Flowing Through Time

Uncovering The Hague's Water Heritage for Awareness and Contemporary Resilience

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Figure 1.1. Gezicht op de Hofvijver (Van Call„ ca. 1700)

Figure 1.2. Plattegrond Den Haag (Hierat & Hogenberg, 1618)


t'Doorhout
De Placts
De Vyverg
t'Buijten Hoff
t'Hoff
De Merckt
De Nieuwe Bierkuy
Gracht

Figure 1.3. Koninging Emmakade Den Haag

Abstract

Dutch water management has undergone a significant transition, evolving from early adaptations that allowed coexistence with water to more extensive interventions aimed at active control. However, recent insights have revealed the unsustainability of these practices. Persistent measures, such as the continuous lowering of groundwater levels for construction and intensive agriculture, combined with the impacts of climate change, have led to significant consequences. Notable events like the Maas floodings in 2021 underscore the lack of preparedness and low water awareness among the Dutch population.

In response to these challenges, there is a growing emphasis on revisiting and revitalizing water management heritage. This research aims to contribute to this shift by proposing strategic design interventions focused on The Hague, Netherlands. The designs are informed by a comprehensive historical analysis of the city's water systems and aim to integrate heritage with modern water management practices. These interventions seek to enhance urban resilience, raise public awareness of water-related challenges, and reestablish the community's connection to its historical relationship with water.

Keywords: Water management, heritage preservation, landscape biography, water awareness

Contents

01
Introduction

During my bachelor Landscape Architecture at Wageningen University, I discovered I had a great interest in heritage and history. Quickly I saw that design and heritage can be combined very well and I decided to deepen my knowledge by following a minor in Art History at the University of Amsterdam. Courses on art, architecture, and urbanism showed me how to make better historic analyses.

After my bachelor, I enrolled in the master's program in Architectural History and Heritage Conservation at the University of Utrecht. However, I soon realized that the program was very theoretical and had limited practical application. Therefore I did an internship at an engineering firm. Here I learned that my two interests, landscape design and history, could in fact be combined and applied in the field.

01.1 Personal Motivation

During my internship, I got to work on the historical research of the Heemraadssingel in Rotterdam. The goal was to align the team's redesign plans for the waterway with its original design. To do this I got to further investigate the Waterproject and the Coolpolderplan of Rotterdam, which initiated my interest in historic water systems.

As I have been living The Hague for only one and a half years I knew I wanted to choose a project in the city. Living next to the historical canals, I couldn't help but notice that the waterways here don't seem to be a prominent attraction for residents or tourists. This got me thinking. How did The Hague's water system evolve, and what factors influenced its current configuration? While I was looking for anwsers, I stumbled upon a local initiative led by the neighborhood organization Het Oude Centrum (the old center). Their efforts center around advocating for the reopening of several filled-in canals, in the historic center. Discovering the extent to which these canals were filled over time made me wonder the implications for the city. It became the starting point for my thesis where I use water heritage as a resource for addressing contemporary water-related challenges.

01.2
Setting the Scene

Dutch water management
It is said that water is in the DNA of the Dutch. The Netherlands has a long-standing tradition of dealing with water. Through trial and error, lessons were learned on how to keep water at bay. Water was also optimally utilized to increase food production and prosperity, leading to profound changes in the landscape over the centuries. New techniques and materials were continually invented and applied on an increasingly larger scale than ever before. Analyzing this history shows that there has been a transformative journey – a shift from living with water to actively controlling it. Over time, smaller interventions that allowed humans to coexist with water evolved into larger, deliberate measures that aimed at its active management (RCE, n.d.).

Water has always held a central role in human history, influencing the settlement patterns of prehistoric hunters and gatherers who sought access to vital resources along rivers, lakes, and coastlines. Over time, prehistoric farming societies ingeniously manipulated water systems to meet their essential needs, and early states implemented large-scale facilities like aqueducts, irrigation systems, and polders to manage water resources for drinking, food, and agriculture. Throughout history, people worldwide have both harnessed water for defense and developed strategies to protect against its forces, especially floods from rivers and seas (Hein et al, 2020).

This historical relationship with water is particularly evident in the Netherlands, a country with a long tradition of urban and regional planning, which is largely based on dealing with water(Janssen & Van Asseldonk, 2023). Living on the edge of land and water has its advantages. Despite the encroaching sea, our ancestors chose to live here, adapting to water's presence. Excavations in Vlaardingen revealed early interventions in water management before the Common Era, with structures like dams and culverts guiding water flow (Rijkswaterstaat, 2019).

Among early adaptations are interventions like dikes and terps. Over time, a significant turning point occurred, smaller interventions that let humans live with water changed into bigger interventions that could actively control the water. These are Interventions like the Afsluitdijk and the land reclamation of peat-formed lakes, such as the Beemster and Schermer, that became possible due to new advancements (RCE, n.d.).

This water transition can be described as a change in the interplay between the physical water system (water, subsurface, infrastructure) and the socio-economic system (spatial functions that need protection and facilitation). Formerly, water management was organized to ensure predetermined functions within the socio-economic system. However new insights show that this is no longer sustainable. The prolonged and persistent application of this principle, such as the continuous lowering of the groundwater level for construction and intensive agriculture, has, in combination with climate change, now resulted in far-reaching consequences. Dry summers have shown how vulnerable the Dutch freshwater supply is and the flaws in the water management in the high sandy soils (Van Dokkum, Nap, Duijn & Grin, 2020).

Water management heritage
In response to these challenges, recent developments in water management heritage suggest an emerging intent to reverse this trajectory. Restoring the relationship with the natural system offers opportunities to make systems logical again and address issues such as societal challenges like housing, energy transition, climate adaptation, and current problems like drought and waterlogging (Buntsma & De Zeeuw, 2021).

This change is important because Climate change leads to a more rapid warming in northwest Europe compared to the global average, resulting in noticeable shifts in

precipitation patterns and an accelerated sea-level rise (Van Dokkum et al., 2020). This results in extreme amounts of rainfall and drought (Atlas Leefomgeving).

Water awareness

That the climate is changing can already observed. Recently, the water levels were high in various parts of the country due to wind and persistent rain (Figure 1.3). Throughout the Netherlands, water authorities had to try to prevent high water from causing more problems. They implemented measures, particularly along the rivers, such as the Roer in Vlodrop, the Lek in Lopik, and the Overijsselse Vecht (NOS, 2023). During critical moments like these, it becomes evident how many people are unprepared for such events (Figure 1.3).

In response to the floods along the Maas River in 2021, a study was conducted to assess the level of preparedness among residents for emergency situations. The findings revealed that water awareness is low, and there is still significant room for improvement in the precautionary measures taken by residents (Provincie Limburg, 2023). These findings align with an important research from OESO (2014). This research revealed that the Dutch are insufficiently aware of the fact that significant efforts are needed to keep the Netherlands dry and habitable, and that there is indeed a risk of flooding. People are also scarcely aware of the efforts required to produce good-quality drinking water (Rijksoverheid, 2016).

Greater awareness is important to increase citizen engagement and self-reliance (Rijksoverheid, 2016). But this applies not only to citizens; government agencies also benefit from increased awareness. As seen in an article (Figure 1.3), many insurers view plans to build in deep polders with skepticism as the ground is subsiding and the sea level is rising.

In samenwerking met L1mburg

NOS Nieuws • Zaterdag 23 december, 12:35

Hoogwater in de rivieren: 'Met kerst wordt het spannend'

Hoogwater in Limburg in juli 2021

Meeste Limburgers niet goed voorbereid op extreme wateroverlast

H2O ACTUEEL . 02 MEI 2023

Verzekeraars kijken met argusogen naar ambitieuze bouwplannen in de polder

Figure 1.3. News articles (NOS Nieuws, 2023), (H2O Actueel, 2023) & (AM, n.d.)

01.3
Site Introduction

This thesis will focus on the city of The Hague (515.000 inhabitants). It is the third largest city in the Netherlands and is the government center of the Netherlands. This traces back to the court, situated on a beach ridge, where the counts of Holland established themselves in The Hague – or 's-Gravenhage – in the 13th century (Raap, Brinkkemper & Baas, 2022). The city is part of the City Region Haaglanden, the 'Rotterdam The Hague Metropolitan Area' and the larger Randstad metropolitan region (Meijers et al, 2014).

The city's location next to the sea (Figure 1.5) has significantly influenced its geological features. Initially, the area was a tidal landscape where clay and sandbanks and tidal channels developed. About 4500 years ago, a row of dunes formed along the coast, reducing the influence of the sea. The area behind the dunes became brackish. Extensive peat formation took place, and over thousands of years, a thick layer of peat accumulated. Large parts of the peat areas in the eastern part of the region were extensively excavated for peat extraction over time. As a result, the city now sits on a mix of beach ridges and beach plains (Figure 1.4). A narrow coastal strip protects the city from the North Sea and is an integral part of the urban landscape (Raap et al., 2022).

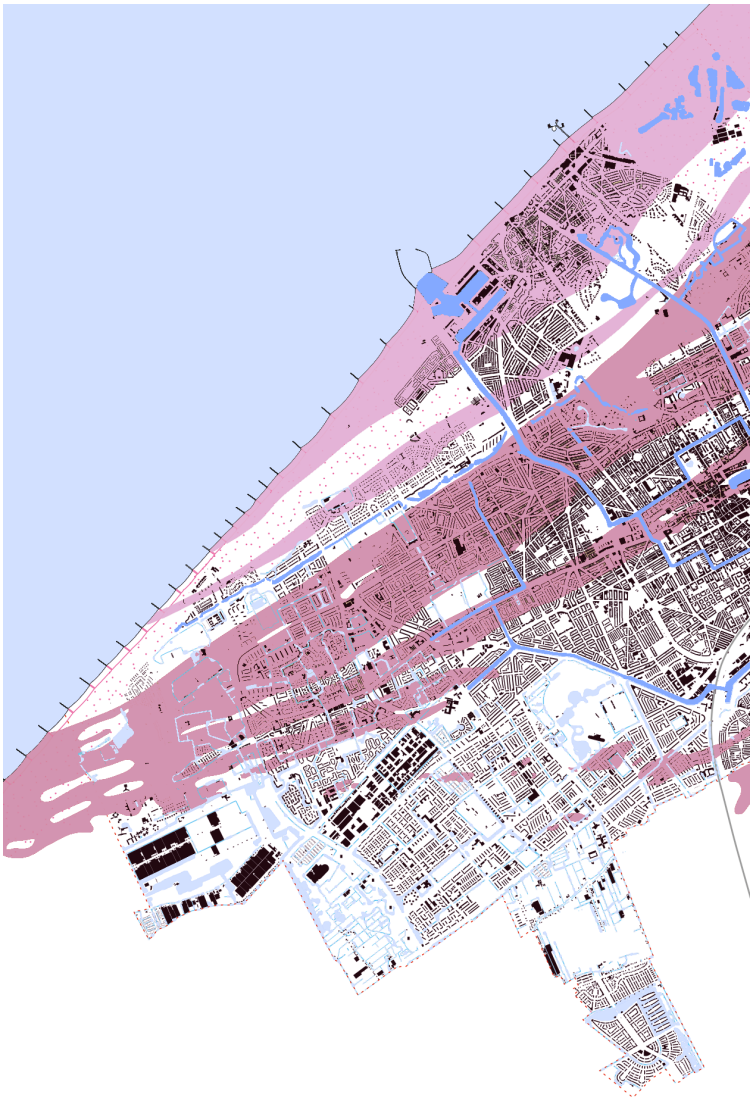
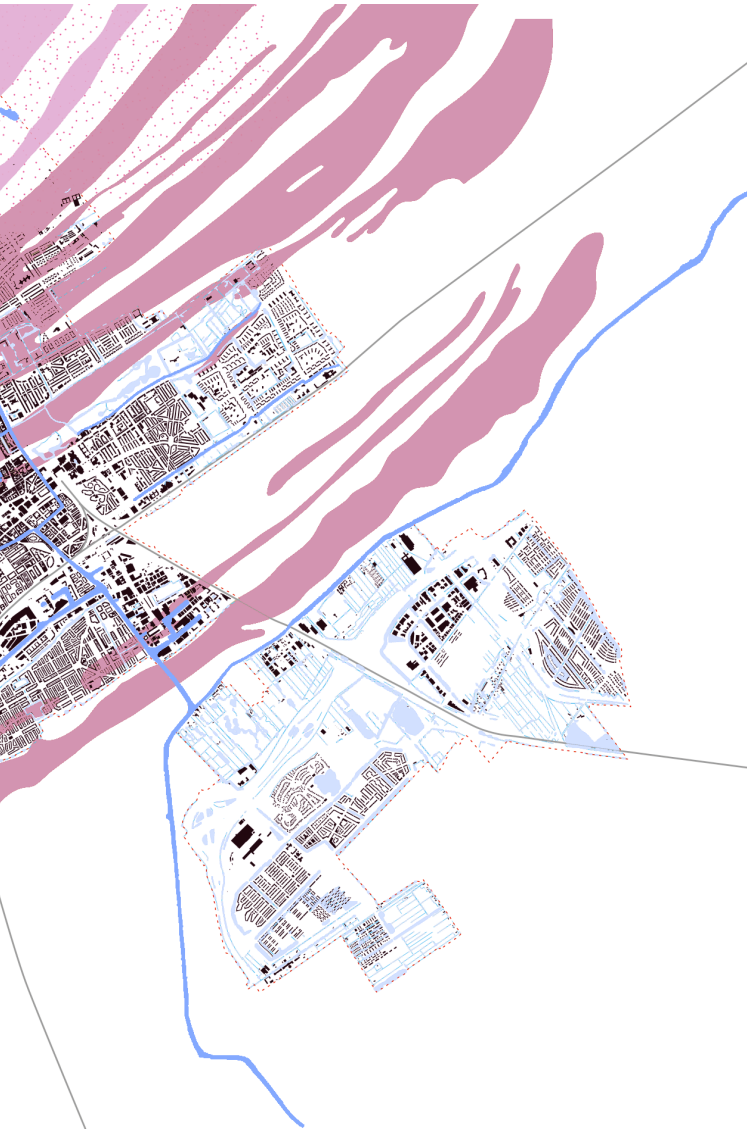


Figure 1.4. The Hague positioned on beach ridges based on Schoper (2007)



Water plays a significant role in shaping the diverse identities of the city. In addition to the sea, there is also the historical water in the city center, water-related activities in Binckhorst, or, for example, the 'reconstruction' water in Moerwijk (Municipality of The Hague, 2015). The old center of The Hague is entirely situated in the beach ridge landscape. The longer waterways of the rectangular city canal surrounding the historic center are located within the beach plains. Crossing this landscape are the transverse connections of the canal rectangle. Peat streams that connect to the city canal have a southwest orientation and are situated in the beach plains. Perpendicular to these, canals have been dug for shipping, as well as along the inner dune edge (Bobbink, 2016).

This shows how the inhabitants of The Hague have worked together with the natural system in order to create the most optimal water system. Nowadays, however, many waterways like the canals within the historic center have been filled in. Further research into these developments will show what effect this has had on the working of the water system.

Figure 1.5. Location of The Hague in The Netherlands

01.4
Problem Statement

This thesis approaches two themes: water and heritage. More specifically how heritage can be used to create more sustainable water systems. Dutch water management has gone through a transition. Early adaptations to water, interventions like dikes and terpen, were made in connection with the natural landscape. However, since roughly 1900, this relationship has gradually been lost (Grond et al., 2021). Smaller interventions that let humans live with water changed into bigger interventions that could actively control the water (RCE, n.d.).

This water transition can be described as a change in the interplay between the physical water system (water, subsurface, infrastructure) and the socio-economic system (spatial functions that need protection and facilitation). Formerly, water management was organized to ensure predetermined functions within the socio-economic system. However new insights show that this is no longer sustainable. The prolonged and persistent application of this principle, such as the continuous lowering of the groundwater level for construction and intensive agriculture, has, in combination with climate change, now resulted in far-reaching consequences (Van Dokkum et al., 2020). Actions like these, alongside other climate related emergencies like the Maas floodings in 2021, highlight the lack of preparedness and low water awareness among the Dutch population, as identified by the OECD (2014).

New perspectives in water management heritage highlight a growing recognition of the need to shift towards more sustainable practices. This evolving mindset seeks to address the limitations of current approaches and foster resilience against the challenges posed by climate change. Although these trends suggest a promising direction for future water management, they require further exploration, which will be addressed in the next chapter.

This research focuses on The Hague, Netherlands, and aims to contribute to this paradigm shift through the development of strategic designs within the city. The exploration of the city's water heritage, its current water management system, and the impacts of climate change will provide the necessary information to create tools that enhance resilience and awareness.

01.5
Research Question

The primary research question aims to discover the potential insights that can be derived from historical water practices. Specifically, this research aims to answer the question: How can water heritage strengthen the future water management system and its surrounding public space to improve climate adaptation and awareness in The Hague? To address this overarching question, research will be conducted on The Hague's water heritage, water management system, and the impacts of climate change. This investigation will identify potential sites for strategic interventions that align with the goals set by this research question.

The sub-questions guiding the research are designed to provide a comprehensive understanding of the intricacies involved. The historical context will be researched by uncovering the specific water heritage of The Hague. The existing water management system will be examined and future changes influenced by climate change will be anticipated. Additionally, landscape design will be used to create a resilient water system that raises awareness on the challenges and opportunities associated with water in The Hague.

What is the water heritage of The Hague?

How does the water management system in The Hague work?

How can water heritage strengthen the future water management system and its surrounding public space to improve climate adaptation and awareness in The Hague?

How can landscape design raise awareness, through heritage, of both the challenges and opportunities associated with water?

How will climate change impact the water system in The Hague, and what changes are anticipated in the future?

01.6 Relevance

This thesis holds significant societal value as it addresses critical issues related to urban resilience, water management, and cultural heritage preservation. By developing strategies that can be adapted to other Dutch cities facing similar water-related challenges, this project offers practical solutions to enhance the livability and sustainability of urban environments. These strategies promote a more resilient urban fabric, capable of withstanding the impacts of climate change, while also preserving the historical and cultural significance of water management practices. Moreover, the project aims to reconnect residents with their historical relationship with water and creating a larger water awareness.

For professionals in the field of landscape architecture and urban planning, this thesis can serve as a valuable resource, offering a methodological approach that integrates historical insights into contemporary design practices. This approach is particularly relevant for professionals working on projects involving water management and heritage conservation, as it provides a replicable framework for incorporating these elements into their work. This can guide other landscape architects in designing urban spaces that are both functional and historically significant.

This thesis is scientifically relevant as it contributes to the ongoing discussions about sustainable urban water management and the conservation of Dutch water management heritage. It offers a comprehensive case study on The Hague, which can serve as a reference for future research and academic discourse on the subject. By bridging the gap between historical water practices and modern-day challenges, this research highlights the importance of interdisciplinary approaches in solving complex urban problems.

01.7
Research Aim

The aim of this thesis is to explore how water heritage can offer innovative perspectives to enhance future water management systems and their surroundings, improving climate adaptation and awareness. The research involves analyzing the historical context of water systems, understanding current water management practices, anticipating climate change impacts, and proposing landscape design interventions. The goal is to boost climate adaptability, raise awareness of water-related challenges and opportunities, and reconnect residents with their historical relationship with water in The Hague.

The conceptual framework (Figure 1.6) explains how this goal will be reached. The integration of heritage preservation with The Hague's water system aims to ensure greater resilience and increase awareness.

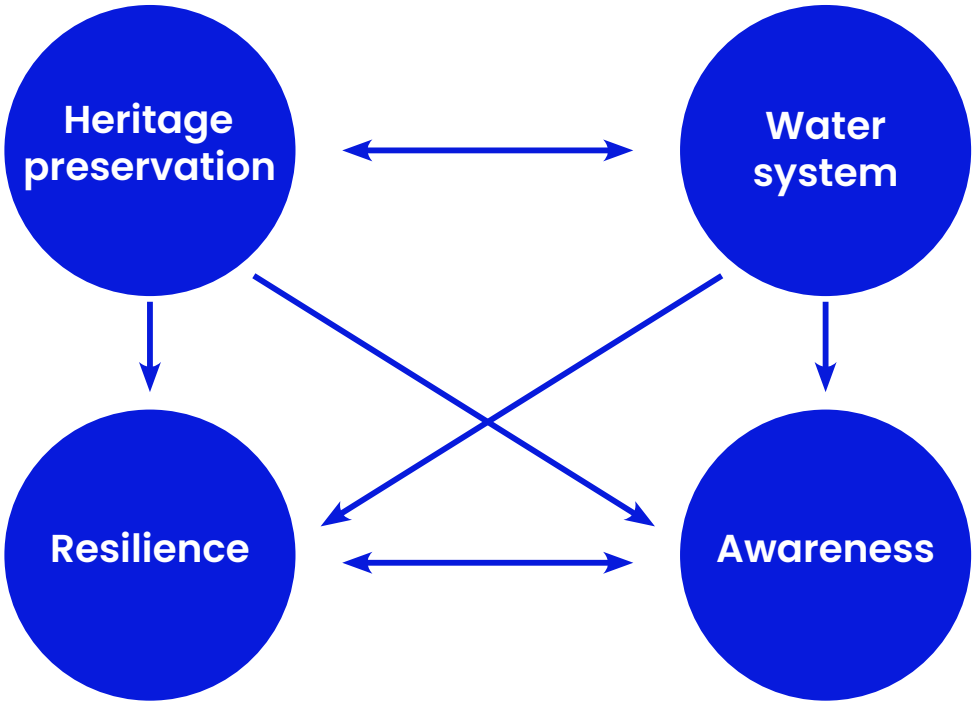


Figure 1.6. Conceptual Framework

02
Research Methodology

02.1 Introduction

In this chapter the research methodology of this thesis will become apparent. Firstly, the theoretical framework will outline the literature and theories that will support the research and design. Subsequently, the methodologies used will be explained and organized into a scheme to explain the structure of this thesis and its following chapters.

Figure 2.1. Bij de Westermolens (La Fargue, ca. 1757)

02.2
Theoretical Framework

What is heritage?
The term "heritage" holds diverse meanings and complexities. According to the Oxford English Dictionary, heritage is defined as "property that is or may be inherited; an inheritance," including "valued things such as historic buildings that have been passed down from previous generations." Thus, heritage, as per the Oxford English Dictionary, is something that has the potential to be passed down from one generation to another, can be preserved or inherited, and possesses historical or cultural significance (Harrison, 2010).

Beyond actual physical objects, heritage encompasses practices handed down through generations. Language, culture, music, literature, and even conservation practices are vital aspects of intangible heritage. These practices shape collective social memory, illustrating that heritage is not solely about physical objects but extends to the customs and habits that define a community (Harrison, 2010).

Heritage is subject to various official categorizations and legal meanings, such as inclusion in World Heritage Lists. These categorizations create obligations for active conservation and management. The categorization of heritage influences societal values, introducing a dialectical relationship between official recognition and perceived significance. However, heritage is not limited to official designations; it involves personal and collective interpretations. The gap between individual understandings of heritage and the official heritage promoted by the state allows for multiple perspectives on what holds significance (Harrison, 2010).

Heritage conservation and its evolving perspectives
The perspectives on heritage conservation have changed over time and are still changing. Heritage is a fluid and adaptable concept, subject to constant redefinition by society. Within this dynamic framework, it is inevitable for new approaches and practices to emerge in addressing heritage within the realm of planned development. Janssen, Luiten, Renes and Stegmeijer have introduced a conceptual framework that frames three approaches to the planning treatment of heritage; the sector, factor and vector approach, respectively (2017). While these approaches have evolved in a historical sequence, the new did not replace the old; instead, it gained ground among different actors. Consequently, three distinct ways of addressing the past in the present now coexist in Dutch planning practice (Janssen et al, 2017).

The heritage as sector approach embodies a traditional perspective in Dutch planning, rooted in the belief that socio-economic and spatial dynamics pose constant threats to cultural heritage. Originating alongside the post-war expansion of the Dutch welfare state, this approach views heritage preservation as a symbolic backdrop for the modern city and countryside shaped by accelerating forces of modernization. In this framework, preservation aims to save valuable relics from the past by isolating them from the present, emphasizing their intrinsic qualities. The value of monuments lies in their therapeutic capacity amid rapid societal change, representing a nostalgic view of heritage as a static entity (Janssen et al, 2017).

Contrary to the heritage as sector approach, the heritage as factor approach acknowledges that not all historical objects can be preserved in the same way. Rigorous protection is reserved for a select few, while a more dynamic and flexible approach considers heritage as one of many factors contributing to the quality of a place. Emerging alongside large-scale revitalization and regeneration schemes, this approach integrates conservation into area development. Valuing heritage not only for its historical significance but also for its contribution to present-day needs, the focus shifts from individual objects to contextual descriptions of entire areas (Janssen et al, 2017).

The heritage as vector approach recognizes the narrative dimension of built and landscape heritage, emphasizing the essential role of stories and meanings associated with buildings and districts. This approach views heritage not solely through physical structures but also through intangible factors like stories and traditions. Serving as a historical narrative for spatial planning, the heritage as vector approach inspires and guides development by connecting the history of a district or site with contemporary planning. It acknowledges the importance of intangible heritage in shaping the past's influence on both physical and non-physical dimensions of planning (Janssen et al, 2017).

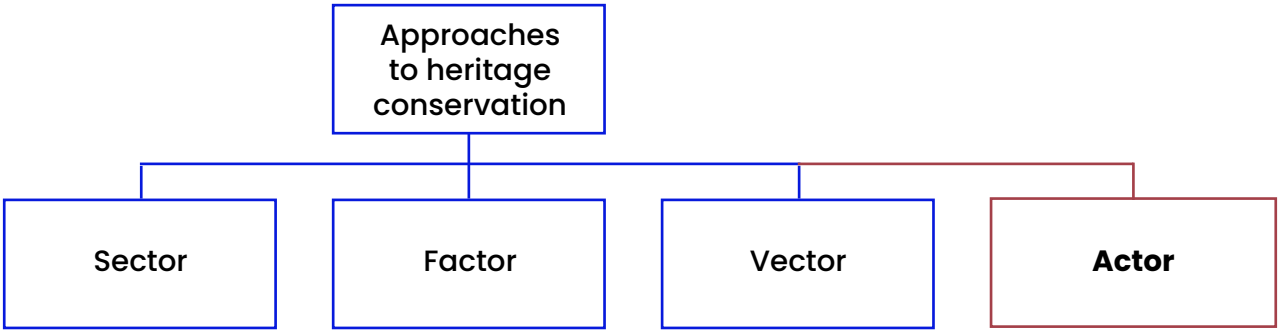


Figure 2.2. Sector, Factor, Vector and missing approach.

Water management and heritage

Examining water management more closely reveals that within this sector there are also varying viewpoints on heritage. The very definition of water management heritage has sparked extensive debate. Two distinct perspectives have emerged: the first perspective frames heritage as an ongoing legacy of inventive engineering and adaptive strategies in water management. In contrast, the second perspective is focused on conserving the physical heritage embodied in historical water structures (Hein et al, 2020).

