

# The synergy between flood risk protection and spatial quality in coastal cities

ANNE LOES NILLESEN

# Abstract

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Coastal regions throughout the world are subject to flood risk challenges. This paper concentrates on the Netherlands; its coastline fulfils an important role in the protection of the Dutch delta. Due to the expected sea level rise, part of the Dutch coastline will have to be reinforced. Along most of the sparsely occupied coastline, the space needed for the reinforcement of the flood risk protection infrastructure can be found easily, either on the seaside or inland. However, some segments of the coastline have been built upon and are difficult to reinforce; buildings have limited the adaptability of the originally flexible coast. One of these locations is Scheveningen, a borough of the city The Hague and a seaside mass-tourism resort operating on a national scale. It is difficult to reinforce the borough's flood risk infrastructure without significant restructuring. In addition to water-safety issues, Scheveningen faces social-economic challenges and needs a qualitative programmatic and spatial impulse. An integrated approach to spatial and flood risk design is essential to come to a qualitatively as well as functionally acceptable solution for multifunctional flood defences. This paper describes and demonstrates the approach and application of an integral 'research by design' study for flood risk management and spatial quality in Scheveningen. It is the result of a collaborative effort between spatial designers and flood risk engineers, who worked together in so-called 'Delta ateliers'. Three different flood risk strategies ('a sandy shore', 'a hard protection body' and 'a perpendicular dam') are used as leading principles for integral designs in which both the spatial assignment as well as the long term flood risk protection assignment are addressed. This results in three different designs that are discussed in relation to their spatial potential and hydraulic efficiency. This applied research by design approach was considered very valuable—even essential—to feed the debate regarding the choice of a flood risk intervention. As a result, this approach will be continued throughout the Dutch National 'Delta Programme' that focusses on long term flood risk protection.

## KEYWORDS

flood risk protection; seaside; waterfront; spatial quality; integrated design; Delta Programme; research by design; Dutch delta; Scheveningen

## 1. INTRODUCTION

Coastal regions throughout the world are subject to flood risks challenges (IPCC, 2007). This paper concentrates on the Netherlands, where the coastline plays an important role in the protection of the Dutch delta. Erosion, climate change and the growing economic value of low-lying parts of the country create significant long-term flood risk challenges. The Delta Programme was established in order to define suitable strategies and interventions to answer these challenges (Delta Programme, 2008). Through several projects the programme is orientated towards specific regions, such as the south-west delta and the Wadden region, and specific topics, such as freshwater supply. One of the regional sub-projects concentrates on the Dutch coast.

In this project, a series of expected short-term (2050) and long-term (2100) weak spots in the Dutch coastal defence system were identified and addressed. The short-term weak spots have been strengthened through regular maintenance of existing flood risk protection infrastructure works. In the long term, regular maintenance will have to be carried out continuously to compensate for erosion. In addition to erosion, rising sea water levels will contribute to the creation of new long-term weak spots as well. In these coastal sites, the flood risk protection infrastructure will have to be reinforced. This infrastructure consists of a combination of natural stretches of sandy dunes or barrier islands and elements such as dikes, barriers and dams (Hidding & Van der Vlist, 2009).

Given the sparse occupation of most of the Dutch coastline, the extra space needed for the reinforcement of the flood risk protection infrastructure can easily be found either at the seaside or inland. However, some settlements are located in close proximity to, or even directly on the coastal defence line. One of these is the former fishing village of Scheveningen that dates from the Middle Ages. Nowadays Scheveningen is a relatively densely populated borough of The Hague and a seaside mass-tourism resort operating on a national scale. For such a location, it is difficult to reinforce the flood risk infrastructure without significant restructuring, which is controversial and costly given the private ownership of most of the properties. In addition to water-safety issues, Scheveningen faces social-economic challenges. The old town centre has degraded and needs qualitative programmatic and spatial improvement (Municipality of The Hague, 2009).

An integrated approach to spatial and flood risk design is essential to come to a qualitatively and functionally acceptable solution for multifunctional flood defences. Such an integrated approach becomes even more relevant if the flood risk protection task coincides with a complex spatial assignment. The latter is the case in Scheveningen. Given the dual requirements of social-economic and flood-risk improvements, an opportunity for synergy arises (Nillesen, 2014).

