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RESEARCH BY DESIGN: CONNECTING CITY AND DELTA

Judit Bax, Martin Hulsebosch, Ellen Kelder

fig.1

For several years now the municipality of Dordrecht has been working on the definition of planning and water management policy together with other public and private parties. The position of Dordrecht as an urban island in the Dutch Delta makes the city an interesting laboratory for testing new approaches – and the Municipality warmly welcomes fresh viewpoints, such as those coming from international urban and landscape design students, allowing us to relate the Dordrecht approach to urban flood management to the lessons we have learned from the results of international Swiss, North-American, and Dutch design studios.

figure 1: Waterbus (ferry) stop at
Merwekade Dordrecht. In the background,
the Stadswerven area. Photo: Bax

This is the Island of Dordrecht

Dordrecht is a city of approximately 120,000 inhabitants, situated in the southwest of the Netherlands. People are frequently surprised to learn that the city of Dordrecht is an island as well. The island covers almost 10,000 hectares, the northern part of which is urbanized and the southern part agricultural and natural land. The island is situated at the transition from the river area to the Delta and as such has to deal with flood risks from both river discharges and tides from the sea.

Dordrecht is inextricably linked to a history of water and land reclamation. Around the old river Thure(drith), Dordrecht started out as a linear village. The oldest archaeological finds date from the 12th century; at that time it is likely that there was a settlement.

After several floods in quick succession, together with the – almost mythical – St. Elizabeth flood of 1421, Dordrecht was largely surrounded by water for almost two centuries. In the 17th century people start reclaiming the land that was lost during the floods. The 18th-century land reclamation laid down the basic form of Dordrecht. The latest and greatest polder (Polder Biesbosch) was finished in 1927.

Nowadays, the great political ambition is to redefine Dordrecht as a delta and river city. Since the nineties, Dordrecht and the Drechtsteden region have worked on the redevelopment of former industrial river banks to give the cities a new panorama of the rivers. Innovation and growth of the maritime sector constitute a key issue in the regional economic strategy. And, finally, the Dordrecht municipality is considered a Dutch pioneer in researching and implementing innovative water policy.

Since 2005, the Dordrecht Municipality has been working on the UFM[1] and MARE[2] projects, two practical-orientated lines of research focused on understanding and reducing urban flood risks, and integrating

1 In the UFM-project (2005–2008) the cities of Dordrecht, Hamburg and London work together on the development of sustainable urban flood management in three areas. The Dordrecht project was supported and financed by Leven met Water.

2 MARE (2008–2012) stands for 'Managing Adaptive REsponses to changing flood risk' and is an innovative, practically-orientated and demand-driven reseach project to flood proof and climate proof urban development. The consortium of public parties, private parties and experts involved in MARE Dordrecht consists of: Dordrecht Municipality, Hollandse Delta Water Authority, Rijkswaterstaat South-Holland, Ministry for Infrastructure and the Environment (DG Water, DG Environment), Province South-Holland, Dura Vermeer, UNESCO-IHE, Safety and security region ZHZ, Deltares and Delft University of Technology. The project is funded by Interreg IVB North Sea region Programme.

