cardiff (Hilling 1988).

The same examples illustrate that the improvement of the accessibility of the waterfront should not be limited to patching up the pavement. The improvement should include stimulating favorable economic activity, associated with current social trends. Although the exact character of this activity depends on the geographic location of a waterfront, in general the activity should be associated with tourism and leisure (e.g. yachting, cultural heritage, wining and dining). Not all of these economic activities may be water related in the traditional sense but they have a great economic and social impact (Krausse 1995; Sairinen & Kumpulainen 2006; Huang et al. 2011). The quality of water in a city being a large open space is a quality which is inalienable. This quality is much associated with the waterfront as a place for public gathering and leisure. This function of the waterfront is as old as people built their cities along the water, but it will be increasingly important. Therefore it is absolutely vital to improve the accessibility of the waterfront.

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ILLUSTRATIONS

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Waterstad, reintroducing water in Rotterdam