The first perspective is supported by engineers, planners and nature conservationists. They propose that the heritage of the Dutch delta is in fact, an intangible tradition of skillful water management and engineering. This would mean that the typical Dutch river landscape and its system of closed dikes and sunken polders, that is currently the pride of Dutch identity and water management, is actually outdated (Hein et al, 2020).

On the other side are heritage managers who believe these physical structures of water management, for instance, the closed dike systems initiated by Dutch engineers and planners during the Middle Ages, evolving into their present form in the latter half of the nineteenth century, are considered essential for preservation. Occasional floods are viewed as integral to a system that has never been and is unlikely ever to be completely secure (Hein et al, 2020).

The unproductive binary discourse between water and heritage advocates has seen a shift in the Netherlands towards a more integrative approach. Embodied in the Belvedere Memorandum and its incentive program (1999–2009), this national policy aimed to merge heritage management with contemporary spatial developments through historically informed design. This approach, fostering experiments at the local level, has yielded promising results in connecting heritage and water-related issues. By incorporating both technological creativity and historic preservation, it allows for innovative solutions, such as reusing old hydraulic systems or creating new ones with historical influences (Hein et al, 2020).

This integrative approach is very similar to the strategy of the Dutch heritage department. They emphasize that for centuries the connection with the natural system was the foundation for the development of cities, villages, and infrastructure. Cultural heritage often remains the visible remnant of this: an old pumping station, a watermill channel with a weir, a canal house along an embankment, a well, or a section of city wall with a moat. However, since roughly 1900, this relationship has gradually been lost. Restoring this relationship offers opportunities to make systems logical again and address issues such as societal challenges like housing, energy transition, climate adaptation, and current problems like drought and waterlogging (Buntsma & De Zeeuw, 2021).

This perspective aligns with the vector heritage approach within the broader context of the sector, factor, vector heritage framework. It describes a shift in the Netherlands towards a more integrative approach. But something is still missing. The vector role can be interpreted more broadly by emphasizing the necessity of preserving heritage for people and understanding why people appreciate (or do not appreciate) certain heritage. These societal and social values take precedence in the Faro Convention, highlighting how our material and immaterial heritage connects people to their environment and to each other through customs, celebrations, and the stories of our ancestors. Heritage is no longer just about creating a good transformation plan but also about developing these plans in a participatory manner (Verschuure-Stuip, 2024). This implies that a new box should be added to the sector, factor, and vector framework (Figure 2.2).

In a recent initiative, for the implementation of Faro, a new approach was introduced to fill in this gap. This is described as the actor approach. Unlike earlier methods focusing primarily on documenting the life cycle of landscapes or heritage, this approach prioritizes the central role of people. It delves into questions such as how the community was formed and evolved over time, how it functioned, what significance it held for the community and individuals, and what role people play in it today (Stichting Cepro, et al., 2023).

Water awareness
While heritage recognition is important for protection, it often does not integrate historical sites into contemporary water management practices. This means that although historical sites may be acknowledged for their significance, they might not be actively utilized or managed in a way that considers their historical water systems. The water sector can benefit from a broader understanding of the social and cultural implications of past water practices. Similarly, the heritage sector can benefit from adopting a more networked approach to preservation, which includes considering the functional aspects of water systems within heritage sites (Hein, 2023).

However, this integration is often lacking, resulting in numerous important sites being statically preserved and perceived as burdens to the water management sector. Their potential is not seen for promoting circular practices or for having socio-cultural importance. Yet, in fact, heritage sites can contribute to better water futures and to promoting water awareness (Hein, 2023).

Water awareness is not only important for decision makers to facilitate a return to circular practices, but also for citizens to increase engagement and self-reliance. Water awareness can discourage unwise activities, like building in flood-prone areas, and promote prudent actions that anticipate potential risks. Additionally, heightened water awareness can lead to increased support and understanding for tackling a societal risk, and a shift toward more forward-thinking approaches. By making people more aware of future water management challenges, resistance to change can potentially be reduced (De Boer et al., 2003).

Climate adaptation
Climate change profoundly impacts our living environment. Failure to mitigate its effects may result in the loss of heritage to waterlogging, drought, wildfires, or extreme weather events. To mitigate the consequences of climate change, humanity must significantly reduce its CO2 emissions. This process is known as mitigation. Simultaneously, efforts are made to prepare for and adapt to these consequences in the Netherlands. This is called adaptation. In addition to climate change itself, both mitigation and adaptation efforts can have significant consequences for our heritage (RCE, n.d.)

Adaptive measures, for example, could involve the dredging of a river arm that has been silted for centuries, potentially leading to the loss of archaeological sites. Alternatively, wetting peat meadows could erase the age-old parcel structure. To ensure that climate adaptation does not have adverse effects on heritage, it is essential to first analyze the functioning of the soil and water system over time, in relation to human activities. This will show the cultural-historical value of sites or objects and knowledge on the natural systems. This information is needed to find the right adaptive solutions (RCE, n.d.).

Resilience
The changing climate emphasizes the need for cities to be able to quickly bounce back from climate-related shocks and stresses. Enhancing resilience is often highlighted as a crucial objective for both adaptation and mitigation efforts in cities and urban areas. However, climate adaptation is not the only way to improve resilience. Urban resilience involves the ability of a city to withstand various shocks and stresses, with climate change being just one among many. These climate-related shocks often occur alongside other environmental, economic, and political challenges. As resilience becomes integrated into development, it's essential to ensure that efforts to enhance climate resilience also promote positive social change and long-term sustainability (Leichenko, 2011).

One approach to improve resilience is by learning from history. While historic practices may no longer be directly applicable to modern contexts, they offer valuable lessons for developing future water systems that are compatible with natural, social, and cultural frameworks. Integrating heritage preservation into sustainable development strategies is crucial, ensuring that historical insights inform present-day decision-making. By intertwining water management with heritage preservation and sustainable development, societies can forge a path toward a more resilient future (Hein, 2023).

Heritage values

To design with heritage it is important to find out how the location came to be, which can be done with the landscape biography. This approach delves into the historical narratives and long-term changes that have shaped the landscape, drawing from diverse disciplines such as archeology, geography, architecture and history. By using these various sources and methods, landscape biography enhances our comprehension of the landscape's evolution, making it relevant and useful in contemporary planning, design, and heritage management endeavors (Kolen, Renes & Bosma, 2016).

The challenge is to tackle current issues in coherence with the cultural-historical values and considering future implications. Furthermore, it is important to ensure heritage is both utilized and preserved, allowing the essence of the place, or genius loci, to thrive (Rijksdienst voor het Cultureel Erfgoed, 2022). To go from the historic analysis to making a design it is then still needed to define these values of the landscape, to know what to preserve from the past and what is needed to include for modern day use.

There are many typologies of cultural values. The UNESCO's World Heritage Convention recognizes four cultural values: historic, aesthetical, scientific and social values. In 2007, Pereira Roders added four values to complement these existing values. These are: ecological, economic, political and age values as the values conveyed in cultural heritage assets. To find these values Pereira surveyed forty international documents, such as the recommendations from UNESCO and ICOMOS to show that the variety of values that are being used to describe the significance of cultural heritage was in fact much broader than expected (Tarrafa Silva & Pereira Roders, 2012).

The eight primary values of heritage, as described by Pereira Roders, encompass a diverse range of dimensions that contribute to the significance and understanding of cultural assets. Social value, often expressed through the notions of "spirit of the place" or "genius loci," denotes the emotional connections and communal identity associated with heritage. People associate the place with distinctiveness, social interaction and coherence. Economic value, distinct from cultural values, is appraised through market principles, focusing on the potential function and financial returns of heritage assets within economic systems (Tarrafa Silva & Pereira Roders, 2012).

Political value can symbolize power struggles and political decisions. Historic value serves as the foundation of heritage assets, connecting present generations to the past through associations with people, events, technological qualities, and archival significance. Aesthetic value, subjective and individualistic, contributes to the labeling of objects and places as heritage, drawing from sensory and intellectual stimulation and emphasizing creativity and preservation of attributes (Tarrafa Silva & Pereira Roders, 2012).

Scientific value focuses on the importance of data, rarity, and representativeness of heritage assets, contributing to future knowledge through design processes and technological mastery. Age values reflect the life cycle, survival, and evolution of heritage assets over time, serving as evidence of cultural continuity and transformation. Ecological values highlight heritage assets' relationship with the natural environment, emphasizing sustainability, regeneration, and ecological consciousness (Tarrafa Silva & Pereira Roders, 2012). Together, these values form a comprehensive framework for understanding and preserving cultural heritage, which can be used when transforming a historical site.

Social	**Spiritual**	beliefs, myths, religions (organized or not), legends, stories, testimonial of past generations;
	Emotional, individual	memory and personal life experiences;
	Emotional, collective	notions related with cultural identity, motivation and pride, sense of "place attachment" and communal value.
	Allegorical	objects/places representative of some social hierarchy/status;
Economic	**Use**	the function and utility of the asset, original or attributed;
	Non-use	the asset's expired function, which has it value on the past, and should be remained by its existence (of materials), option (to make some use of it or not) and bequest value (for future generations);
	Entertainment	the role that might be have for contemporaneous market, mainly for tourism industry;
	Allegorical	oriented to publicizing financially property;
Political	**Educational**	the education role that heritage assets may play, using it for political targets (e. g. birth-nations myths, glorification of political leaders, etc.);
	Management	made part of strategies and policies (past or present);
	Entertainment	it is part of strategies for dissemination of cultural awareness, explored for political targets;
	Symbolic	emblematic, power, authority and prosperous perceptions stem from the heritage asset;
Historical	**Educational**	heritage asset as a potential to gain knowledge about the past in the future through;
	Historic-artistic	quality of an object to be part of a few or unique testimonial of historic stylistic or artistic movements, which are now part of the history;
	Historic-conceptual	quality of an object to be part of a few or unique testimonial that retains conceptual signs (architectural, urban planning, etc.), which are now part of history;
	Symbolic	fact that the object has been part/related with an important event in the past;
	Archeological	connected with Ancient civilizations;
Aesthetical	**Artistic**	original product of creativity and imagination;
	Notable	product of a creator, holding his signature;
	Conceptual	integral materialization of conceptual intentions (imply a conceptual background);
	Evidential	authentic exemplar of a decade, part of the History of Art or Architecture;
Scientific	**Workmanship**	original result of human labour, craftsmanship;
	Technological	skillfulness on techniques and materials, representing an outstanding quality of work;
	Conceptual	integral materialization of conceptual intentions (imply a conceptual background);
Age	**Workmanship**	craftsmanship value oriented towards the production period;
	Maturity	piece of memory, reflecting the passage/lives of past generations;
	Existential	marks of the time passage (patine) presents on the forms, components and materials;
Ecological	**Spiritual**	harmony between the building and its environment (natural and artificial);
	Essential	identification of ecological ideologies on its design and construction;
	Existential	manufactured resources which can either be reused, reprocessed or recycled;

Table 2.3. The cultural values (Tarrafa Silva & Pereira Roders, 2012).

02.3
Methods

1. What is the water heritage of The Hague?:

Fieldwork
To find out what the most important water structures are for The Hague fieldwork will be executed. This will also necessary to find out what has changed.
Historical analysis
To explore the different narratives of the waterways in The Hague a literature review will be done.
Spatial analysis
During the spatial analysis, there will looked at the historical mapping of The Hague. The focus will be on the water structures.
Landscape Biography
To organize the information collected with the methods above, the Landscape Biography will be used to show the changes over time and put these in different time periods and create a timeline.

2. How does the water system of The Hague work?:

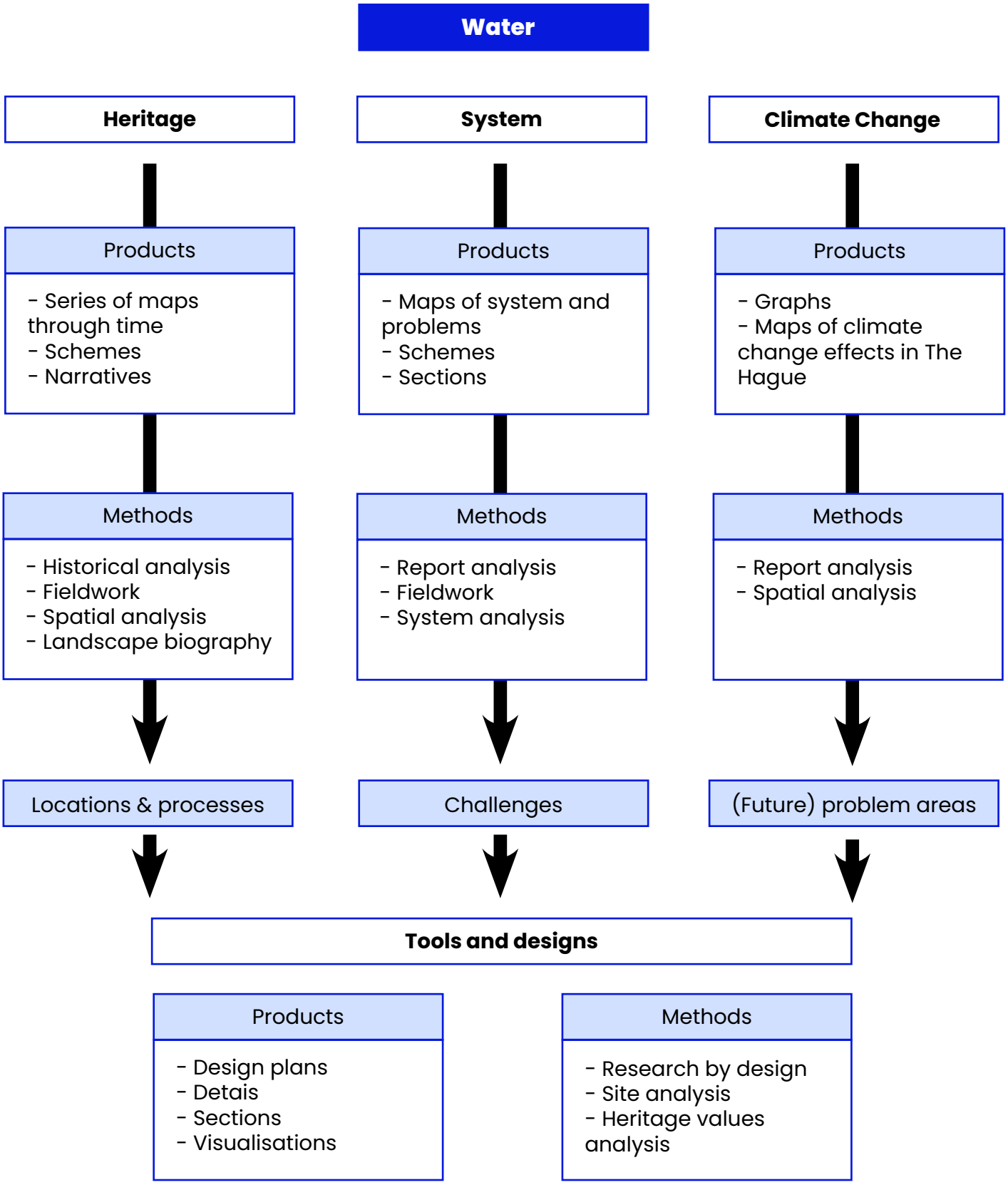
Report analysis
Documents from the municipality of The Hague and the Hoogheemraadschap van Delfland will provide insights into the water system. This will also help to find the current problems in the water system.
System analysis
To explain how the current water system works (boezem system and ground water system) maps and illustrations/diagrams will be made.
Fieldwork
To find out how the system works in real life fieldwork will be executed.

3. How will climate change impact the water system in The Hague, and what changes are anticipated in the future?:

Report analysis
Documents from the government (Rijkswaterstaat, KNMI, municipality of The Hague, Hoogheemraadschap van Delfland) show how the climate is changing and what effects these have on the current water systems and what this will mean for the future.
Spatial analysis
The spatial analysis will reveal what the physical consequences of climate change are.

4. How can landscape design raise awareness, through heritage, of both the challenges and opportunities associated with water?:

Research by design
Research by design aims to combine all the findings of the previous methods and provide a design perspective as result.
Site analysis
To make a design a further analysis will be necessary to better understand the chosen locations.
Heritage values analysis
The theory on the different heritage values will be applied to the two sites to reveal what values have been lost and how these can be restored.


Water
Heritage
System
Climate Change
Products
- Series of maps through time
- Schemes
- Narratives
Products
- Maps of system and problems
- Schemes
- Sections
Products
- Graphs
- Maps of climate change effects in The Hague
Methods
- Historical analysis
- Fieldwork
- Spatial analysis
- Landscape biography
Methods
- Report analysis
- Fieldwork
- System analysis
Methods
- Report analysis
- Spatial analysis
Locations & processes
Challenges
(Future) problem areas
Tools and designs
Products
- Design plans
- Detais
- Sections
- Visualisations
Methods
- Research by design
- Site analysis
- Heritage values analysis

03
Heritage

03.1 Introduction

This chapter will provide more insights into the history of the water in The Hague. Using the Landscape Biography method, different locations and processes surrounding water have been put into different time periods. For these time periods a short introduction will explain what has happened in this period and a time line shows more information on the locations and processes. As a result, this will show what has changed over the years and what waterways have dissapeared.

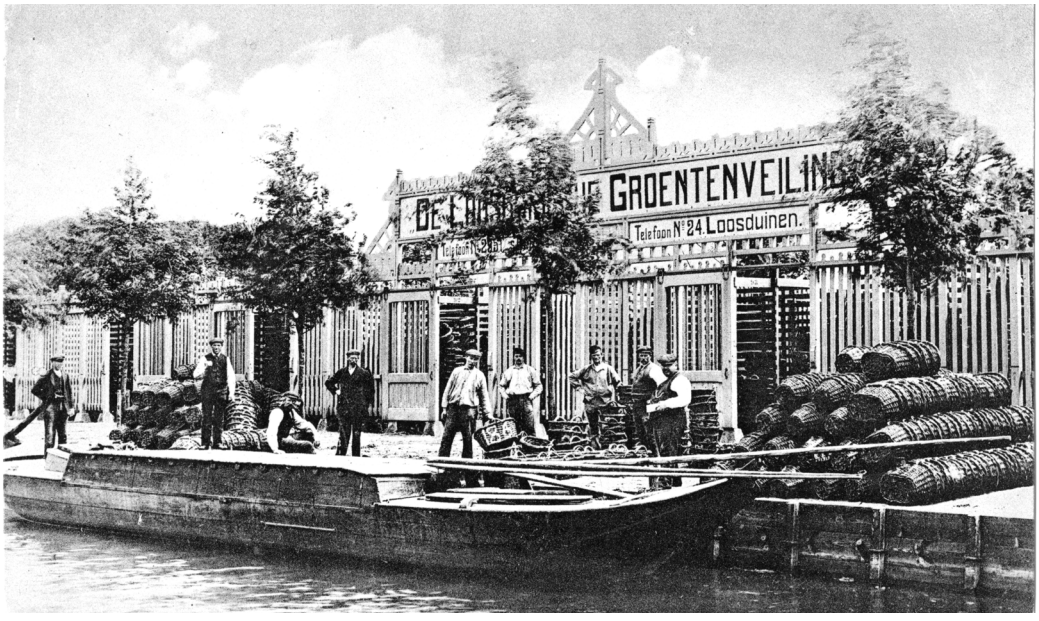


Figure 3.1. Veilingschuit aan de kade bij de groenteveiling (ca. 1910)

03.2
Residence of the Counts of Holland

1200 - 1550

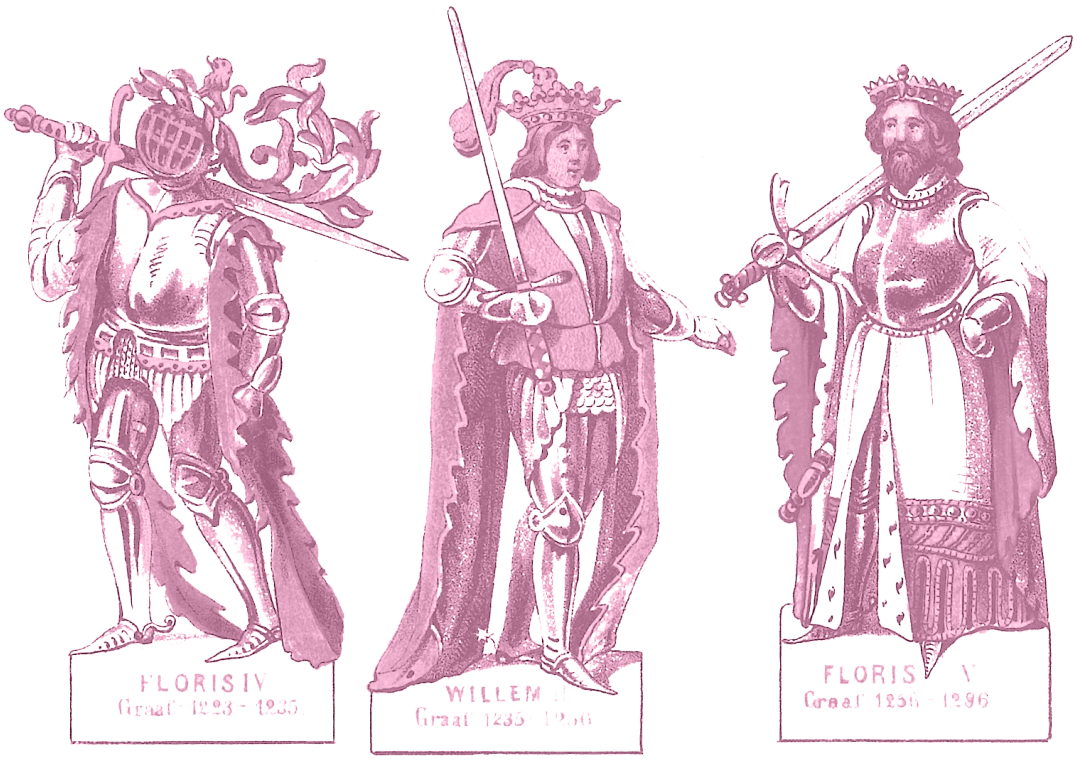


Figure 3.2. De Graven van Holland en Zeeland (1860)

1550

Figure 3.3. The Hague around 1550 based on Schoper (2007) and Haagse kaart (n.d.)

During this time period the most powerful medieval nobles in this region were the Counts of Holland (Figure 3.2). Formally, they were 'vassals' of the German emperor. Gradually, however, they evolved into independent rulers in 1018. In the following centuries, the counts would continue to expand their territory at the expense of the Bishop of Utrecht in the east, the West Frisians in the north, and the Count of Flanders in the south. Around 1300, the county comprised present-day North and South Holland and the majority of Zeeland (Canon van Nederland, n.d.).

In 1229 count Floris IV bought a piece of land in The Hague and started to build a small building that later became the Ridderzaal (De Wit, 1968.). Floris V expanded the surroundings of the Ridderzaal into the Binnenhof, thereby turning it into an important center of power (Canon van Nederland, n.d.). This meant that the surrounding of the Binnenhof had to be adjusted to their wishes. The Hofvijver and Haagse Beek were dug to provide the counts with water (De Wit, 1968). The Haagvliet and Spui were dug to get rid of the dirty water from the Hofvijver (Hilberts, 2015). The Schenk was dug to define the border and get rid of excess water released from intensive peat extraction (De Ceuninck, 2021).

Slotgracht & Hofvijver

1229

Around 1229, the Counts of Holland began settling in the region of The Hague. Floris IV purchased a piece of land and constructed a small building near a dune lake. However, at that time, it could not yet be considered a pond. In 1280, Floris V, the grandson of Floris IV, continued his grandfather's plans. He erected the Count's Halls. Around the Binnenhof, he had a double moat constructed for defensive purposes (De Wit, 1968).

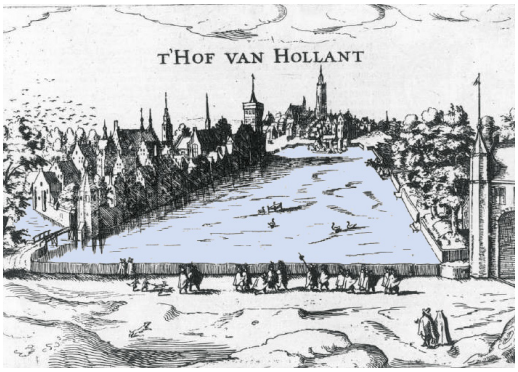


Figure 3.4. 't Hof van Hollant (Kaerius, ca. 1641)

Figure 3.8. De Nieuwe Veenmolen aan de Schenk (Houbolt, ca. 1936)

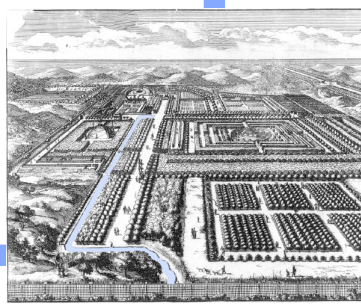
Presumably, in the early 14th century, the Binnenhof pond was excavated. The excavated soil was deposited on the Binnenhof, not precisely on the beach ridge but slightly beside it, where the soil is already peaty (de Wit, 1968). The water from the Hofvijver and canals was utilized for household water supply, watering places, and as an open sewer (Haags Historisch Museum, 2023).

Early 14th Century

Haagse Be & Bossloot

The water pool next to the Binnenhof was fed by two streams, the Haagse Beek and the Bossloot (or Bosbeek) (Dienst Publiek en Communicatie, 2019). The Haagse Beek originated near the present-day Alexanderveld before the construction of the Hofvijver. The Bossloot originated from the Haagse Bos. When the Hofvijver was dug, the streams were no longer sufficient as a water supply. Therefore, the Haagse Beek was redirected from the Wijndalermeer in the Segbroekpolder (a moist beach plain) from that point onwards. To achieve this, a beach ridge had to be dug through at the location of Zorgvliet (De Wit, 1968).

Figure 3.5. De Bossloot in het Haagse Bos (La Fargue, ca. 1756)



1403

Schenk

As a dug watercourse, the Schenk has a long history. Around 1403, at the behest of the Count of Holland, the construction of the Schenk began. It was a branch stemming from the Haagvliet, and this watercourse ran along the Heerenveen or Veenpolder. The Schenk served as a boundary between The Hague and Voorburg, but it also functioned as a drainage system for the water released during intensive peat extraction. This was urgently needed because the existing drainage systems were unable to cope with the annual recurring floods (De Ceuninck, 2021).

ek

Haagvliet & Spui

1345

The Vliet dates back to the 12th century or earlier and was dug as a drainage canal and connection between the Old Rhine in Leiden and the Schie near Rotterdam (Koot, 2013). The entire route is called the Rijn-Schiekanaal. In 1345, the center of The Hague was connected to the Vliet with the Spui and the Haagvliet (or Trekvliet). This connection served both navigation purposes and the discharge of polluted water from the Hofvijver (Hilberts, 2015). The Spui was formerly called the watercourse 'Spoye' and had previously already been used to discharge water (spuien in Dutch) (Haags Gemeentearchief, n.d.).