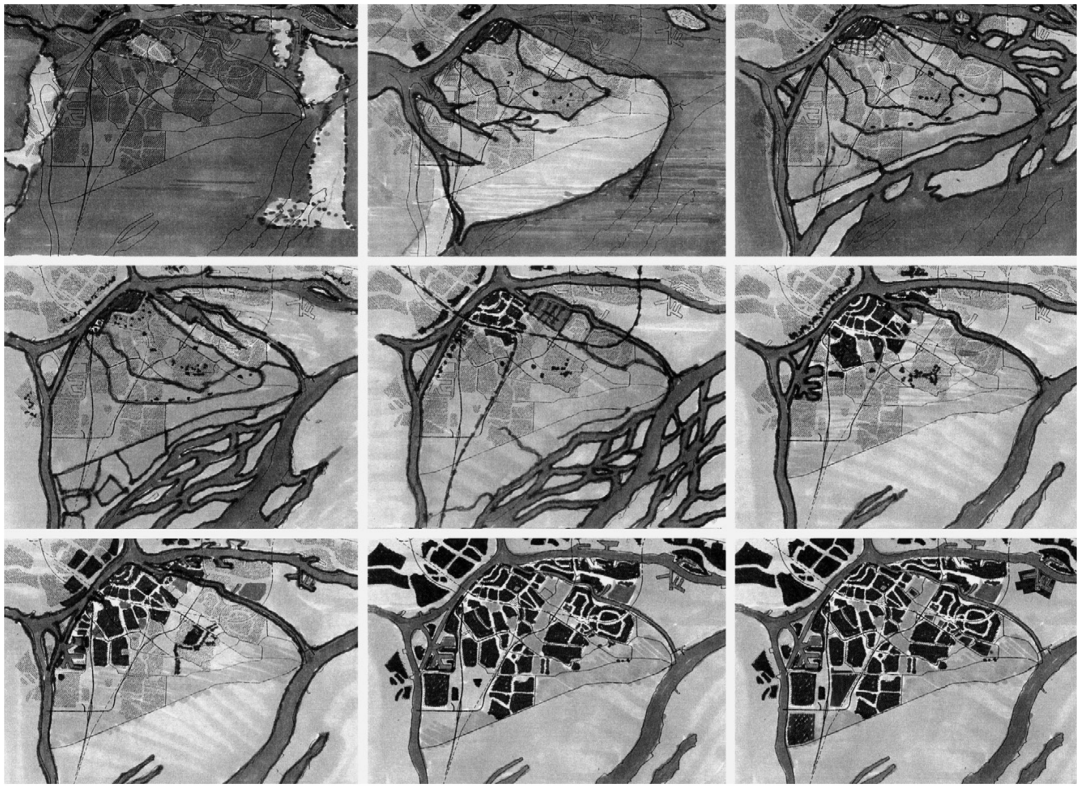

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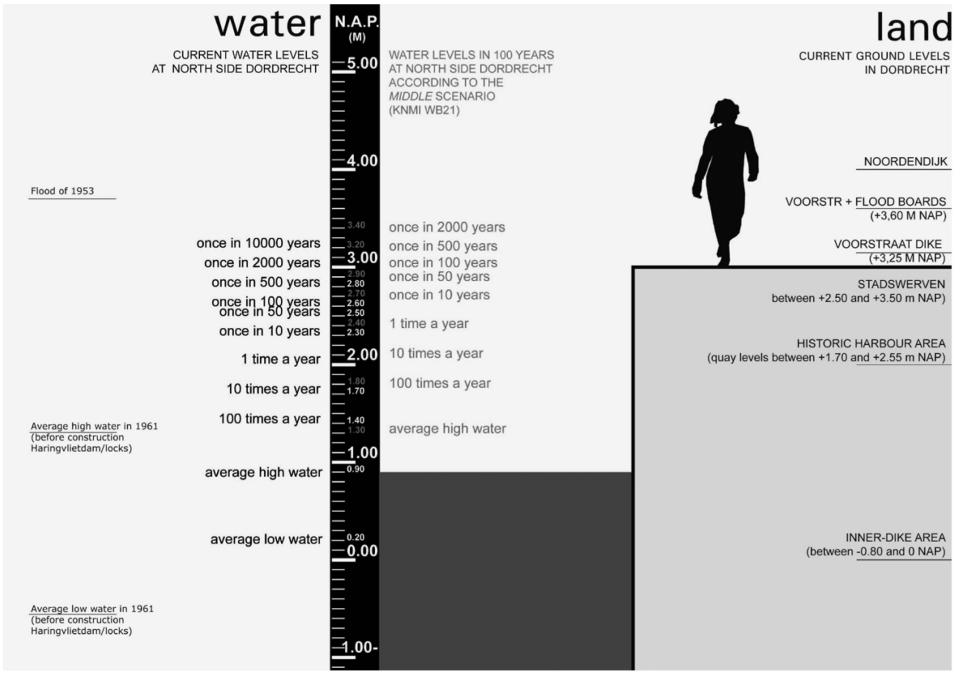
figure 2: Development of Dordrecht after the 1421 St. Elisabeth Flood: a history of water and land reclamation. Dordrecht in ca.1560, 1600, 1700, 1850, 1912, 1939, 1958, 1998, 2012. Source: Dordrecht Municipality

flood risk management into the daily practice and development of the city. Research by design plays a crucial role in understanding problems and finding effective measures that can be linked to programs and investments in the city. The process of the project is organized around the three activities: assessment of the water system, design, and governance. Therefore the municipality works in an alliance with several public and private partners.