This paper describes an integrated research by design study that is conducted in order to develop designs for flood risk interventions that are effective from both the perspectives of flood risk management and spatial quality. It is the result of a collaborative effort between spatial designers and flood risk engineers, who worked together in so-called 'Delta ateliers'. In this study, three different types of interventions for Scheveningen were developed and evaluated. The interventions are referred to in this document as 'a sandy shore', 'a hard protection-body' and 'a perpendicular dam'.

The methods paragraph starts with a brief introduction on the concepts of the delta ateliers and research by design approach. Subsequently, the flood risk assignment and spatial assignment for Scheveningen are described, as well as specific choices regarding design goals that serve as starting points for the development of the aforementioned designs. Then the designs for flood risk management and spatial quality themselves are described. The paper concludes with a reflection on the methodology.

## 2. METHODOLOGY

Atelier sessions and research by design are approaches that are often referred to in contemporary design related studies. The exact meaning of those terms often remains vague or undefined, therefore this paragraph will start with the description on how those approaches are used within this research. The use of the layer model as a conceptual framework to describe and understand the essence behind the flood risk assignment in Scheveningen is then set forth.

### 2.1 Delta ateliers

Workshops or design ateliers that bring together different stakeholders and multidisciplinary experts are successful work formats to reach an integrated design (Prominski et al., 2012). Atelier work sessions in which stakeholders and designers work together to develop a holistic plan are often referred to as 'charettes' (Girling, Kellett & Johnstone, 2006). However this term is typically used to describe interactive sessions for community participation (Sanof, 2000; Girling, Kellett & Johnstone, 2006), whereas this research focuses on integrated design and participation among professionals. Because of the community participation connotation, the term 'charettes' in this study is deliberately avoided and the design sessions are referred to as 'delta ateliers'.

During this research two types of delta ateliers have been applied: 'interactive stakeholder sessions' and 'expert sessions'. Interactive stakeholder sessions are workshops in which professional stakeholders and experts in-

teract. The goal is to share knowledge, to establish joint fact-finding, to identify relevant topics and assignments, and to create understanding and agreement on different standpoints and visions. An interactive stakeholder session consists of a general presentation to bring participants up to date and the actual interactive workshop, for which the participants are divided in small groups that discuss topics under guidance of a team leader. At the end of the workshop session, there is a feedback round followed by a discussion under the direction of the atelier leader and agreement is reached on standpoints and visions.

Expert sessions focus on collecting, sharing and creating knowledge. During sessions with a core team of multidisciplinary experts (urban designers, landscape architects and civil engineers) insights are created and shared, knowledge gaps are identified and measures and strategies are proposed, integrated or assessed. In instances when a knowledge gap is identified, experts are requested to do additional research. The urban design office *Defacto Urbanism* supported the delta ateliers by preparing the sessions, performing additional in depth analysis and further developing, integrating and visualising the conceptual visions and design proposals as formulated during the ateliers. The outcomes of the delta ateliers and the additional research and design proposals were combined in a research report *De Stad aan Zee* (Atelier Kustkwaliteit, 2011).

During this research three interactive stakeholder sessions were organised. The first session focussed on the problem definition, the sharing of knowledge regarding flood risk protection and spatial tasks and ambitions. Agreement was reached on the long-term goals and the future development scenarios that will be applied.

As a preparation for the second interactive stakeholder session a spatial analysis of the area was performed by the urban design office based on the information shared during the first session. An expert session was conducted in order to formulate and select three flood risk interventions that were effective from a hydraulic point of view. During the second session three effective interventions from a flood risk point of view were confronted with spatial considerations of the area. Opportunities and threats were identified and discussed. The outcomes of the first and second sessions were used as building blocks in the preparation of the third session.

Based on the building blocks as described above, the design office performed a research-by-design exercise in which integrated designs were made that address both flood risk and spatial considerations. The development of the integrated design was done in cooperation with the multidisciplinary expert team that provided detailed information on the flood risk related aspects of the design alternatives. During the third interactive stakeholder session the outcomes of the research-by-design exercise were presented and dis-

cussed among experts and stakeholders.