Figure 3.7. Het Spui (Van Vianen, ca. 1697)

Figure 3.6. Buitenplaats Zorgvliet (ca. 1700)

03.3
The Hague as Seat of Government of the Dutch Republic

1550 - 1750

Figure 3.9. Portrait of Filips II (Wierix (II), 1565-1604)

Figure 3.10. The Hague around 1750 based on Schoper (2007) and Haagse kaart (n.d.)

In 1555, King Philip II (Figure 3.9) ascended to power, but his policies (forcing Roman Catholic religious conviction) were met with discontent in the Netherlands. The dissatisfaction culminated in the Eighty Years' War, which began in 1568. The Netherlands rebelled against the Spanish Empire (Canon van Nederland, 2016). Amid this conflict, the residents of The Hague, fearing their unprotected village could become an easy target, sought refuge in Utrecht and Delft, cities fortified with walls. The Hof van Holland and the Rekenkamer also relocated to Utrecht due to fears of the ongoing war. In the same year, the Geuzen, a group of rebels, entered the partially deserted The Hague (Haags Historisch Museum et al., n.d.).

Within a year of the Geuzen capturing The Hague, the Spanish forces expelled them. On October 3, 1574, the Geuzen successfully drove the Spanish forces out of Leiden, and by the end of November, the soldiers vacated The Hague. Left in disarray, The Hague was marked by plundered homes, and streets filled with dirt and accumulated waste abandoned by the departing Spaniards. The rejection of King Philip II by the States General eventually led to the establishment of the Republic of the Seven United Netherlands in 1588 (Haags Historisch Museum et al., n.d.). This meant that The Hague became the seat of government for the whole Republic and the city prospered again (Coolen, 2021). In the seventeenth century, known as the 'Golden Age,' The Hague becomes a true court city where art and craftsmanship flourish as never before (Haags Historisch Museum et al., n.d.).

1612

Singelgracht

The Binnenhof was early in getting a moat for defense, but the village lacked such protection. After numerous plunderings and conflicts against the Spaniards, the vulnerability of the village became evident. From 1588, The Hague became not only a regional administrative center but also the administrative center of the entire Republic, and it prospered again. However, it wasn't until 1600 that Prince Maurits urged the States of Holland to establish urgent defense works. Many plans were devised, but the construction of city walls or bastions did not materialize. Instead, a rectangular moat with drawbridges was chosen, primarily for aesthetic reasons. Although this did not provide defense against enemy armies, it did offer protection against beggars and thieves. Excavation began in 1612, and by 1619, the moat was completed (Coolen, 2021). Within the moat, various harbors and canals, such as the Prinsegracht, were later constructed.

Figure 3.11. Zuid-West-Binnensingel (La Fargue, ca. 1764)

1638

Trekschuiten

In the sixteenth century, the transportation of people and goods between Dutch cities increased due to growing trade and prosperity. Regular services for goods transport with sailing ships, known as "beurtveren," were established between Delft and Rotterdam and Delft and The Hague. From the first half of the seventeenth century, the first public transportation network for passengers on the Vliet emerged: the trekschuitdiensten. This was formerly the fastest and most reliable means of transportation. Roads were still unpaved, and in winter, often impassable, making a journey by towpath barge more comfortable than by carriage. Unlike sailing ships, an advantage of towpath barges was their independence from the wind, as they were pulled by a horse (Panman, n.d.).

Figure 3.12. Gezicht op Hofwijck (Knip, ca. 1825)

The vessel had a mast with a tow rope, about 70 meters long and one centimeter thick, attached to it. This rope was used to pull the barge, drawn by a horse walking along the towpath. The person on the horse, known as the 'jager,' was usually a not-too-heavy boy. In 1636, Leiden and Delft jointly decided to adapt the Vliet for towpath barges, and in 1638, The Hague was also connected. The service between The Hague and Delft was one of the busiest in Holland, with a barge departing every half hour (Panman, n.d.).

1646

Loosduinse Vaart

After the completion of the Singelgracht, the Loosduinse Vaart was dug parallel to the Loosduinseweg in 1646. This provided ship captains and horticulturists from Westland with a direct connection to the canals. Farmers could transport their vegetables and fruits directly to the Grote Markt via the Prinsegracht, which grew to become the city's main market. The canal was of great importance to Stadtholder Frederik Hendrik as it provided him with a direct connection to his country residence in Honselersdijk (Coolen, 2013).

Figure 3.13. Toegangs-brug over de Loosduin-sevaart (Brouwer, ca. 1890)

17th Century

Peat extraction

Initially, wood was primarily used as fuel, but when it became scarce in the seventeenth century, people turned to peat extraction. Peat is a type of soil made up of the remains of dead plants, and in its dried state, it proved to be a suitable fuel. Farmers usually began by extracting peat above the groundwater level. Subsequently, peat was also extracted from the water: wet peat extraction. This process led to significant land loss, as excavated strips turned into large ponds. In The Hague, this fuel was sold at the Turfmarkt by the Turfgracht (Geschiedenis van Zuid-Holland, z.d.).

Figure 3.14. De Houtmarkt (left) en de Turfmarkt (right) (Esser, ca. 1820)

03.4
Hygiene in the City

1750 - 1880

Figure 3.15. Portrait of Willem I Frederik, King of the Netherlands (Van Senus, 1813-1819)

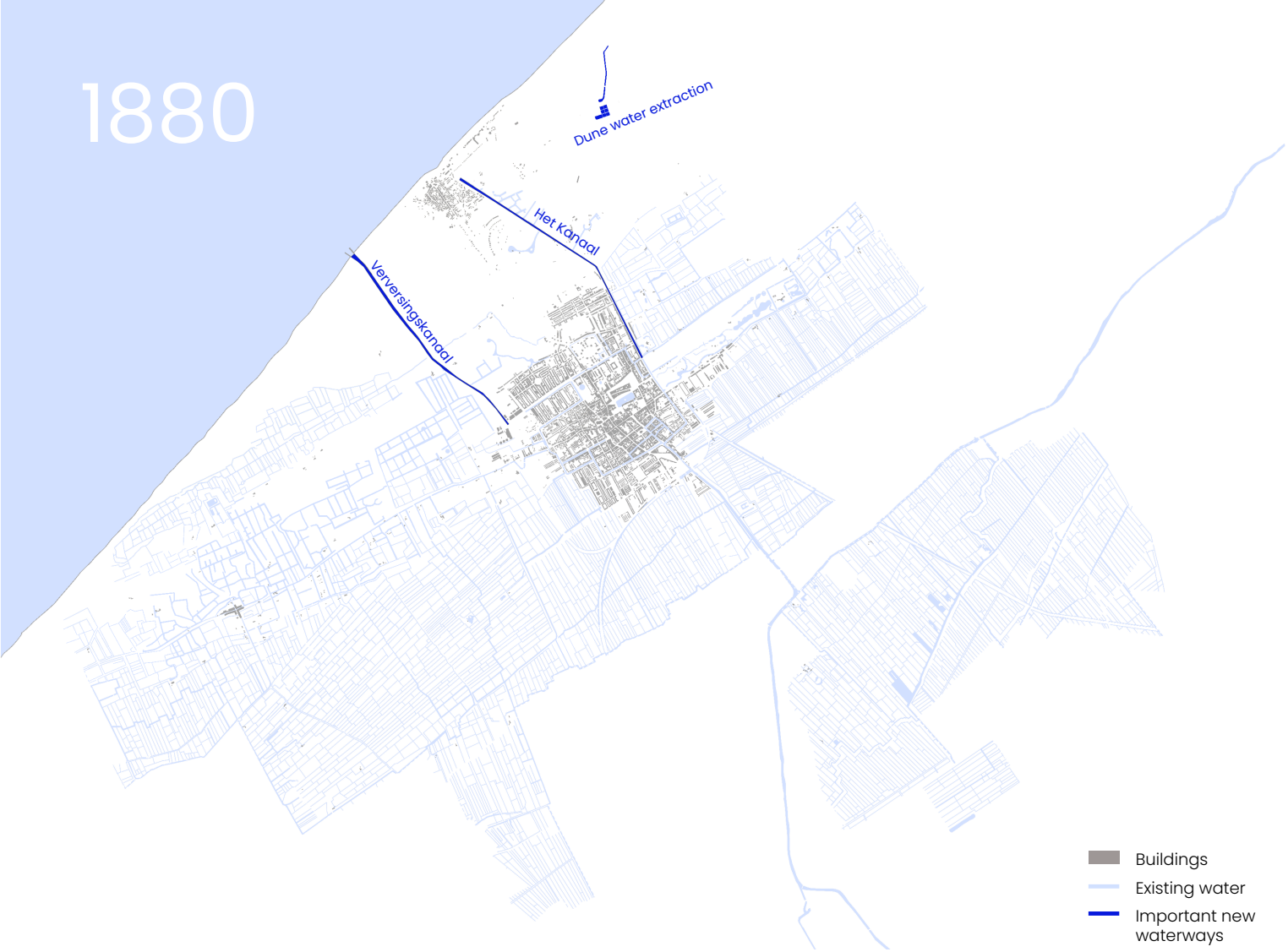


Figure 3.16. The Hague around 1880 based on Schoper (2007) and Haagse kaart (n.d.)

In 1794, the French invaded the Dutch Republic, leading to the country's eventual subjugation. In 1815, following the French rule, the Kingdom of the Netherlands was established under Willem I (Figure 3.15). This marked a pivotal moment as The Hague regained its status as the seat of the court and the central government, sharing the latter function with Brussels until the separation of Belgium in 1830. The city had to accommodate civil servants and court personnel, leading to a population surge, with around 42,000 inhabitants in 1815, growing to 50,000 by 1828 (Haags Historisch Museum et al., n.d.).

The burgeoning population necessitated the expansion of The Hague, prompting the development of new canals and roads. Infrastructure improvements included extending the Prinsessegracht towards Scheveningen (The Channel), establishing railway connections with Amsterdam (1843) and Rotterdam (1847), and introducing tram lines to Scheveningen, which was emerging as a popular seaside resort (Raap et al., 2022). Concurrently, efforts were undertaken to enhance hygiene, involving the construction of the Verversingskanaal, the initiation of a dune water supply network, and the filling in of some canals that had become gathering places for various pollutants (Haags Historisch Museum et al., n.d.)

1832

Figure 3.17. Het Kanaal (Couwenburg, ca. 1828)

Het Kanaal

In 1832, the digging of the Canal to Scheveningen began, driven by reasons such as the disposal of dirty canal water, establishing a direct connection to the Bathhouse, supplying Scheveningen, and transporting caught herring. In 1834, the work was interrupted due to financial issues and local resistance fueled by concerns about polluted beaches. It wasn't until 1853 that the digging resumed, and in 1863, the canal reached Scheveningen at Seinpost. The Canal, therefore, never reached the sea (Hilberts, 2016).

1858

Figure 3.18. De gedempte Heren-gracht (Weissenbruch, ca. 1859)

1873

Figure 3.19. De Tedingerbroekpolder (Gemeente Leidschendam, ca. 1900)

Reclaiming lakes

Until 1873, the Tedingerbroekpolder was drained by two water mills. However, this was insufficient for draining the large peat lakes. The reclamation, which was approved in 1870, required robust drainage. Two steam pumping stations were constructed, and by 1873, the area of approximately 550 hectares was reclaimed. The polder could then be subdivided and developed (Hoogheemraadschap Delfland, 2018).

1874

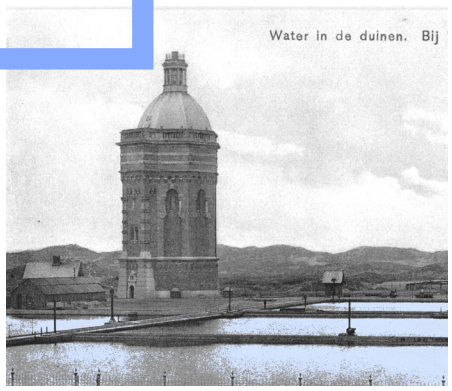


Figure 3.20. Water in de duinen (ca. 1910)

Drinking Water

Water was traditionally drawn from wells, springs, and sometimes even from the canals by the less fortunate. Purified piped drinking water wasn't available, but this changed in 1874 when efforts were made to improve the hygienic situation. A dune water pipeline network was established, pumping water from the dunes into a water tower (Haags Historisch Museum et al., n.d.).

Filling in canals

In the course of the 19th century, the canals in The Hague had become a gathering place for all sorts of waste. The canals were used as public sewers, and as a result, they often emitted unpleasant odors. In 1858, the municipal government decided to fill in several smaller canals, including the Fluwelen Burgwal and the Herengracht (Haags Historisch Museum et al., n.d.).

1875

Figure 3.21. Verversingskanaal (ca. 1915)

Verversings-kanaal

After 1850, plans were made for a new drainage canal to the sea. This required altering the flow direction of the canals in The Hague. As a result, canals that didn't align with the desired direction were filled in, starting from 1861, including the Spui. Excavation began in 1875, and in 1888, wastewater was pumped from the canal onto the beach for the first time (Nicolai, 2023).

03.5 Expansion and Industry

1880 - 1950

Figure 3.22. The crew of a lugger (ca. 1910)

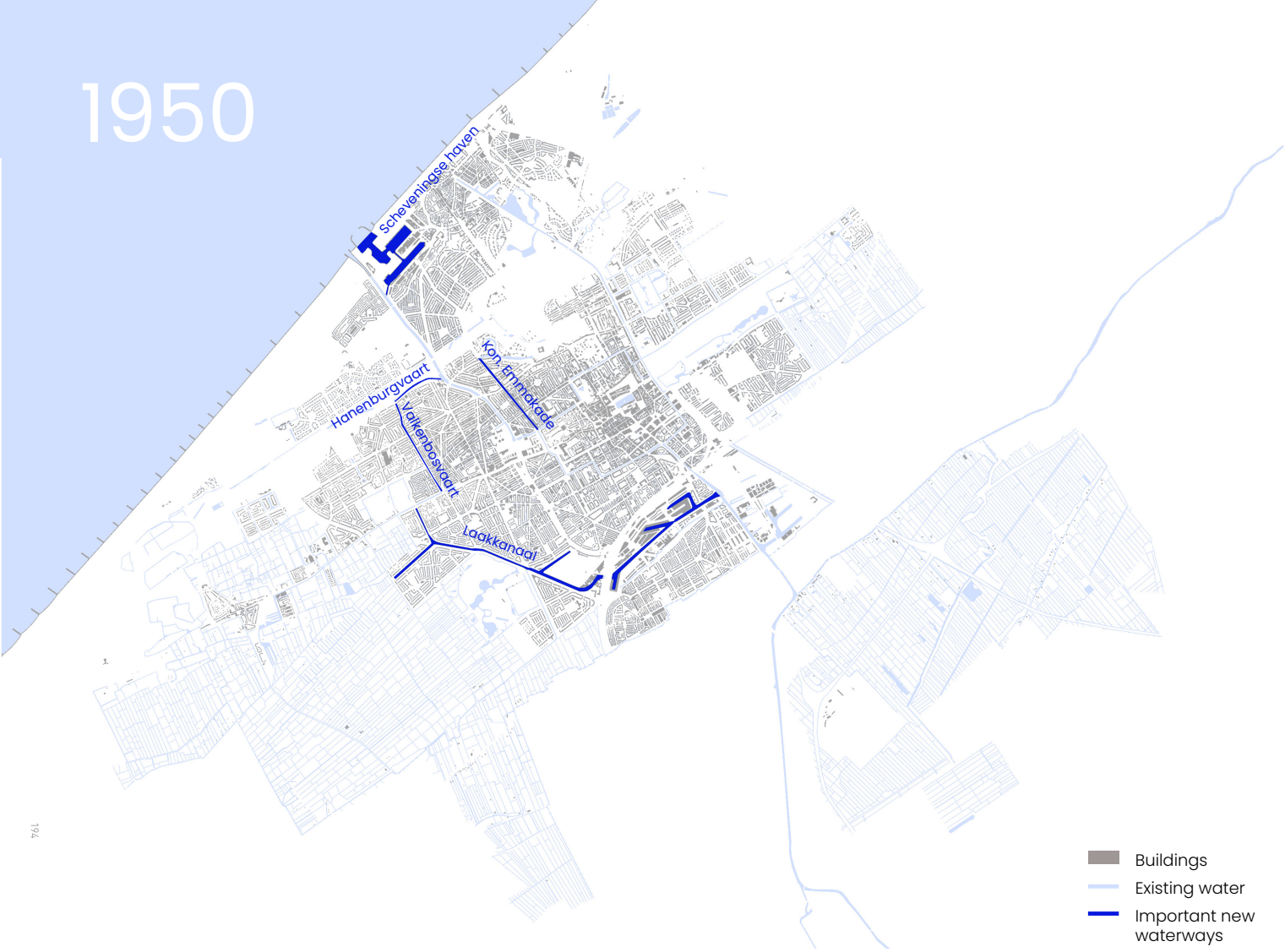


Figure 3.23. The Hague around 1950 based on Schoper (2007) and Haagse kaart (n.d.)

Due to The Hague's evolving role as the national administrative center and the concurrent industrialization, predominantly along the Trekvliet in the southeast, the city's population experienced explosive growth in the latter half of the 19th century. Expansions were necessary (Raap et al., 2022). During the 19th century, canals were dug to transport excavated dune sand with barges. This sand was used for urban expansions on the peat (Hilberts, 2015).

From around 1870, The Hague grew significantly as a hub for industry and trade. Many goods were transported through the waterways. The Trekvliet was bustling with activity from ships and boats. This activity led to the decision to create a new inner harbor for loading and unloading ships, known as Laakhaven. Later, the Laakhaven was connected to the Loosduinse Vaart via the construction of the Laakkanaal (Municipality of The Hague, 2019). Scheveningen also expanded, and a harbor was constructed to accommodate the numerous fishing vessels.

1890

Sewer system

Figure 3.24. Wagenstraat, aanleg riolering (ca. 1910)

The construction of the Verversingskanaal marked the first step in establishing a municipal sewerage system. However, it quickly became apparent that the odor in the city center persisted, and residents near the Verversingskanaal also had reasons to complain. In 1890, upon the establishment of the Haagse Dienst Openbare Werken, immediate instructions were given for the design of an integrated sewer system for the entire city. A flush system was chosen, initially connecting to the Verversingskanaal. In 1917, a pressure pipe was installed, allowing the municipality to discharge sewage further offshore into the sea (Buiter, 2003).

Late 19th Century

Zanderij-vaarten

In the nineteenth century, canals were dug to transport excavated dune sand using barges. The urban expansions on peat, as well as in Rotterdam and Delft, had a substantial need for fill sand. The Valkenbosvaart, Hanenburgvaart and the canal along the Koning Emma kade were excavated for this purpose. Both canals connected to the Haagvliet through existing waterways. The Kanaal was also used as a sand extraction canal. The sand released from digging the canal was utilized for the elevation of the Statenkwartier. To transport the sand, several branches were dug (Hilberts, 2015).

Figure 3.25. Zanderij achter het Schietterrein (ca. 1900)

1900

Scheveningse Haven

Figure 3.26. Eerste haven Scheveningen (ca. 1905)

In 1894, a severe storm destroyed many Scheveningen fishing vessels that were beached. This disaster prompted the construction of a new seaport in Scheveningen. Excavation began in 1900, and by 1904, the harbor was completed. The fishing harbor quickly proved to be too small for the fleet of 340 ships. Therefore, there were immediate calls for a new harbor, which was eventually established in 1931 (Haags Historisch Museum et al., n.d.).

1924

Laakkanaal

The Hague experienced significant growth as a center of industry and trade. Many goods were transported via waterways, making the Haagvliet a bustling area. The congestion and the desire to fill in canals led to the initiation, in 1899, of the excavation of a new inner harbor for loading and unloading ships. Around the harbor, an industrial district emerged with factories and warehouses. In 1924, the Laakkanaal was constructed to connect the Laakhavens with the Loosduinse Vaart (Gemeente Den Haag, 2019).

Figure 3.27. Laakhaven (ca. 1925)

03.6 Conclusion

In conclusion, the evolution of water management in The Hague during Period I (1200-1550) reflects the connection between political and environmental factors. The positioning of the Binnenhof, initiated by Count Floris IV in the 13th century, led to the creation of the Hofvijver and Haagse Beek to provide water for the counts. The Spui was build to get rid of the dirty water from the Hofvijver and the Schenk was constructed as a border between The Hague and Voorburg.

Period II (1550-1700) witnessed significant change during the Eighty Years' War, causing The Hague to face threats of invasions. The establishment of the Republic of the Seven United Netherlands in 1588 marked a turning point, making The Hague the political epicenter. The construction of the Singelgracht, a rectangular moat with drawbridges, was build for defense, but even more for aesthetic enhancement. Trekschuit services and the Loosduinse Vaart facilitated transportation for persons and wares.

Period III (1700-1875) saw The Hague grow to become increasingly crowded and dirtier. The city had to deal with the unsanitary conditions of its canals, leading to the demolition of smaller canals for aesthetic reasons. The construction of the Kanaal naar Scheveningen in the mid-19th century was meant to address various needs, including waste disposal, direct access to the sea, and transportation for the fishing industry.

In Period IV (1875 onwards), The Hague experienced rapid growth due to its role as a national administrative center and industrialization. Expansion necessitated the creation of Laakhaven, the Laakkanaal, and the Scheveningen harbor. Simultaneously, the implementation of a sewage system and the Verversingskanaal, and the Zanderijvaarten aimed to improve hygiene and manage urban growth.

Overall, The Hague's historical development shows that there is a relationship between its water systems and the city's political, economic, and cultural evolution over the centuries. From defensive moats to navigable canals and industrial harbors.

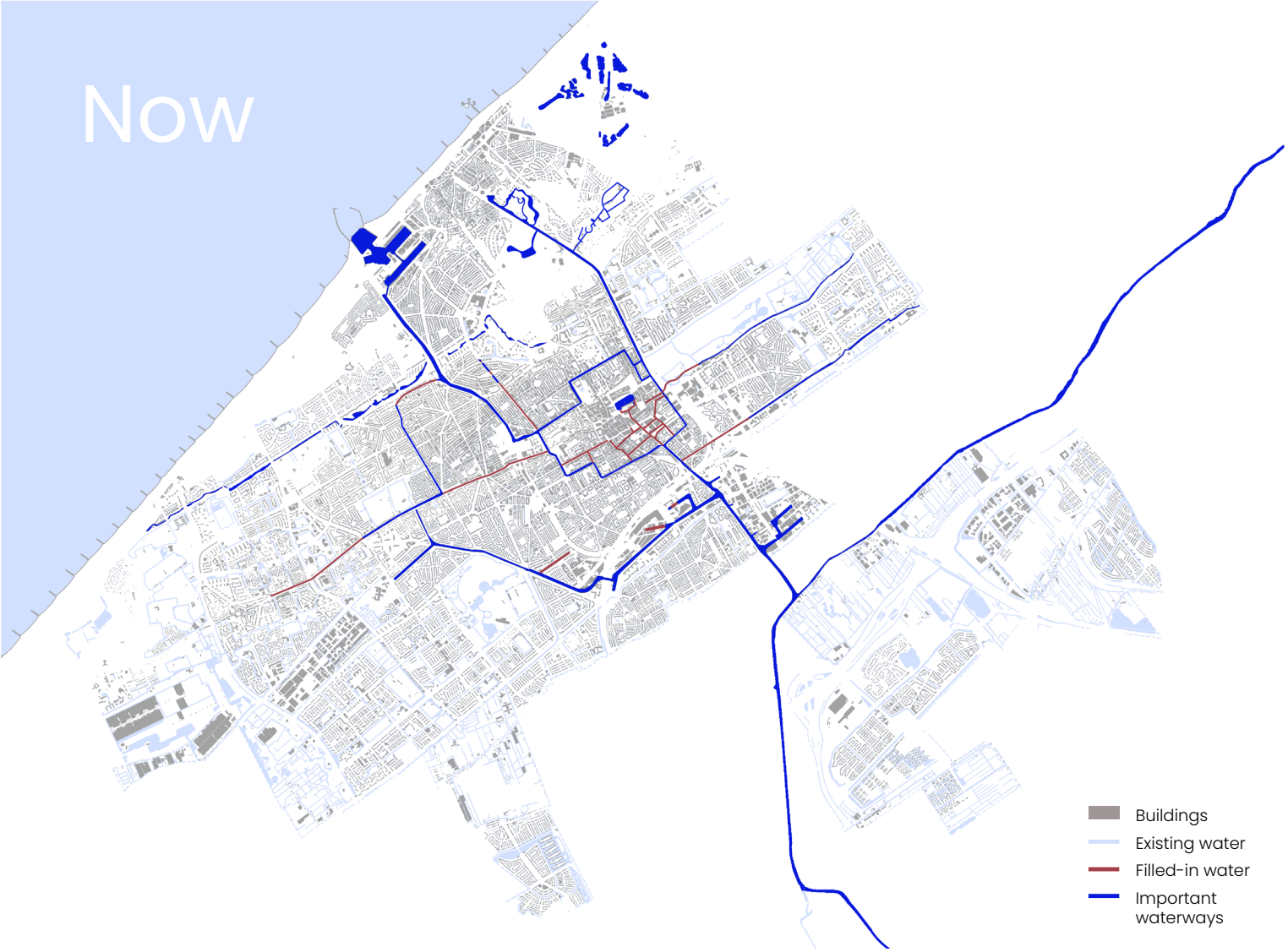


Figure 3.28. The Hague currently, based on Schoper (2007) and Haagse kaart (n.d.)

The landscape biography shows a dynamic transformation in The Hague's water system, as illustrated by Figure 3.28. While the city has gained an intricate network of waterways over time, it has also experienced the loss of crucial connections, especially evident in the center. Many of the historic canals and harbors have disappeared, leaving the city center without water bodies, with exceptions being the Singelgracht and the Hofvijver. Additionally, there are notable waterways such as the Schenk and the Bossloot that are now disconnected from the broader water system.

In the upcoming chapter, the implications of these developments on the city's water system will be explained. Analyzing how these changes have shaped the aquatic infrastructure over the years will provide valuable insights into understanding the current water system and can help explain certain problems in the system.

04
Water

04.1 Introduction

This chapter explains the working of the water system of The Hague. To do this it is necessary to first explain the larger boezem system of Delfland. Then the system of The Hague is explained and the challenges that it is currently facing.