Outside the dike might well be the safest place on the Island

Six years ago, at the start of the UFM project, we drew a diagram showing the ground levels of several areas in the city and the water levels of the rivers around the city – both under daily and extreme situations. Later on, we added the calculated water levels that are expected in future due to sea level rise and increasing peak discharges from the rivers. This might seem like obvious knowledge, but it wasn't. Fransje Hooimeijer argues that in the Netherlands the relationship between urban design



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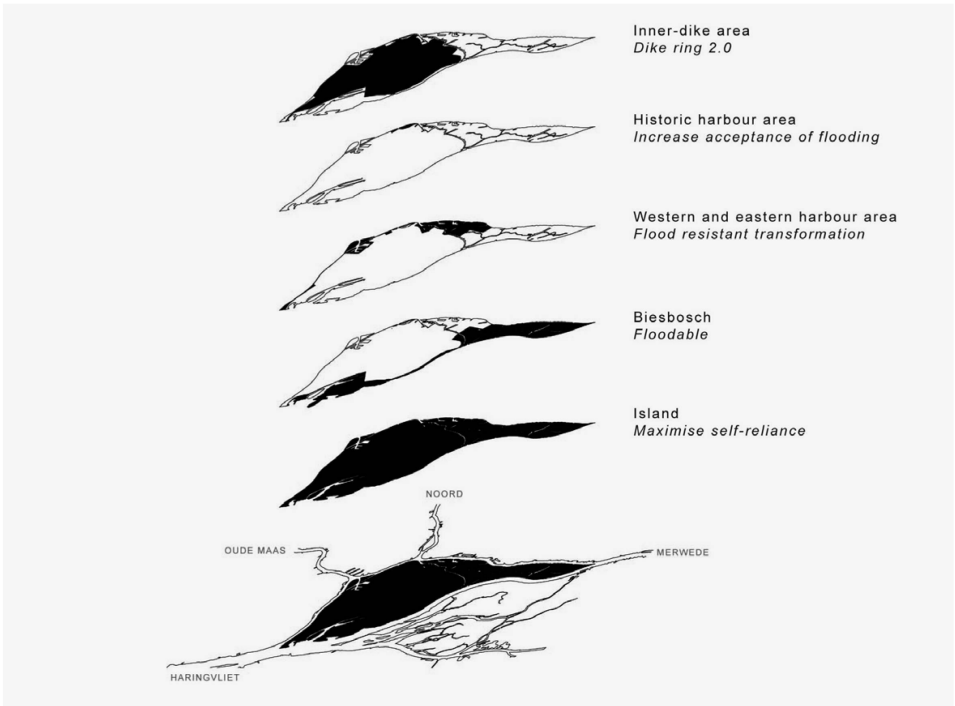

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figure 3: Understanding flood risks by combining water levels and ground levels of Dordrecht in a diagram. Source: UFM-project
figure 4: Flood risk management strategy: "Safe and self-reliant island." Source: MARE-project

figure 5: Aerial view of the historic harbor area, with the Stadswerven area in the background. Source: Masterplan Stadswerven. Dordrecht, 2009
figure 6: Map of the Stadswerven Master Plan with ground levels at varying heights. Depending on the specific location, the buildings and public areas will be adapted to cater to high water levels. Source: Masterplan Stadswerven Dordrecht, 2009.

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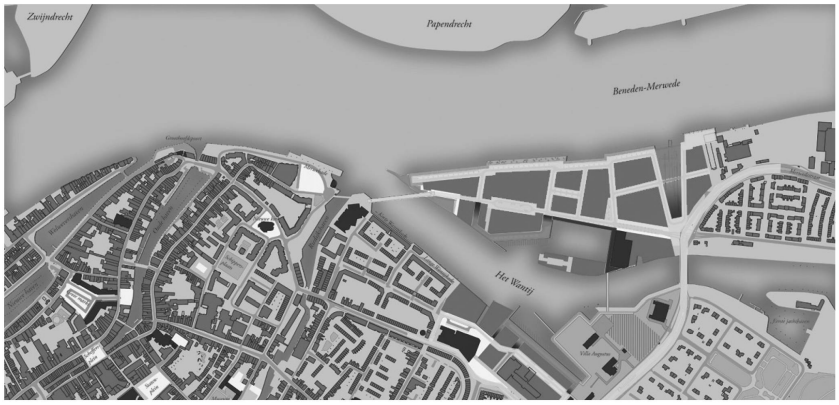