## 2.2 Research-by-design

Different definitions of research-by-design exist (Geldof & Janssens, 2013). The research-by-design method used during this research assumes a definition in which a single parameter is systematically varied (the type of flood risk intervention) while fixing other parameters (such as the location, the expected scenarios for climate change and economic development, and the spatial design component). The different flood risk interventions are used as a leading principle for an integrated design in which both the spatial considerations and long-term flood risk protection are addressed. In the Scheveningen case this results in three different designs that are discussed in relation to their spatial potential and hydraulic efficiency. The aim of this research-by-design study is not to develop and select the most favourable alternative, but to feed and support the on-going debate regarding flood risk interventions for Scheveningen by exploring strategic opportunities for flood risk protection.<sup>1</sup>

## 2.3 Layer analyses and complex systems

In this study the 'layer model' is used as a conceptual framework to describe and understand the essence of the flood risk assignment in Scheveningen. The layer model was documented by the Dutch Ministry of Infrastructure and Environment (VROM, 2001) and based on the triple layer model by Ian McHarg (1969). The layer model contains three conceptual layers: The substratum (the natural layer of the subsoil in which changes take place over the course of centuries), the network (the layer of the infrastructural networks, changing over the course of 50-100 years) and the occupation layer (the layer of the human occupation, changing over the course of 25-50 years) (Meyer & Nijhuis, 2013). In the current research context, these layers are interpreted as the three layers of water, flood risk infrastructure and occupation.

## 3. THE FLOOD RISK PROTECTION TASK

The coastline is part of the Dutch flood risk protection system, protecting low-lying parts of the Netherlands against floods in the event of a storm surge. The Dutch coastline used to be a dynamic landscape that transformed over time due to erosion, sedimentation and varying water levels. However in 1990 the Dutch government decided to define a base coastline (*basiskustlijn*) to prevent further erosion of the coastline. The main goal of this measure was twofold: to protect both the sea defence line and the functions in the coastal zone. The coastline is maintained by Dutch water boards and if the dunes

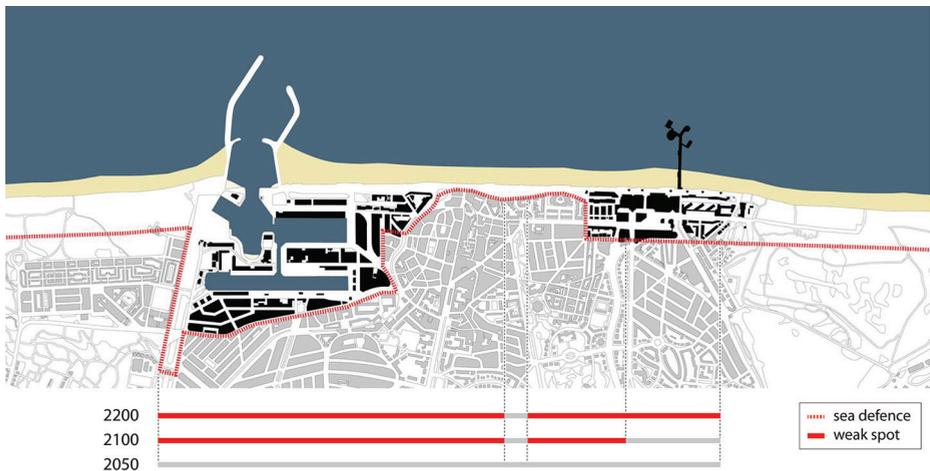
do not meet the flood risk protection standards anymore or there is a severe deviation from the base coastline, action is taken to reinforce the coastline. When it comes to reinforcing the coastline, different landward and seaward interventions are possible, varying from more natural sandy reinforcements to hard structures such as dams, quays and barriers to hold back the seawater. The Dutch erosion management policy is referred to as ‘dynamic preservation’ (VROM, 1990) and prescribes a sequential preference of measures. Preservation and free transport of sand along the coast is encouraged. If an intervention is necessary, this is done with sandy (or ‘soft’) measures, only using hard measures such as constructions when they are unavoidable (VROM, 2006).