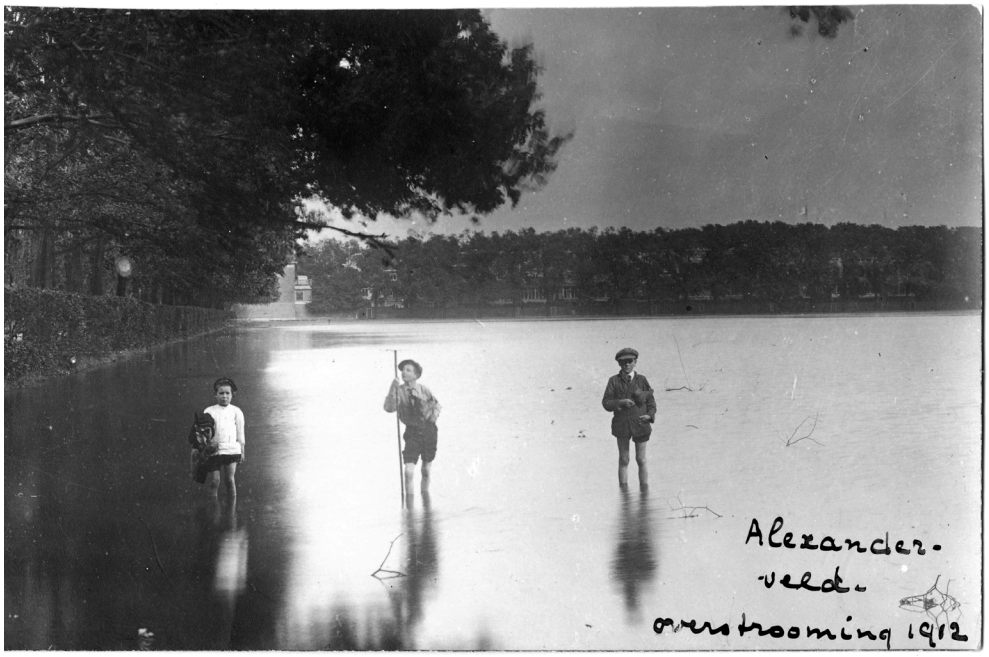


Figure 4.1. Overstroming Alexanderplein (1912)

04.2
Boezem System Delfland

The municipality of The Hague and the Delfland Water Authority jointly oversee the functioning of the water system in The Hague. The canals and waterways in the municipality of The Hague are part of the Delfland boezem system. This system consists of lower-lying polders and the higher-lying boezem (Gemeente Den Haag & Hoogheemraadschap Delfland, 2015). The general principle of the Delfland water system is that excess water from all polders and the boezem area drains into the boezem. In case of water shortages, water is supplied to the polders through the boezem (Hoogheemraadschap Delfland, 2016). Figure 4.3 illustrates how the boezem system works.

Figure 4.2 illustrates the boezem system within the Delfland management area. Low-lying polders discharge water to the boezem through a pumping station. The boezem, in turn, discharges water to the outer water: the North Sea, the New Waterway, and the New Meuse, using six main pumping stations. The boezem constitutes the main artery of the system. Under normal circumstances, the boezem and polder system is in balance (Hoogheemraadschap Delfland, 2016).

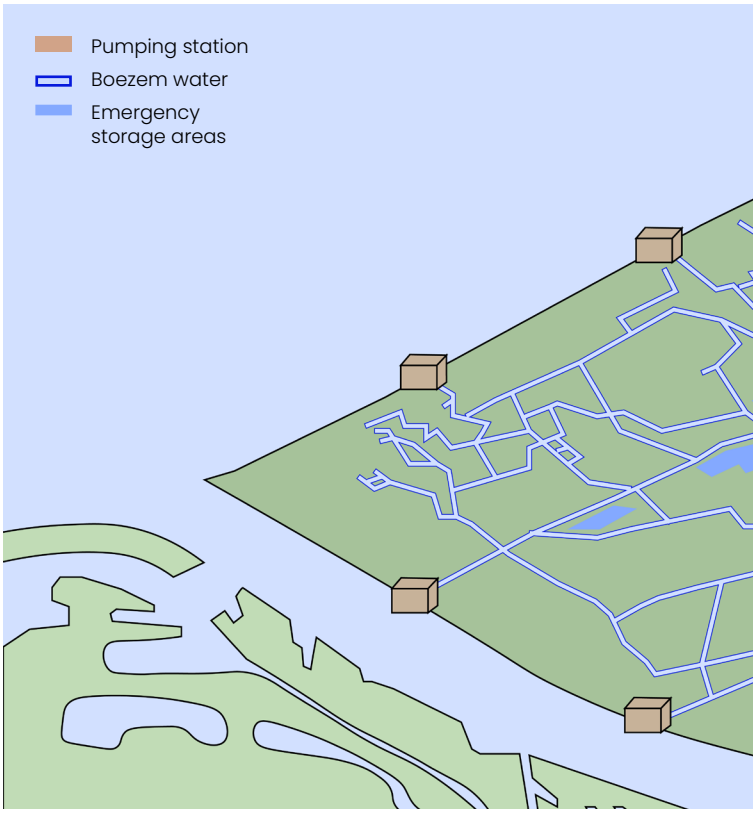


Figure 4.2. Boezemsysteem Delfland based on Hoogheemraadschap Delfland (2020)

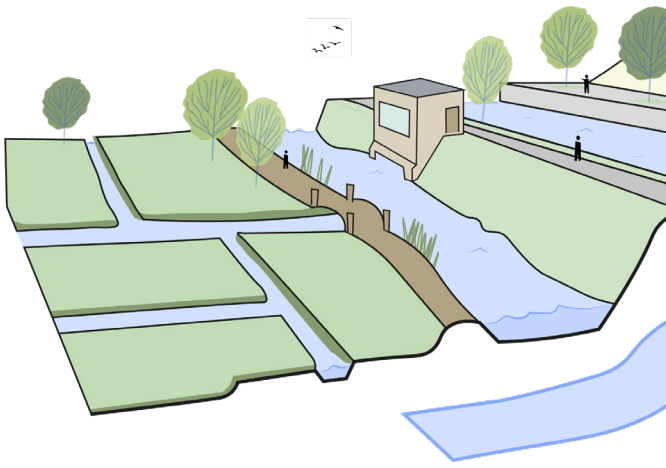
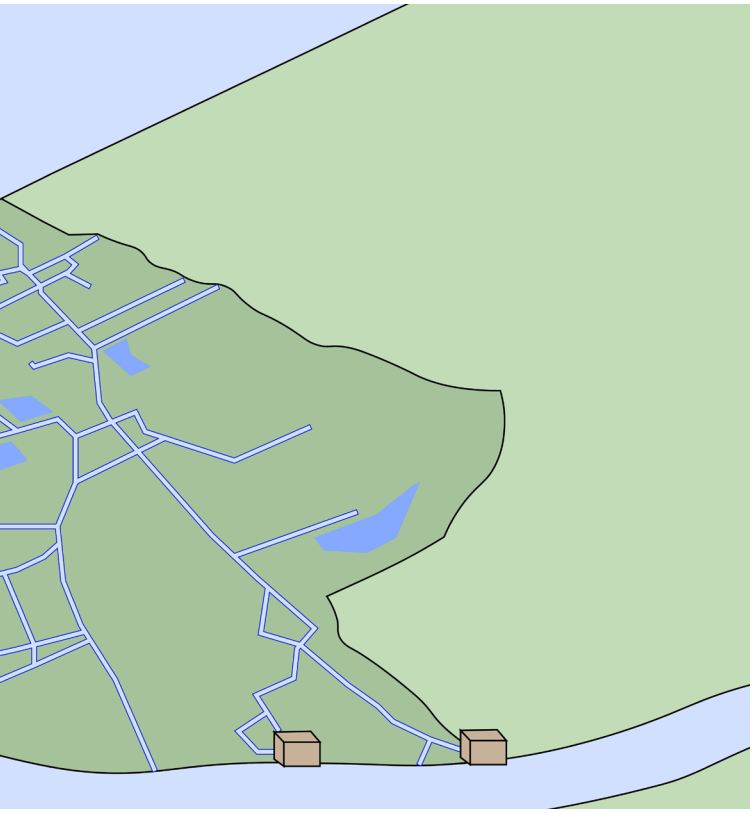
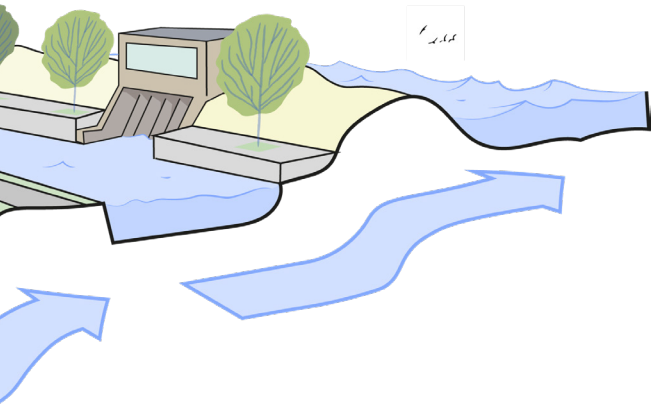


Figure 4.3. Boezem system based on Hoogheemraadschap Delfland (2020)



During extreme rainfall, not all water can be pumped out immediately, and water flows from the boezem area in an eastern direction towards the rest of the boezem system where the low-lying polders are located. Here, boezemkeringen (boezem dikes) are situated to ensure the safety of the polders. To prevent water levels along the dikes from rising too high, four boezem emergency storage areas have been created within Delfland, where boezem water can be temporarily stored. This helps capture peak water levels during extreme rainfall (Hoogheemraadschap Delfland, 2016).

The water level in the boezem is generally maintained at a constant level (NAP -0.43m). During heavy rainfall, depending on the location, the water level in the boezem may rise by 20-40 cm. Anticipating certain rainfall forecasts, the boezem water level is temporarily lowered by about 10 cm (pre-pumping) to create additional space for water storage at the onset of precipitation. In dry periods with a lack of rainfall, the catchment system is sustained by pumping water from the Brielse Meer using a pumping station. In times of extreme drought, water may also be sourced from the northern part of Delfland, supplied by the Hoogheemraadschap van Rijnland (Hoogheemraadschap Delfland, 2016).



04.3
Boezem System The Hague

The boezem system of The Hague is divided in a boezem area on the higher grounds near the shore and the polder area on the lower peat soils (Figure 4.4). Pumping station P.H. Schoute in Scheveningen drains the boezem water from The Hague and a part of the hinterland to the sea. This pumping station can discharge more than 42,000 m3 per hour.

Polders
A polder is an area protected by a dike or levee against external water. Within a polder, there are various regions, each with its own water level (level areas). The water level in the polders is artificially controlled by pumping stations. In The Hague, several polders can be found. One notable polder is the Haagse Beek. This polder is situated higher than the catchment area, and groundwater from the dunes flows through this stream. In times of drought, water is pumped into the stream (Gemeente Den Haag & Hoogheemraadschap Delfland, 2015).

Boezem
The boezem is a continuous network of canals and waterways. The Hague's section of the boezem includes the canals in the city center, the water in Loosduinen, Benoordenhout, and Scheveningen, as well as major canals such as the Verversingskanaal, the Vliet, and the Laakkanaal. Due to The Hague's predominantly elevated natural sandy terrain, a significant portion of the city allows water to flow freely to the catchment area without the need for pumping stations. Areas within this so-called catchment area include Scheveningen, Loosduinen, Duindorp, Vogelwijk, and The Hague Center, including part of the Veen- and Binckhorstpolder (Gemeente Den Haag & Hoogheemraadschap Delfland, 2015).

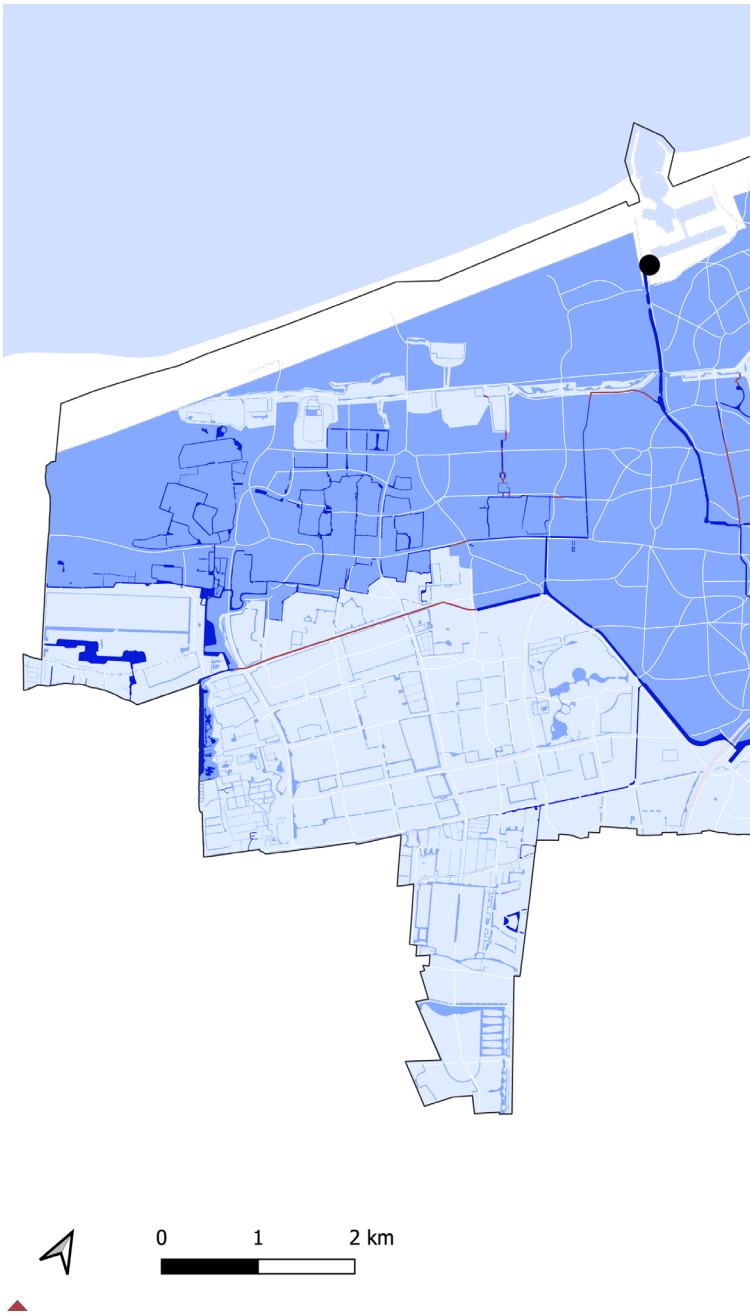
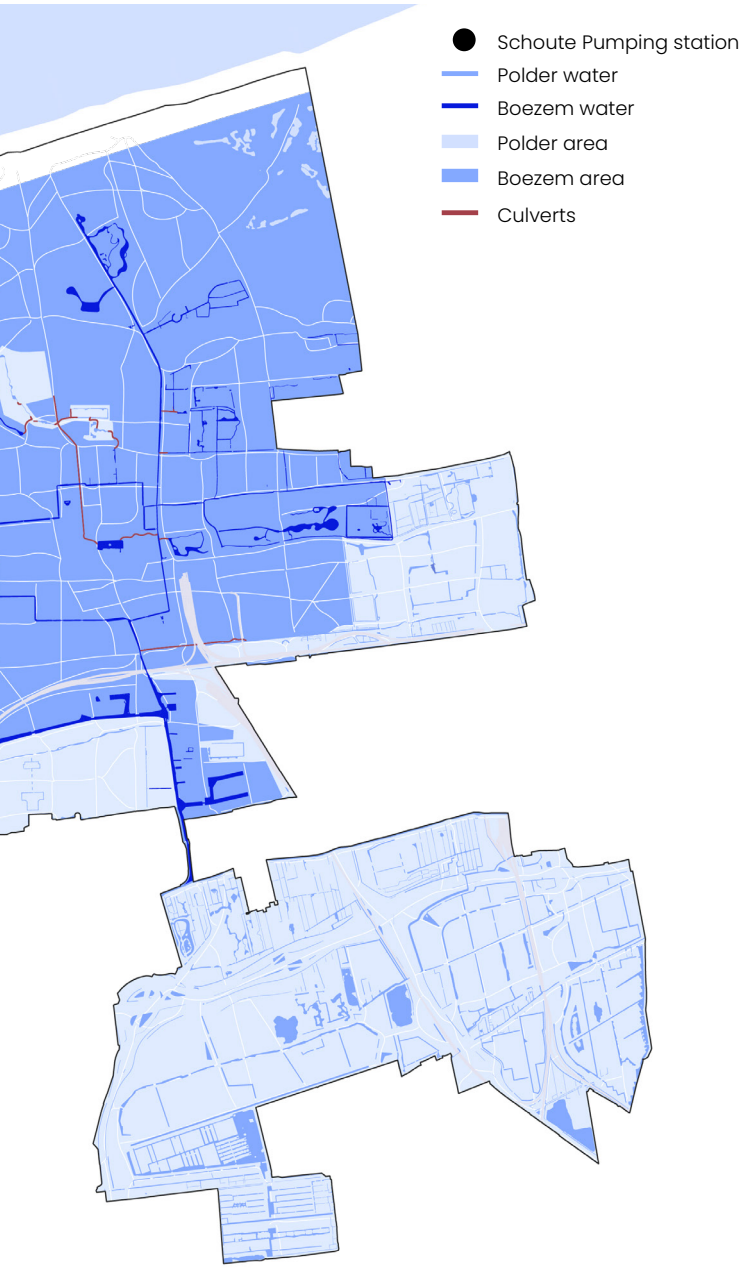


Figure 4.4. Boezem system The Hague based on (Gemeente Den Haag & Hoogheemraadschap Delfland, 2015)



The surface area of open water in the boezem is limited in proportion to the surface area draining into it. The high degree of impervious surfaces, the limited open water surface, and the substantial pumping capacity make the catchment system a very responsive water system sensitive to short, intense rainfall peaks (Hoogheemraadschap Delfland, 2016).

The direction of flow in the boezem system depends on the use of pumping stations and can, therefore, differ over time. When the pumping stations are used to pump out excess water, the supply runs from the Vliet east of The Hague to the Schoute pumping station, through two boezem branches through the city center of The Hague. The water mainly flows via the Zuid and Noordsingel in the city center but can also flow via the Laakkanaal, depending on precipitation and the use of pumping stations. Water from the Loosduinse Vaart and southwest The Hague flows via the Valkenbosvaart to the Schoute pumping station (P. Strohschein, personal communication, February 26, 2024).

Sewer system

The Hague has both combined and separate sewage systems. Eighty percent of the sewage system in The Hague consists of combined systems, where wastewater and rainwater are collected together and conveyed to purification plants via sewage pumping stations. Twenty percent of the sewage system is comprised of separate systems, directing clean rainwater directly to surface water. The remaining portion of rainwater infiltrates into the soil, primarily in higher-lying areas with well-draining (sandy) soils, such as the Vogelwijk (Gemeente Den Haag & Hoogheemraadschap Delfland, 2015).

04.4 Challenges

In the standard situation, boezem water is pumped to the sea by the Schoute pumping station in Scheveningen. Studies on the flow in The Hague have shown that during heavy rainfall, the water cannot be discharged quickly enough or stored adequately. As a result, water levels rise too high in parts of The Hague and the hinterland. In other parts of The Hague, the water system exhibits (too) many rapid fluctuations in water levels due to its limited manageability (Gemeente Den Haag & Hoogheemraadschap Delfland, 2015).

Drainage capacity
In these boezem waterways, there are numerous bridges, and the waterways are narrow at multiple locations, acting as bottlenecks. The capacity of the the waterways is visible in Figure 4.5. The water supply to the Schoute pumping station is therefore not optimal. The storage capacity of the boezem water in the city center is limited, leading to the highest water levels occurring in this area during heavy rainfall events. The bottlenecks make it challenging for the pumping station to receive the water, leading to eastward flow towards the Vliet and the Schie in such situations (Hoogheemraadschap Delfland, 2016).

This shows that the internal drainage capacity of the boezem system is the limiting factor. Increasing the pumping capacity is only possible if the main drainage system is also enlarged. This involves widening, deepening existing waterways, or creating new ones. However, due to the pressure on space in the area, coupled with the scarcity and cost of space, this imposes a challenge on a potential expansion of the drainage capacity of the boezem system (Hoogheemraadschap Delfland, 2016).

Fluctuations in water levels
Heavy rainfall events also lead to rising water levels. This dynamic is unfavorable for system manageability, increasing the risk of waterlogging in the northeastern part of the city (earlier and prolonged water on the streets). Additionally, during heavy rainfall, high flow velocities can cause (bottom) erosion in the canals. Combined with poor flow through the city towards the Schoute pumping station, this results in an extra burden on the boezem system (Gemeente Den Haag & Hoogheemraadschap Delfland, 2015).

Sewage overflow
As mentioned before, the sewer system of The Hague largely consists of combined systems, where wastewater and rainwater are collected together. Due to the high percentage of impervious surfaces, such as roofs and roads, rainwater cannot always infiltrate the soil and, instead, largely flows through the sewage system. During extreme rainfall, sewage overflow systems may be activated to prevent flooding. Through these constructions, the water can be discharged directly into the canals and other waterways, negatively impacting both water quantity and quality (Gemeente Den Haag & Hoogheemraadschap Delfland, 2015). In practice, this only happens once a year (Markus and Hagen, 2021).

Circulation
When there is no heavy rainfall, circulation and transit pumping stations are in use, and the water therefore flows in a different way than previously described. There is a power plant on the Verversingskanaal near the city center that heats up the water. To ensure that the water does not heat up excessively, there is a circulation pumping station that pumps water from the Verversingkanaal to the Valkenbosvaart to circulate the water (P. Strohschein, personal communication, February 26, 2024). If the water heats up too much, this can have consequences for the water quality in the canals.

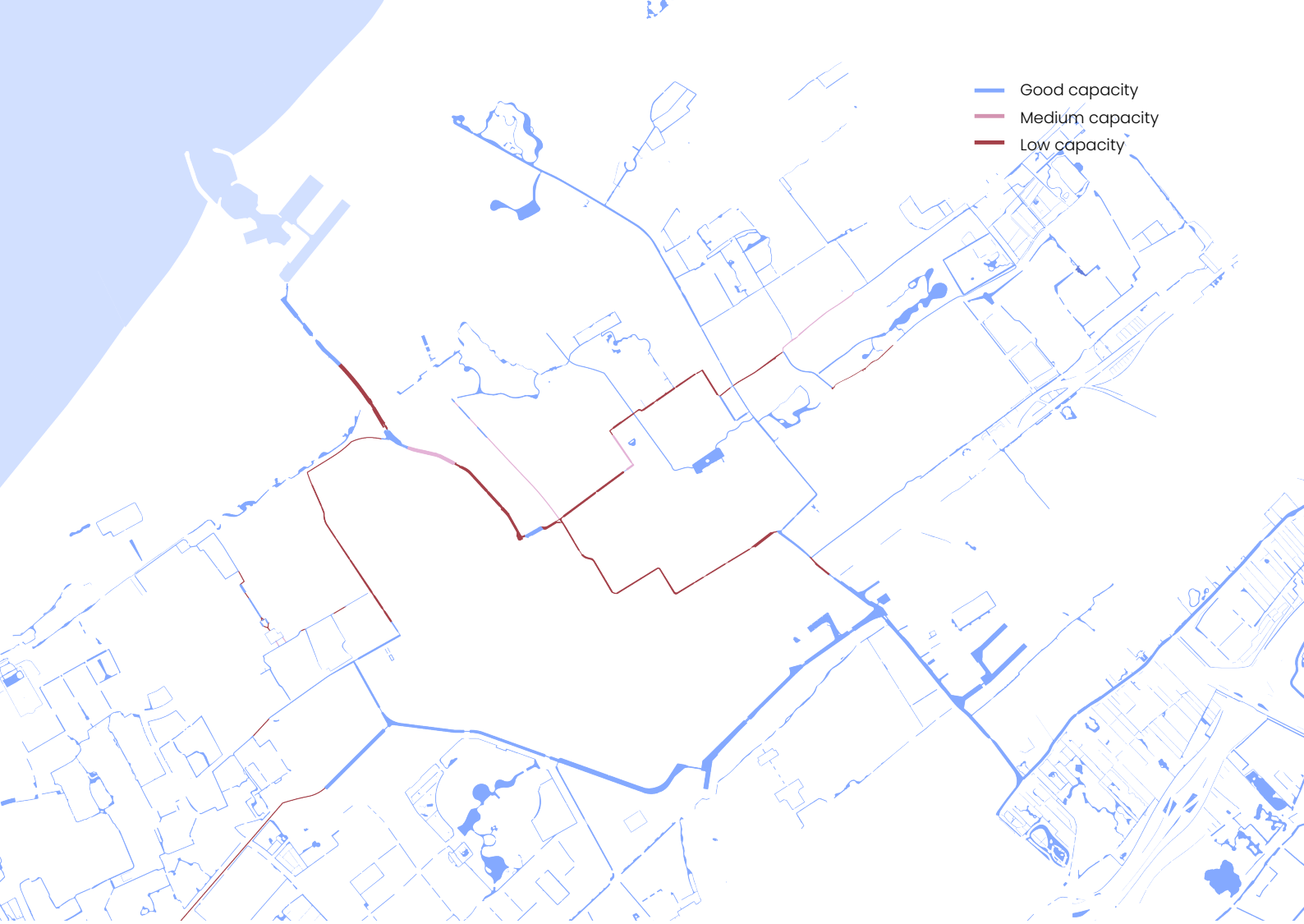


Figure 4.5. The capacity of waterways (P. Strohschein, personal communication, February 26, 2024)

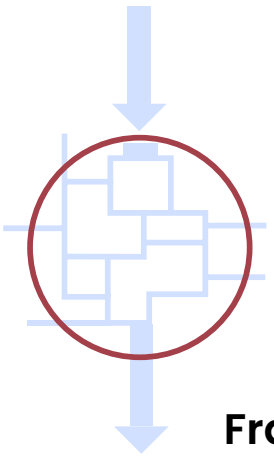


Figure 4.6. Fragmentation boezem system (Hoogheemraadschap Delfland, 2019)

Fragmentation

In The Hague, the boezem system branches out quickly, preventing the water from being drained rapidly enough. This can lead to waterlogging (Hoogheemraadschap Delfland, 2019).

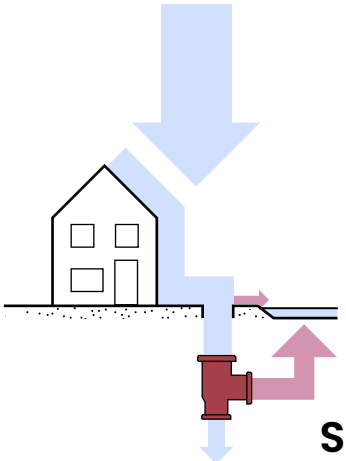


Figure 4.7. Sewage overflow (Hoogheemraadschap Delfland, 2019)

Sewage overflow

In areas with a lot of pavement, all water must be drained through the sewer. When the capacity of the sewer is insufficient, the excess rainwater (mixed with wastewater) will overflow into surface water (Hoogheemraadschap Delfland, 2019).