fig.6

and civil engineering has disappeared, despite the fact that nowadays problems especially require this combined approach.[3] The diagram appeared to be a crucial tool in understanding flood risks for Dordrecht and starting up a dialogue between water engineers and urban planners. The diagram also showed that sometimes problems were not what they seemed to be. There used to be a commonsense notion that areas outside the dike were dangerous places, because they were not protected against floods. The diagram shows that most of the – especially harbor – areas outside the dike actually have a relatively high ground level. During their construction in the 19th and 20th centuries the harbor areas to the west and east of the city were artificially raised to between three and four meters above N.A.P.[4] Because of their high ground level, flood risks for these areas are relatively low. The probability of flooding is small and the

3 Hooimeijer, F. et al. *Atlas van de Hollandse Waterstad*. Amsterdam, 2005

4 N.A.P. means Nieuw Amsterdams Peil and is the reference level for water levels in the Netherlands.

characteristics of the flood would be very different from a flooding of the low-lying polders. The water never rises very high and flows away naturally as soon as the water levels go down. We concluded that these areas outside the dike might actually be the safest place on the Island. This discovery is what we now use in the development of an integrated flood risk management strategy for the entire Island. In this strategy, the self-reliance of the Island and its people is a guiding principle.

Flood risks as design motif

In the recent master plan design for the new district of Stadswerven,[5] flood risks are used as a design motif. Stadswerven is an old industrial area next to the historic city center. In the coming years, this area will be redeveloped, with new housing and a cultural program. The area is surrounded by rivers and not protected by dikes. The planned transformation offers the opportunity to make the new urban area resilient to floods. Initially, the plan was to elevate the area to a "safe" level of four meters above N.A.P. By doing this, the probability of flooding would become very small. During the design process a study was done into which ways the area could be made safe from flooding, taking into account not only the probability but also the impact of flooding. This is called a flood risk approach. This has resulted in a more differentiated approach to water safety that matches the area's exceptional position between two rivers. A new topography for the area has been defined by ground levels ranging from a five-meter high central street to low-lying public spaces next to the water. Depending on the ground level, buildings and public spaces have been more or less adapted to flooding. This concept is an invitation to create architecture that has a close relationship to the water. Differentiation in distance between land and water is a characteristic of Dordrecht: one can experience this on the dikes, piers, slipways, quays, and houses in the city. We believe that river dynamics are part of the quality of life in Dordrecht and that the layout of urban space can help people enjoy the water and keep them alert as well.

5 The Masterplan Stadswerven (2009) has been designed by Paul van Beek Landscape Architects and AWG Architects in cooperation with building developer OCW and Dordrecht Municipality.