Figure 1 Scheveningen coastal protection zone

Scheveningen is part of the sandy coastal stretch referred to as the ‘Holland coast’ (Mulder, Hommes & Horstman, 2011) which protects the core economic and urban centre of the Netherlands (the Randstad) from flooding. In figure 1 the coastal protection zone of Scheveningen is visualised. The coastal protection zone consists of both the actual flood protection body as well as a reservation zone, anticipating future land or seaward extensions of the flood risk protection body. When the flood risk protection body is a dune (as is the case in Scheveningen) the possibility of that part of the dune collapsing during a storm surge is taken into account. The dune is designed to be wide enough to still function as a flood protection body after a partial collapse. The line that should still be able to shield the water under all circumstances (within the range of the flood risk protection standard) is referred to as the ‘water shielding line’. In Scheveningen, the water shielding line is positioned in the densely built centre. This complicates the enforcement of the sea defence line since the flood risk protection body as well as most of the reservation zone are built on and with that, fixed.

When following the layer model theory the occupation layer is regarded to be the most flexible layer. In this case, the occupation layer has actually become the fixed layer. The dynamics of sedimentation and erosion on a local scale have already caused changes to the base coastline and protection standard over the course of decades. This asks for the involvement of the infrastructural layer. However, the occupation layer on top of the infrastructure layer consists of buildings that do not match the theoretical life span from the layer model of 25–50 years: For example the famous Kurhaus building, a hotel along the beach–promenade that was built in 1887 and many heritage protected houses that date from around the year 1900. Of course such monuments can be regarded exceptions, but even the ‘modern’ privately owned seaside apartments already date from the seventies and are expected to last at least some more decades. In other words, the necessary dynamic of the infrastructural and occupation layer to adapt to natural processes is in practice limited by the built tissue of the occupation layer.



**Figure 2** Indication of expected weak spots of the sea defence (in red) over time

When considering the maintenance of the flood risk protection standards on the short term (up until the year 2050) a weak spot was identified in the old village of Scheveningen (figure 2). This weak spot has been already resolved with the realisation of a higher boulevard. With that addition, the coastal protection is extended seaward by the construction of a hard structure. Figure 3 indicates the new extension movement of the water shielding line seaward. This new extension by the Spanish architect de Sola-Morales has been praised for the added spatial value that the enforced boulevards offer Scheveningen.

In the long term (2100) the whole sea defence of Scheveningen including the new extension is expected to need re-enforcement.



**Figure 3** The boulevards' extensions shifts the water-shielding line seawards

During the first interactive stakeholder meeting the position was taken that restructuring the complete sea defence line at its current location, or land inward is neither feasible nor desirable. This means that the focus of this research is a seaward extension. During the first expert meeting three main principles for extending the sea defence line were decided upon: a sandy dune extension, a hard protection body and a perpendicular dam. An important starting point was that the dimensions of the proposed flood risk protection bodies should be viable from a flood risk protection point of view until 2200.

#### 4. THE SPATIAL ASSIGNMENT

Two important positions with respect to long term scenarios were taken during the first stakeholder sessions: in the long term the city of The Hague will still grow regarding both economics and population, and the borough Scheveningen will remain an important part of the city of The Hague and should reinforce the identity of The Hague as a city by the sea.

During the first interactive stakeholder session the governmental vision and ambition for Scheveningen were presented. The findings were later supplemented with the outcomes of a spatial analyses performed by the urban design office. The spatial tasks that were identified concerned the identity, accessibility, spatial quality and vitality of Scheveningen.

### 4.1 Identity

Within Scheveningen three different coexisting identities can be distinguished: that of Scheveningen harbour, Scheveningen village and Scheveningen resort. The harbour in the south of Scheveningen has a rough character and offers potential for redevelopment now that many businesses are relocated. The adjacent part of Scheveningen is the authentic centre of the historic fishermen's village Scheveningen. Here we find small-scale residential buildings. The central axis of the village is directly connected to the seaside. North of the village the futuristic seaside resort can be found, characterised by the faded glory of the boulevard, the Kurhaus hotel and the Pier.

The different seaside towns along the Dutch coast all have their own distinctive characteristic and identity. The wish to contain and strengthen this difference of identities is expressed in a regional vision (Provincie Zuid-Holland, 2009). Scheveningen stands out as the only seaside town with a metropolitan identity. However the city centre of The Hague is not well connected to the borough of Scheveningen. You could say currently Scheveningen is a village by the sea instead of The Hague being a city by the sea. In order to enforce the identity of a city by the sea the ambition is to develop Scheveningen to become a mixed-use urban sub-centre of The Hague (Municipality of The Hague, 2009).