04.5 Conclusion

This chapter explained the general principal of the boezem system of Delfland. Low-lying polders discharge water to the boezem through a pumping station. The boezem, in turn, discharges water to the outer water. For The Hague this is the North Sea.

In the standard situation this process goes well. However during heavy rainfall, it has been shown that water cannot be discharged quickly enough or stored adequately. The water has to go through the city center of The Hague, where there are numerous bridges, and the waterways are narrow at multiple places, acting as bottlenecks. The water supply to the Schoute pumping station is not optimal.

Next to that, there is also a lack of storage surface of boezem water in the city center, while there are numerous overflows from the combined sewer system due to the high degree in impervious surfaces. The combination of these problems makes it challenging for the Schoute pumping station to receive the water, causing the water to flow eastward to the Vliet and the Schie and increasing the risk of waterlogging in the hinterland.

Increasing the pumping capacity to stop these problems is currently not possible. The main drainage system would need to be enlarged. This involves widening, deepening existing waterways, or creating new ones. However, due to the pressure on space in the area, coupled with the scarcity and cost of space, this imposes a challenge on a potential expansion of the drainage capacity of the boezem system.

Figure 4.8. Plattegrond Hoogheemraadschap Delfland (De Been van Wena, 1606)

Noort
Zee
De
Den Haech
Delff
Den briel
De
Mase
De
Oude
Mase
Vlaerdingh
Monster
Maeslant

05
Climate Change

Throughout history, cities have experienced significant transformations in the surrounding natural environment, gradually giving way to the dominance of gray infrastructure. The expansion of urban areas has led to a substantial decrease in open and permeable land surfaces, often resulting in a scarcity of green spaces and water bodies (Iojă et al., 2018). This trend makes cities more susceptible to the repercussions of extreme rainfall and high temperatures. As climate change unfolds, cities find themselves under growing pressure, with escalating risks of floods, droughts, and heatwaves (Van Hattum, 2017).

05.1 Introduction

The climate of the Netherlands is changing and has already changed, it is visible through the increase of extremes in heat, drought, and precipitation. The KNMI'23 climate scenarios, presented on October 9th 2023, show what else awaits the Netherlands if the emission of greenhouse gases continues to increase at the current pace until 2080. All four scenarios show that we will face sea level and temperature rise, drier summers, and wetter winters (KNMI, 2023).

For The Hague climate change poses a real threat. Characteristic of the urban area of The Hague is the large percentage of paved surfaces in the form of roofs and roads. In recent years the city has had to deal with multiple floodings after heavy rainfall as well as drought, with 2018 being an extreme example (Gemeente Den Haag, 2022). Climate change affects different aspects of the city. For The Hague the following issues are, or will be, apparent in the city:

05.2
Climate Change

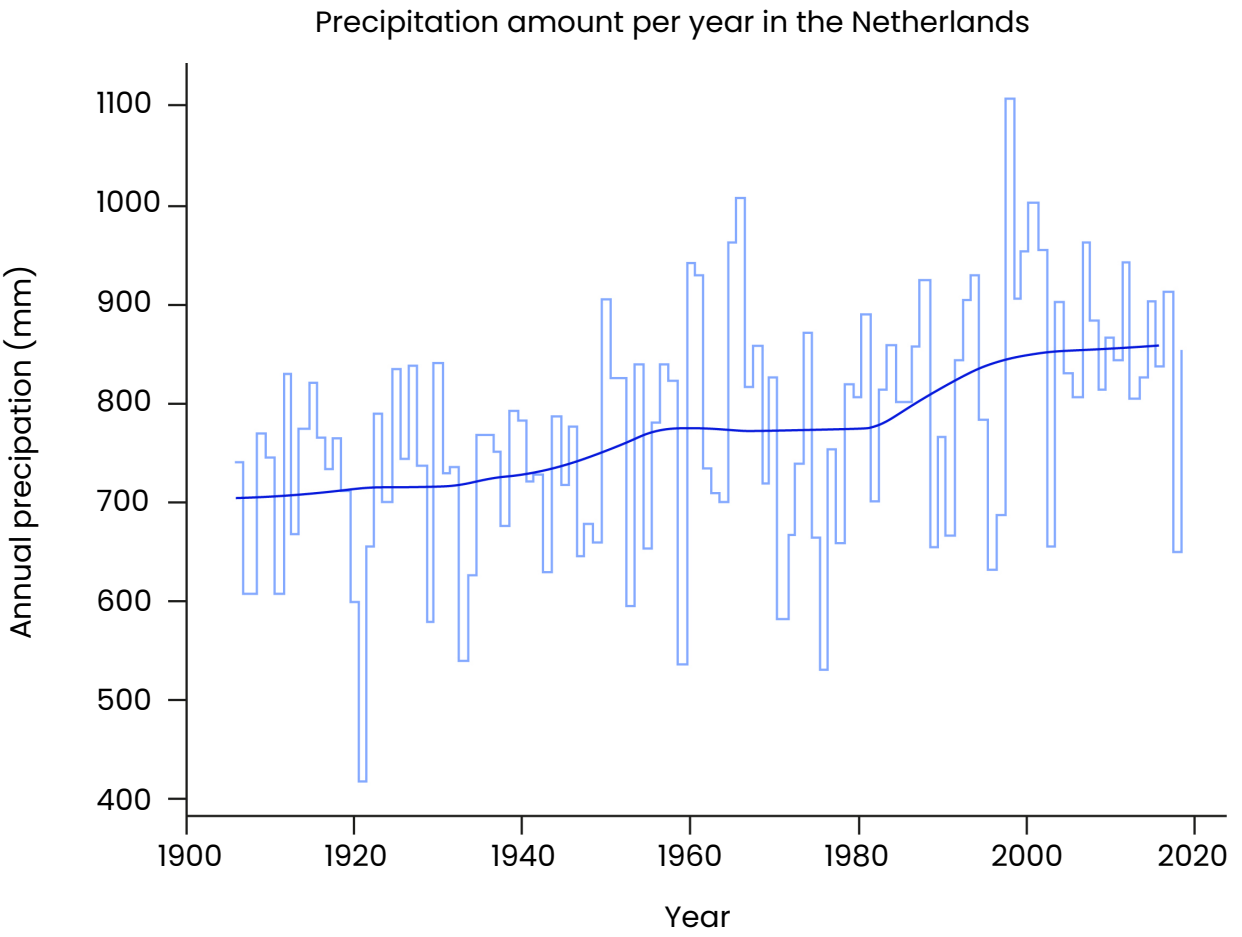


Figure 5.1. (KNMI, 2022)

Increase in precipation

In a warmer climate, it will rain more during the winters, and extreme downpours will occur more frequently in the summers. Winters will become even wetter, while summers will become drier. However, when it does rain in the summer, the intensity of the rainfall will also increase. This can cause floodings, which occur when more rain falls than the soil can absorb, be collected in basins, or be drained through sewers, ditches, or canals. Especially urban areas, such as large cities, experience issues with excessive rainfall. Surfaces like stone, and asphalt prevent rainwater from infiltrating the soil effectively. Instead, the water must be retained or drained, putting increased pressure on local drainage systems (KNMI, 2021).

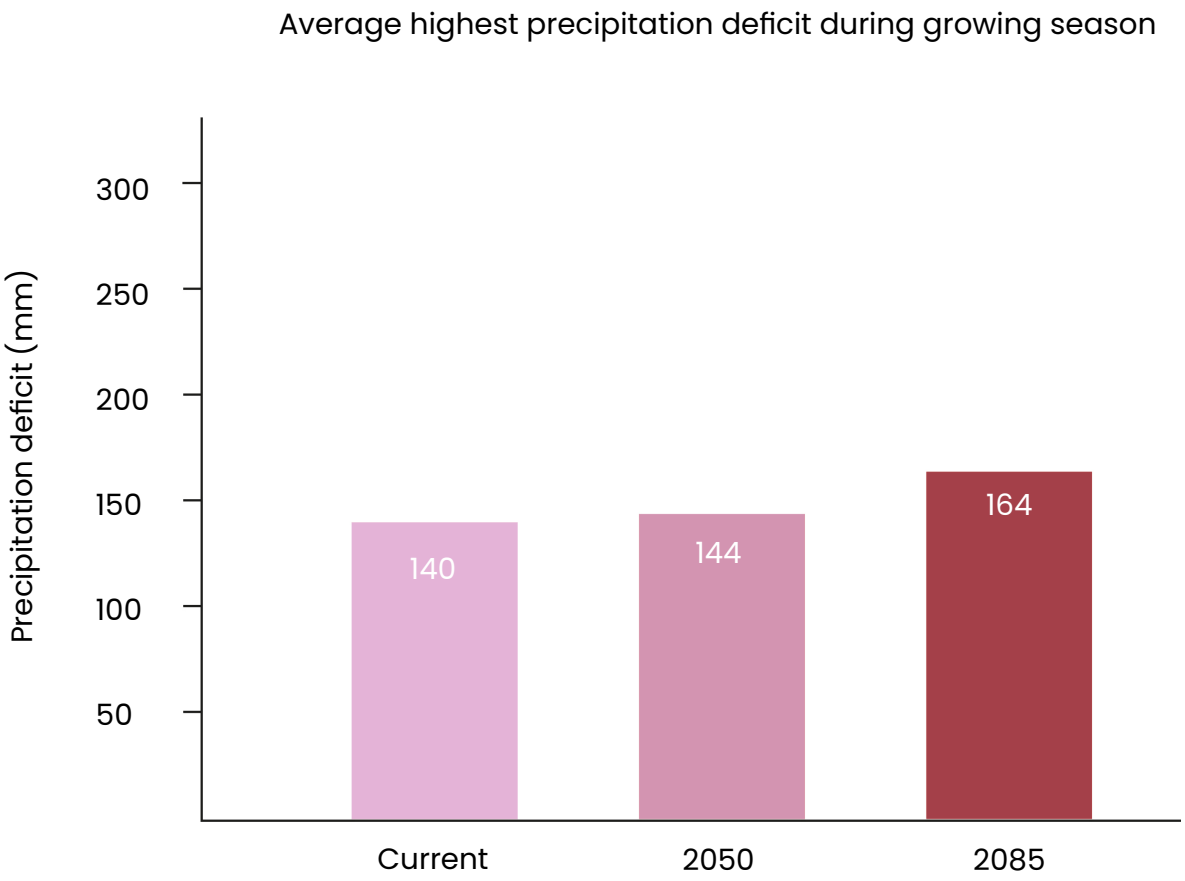


Figure 5.2. (Hoogheem-raadschap Delfland, 2022)

Drought

During the summer, the possibility of drought looms. Drought is characterized by a prolonged period of below-average rainfall coupled with substantial evaporation. If more water evaporates than is replenished, drought sets in. With the escalating impact of global warming, dry conditions are becoming increasingly prevalent (KNMI, n.d.). As a result, groundwater levels in the city are diminishing, presenting risks to wooden foundation piles, (young) trees, and delicate ecosystems. The likelihood of land subsidence and wildfires also increases (Den Haag Klimaatbestendig, 2021).

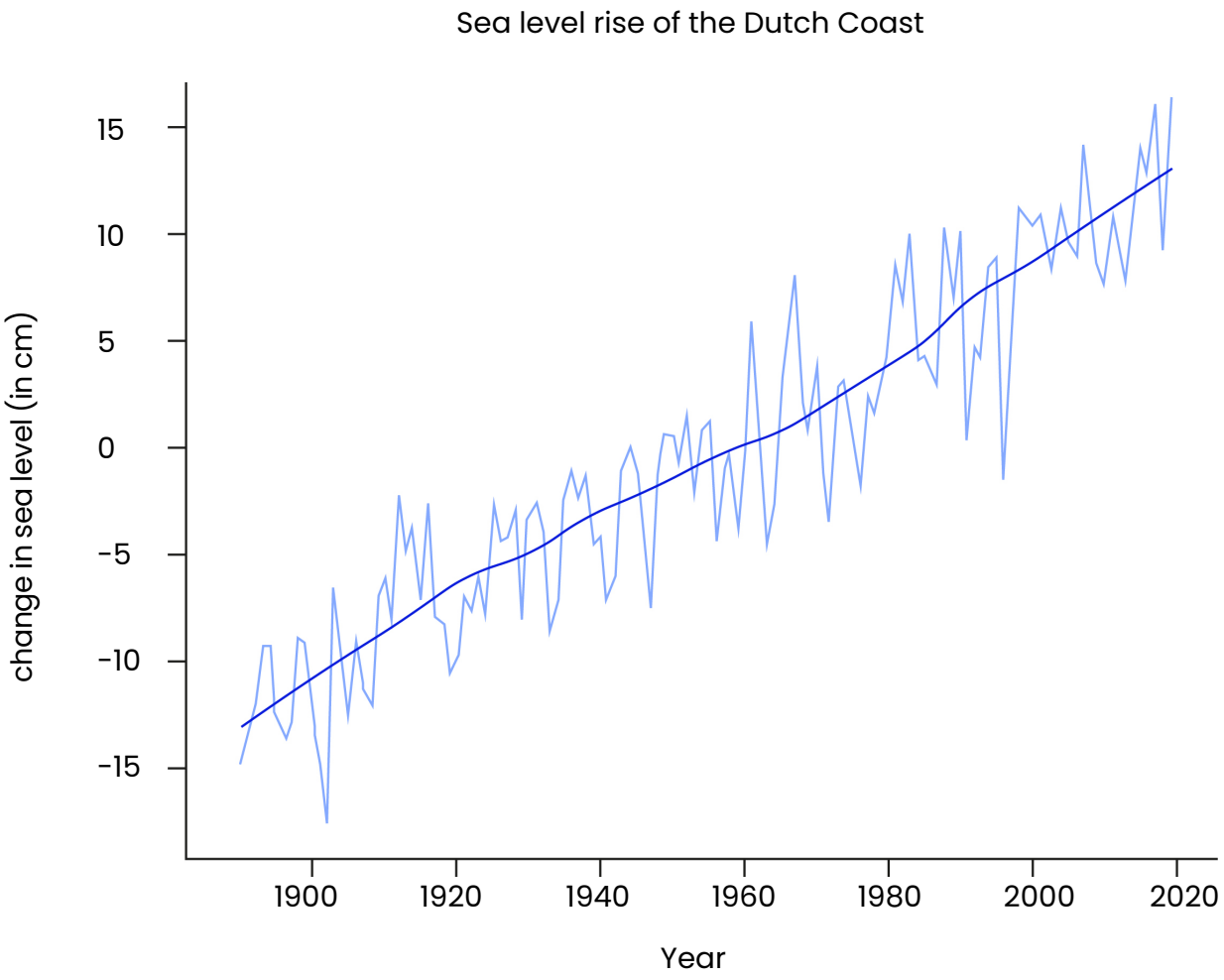


Figure 5.3. (KNMI, 2022)

Sea level rise

In the twentieth century, the sea level has risen approximately 20 centimeters. For the Netherlands, this is one of the key consequences of climate warming. A higher sea level imposes greater stress on dunes, dikes, and storm surge barriers. Additionally, more saltwater enters the country through the coast and rivers, a phenomenon known as salinization. This is detrimental to the freshwater supply essential for agriculture, nature, and drinking water (Rijksoverheid, 2022).

Addressing these challenges requires significant effort and substantial measures, such as extensive sand supplementation, higher and wider dikes, and more pumps. Sufficient space and a supply of sand and clay must be maintained for these purposes (Rijksoverheid, 2022).

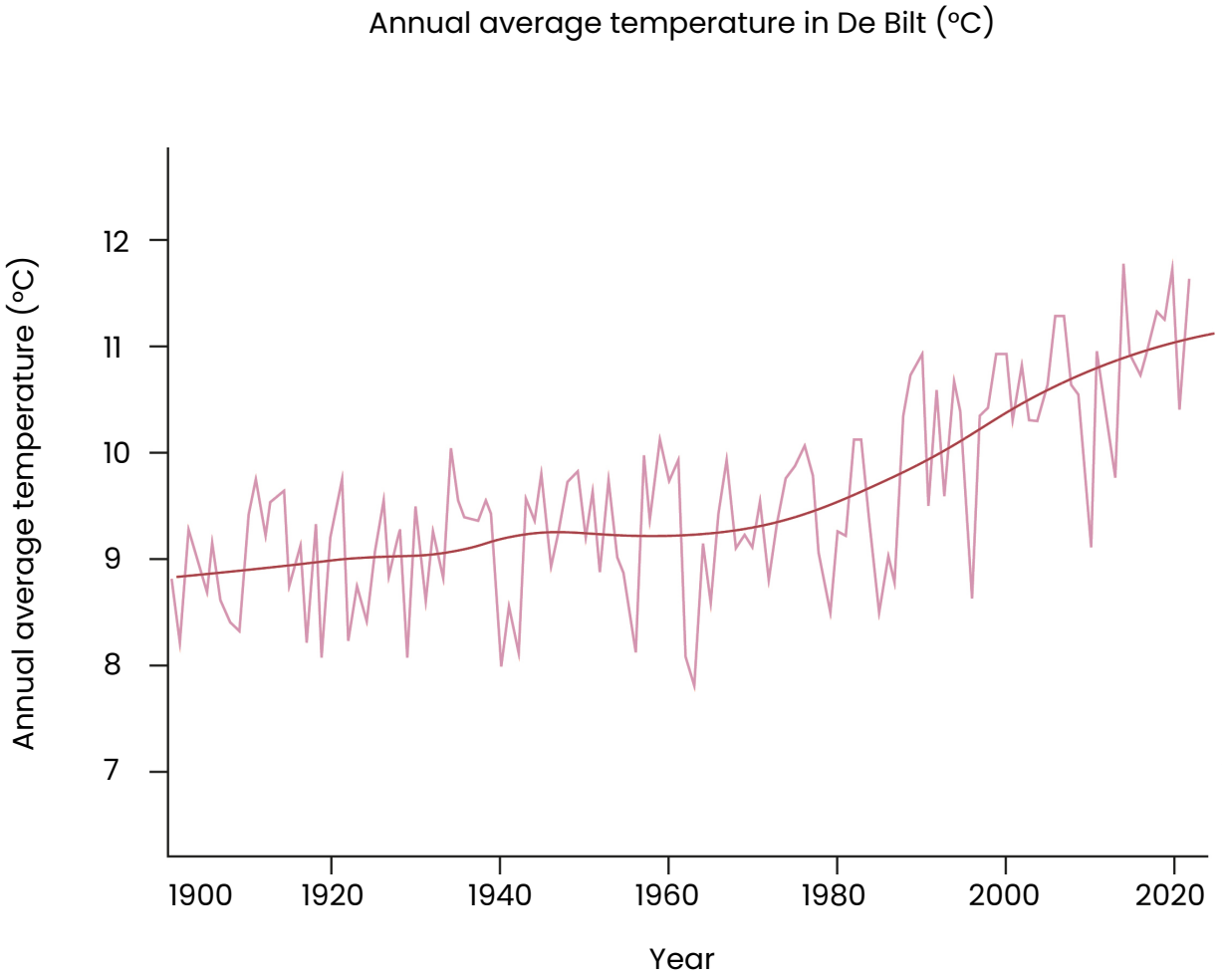


Figure 5.4. (KNMI, 2022)

Rising temperature

The annual average temperature in the Netherlands has shown a consistent upward trend and is 2.3°C higher in 2022 than it was over a century ago in 1907 (Rijksoverheid, 2023). According to the KNMI'23 scenarios, it is evident that not only the average temperature is increasing but also the occurrences of heat extremes are on the rise. In areas characterized by high levels of urbanization and limited greenery, such as urban centers and industrial zones, the temperature is significantly higher compared to rural areas. This phenomenon is known as the urban heat island effect (UHI). The expansion of buildings and increased paving in cities contributes to the reinforcement of the urban heat island effect (Kennisportaal Klimaatadaptatie, 2023).

05.3
Physical Consequences

Figure 5.5. Water depth during heavy rainfall (Klimaatef-fectatlas, n.d.)

Waterlogging

In the third chapter it became apparent that waterlogging is already a problem in The Hague and that during heavy rainfall, water cannot be drained quickly enough or adequately stored. The increase in precipitation that is expected due to climate change will add to these problems and can possibly make them a bigger problem in the future.

Figure 5.5 shows how deep the water would get during a heavy rainfall. From the image it is visible that the water would be the highest in the city center and near Scheveningen.

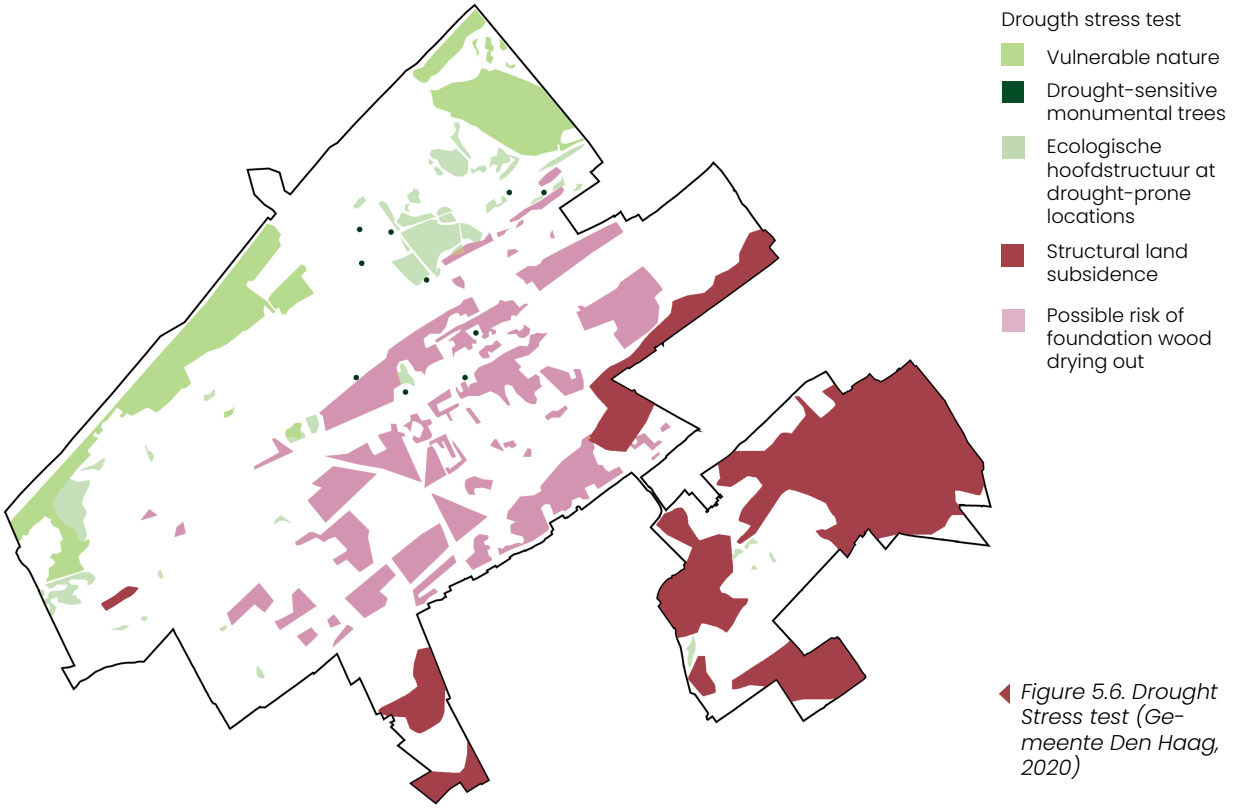


Figure 5.6. Drought Stress test (Gemeente Den Haag, 2020)

Drought stress test

Different areas of the city may be vulnerable to the diverse effects of drought. The natural environment in the dunes, for instance, is notably susceptible. Within the urban landscape, house foundations in areas like Schilderswijk and Transvaal may be affected (Gemeente Den Haag, 2021). In the lower peat areas there is increased soil subsidence during drought (Figure 5.6).

Moreover, drought presents a formidable challenge to the production of drinking water in the dunes. The primary sources for drinking water production in The Hague are the Maas and, to a lesser extent, the Lek. Drought can result in reduced water flow in the Maas, with a potential decline in water quality. During periods of low water levels, the river becomes more susceptible to incidents or (industrial) discharges as pollutants become less diluted and are scarcely carried away (Dunea, 2022).

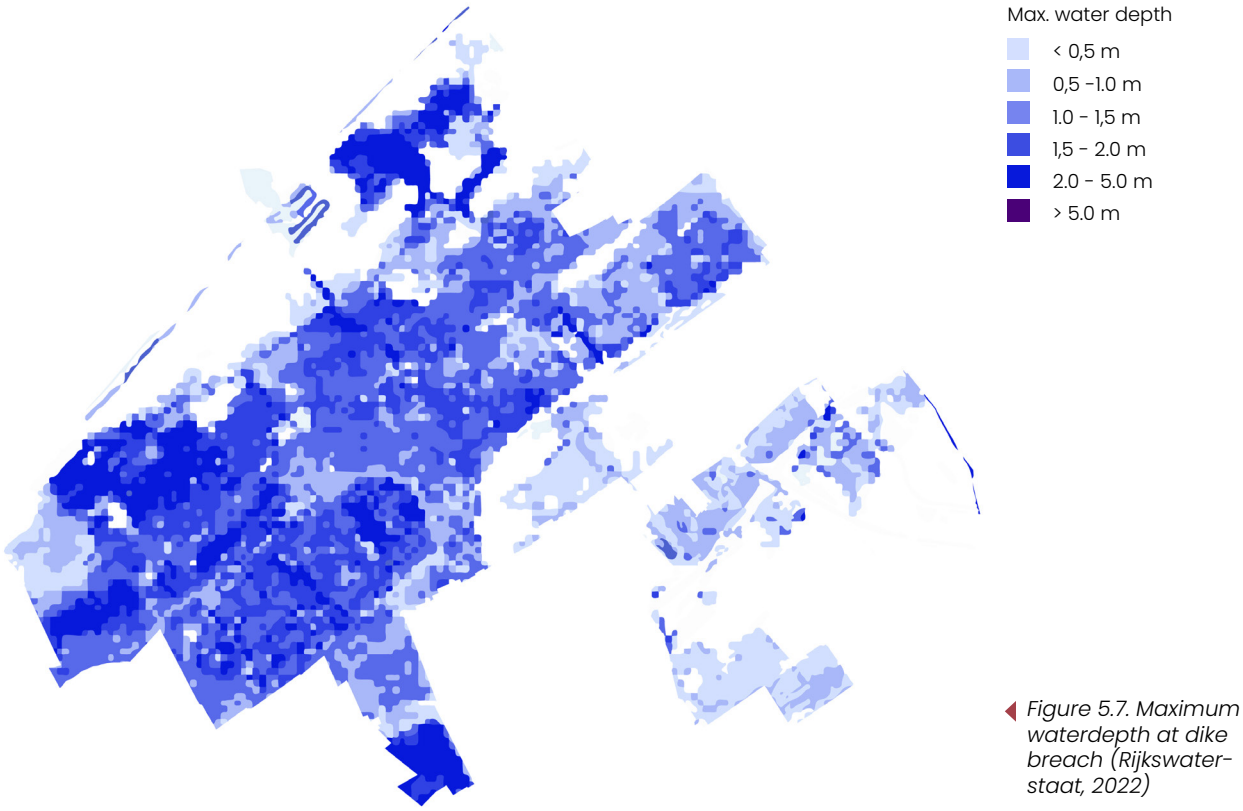


Figure 5.7. Maximum waterdepth at dike breach (Rijkswaterstaat, 2022)

Water safety

In The Hague, measures against the sea will be necessary in the future as the city is located along the coast and a considerable part is situated below sea level. Figure 5.7 shows the maximum water depth in the event of a dike breach. Without dikes, on average, The Hague would be submerged by 20 cm of water (Delfland, 2019).