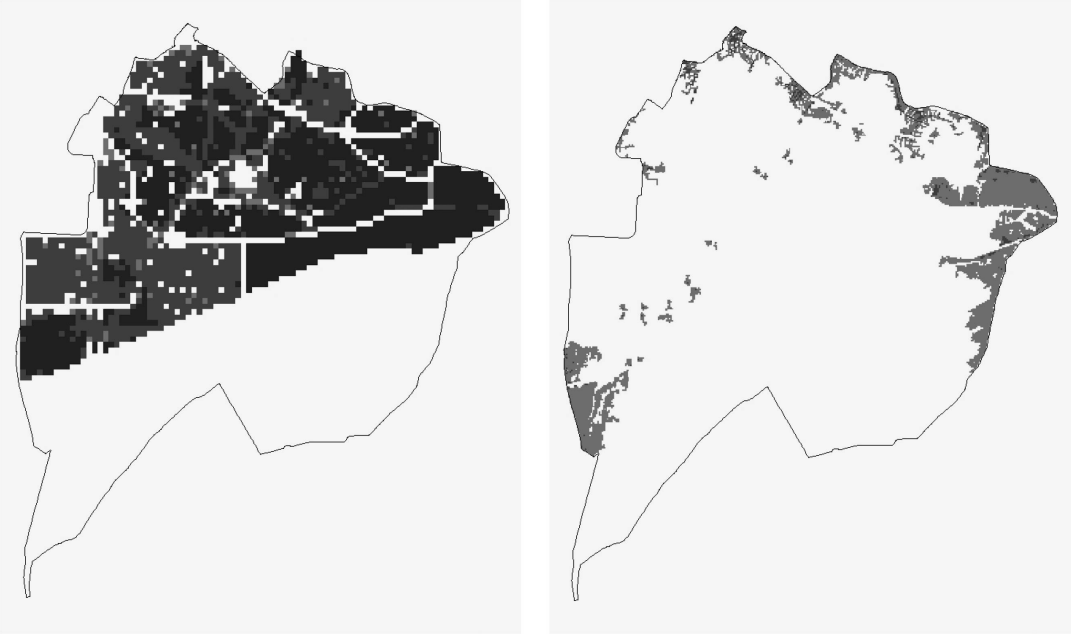

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figure 7: Flood maps for the inner-dike area following a dike breach (left) and flooding over the top (right). Source: MARE-project

One size doesn't fit all

There's a growing belief in the Netherlands that the search for a sustainable water safety strategy should not only take place on the level of the river-delta-sea system but also require custom-made solutions on a regional scale. Even the national Delta Program[6] embraces this idea by using an area-based approach. The area that the Rhine and Meuse Rivers pass in their way to the sea covers a broad variety of landscapes and populations. The way Dordrecht is dealing with flooding in the Stadswerven area is thus not very likely to be applied elsewhere in the southwestern part of the Delta. This is not only a matter of fresh and salt water, but also a difference in people's feeling towards floods, since the 1953 Flood in Zeeland greatly disrupted the lives of the people that lived in that area.

An important element of the current Dutch flood protection system is the 55 dike rings that protect the area within them from flooding.

6 The objective of the Delta Programme is to protect the Netherlands from flooding and to ensure adequate supplies of freshwater for future generations.

The question is: In what ways can the dikes be adapted to rising water levels in the future? One of the dike rings is situated on the Island of Dordrecht and encloses the polder area. In the MARE project, several breaches of the Dordrecht dike ring were simulated. The simulation showed that the polder area was at high-risk; flooding would either take place deeply and slowly, or deeply and fast. However, analysis of dike sections showed that large sections of the dike are integrated into the urban structure in such a way that it is very unlikely that they will be breached: raised outer-dike land, building construction, or a gently sloping landscape make these sections of the dike extra strong and stable. These existing characteristics make the transformation to a smart, improved dike system very promising.

International design studios

When the Chair of Professor Girot from the ETH Zurich contacted the Dordrecht municipality in 2010, we believed it would be very interesting to welcome landscape architecture students from a country where rivers start in the mountains and have them study an island where one of these very rivers runs into the Delta. The Swiss design studio focused on the connection between city and Delta: "How could the landscape of Dordrecht benefit from a safer Delta, and how could the city in turn develop a better living environment?" The special position of Dordrecht as island and city on the edge of the Dutch Delta has been recognized as well by other international design schools, which used the Island as a laboratory for testing questions and opportunities raised in terms of the Dutch Delta. In 2010, the Harvard University Graduate School of Design organized a studio whose aim was to present a "series of adaptive flood strategies, safe-to-fail infrastructures, and contemporary spatial models that challenge the five-hundred-year-old legacy of the Dutch polder model and the tradition of civil engineering that have dominated the past five hundred years."[7] And very recently TU Delft finished a studio for postgraduate urbanism students on the resilience of the city. The objective was to study "the possibilities for future transformation of the Island into the envisioned resilient state."[8]

7 Belanger, P. et al. *Dordrecht 2100. Strategies for the Urban Island of Dordrecht in the Dutch Delta Region.* Harvard, 2009.

8 Hausleitner, B. (ed.). *Constructing the sustainable Delta-City. Student work Design Studio.* Delft, 2012.

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fig.9

figure 8: Use of existing relief in the Swiss proposal "Gates to nature." Source: ETH Zurich, Ruoss, Klumpe, 2011
figure 9: The landscape of Dordrecht as a tabula rasa for a new economic and ecologic perspective. Source: ©2010 Harvard Project on the Region

The island as evolving landscape or tabula rasa?

The Swiss students could be characterized as surgeons: they like to cut, but their surgeries are very precise. The techniques they use to analyze the "micro topography" of the island's landscape are impressive and once again emphasize the existing relief. Many of the design proposals show the potential of these fine differences in height by making new gradients between city and rural land, or city and river. By doing this, they considered the Island as an evolving landscape.