### 4.2 Connectivity

At both the city scale and the local scale, Scheveningen is poorly connected to the seaside. From the The Hague train station it is a 40-minute tram ride to reach the seaside. During sunny days, regular car traffic is hampered by traffic jams. Both directions of travel bring you to either tram stops or parking garages. At these points, although you are very close to the seaside, the seaside is not experienced. The sections in figure 4 show how the barrier formed by the dune top separates the arrival point and the tissue of Scheveningen from the actual seaside.

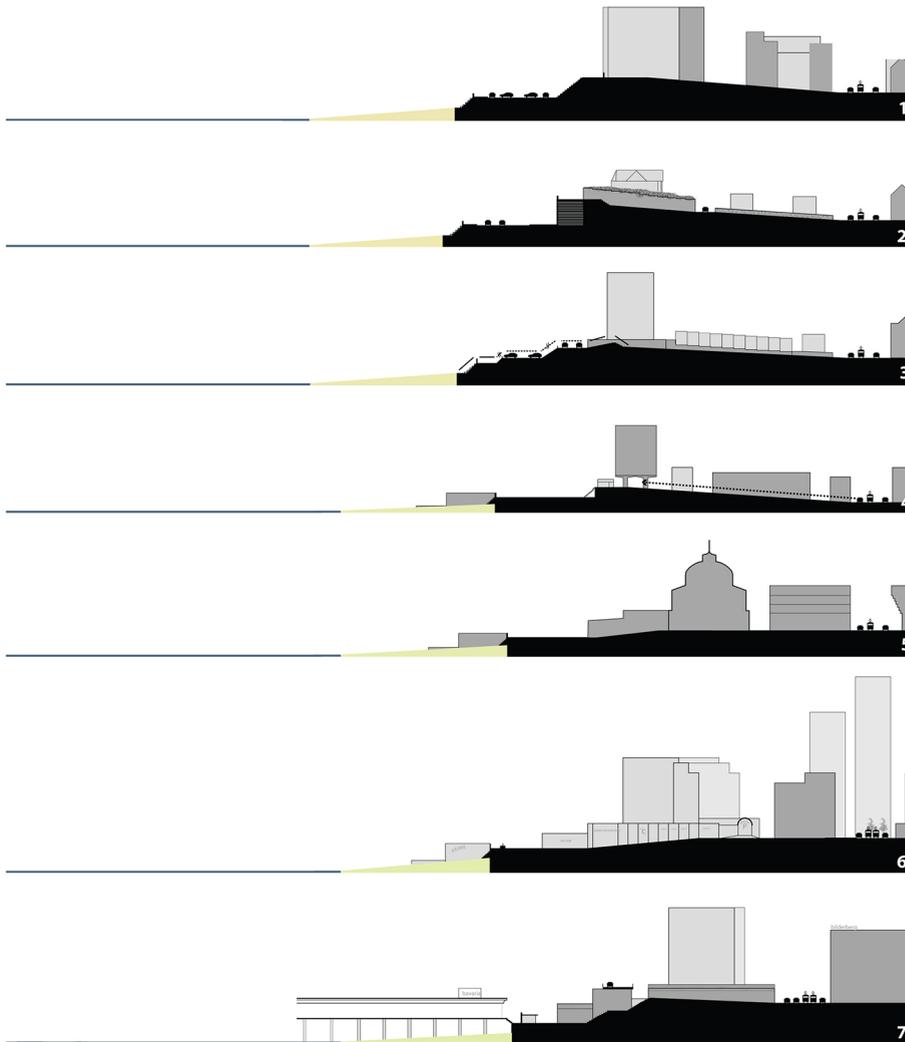


Figure 4 Scheveningen sections; from its entry points to the shoreline

### 4.3 Spatial quality

During the first interactive design session the experts and stakeholders were asked to name the qualitative aspects of Scheveningen (figure 5). The participants constructed a map, indicating the challenges from a spatial point of view (figure 6). In general the spatial quality in Scheveningen was considered to be poor. Buildings alongside the boulevard are oriented towards the sea only, and many streets have blind facades or parking garages on street level. The streets close to the sea lack any trees or any qualitative public green due to the strong salty wind. Additionally, many buildings are due for renovation and the partly abandoned harbour is fenced off. The proximity of the sea

and some of the majestic buildings along the boulevard offer a great potential, as do the characteristic 1920s and 1930s neighbourhoods. The character offered by the old harbour offers potential as well.