Hoogheemraadschap Delfland has calculated what one, two, or three meters of sea level rise could mean. It is not yet sure what the coastal defense will look like in 70 years. What is certain is that the built-up coast at Scheveningen and Scheveningen Haven will no longer meet the requirements in the event of significant sea level rise. Whether the beach has significantly widened and whether the pier in Scheveningen will still be in the sea is still uncertain (Hoogheemraadschap Delfland, 2023).

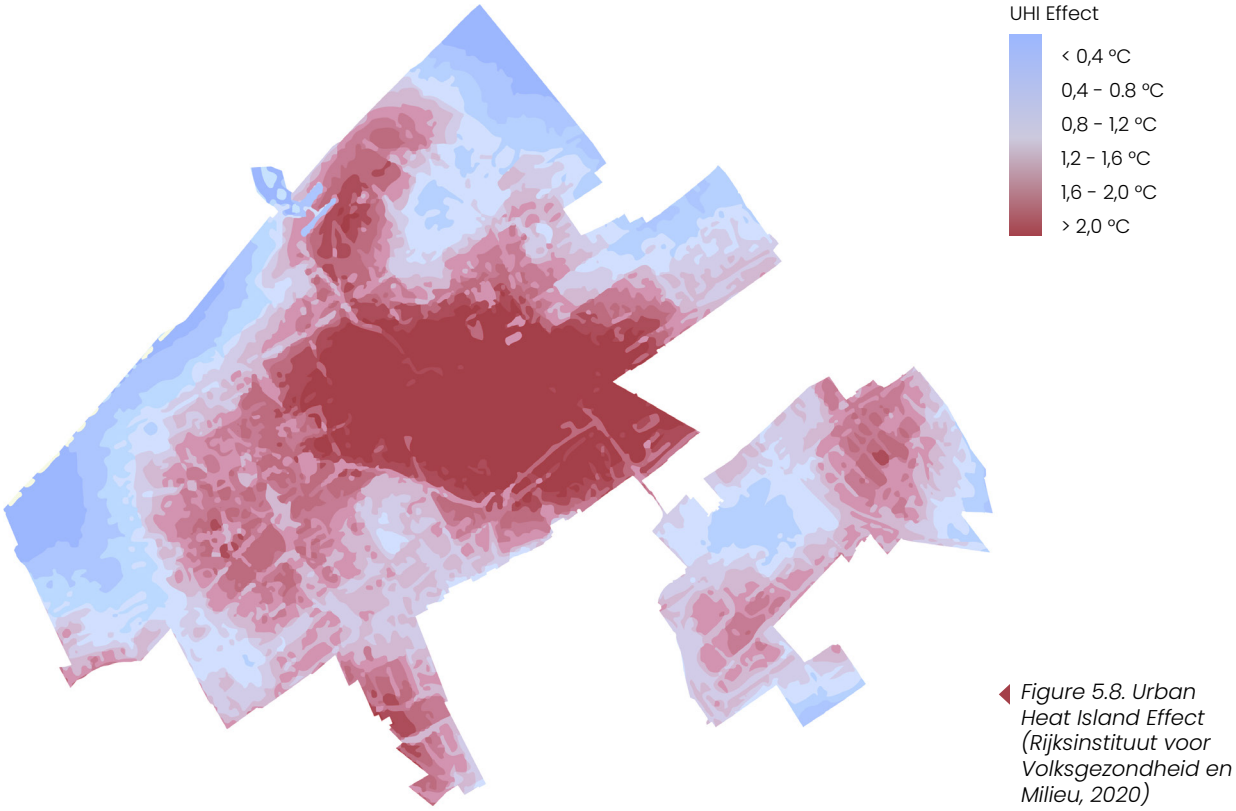


Figure 5.8. Urban Heat Island Effect (Rijksinstituut voor Volksgezondheid en Milieu, 2020)

Urban heat island effect

Research into the urban heat island effect in the largest cities in the Netherlands reveals that among all cities, The Hague has the highest fraction of paved and built-up surfaces and a relatively low amount of greenery. As a result, the city experiences the highest average UHI during the day, reaching 8.6°C. This is also influenced by the nearby dunes and sandy substrate, which can attain high surface temperatures during the daytime (Klok, Schaminée, Duyzer & Steeneveld, 2012).

Figure 5.8 shows that the temperatures in the city get the highest in the center and the areas surrounding the center. There is also a bright red spot visible in Scheveningen.

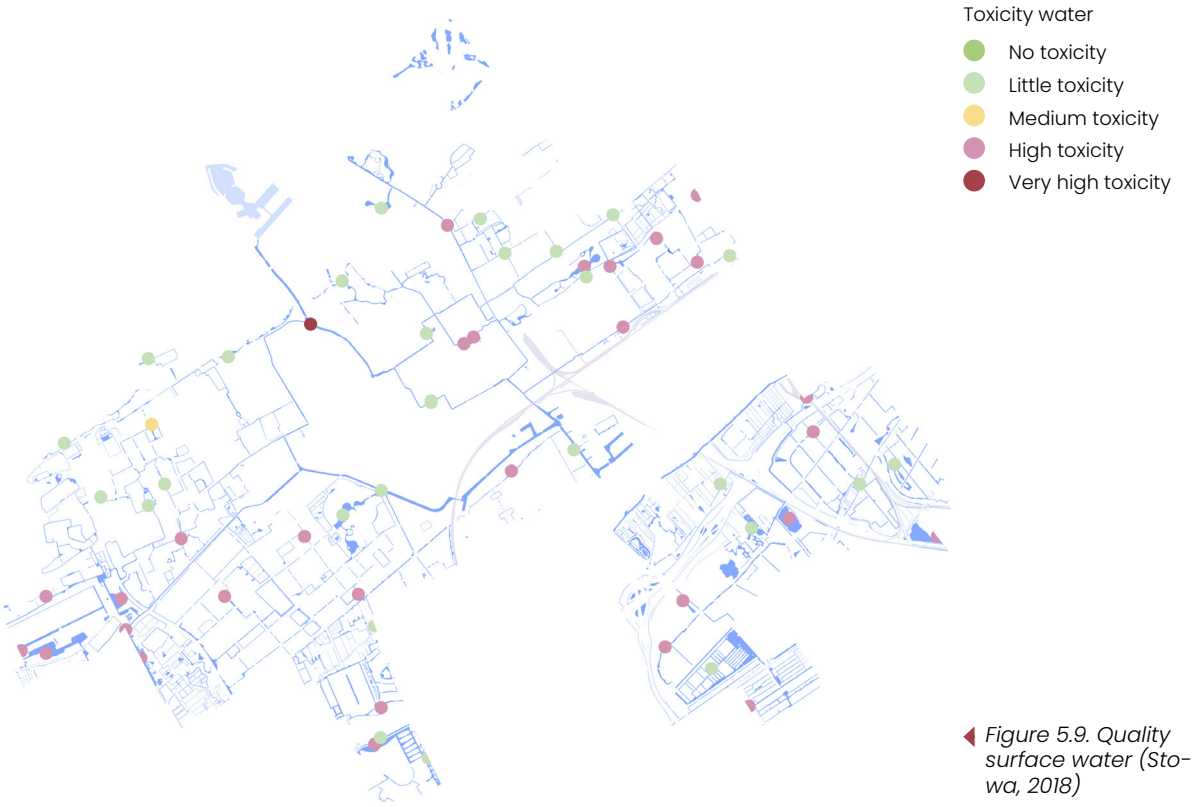


Figure 5.9. Quality surface water (Stowa, 2018)

Water quality

Drought and heat directly impact water quality. During periods of low water levels, water quality diminishes due to a lack of dilution of nutrients, pesticides, pharmaceutical residues, and other chemicals, exacerbated by rising temperatures. At surface temperatures above 20°C, exotic animals and plants, blue-green algae, and pathogens thrive more effectively. This results in an increased purification effort by water treatment plants and has significant consequences for biodiversity (Mens, 2022).

Although the quality of surface water has improved over the years, this improvement remains limited, visible in Figure 5.9. In The Hague, there are still many areas where excessive nutrients are present in the water (Delfland, 2019).

Additionally, the water quality in canals and ponds in specific dead-end areas of the water system is vulnerable due to stagnation and warming, as observed in Westbroekpark, Loosduinen, and Benoordenhout (Gemeente Den Haag, 2021). Lastly, during intense rainfall, sewer overflows may occur, impacting both water quantity and water quality negatively (Gemeente Den Haag & Hoogheemraadschap Delfland, 2015).

05.4 Conclusion

The climate of the Netherlands is changing and has already changed, it is visible through the increase of extremes in heat, drought, and precipitation. For The Hague this has serious consequences as there are already problems with waterlogging and water drainage.

This chapter has shown that The Hague has multiple climate-related issues to deal with now and in the future. Waterlogging is already a problem and this will be a bigger problem in the future as there will be more heavy rainfall.

Drought will form a problem for many reasons. The foundations of houses can be affected, the land will subside in low lying peat areas and the production of drinking water will become an even bigger challenge in the future. Drought also impacts water quality, which is improving but there are still many areas where excessive nutrients are present in the water.

Water safety will form a problem in the future as the current built-up coast at Scheveningen and Scheveningen Haven will no longer meet the requirements in the event of significant sea level rise.

The urban heat island effect in The Hague can reach up to 8.6°C during the day, which can have a significant impact on citizens' well-being. Particularly in areas around the city center, temperatures can get very high.

This chapter has shown how important it is to incorporate climate adaptation tools in a design for The Hague.

06
Strategy

06.1 Introduction

After the analysis of the water system of The Hague, its history and the physical consequences of climate change a set of goals has been made to use all this information for a design. After that a set of tools is made in order to reach these goals. These have been used as inspiration when making the designs. Finally two location have been chosen where this approach can be tested.

06.2
Design Goals

After the extensive analysis from chapters 3, 4 and 5 a conclusion can be made on how to continue to create one or multiple designs for The Hague. From the chapter on Heritage the most important water related locations were found and an overview was given on which connections have been lost over time. The chapter on water explains how the boezem system works and what the current challenges are. The chapter on climate change shows how the climate will change over time and what can already be witnessed in The Hague. This information has been used to describe different goals that need to be reached when making a design for the water system of The Hague. This can be described as:

Restoring water heritage to:

Water management
- Increase water storage in the center
- Improve the drainage capacity
- Improve circulation to prevent excessive heating of the water
- Prevent sewage overflow

Awareness
- Create awareness
    - Making water visible again
    - Giving sites an educational function
    - Giving sites a recreational function
    - Using the historic narratives

Climate adaptation
- Reduce the impact of climate change
    - Prevent waterlogging
    - Decrease the effects of drought
    - Decrease the Urban Heat Island effect

06.3
Design Tools

Developing a design to achieve these goals requires a set of tools. These are important to get an understanding of what is possible to reach these goals. The tools can be a source of inspiration when making the design.

When wanting to restore water heritage, the design location must be in a place where there is already water or there once was water. After choosing a location, first the water management and awareness tools can be applied and for the surrounding public space the tools from climate adaptation can be used.

To create these tools information has been gathered from different sources. The tools for awareness are all inspired from similar landscape designs that have found a way to show the history of a site. This can be done with water or for example by placing signs.

For the water management tools there has been looked at the problems that were found in Chapter 4 and which specific solutions can help these problems be mitigated.

The tools for climate adaptation are more general as these can be applied anywhere and already many studies have been done to find the most effective tools. The research that has been used is the one from RIONED (2019). They looked at the effects of various measures aimed at limiting negative consequences of climate change. They gave these scores on how effective they were, which have been used in this thesis.

The tools:

Water management
- Creating new connections
- Digging up culverts
- Widening or deepening waterways
- Increasing capacity sewers
- Separated sewers
- Disconnecting rainwater from sewer

Awareness
- Signs
- Materialization
- Restore old situation
- Adding water in a different shape
- Fountains
- Gutter

Climate adaptation
- Limit heat damage
    - Water elements
    - Trees
    - Shadow elements
- Limit drought damage
    - Removing pavement
    - Infiltration basin
    - Permeable paving
- Limit rainwater damage
    - More surface water
    - Infiltration basin
    - Gutter

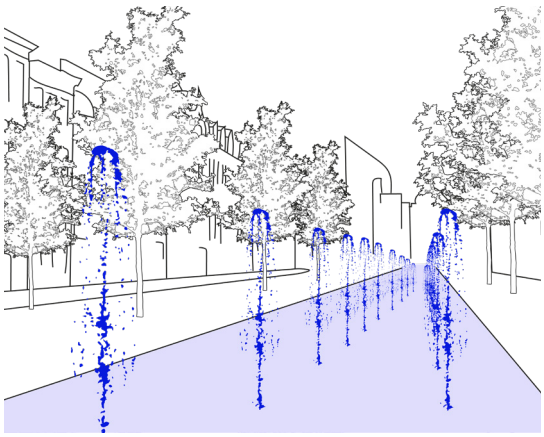
06.4 Awareness

A1. Signs

Signs can display the history and other information about a historical location, such as the risk of flooding or water logging.

Awareness	●	●	○
Water management	○	○	○
Climate change			
Rainwater	○	○	○
Heat	○	○	○
Drought	○	○	○

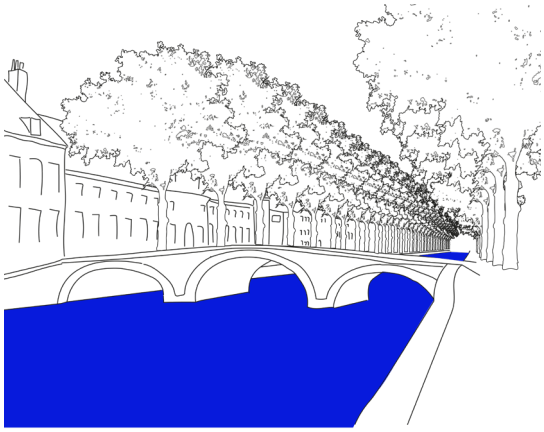
A2. Fountains



Fountains contain water, which evaporates and cools the air. Placing these in a location where water once existed pays homage to the old situation.

Awareness	●	●	○
Water management	○	○	○
Climate change			
Rainwater	○	○	○
Heat	●	○	○
Drought	○	○	○

A3. Restore old situation



In the past, there were more waterways in The Hague, restoring them the way they were before shows the history of the city and restores the old water system.

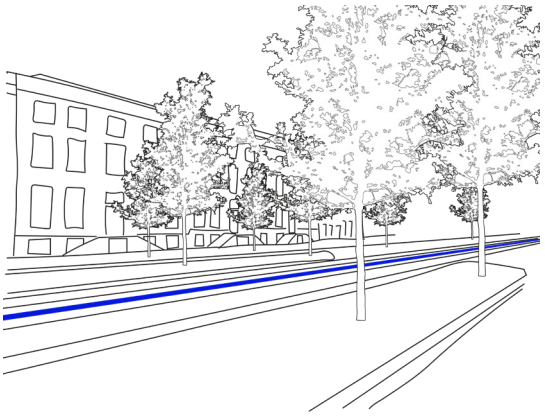
Awareness	●	●	●
Water management	●	●	○
Climate change			
Rainwater	●	●	○
Heat	●	●	○
Drought	○	○	○

A4. Water in different form

Another way to reintroduce water is by designing it in a different form. This way, you still reference the water, but it's not exactly as it was.

Awareness	● ● ○
Water management	● ● ○
Climate change	
Rainwater	● ● ○
Heat	● ○ ○
Drought	○ ○ ○

A5. Gutter



A gutter recalls a past where water was present while also ensuring that rainwater does not directly enter the sewer system.

Awareness	● ● ○
Water management	● ● ●
Climate change	
Rainwater	● ● ●
Heat	○ ○ ○
Drought	○ ○ ○

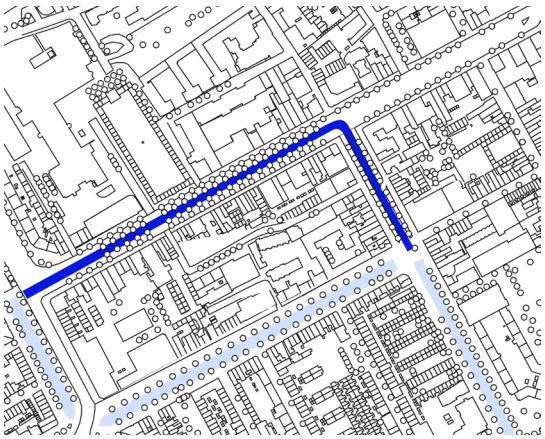
A6. Materialization

With a certain materialization, reference can be made to the old situation. For example, with pavement or a landscaping plan.

Awareness	● ○ ○
Water management	○ ○ ○
Climate change	
Rainwater	○ ○ ○
Heat	○ ○ ○
Drought	○ ○ ○

06.5
Water Management

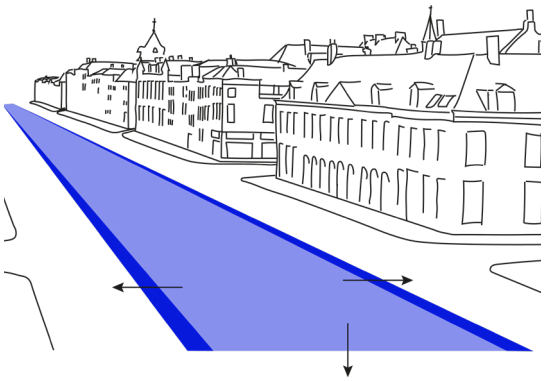
B1. New connection



Increasing the pumping capacity is only possible if the main drainage system is enlarged. This can be done by making new waterways which reduce vulnerability and increase storage.

Awareness	● ● ○
Water management	● ● ●
Climate change	
Rainwater	● ● ○
Heat	● ○ ○
Drought	○ ○ ○

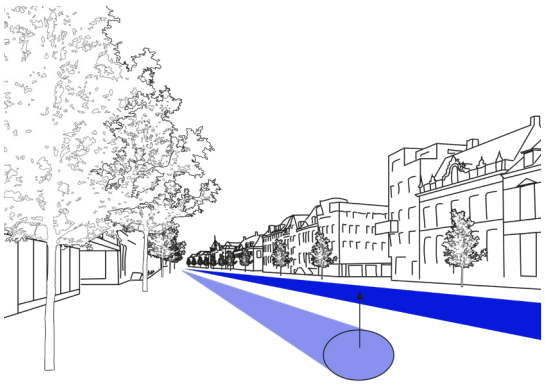
B2. Expanding waterways



Increasing the pumping capacity is only possible if the main drainage system is also enlarged. Another way to do this is by widening or deepening existing waterways.

Awareness	○ ○ ○
Water management	● ● ●
Climate change	
Rainwater	● ● ○
Heat	● ○ ○
Drought	○ ○ ○

B3. Digging up culverts

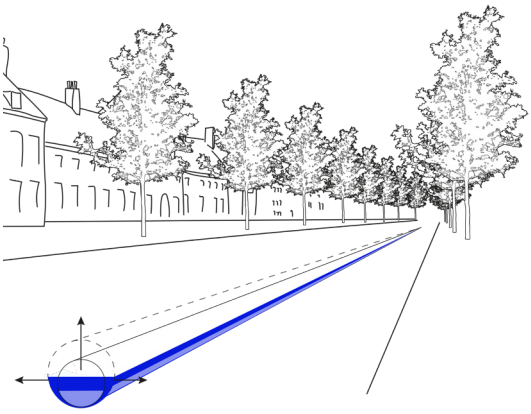


From the analysis of the boezem system it was found that many waterways now lie underground as culverts. Digging these up can increase the drainage capacity.

Awareness	● ● ○
Water management	● ● ●
Climate change	
Rainwater	● ● ○
Heat	● ○ ○
Drought	○ ○ ○

Increasing the capacity of the sewer system of The Hague will mean that there is more storage for rainwater, which will prevent waterlogging.

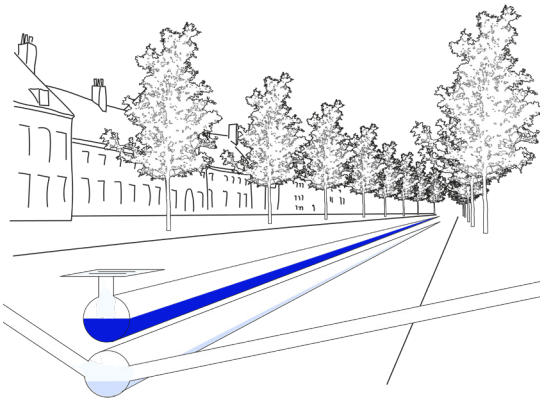
Awareness	○	○	○
Water management	●	●	○
Climate change			
Rainwater	●	●	○
Heat	○	○	○
Drought	○	○	○



B4. Increasing sewer capacity

A separated sewer system increases rainwater storage and prevents relatively clean water from mixing with wastewater. Discharge to surface water is less harmful to water quality.

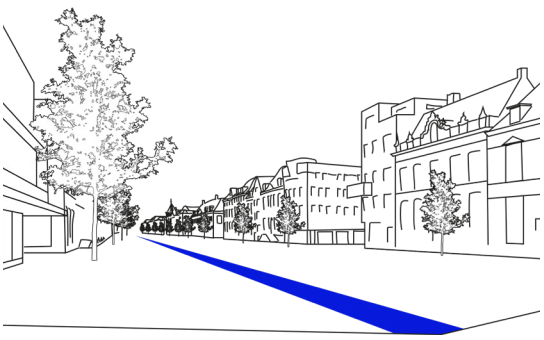
Awareness	○	○	○
Water management	●	●	○
Climate change			
Rainwater	●	●	○
Heat	○	○	○
Drought	○	○	○



B5. Rainwater sewer

A gutter or the inclination of a road can make sure that rainwater does not go directly into the sewer system and thus provide more storage during heavy rainfall.

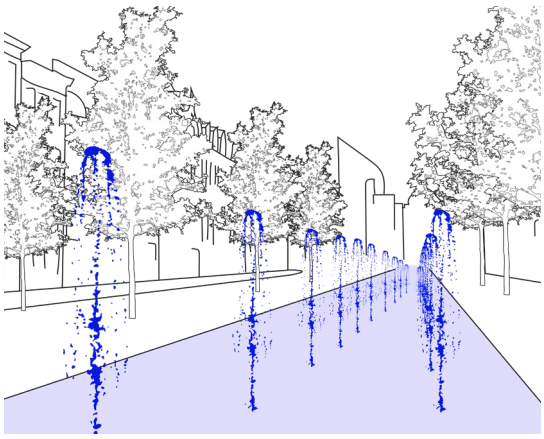
Awareness	●	●	○
Water management	●	●	●
Climate change			
Rainwater	●	●	●
Heat	○	○	○
Drought	○	○	○



B6. Incliantion of road

06.6
Climate Change - Heat

C1. Water elements



Fountains contain water, which evaporates and cools the air. Smaller fountains in the streets wet the surface locally and invite play.

Awareness	●	●	○
Water management	○	○	○
Climate change			
Rainwater	○	○	○
Heat	●	○	○
Drought	○	○	○

C2. Shade elements

The placement of shade elements such as canvas cloths or pergolas provides flexible shading solutions, primarily resulting in a decrease in perceived temperature.

Awareness	○	○	○
Water management	○	○	○
Climate change			
Rainwater	○	○	○
Heat	●	●	○
Drought	○	○	○

C3. Trees

Trees cool by providing shade and evaporating groundwater. The size, tree species, and location are strongly influential. Some precipitation remains on the leaves.

Awareness	○	○	○
Water management	○	○	○
Climate change			
Rainwater	●	○	○
Heat	●	●	●
Drought	○	○	○

06.7
Climate Change - Drought

C4. Removing pavement

Water falling on non-paved surfaces infiltrates the soil, thus combating drought. During heavy rain, water doesn't have time to infiltrate the soil.

Awareness	○ ○ ○
Water management	○ ○ ○
Climate change	
Rainwater	○ ○ ○
Heat	○ ○ ○
Drought	● ○ ○

C5. Infiltration basin

A wadi or other unpaved infiltration basin can provide storage for rainwater. Depending on its size, more or less water can be stored in the ground.

Awareness	● ○ ○
Water management	● ● ○
Climate change	
Rainwater	● ● ○
Heat	○ ○ ○
Drought	● ● ○

C6. Permeable paving

Permeable paving can let through water, infiltrating the soil, thus combating drought.

Awareness	○ ○ ○
Water management	○ ○ ○
Climate change	
Rainwater	○ ○ ○
Heat	○ ○ ○
Drought	● ○ ○

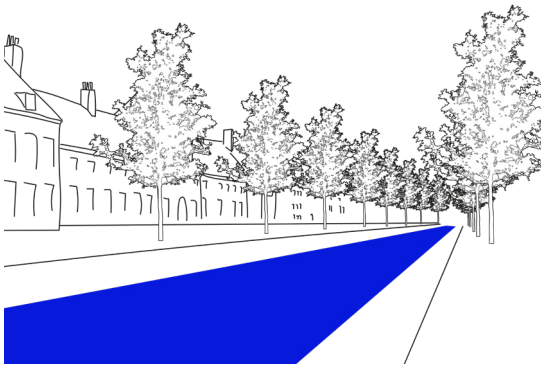
06.8
Climate Change - Water

C7. Infiltration basin

A wadi or other unpaved infiltration basin can provide storage for rainwater. Depending on its size, more or less water can be stored in the ground

Awareness	● ○ ○
Water management	● ● ○
Climate change	
Rainwater	● ● ○
Heat	○ ○ ○
Drought	● ● ○

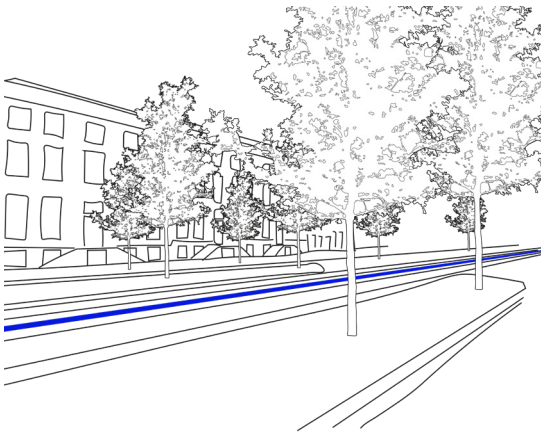
C8. Surface water



More surface water is beneficial for the amount of rainwater that can be stored. The possible rise in the water level through controlled discharge determines the storage.