In the proposals of the North-American students, large parts of the Island are wiped out and filled up again. For them it seemed easy to look a hundred years ahead and consider the landscape as a tabula rasa. The students probably wanted to confront us with the new opportunities that arise if you don't start designing from the existing situation but start

fig.10

from a new economic and ecological perspective for the Netherlands. At first this was shocking, but later on we realized that this was actually a refreshing way of thinking.

More questionable in almost all the student work were the large building programs and suggested urban growth to justify the interventions and changes in the landscape. What would these projects look like if there was no growth in the coming century?

Orientation towards the Delta

One clear recommendation from all the students' work is that Dordrecht should benefit much more from its (strategic) position in the Delta. However, the studios offered very different ways to do this. The students from ETH Zurich emphasized the nearness of the Biesbosch National Park, the fresh water wetland area south of the city. The designs proposed a series of interventions such as improving the accessibility of the agricultural polders and wetlands, extending the wetlands towards the city, and extending the city towards the wetlands. The TU Delft students had similar strategies for the southern part of the Island, but also considered the transformation of the urban river banks as a way to bring the Delta closer to the city. The Harvard students used the Island as a prototype for new Delta economies such as tidal farming and energy parks. In their approach the Delta serves as a basis for a new identity, economy, and way of life.

figure 10: Polders on the southern part of the island. How does the beauty of a de-poldered landscape relate to the beauty of the existing polder landscape? Photo: van der Stelt

For several students, depoldering the southern part of the Island appears to be the ultimate intervention in order to bring about the intended new relationship between city and Delta. Despite spectacular images, we were not convinced by the benefits of depoldering, since, in terms of water management, measures upstream in the river area have proved to be much more effective. The open polders on the south side of the Island are a well-preserved example of the Dutch tradition of land reclamation; they offer wide vistas, and very fertile and productive agricultural land. The people of Dordrecht value these polders highly. So the question is: What would depoldering bring to the city? How would the new "wet" beauty relate to the beauty of what would disappear?

Joining forces with nature

The international student work illustrates – once again – that the Dutch way of dealing with water might be self-evident to the Dutch, but is rather odd to foreigners. The relationship of the Dutch to water and the evolution in strategies to confront the water is a key theme in the studios. In the students' work one can find several proposals to use the morphology and natural material of the rivers to gradually reshape and raise land on the Island of Dordrecht. Don't fight the water, but join forces with nature, is the adage. However, we think the Dutch approach isn't that black-and-white anymore. The departing Dutch State Advisor on Landscape, Yttje Feddes, mentions "moving with the natural system"

as one of the key planning themes in the national Delta Program.[9] In recent projects such as "Room for the River" and "Sand Motor," natural morphology and materials are already used to increase water safety along rivers and coast in the Netherlands. The innovation program "Building with Nature" from the EcoShape Institute[10] proves that using the potentials of the natural system is believed to be a new export product for the Dutch water engineering sector.

Design studio as travelling salesman

How can the student work be of added value for the Dordrecht municipality? The Dutch architect Wouter Veldhuis characterizes the external designer as a travelling salesman.[11] He visits a city with a fresh point of view and tries to sell his ideas, independent of local parties, and open-minded to place and people. This is exactly the role that the international design studios have fulfilled in Dordrecht. The perspectives that have been sketched help us to detach from "this is how we're used to doing it." The students showed the many opportunities for Dordrecht to shape its identity as a Delta city. We believe this might well become a guiding theme in the many challenges the city is facing. At the same time we believe it requires an urban scale to bring change into practice. This is where the municipality must and is willing to act.

9 Feddes, Y. "De kracht van het ontwerp in het Deltaprogramma. Lezing van de Rijksadviseur voor het Landschap Yttje Feddes ter gelegenheid van het eerste Nationale Deltacongres op 4 november 2010". Den Haag.

10 The institute is an initiative of the Dutch multinational dredging companies Boskalis and Van Oord. Dordrecht Municipality is one of the public partners that are involved.

11 Veldhuis, W. "De heremiet en de handelsreiziger. Nieuwe rollen in de stedelijke vernieuwing". In: Stadscahiers (ed.). *Stedenbouw als strategie*. Amsterdam, 2010.