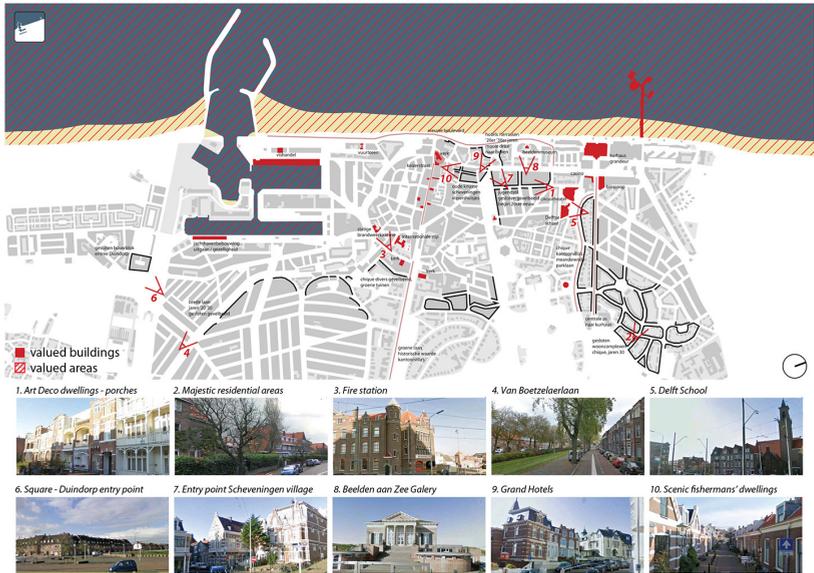


Figure 5 Qualitative elements in Scheveningen



Figure 6 Scheveningen's poor quality areas

#### 4.4 Vitality

Tourism is an important economic contributor for Scheveningen. The seaside now mainly attracts day-trippers that do not spend much on average. Such tourism is seasonal and only pays off for part of the year. The goal for Scheveningen would be to create a mixed programme that is interesting for both tourist and business visitors, and secure a year-round programme to attract more long-stay visitors. The faded glory of the boulevard could be supplemented with a new contemporary identity to attract a wealthier group of tourists.

### 5. THREE INTEGRATED DESIGNS FOR A SAFE AND VITAL CITY BY THE SEA.

To integrate the three different flood risk protection interventions with the spatial considerations and the ambition of Scheveningen, three design concepts for the long-term have been made. The three research-by-design studies resulted in different designs. The first design concept with a hard flood risk protection body is labelled 'the city at the sea', the second concept, with a sandy flood risk protection body is labelled 'the city behind the dunes'. Finally, the third variation based on the perpendicular dam led to the design for 'the city in the sea'.

Within the three designs we can both find generic interventions applied in all three of the design variations to address part of the spatial issues of Scheveningen, as well as specific spatial interventions that are unique for one design variation and relate directly to the choice for a certain type of flood risk intervention. First the generic spatial interventions will be described. Subsequently, the unique qualities of the three design variations in relation to the applied flood risk intervention are described.

In all of the designs a new seaward city extension is used to connect the three parts of Scheveningen: Scheveningen harbour, Scheveningen village and Scheveningen resort. The different identities and characteristics of the three town parts are reflected in the new design of the boulevard. The extension offers space for new economic functions and allows for a new identity of the Scheveningen seaside. There are two essential historical points connecting the existing tissue and the sea: the endpoint of the central street of Scheveningen village and the Kurhaus. At both locations the direct visual and functional relationship between the existing tissue and the sea is retained and enforced. The monumental square in front of the Kurhaus is restored allowing the Kurhaus to become a landmark that marks the transition of one of the main entrance roads to the sea. The tramline is diverted seaward and a direct view of the sea is established at all stops.

### 5.1 Hard seaward extension: City at the sea

The hard seaward extension brings the boulevard and the water shielding line seaward (figure 7). This gives space for an additional permanent programme resulting in a metropolitan city by the sea. A reference project for this identity is the new business and living district of Hafencity in Hamburg, Germany.