Awareness	● ● ○
Water management	● ● ○
Climate change	
Rainwater	● ● ○
Heat	● ○ ○
Drought	○ ○ ○

C9. Gutter



A gutter or the inclination of a road can make sure that rainwater does not go directly into the sewer system and thus provide more storage during heavy rainfall.

Awareness	● ● ○
Water management	● ● ●
Climate change	
Rainwater	● ● ●
Heat	○ ○ ○
Drought	○ ○ ○

06.9
Choosing a Location

To find the possible locations, where current problems exist, a flowchart has been made. The flowchart incorporates locations identified in Chapter 3. These represent key waterways and influential processes that significantly impact The Hague's water system.

To identify possible design locations, information from Chapters 4 and 5 was utilized. These chapters have highlighted challenges and potential future problems concerning the water system and climate change. The goal is to create a design that restores water heritage, and improves the water system and climate adaptation.

The questions that were formulated aim to find these locations are shown in the flowchart. For each site, the question was posed: Is there a problem at this location? The problem can either relate to water management or climate change. For instance, Chapter 4 revealed that much of the Verversingskanaal suffers from low capacity.

For the processes the question was asked how this development is currently viewed. For example, a certain process like filling in the canals, which was done to combat the stench and enhance the city, is something that would not be done today with the current knowledge available. An image of this can be seen in Figure 6.1, depicting the filling of the Loosduinse Vaart.

Figure 6.1. Loosduinse Vaart ten tijde van de demping (Dienst voor de Stadsontwikkeling, ca. 1932)

Sites

- Slotgracht & Hofvijver
- Haagse Beek & Bossloot
- Haagvliet & Spui
- Schenk
- Singelgracht
- Loosduinse Vaart
- Het Kanaal
- Verversingskanaal
- Zanderijvaarten
- Scheveningse Haven
- Laakkanaal

Processes

- Trekschuiten
- Peat extraction
- Reclaiming lakes
- Drinking water from the dunes
- Filling in canals
- Sewer system

Is there a problem on this site?

No

- Slotgracht & Hofvijver
- Haagse Beek
- Schenk
- Het Kanaal
- Scheveningse Haven
- Laakkanaal

Do nothing

Yes

- Bossloot
- Haagvliet & Spui
- Singelgracht
- Loosduinse Vaart
- Verversings-kanaal
- Zanderij-vaarten

How do we view this development?

Bad

- Peat extraction
- Reclaiming lakes
- Filling in canals

Good

- Trekschuiten
- Drinking water from the dunes
- Sewer system

Do nothing

Possible design locations

- Bossloot
- Haagvliet & Spui
- Singelgracht
- Loosduinse Vaart
- Verversingskanaal
- Zanderijvaarten
- Peat extraction
- Reclaiming lakes
- Filling in canals

06.10
Design Locations

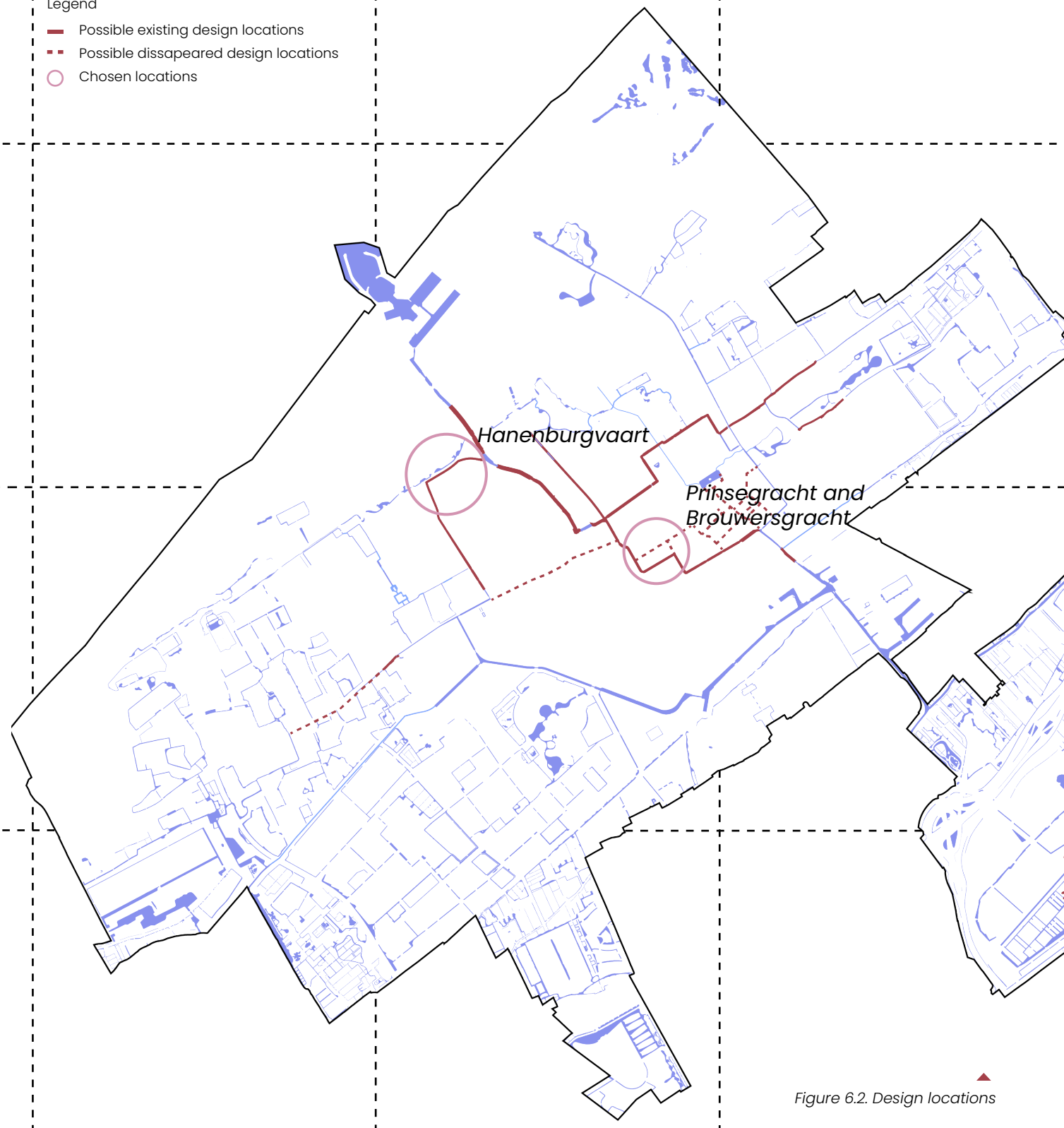


Figure 6.2. Design locations

Figure 6.2 shows the chosen design locations, a site and a process, for which two designs will be developed. It is visible that these two locations lie in different areas. The first location is the Prinsegracht and Brouwersgracht, which are filled in canals and lie within the nationally protected cityscape of the center. The second location is the Hanenburgvaart, which was a zanderijvaart and now lies within the municipally protected cityscape of Sportlaan-Segbroeklaan and the surrounding area. Both locations lie withing protected cityscapes but one lies in the center and the other lies in a residential area.

These sites have been chosen because they are very different, each presenting unique challenges that the designs will address. The surroundings of the Prinsegracht and Brouwersgracht remain intact, however the water has disappeared entirely. At the Hanenburgvaart the surroundings have completely changed and currently, the waterway is underground due to the significant changes of the surroundings. So the first location has its surroundings intact but the water is gone, and the second location has the waterway still intact but the surroundings have drastically changed. Thus, these locations require distinct approaches.

Besides the fact that both sites are different, these locations are also significant because the municipality has expressed interest in revitalizing the Brouwersgracht, and potentially the Prinsegracht, while the waterboard would like to see the Hanenburgvaart excavated. Selecting these sites means that the designs will be of greater relevance.

07
Design Location I

07.1 Introduction

This chapter goes into the design of the first location. First an analysis was made to better understand the location, followed by an assessment to evaluate the current state of the area. Next the history of the site is explained and this is used to define the heritage values. These insights are then combined in the final design, which is further explained with details, sections and visualizations.

07.2
Analysis of the Prinsegracht and Brouwersgracht

The first location is at the filled in canals of the Prinsegracht and Brouwersgracht. These are located within the Singelgracht in the city center. Both streets have a wide profile due to the presence of former waterways. This means that these streets are very suitable for traffic and public transport. Both streets have infrastructure for buses and trams. Additionally, both streets are designed for speeds of up to 50 km/h.

The municipality of The Hague is working on creating a less traffic-heavy city center and thus has an ongoing task concerning mobility and cycling. Currently, there is already a reduced amount of traffic possible in the center. However, cars are still dominant in the center of The Hague. Prinsegracht and Brouwersgracht serve as local access roads, and the Prinsegracht is also a main route in the city center that passes several parking lots (MVRDV, 2020).

The water system on this location is completely gone. In both streets there is still a combined sewer system, so the rainwater that falls on the street goes directly into the sewer. However during heavy rainfall waterlogging still happens. Figure 7.3 illustrates that many canals were filled in, resulting in the loss of significant storage capacity.

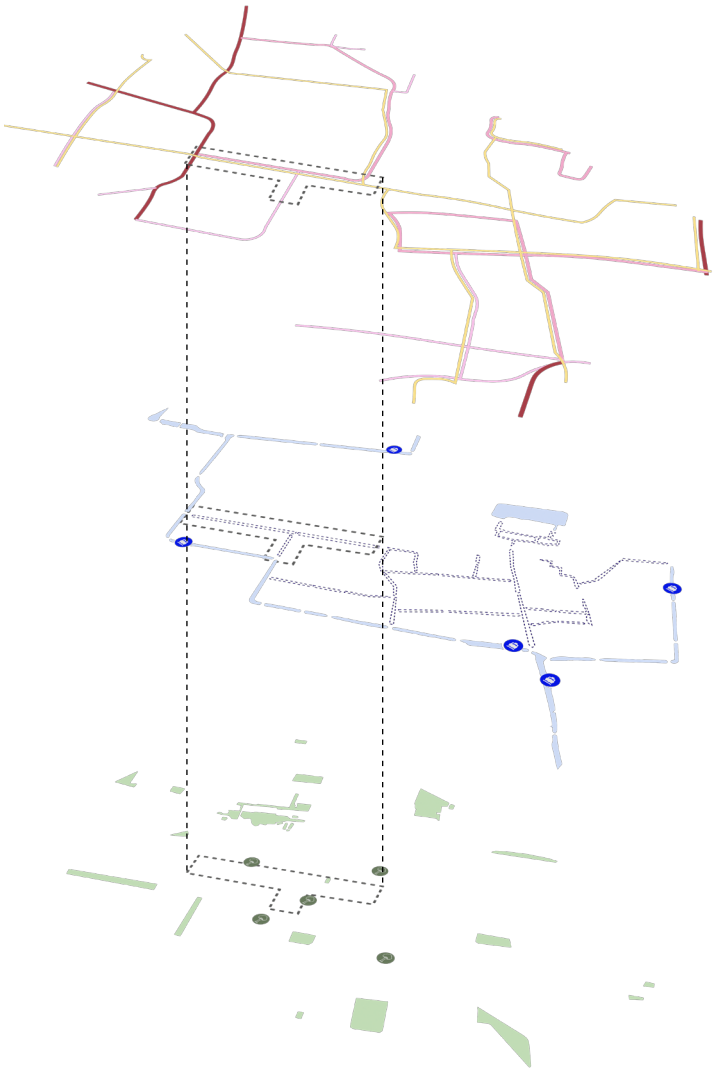
The center of The Hague includes several parks and green squares, such as the greenery along the Lange Voorhout and the publicly accessible Palace Garden. Notably, most of these green public spaces are located in the northern part of the city center (sand versus peat). In the southern part of the city center, large parts are paved, and in many places, the scarce public space is taken up by car traffic and parking. The area does contain several smaller green spaces, such as the typical ''Haagse hofjes'', but these are often only partially accessible (MVRDV, 2020).

Figure 7.1. Prinsegracht.

Figure 7.2. Brouwersgracht.

Considering the location with the same criteria used in Chapter 6, it becomes clear that it scores low on most aspects. The streets are not part of the water system anymore and now face challenges in handling heavy rainfall. Additionally, they retain heat and feature a considerable amount of pavement. Although the water is no longer present, traces of its history remain evident in the street names and broad profiles.

Awareness	● ○ ○
Water management	○ ○ ○
Climate change	
Rainwater	○ ○ ○
Heat	● ○ ○
Drought	○ ○ ○



Infrastructure

- Main roads
- Neighborhood access roads
- Main routes city center
- Main bicycle routes

Water

- Existing water
- Filled in canals
- Mooring place

Green

- City parks and gardens
- Haagse hofjes

Figure 7.3. Spatial analysis Prinsegracht, Brouwersgracht and surrounding area.

07.3
History of the Prinsegracht and Brouwersgracht

In 1643, at the initiative of the city council, the Prinsegracht was constructed between the western Singelgracht and the then Groenmarkt at the end of the Lutherse Burgwal. The Groenmarkt was transformed into the current Grote Markt after the demolition of a former burnt-out monastery in the area. The intention behind this transformation was twofold: to promote the local market and provide a better connection to the Westland for the supply of vegetables and fruit, and to create a location for merchants of some prestige, akin to the successful Amsterdam canal belt (Monumentenzorg Den Haag, 1994). It was supposed to be a chic canal with beautiful and large houses. It was named after Stadtholder Frederick Henry, Prince of Orange (Haags Historisch Museum et al., n.d.).

Initially, this endeavor met only partial success, and in 1649 the Prinsegracht beyond the concurrently constructed Brouwersgracht (Figure 7.4) was scarcely developed. It was not until the heyday of the Dutch Republic in the second half of the 17th century that significant development occurred. The wide

Figure 7.4. Brouwersgracht (ca. 1900).

Figure 7.5. Prinsegracht (Besoet, ca. 1755).

Singelgrachten allowed large areas within the city to remain undeveloped or sparsely inhabited despite gradual growth throughout the 17th and 18th centuries, extending well into the 19th century (Monumentenzorg Den Haag, 1994).

The Grote Markt marked the end of the broad Prinsegracht. However, around 1881 the first part of the Prinsegracht was filled in between the Grote Markt and the Brouwersgracht (Figure 7.7), and around 1902 the Brouwersgracht and the rest of the Prinsegracht followed. The canals were a persistent issue in the bustling and densely populated city. Their role as waterways for transporting goods gradually diminished, accompanied by foul odors and disease outbreaks. Furthermore, vehicular traffic posed increasing spatial constraints (Haags Historisch Museum et al., n.d.). Concurrently, market activities expanded towards the Prinsegracht until the construction of tram lines and a new market area at Herman Costerstraat outside the city center put an end to this situation (circa 1920) (Monumentenzorg Den Haag, 1994).

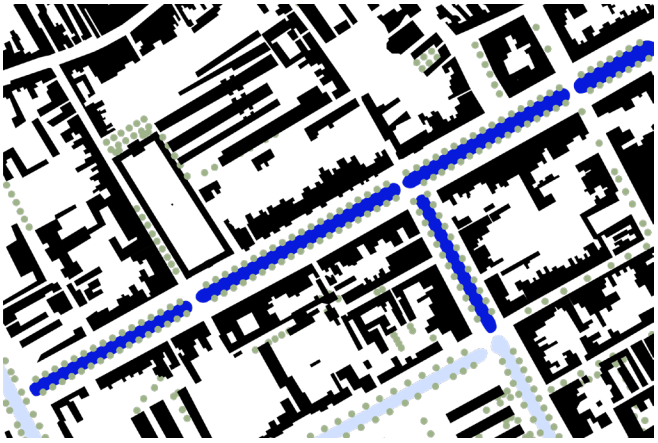


Figure 7.6. Situation around 1868 (Based on Haagse kaart, n.d.).

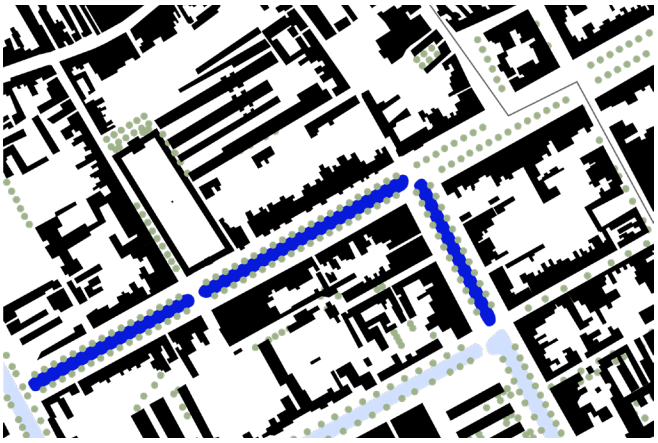


Figure 7.7. Situation around 1881 (Based on Haagse kaart, n.d.).

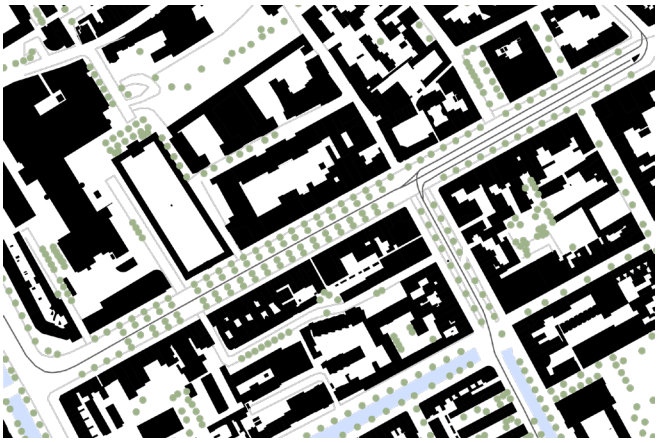


Figure 7.8. Situation in 2024 (Based on Haagse kaart, n.d.).

This district stands out from the older areas due to its more linear street layout, absence of notable public spaces and buildings, and, compared to the surroundings of the Sint Jacobskerk, wider streets. This wider street pattern is especially noticeable at the Prinsegracht and Brouwersgracht because of the filled in canals, visible in Figure 7.8. Due to this broader street width, tree plantations are more prevalent here, often marking the paths of the former canals. At both the Brouwersgracht and Prinsegracht, tram tracks now occupy the former waterways (Monumentenzorg Den Haag, 1994).

07.4
Heritage Values

To design with history, it is essential to understand the values inherent to a place. This can be achieved by assessing the site as a whole or by examining its individual components. By doing so, the crucial aspects of a site become apparent, guiding decisions on what to restore and how to enhance its overall value through design interventions. This assessment encompasses both the historical situation and the current state of the site.

Historic situation

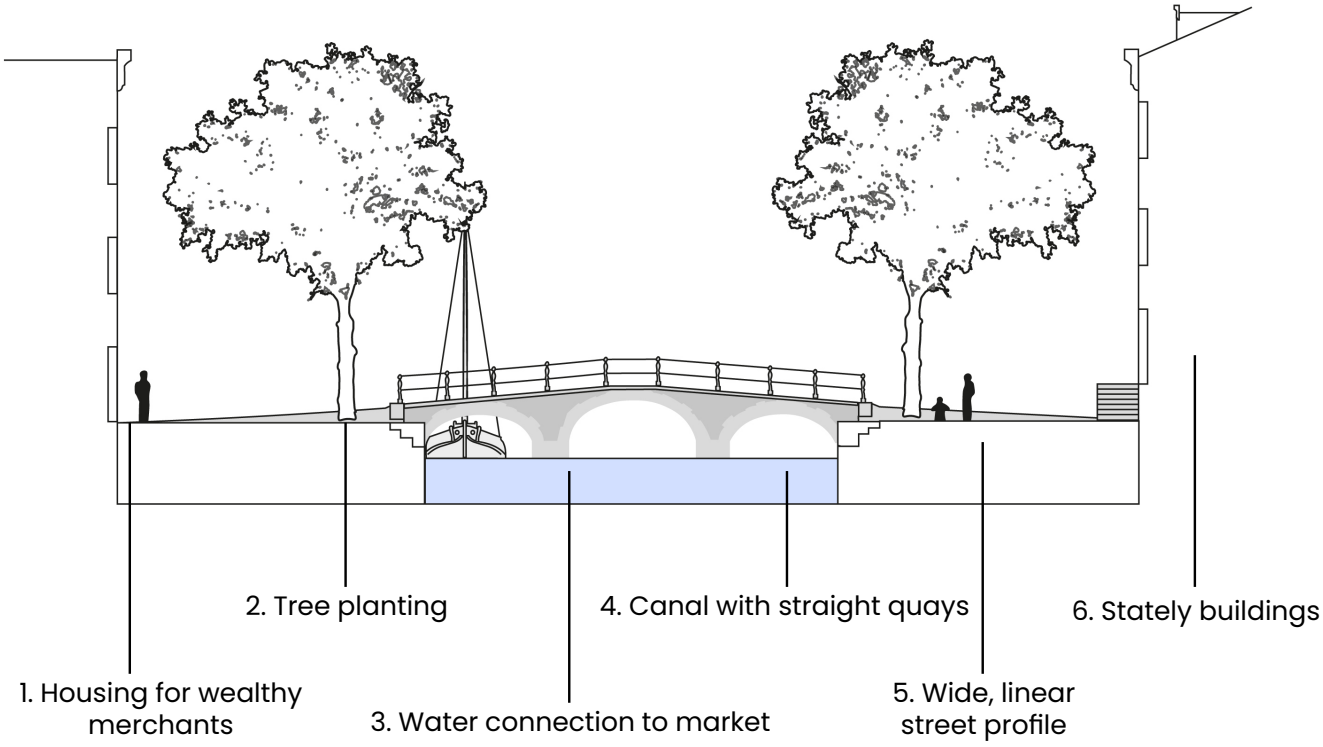
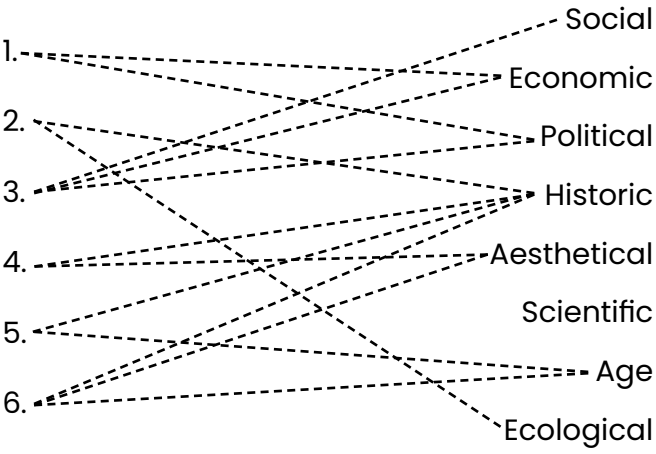
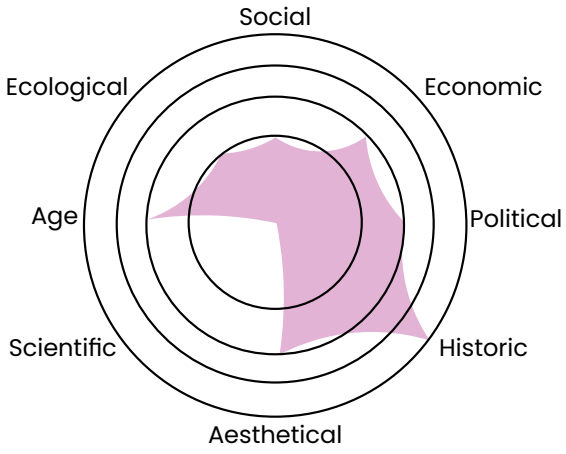


Figure 7.9. Historic situation





Through this analysis, it is evident that many values have been lost over time, with the loss of the waterway being particularly impactful. While the current situation retains some important features such as historic buildings and a wide, linear street profile, which contribute to the streets' historical and age value, it generally scores lower across most aspects.