Figure 7 City at the sea design plan

The height of the water shielding part of the boulevard must be +14 meters NAP in 2200 (Arcadis & Alkyon, 2005). The current boulevard is +6.7 meters NAP. This new height of the boulevard can lead to an undesirable detachment between the boulevard and the sea. Therefore maintaining a strong relationship between the new boulevard and the sea was an important design theme. The choice was made to create a stepped boulevard with three different flood risk protection levels. Moving from the water shielding line towards the sea, an unembanked area at the height of +7 meters can be found, which will flood in extreme weather conditions during the winter months. In this unembanked area additional flood risk protection is achieved by flood proofing the ground floors of individual buildings and applying functional uses less vulnerable to flooding such as car parking. The third element is a timber boulevard in close proximity to the sea. This part of the boulevard brings visitors close to the sea (as does the beach area currently) and will flood regularly during the winter season. The functions positioned along this low-lying boulevard are seasonal functions such as surf rental shops and beach bars that are disassembled in winter.

The flood risk protection body is designed in a way that it can be hinged on a complete floor level, which makes it robust. However, working with a hard construction in the natural surroundings of the dunes creates lots of erosion; sand will have to be supplemented repeatedly under the water level.

### 5.2 City behind the dunes

To extend the dunes seaward, sand is supplemented in front of the current boulevard (figure 9). Depending on the desired proportions of the dune this extends the current beach with tens of meters and heightens it to approximately 12 meters above NAP (Arcadis & Alkyon, 2005). The water shielding zone covers the part of the dune that could collapse in case of a storm. This section should be extended in case of sea level rise or erosion. Therefore it is essential that this zone of the flood risk protection body remains flexible and will not be fixed by the infrastructural layer.



Figure 9 City behind the dunes design plan

The necessary flexibility of the dune is the main design theme of the city behind the dunes. In the water shielding zone, only flexible or seasonal buildings can be positioned. In this zone flexible artist residences and tourist apartments could be located. On the beach itself, which is subject to seasonal tides, seasonal pavilions can be realised. There is potential for pavilions and pools to be also located in the sea. When the dune is extended far enough landward of the water shielding zone the opportunity arises to build permanent buildings. Permanent apartment blocks are proposed within the dune near Scheveningen harbour. Along the current boulevard a new neighbourhood is designed, referring to the majestic living neighbourhoods of the

thirties (figure 10). The character of Scheveningen will be that of a city with grandeur positioned on the beach.



Figure 10 Dwellings amongst the sand dunes

Lots of sand will have to be supplemented to create these new dunes and since the dune is positioned seaward it will erode. The erosion does not have to be problematic; the sand gets transported along the coast and Scheveningen will function as a sand engine, supplementing Holland's northern beaches (this principle is currently tested near Hook of Holland), but on-going maintenance will be necessary.

### 5.3 City in the sea

The third design variation is the city in the sea. Here a perpendicular dam extends Scheveningen into the sea and protects the coast from eroding (figure 11). If a perpendicular dam is applied, additional erosion and sedimentation will affect the beaches nearby. The rule of the thumb given by the participating engineers is that along a stretch of beach of approximately 1.5 times the length of the dam, sedimentation will take place. Beyond that part of the beach, extra strong erosion will occur.



Figure 11 City in the sea design plan

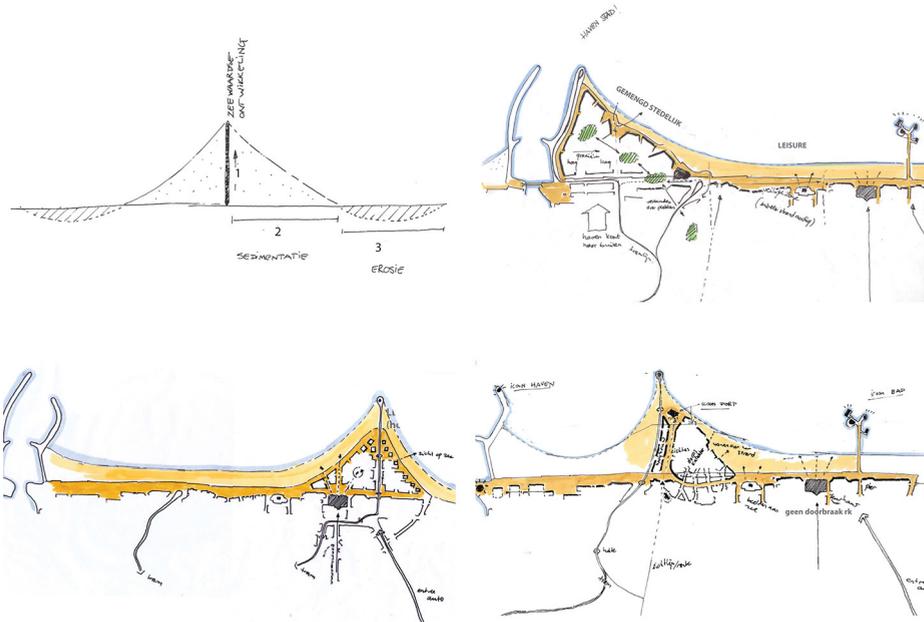


Figure 12 Dam placement evaluations

The main design theme of this design variation was finding the optimal positioning of the dam. An optimal placement would be beneficiary to both the flood risk assignment as the spatial quality assignment. The design has been formulated by testing multiple locations for the dam and then evaluating these locations (figure 12). Finally the dam was positioned in between Scheveningen village and Scheveningen beach. The dam divides the current seaside in two parts: on the south the calmer beach for the local inhabitants and on the north the touristic resort. The tramway can be extended to the end of the dam and bring tourists close to the beach. The type of beach town emerging on the elevated dam with a gradual slope can be best compared with Mediterranean seaside towns.

After placing the dam, the natural sedimentation will already take care of some of the needed supplementation. However, a big supplementation is necessary to extend the beach to its maximal volume. The dam protects the sand from eroding so less maintenance will be necessary compared to the other design variations.

## 6. CONCLUSIONS

This paper described the outcome of an integrated research-by-design study that was conducted in order to develop designs for flood risk interventions that are effective from both the perspectives of flood risk management and spatial quality. Using different optional flood risk interventions as design themes, three different designs were created that demonstrate different options for The Hague as a city at the sea. Although similar spatial interventions and concepts were used to address the spatial considerations as prescribed (the improvement of the accessibility, vitality, spatial quality and identity of Scheveningen), the three designs show completely different types of beach resorts with different identities. This relates to the choice of different flood risk interventions. The various flood risk interventions lead to different main design themes and, as a result, a different design focus for each of the three design variations. Additionally, the physical requirements and characteristics of the flood risk interventions (for instance the difference between a hard quay or sandy dune) directly relate to specific conditions and thus different possibilities for, and atmospheres of, seaward development. Using this approach the spatial characteristics and consequences directly related to different choices regarding flood risk interventions could be explored. This was considered very valuable – even essential – to feed the debate regarding the choice of a flood risk intervention. As a result, this approach will be continued throughout the Delta programme.

This design study qualifies as research-by-design, as the influence of varying a single parameter in the flood risk intervention on the design outcome is transparent, understandable and replicable. The design variations could be assessed from a flood risk perspective in relation to the robustness and necessary maintenance of the design solution. However, there are no objective assessment criteria available to evaluate the different alternatives from a spatial quality perspective; the different designs were mainly judged based on personal preference. In that sense, the sub-study preformed to identify the profitable location for the perpendicular dam both from a flood risk as well as a spatial perspective. This could be considered a more pure form of research-by-design since the different options are assessed both from a functional perspective and a spatial perspective, resulting in the preference for an alternative. This sub-study also fits the definition of De Jong and Van der Voordt (2005) for research-by-design as not only systematically testing different options but also testing them on different locations.

The use of the layer model as a conceptual framework was very useful. It helped to clarify that in the case of Scheveningen, the occupation layer, which is usually considered the most flexible layer, is in fact a fixed layer. This is essential in order to understand the problems related to the current flood risk assignment. The relationship between the layer model and the current flood risk assignment in the Netherlands is subject to a continued research effort.

#### ENDNOTES

- 1 see <http://www.deltacommissaris.nl/onderwerpen/delta-atelier/>

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