Current situation

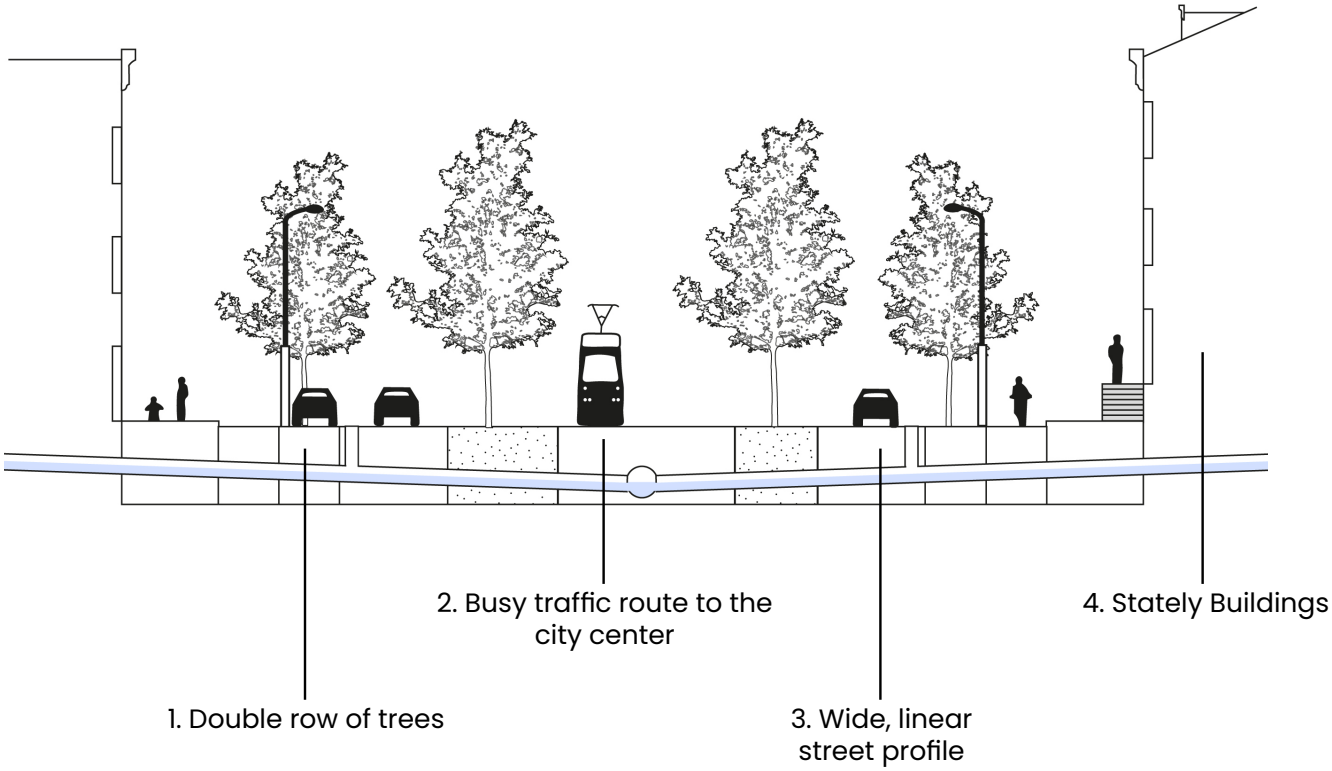
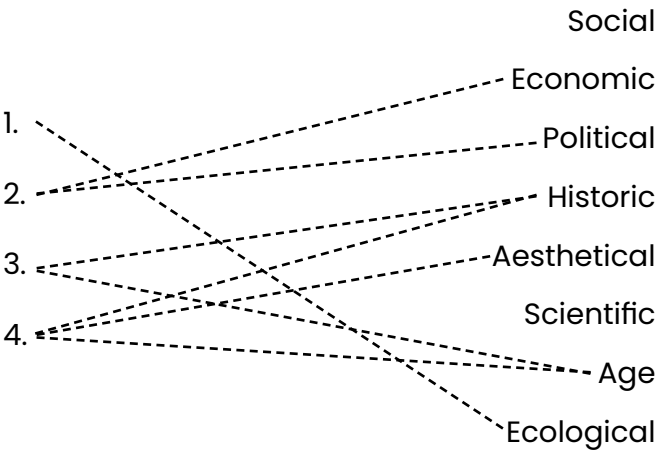
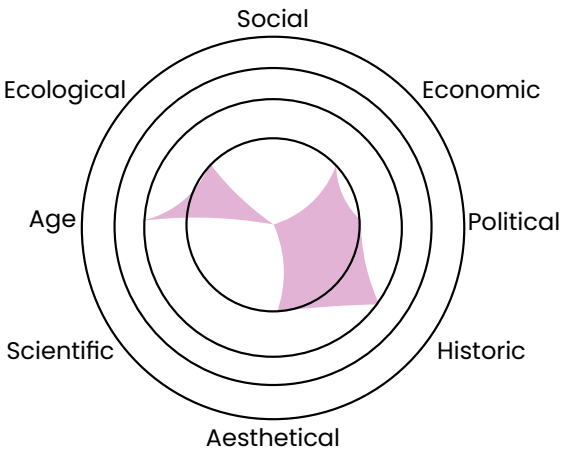


Figure 7.10. Current situation





07.5
Design of the Prinsegracht and Brouwersgracht

The design for the Prinsegracht and Brouwersgracht, visible in Figure 7.13, restores the water connection and raises awareness by giving the water an educational and recreational function, thereby making the site relevant again for the water system and highlighting its importance. A complete restoration was not feasible for this location, but it was possible to reintroduce some of the heritage values.

Awareness
From the analysis it was found that the surroundings of the Prinsegracht and Brouwersgracht are still intact. Due to canals that were once here the street still has a linear, wide profile and stately houses. However, besides that there is not much that can remind people of the water system that once lay within the Singelgrachten.

To make the site relevant again it is necessary to restore the waterway. Due to the street's current usage for traffic, biking, public transport, and pedestrian activities, restoring the location exactly as it was is not feasible. Therefore the design brings back water in a different form [A4]. For the part of the Prinsegracht between the Grote Markt and the Brouwersgracht, where a tram tunnel lies underground, surface water is not feasible. Instead, awareness is raised through a small gutter [A5] in the road that collects rainwater, which then flows to a water playground. This serves as an educational opportunity for citizens and children to learn about the water system of The Hague and its historical significance.

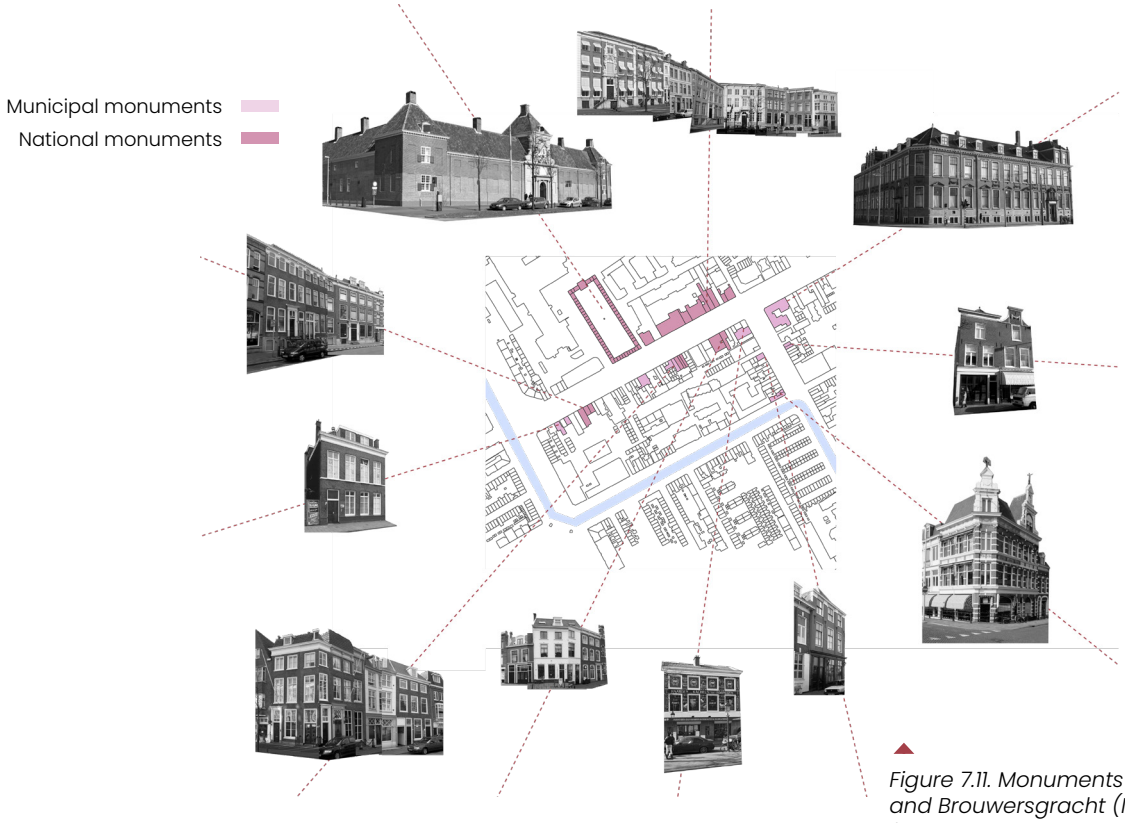


Figure 7.11. Monuments on the Prinsegracht and Brouwersgracht (Images and locations from Monumentenzorg Den Haag, n.d.).

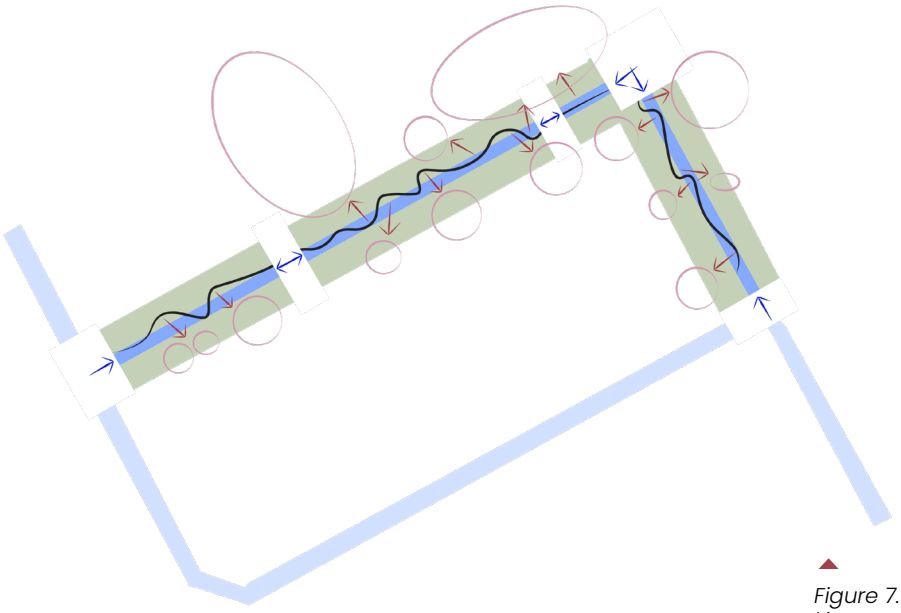


Figure 7.12. Concept for the walking path and viewpoints

Another crucial aspect is enhancing public access to the water and providing recreational opportunities. The design achieves this through numerous viewpoints and a boardwalk that closely follows the water's edge. Given that the design was inspired by the area's history with wealthy merchants, it's unsurprising that there are many municipal and national monuments on both streets (Figure 7.11). To tie back to the design's contextual approach, the path's shape aligns with the locations of these monuments, as shown in Figure 7.12. On the edges of the water and from benches along the path people can sit near the water and enjoy the view. On the quay wall signs [A1] inform people of the history of the site.

Water management

To ensure the site's relevance for the water system, it's crucial that the restored waterway matches the size of the adjacent canals. This prevents creating another bottleneck in the system. This restored connection [B1] would provide extra storage in the city center and reduce the system's vulnerability. Along with the gutter [B6], this measure prevents rainwater from entering the sewer, thereby reducing the risk of sewage overflow into the canals, which could negatively impact water quality.

Climate addaptation

The surrounding area has been designed to mitigate the effects of climate change. To accommodate the canal, one of the tree-lined lanes of the Prinsegracht had to be removed. Eliminating the southernmost tree lane ensures that the remaining ones provide optimal shade. By giving the trees more space they can grow taller and provide more shade [C3].

By choosing for green next to the quay and on the tram track instead of pavement, there is room for water to infiltrate in the ground, thus combating drought [C4]. By choosing a pavement that lets through water this can also help against drought. [C6].

The newly introduced body of water [C8] and gutter [C9] serve as reservoirs for rainwater. This setup prevents waterlogging during heavy rainfall by directing street runoff into these water structures.

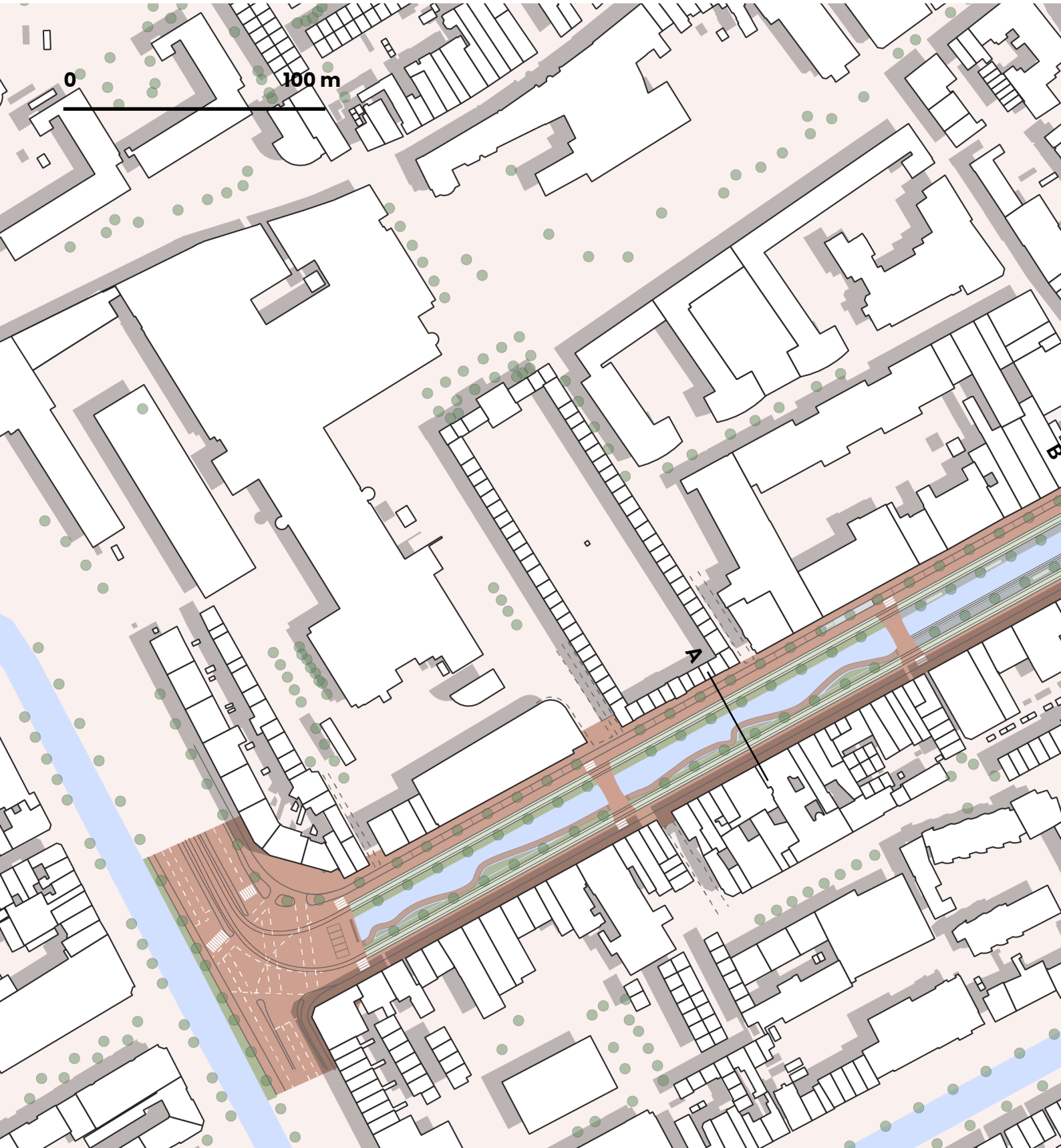
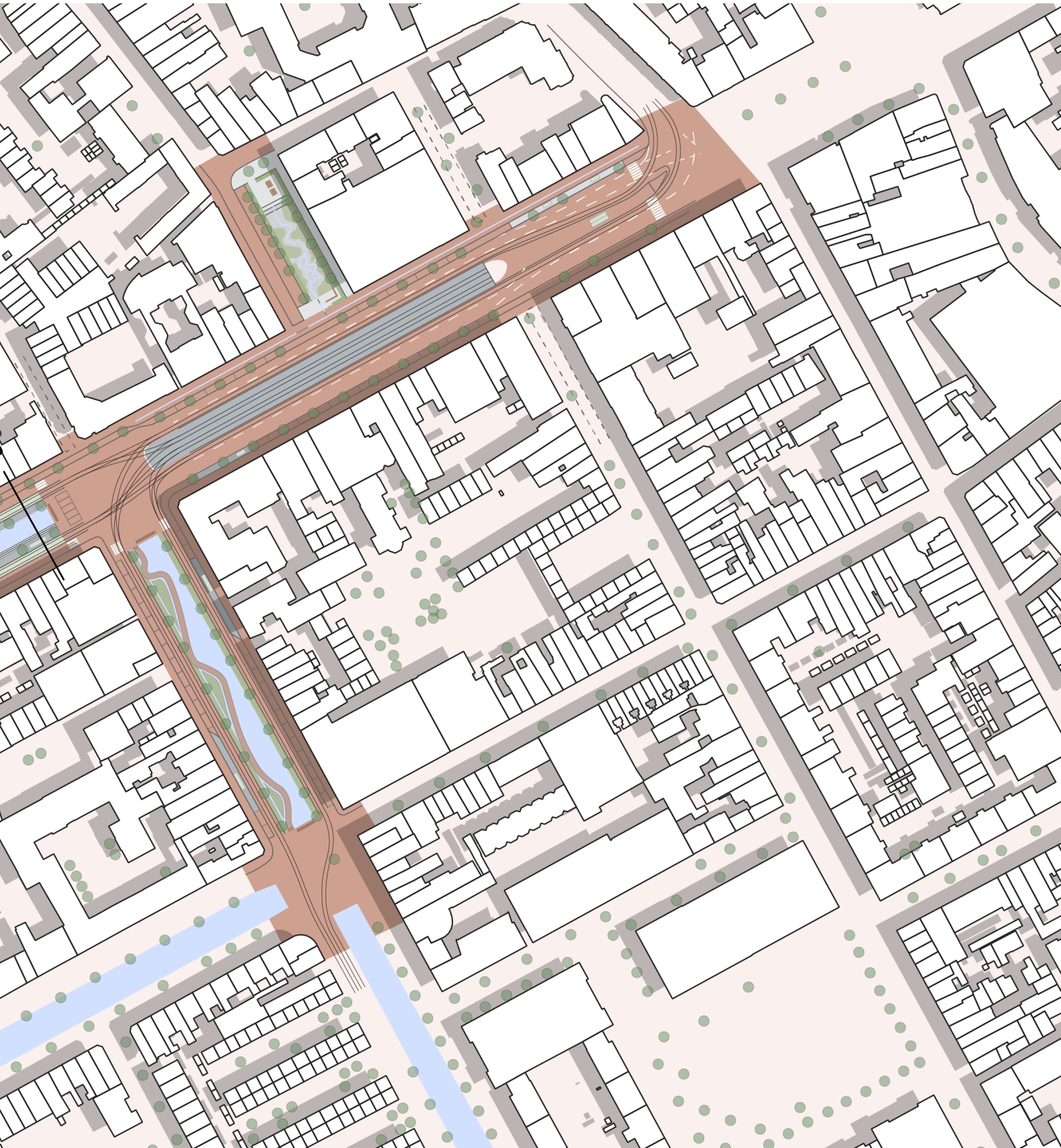

0
100 m
A
B

Figure 7.13. Design for the Prinsegracht and Brouwersgracht



07.6
Design Implications

The design has several important implications for the surrounding areas. When zooming out, it can be seen that it significantly impacts various aspects of the local environment and infrastructure. The design affects the water management, green and recreational spaces, and important traffic routes.

As was mentioned in the analysis most of the green public spaces are located in the northern part of the city center. In the southern part of the city center, large parts are paved, and in many places, the scarce public space is taken up by car traffic and parking. With this design new green public space will be added which provides vital recreational and social spaces for people of all ages. Besides that it also promotes biodiversity and improves the aesthetic appeal of the area.

The new waterway has a great impact on the water system of The Hague. The new connection makes the water system less vulnerable and provides extra storage in te city center. Collecting rainwater in the new waterway and gutter limits rainwater damage and prevents the sewer from overflowing. However it would not make a significant difference for the drainage capacity.

To fit the canal within the current profile, the maximum speed needs to be reduced to 30 km/h, allowing cyclists and cars to share a lane. The Prinsegracht is a neighborhood access road and part of a parking route. Lowering the speed here means the traffic needs to be reduced. This can be achieved by making it impossible to take a route through the center via Jan Hendriklaan (Figure 2,3).

1. Green and recreation
The new green public space offers recreational and social places where people can stroll and rest along the water. It also improves biodiversity.

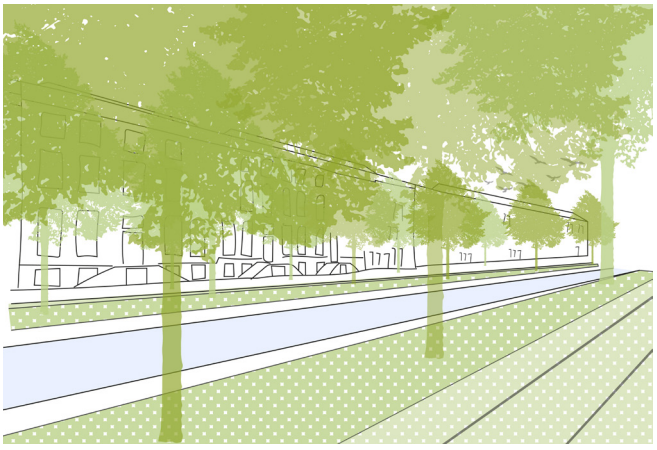


Figure 7.14. New green public spaces

Figure 7.15. New green public spaces

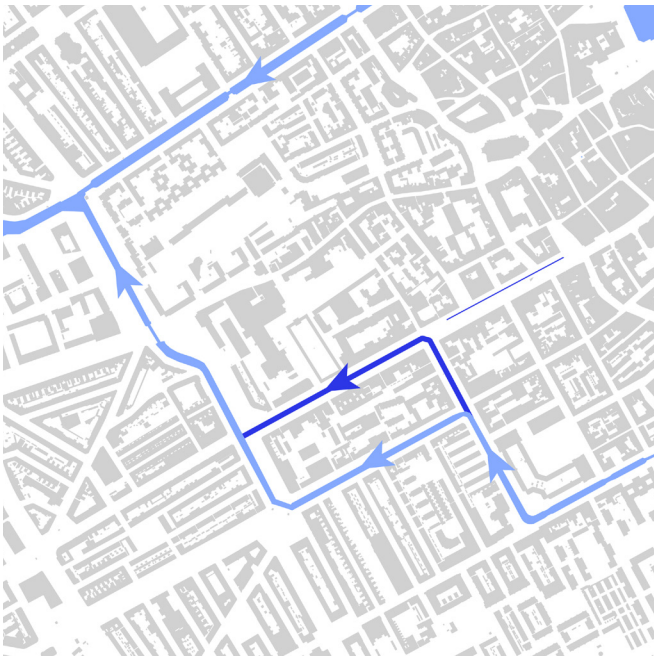


Figure 7.16. New water connection

2. Water system

As can be seen in Figure 7.16 the Prinsegracht and Brouwersgracht will form a new connection, which will decrease vulnerability and provide extra storage.

Figure 7.17. The old water connection restored

Figure 7.18. Adjustment of the traffic circulation

3. Traffic

In Figure 7.18 it is visible that the traffic circulation in the city center will have to be adjusted to accomodate the reduced maximum speed of 30 km/h.

Figure 7.19. Shared car and bike lane

07.7
Sections and Visualizations

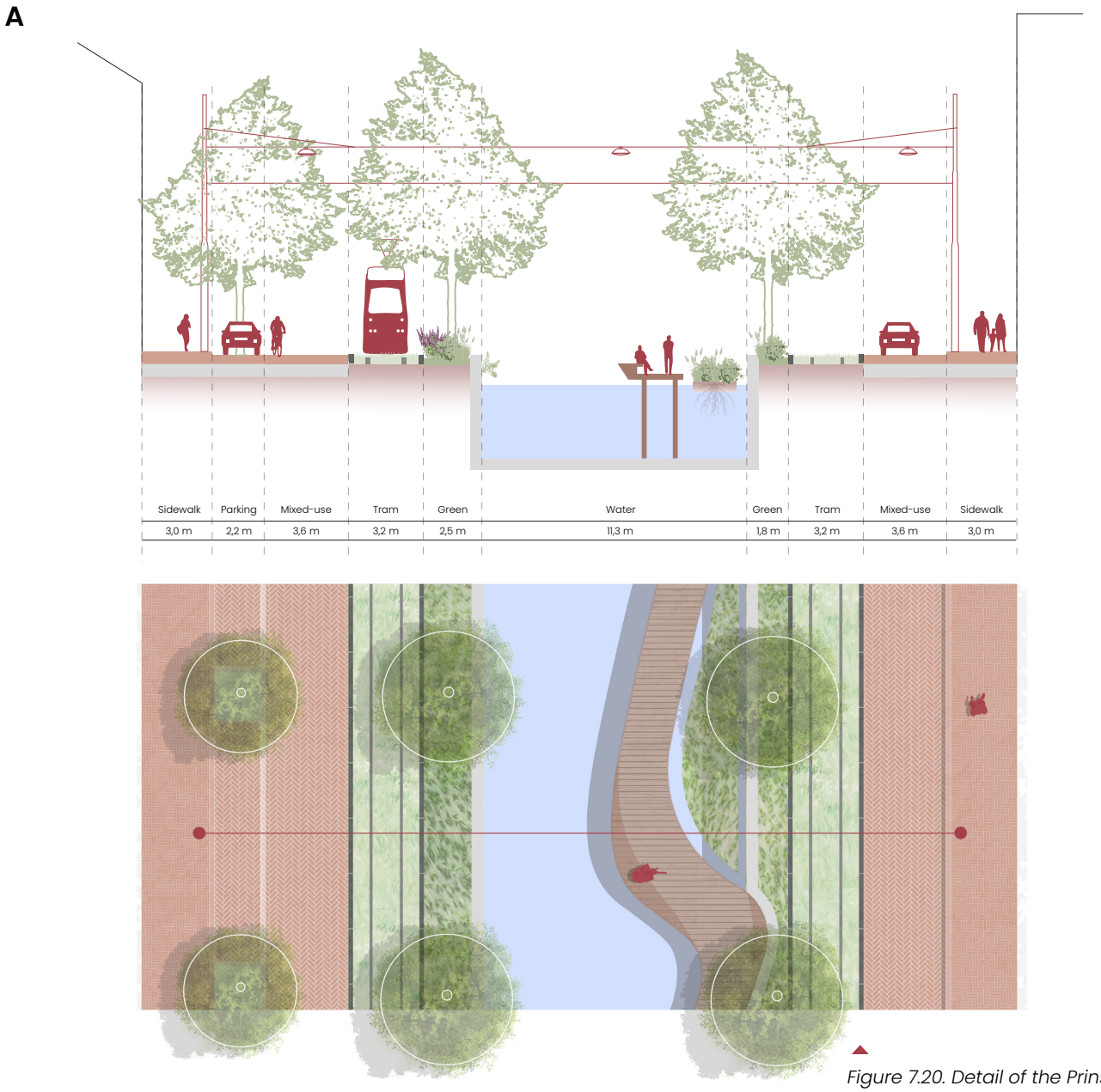


Figure 7.20. Detail of the Prinsegracht

This section and detailed map (Figure 7.20) illustrate a small portion of the Prinsegracht. Here, it is more evident how the design affects the road layout. The most significant change is the reduction of the speed limit to 30 km/h, allowing for a narrower road and eliminating the need for a separate bike lane.

Another important decision was made on parking spaces. Parking spaces will need to be removed on one side of the Prinsegracht to accommodate the necessary width for the waterway. There is a lot of public transportation available, reducing the necessity for cars. To accommodate this shift, a few parking spaces have been added along the edges of the Prinsegracht.

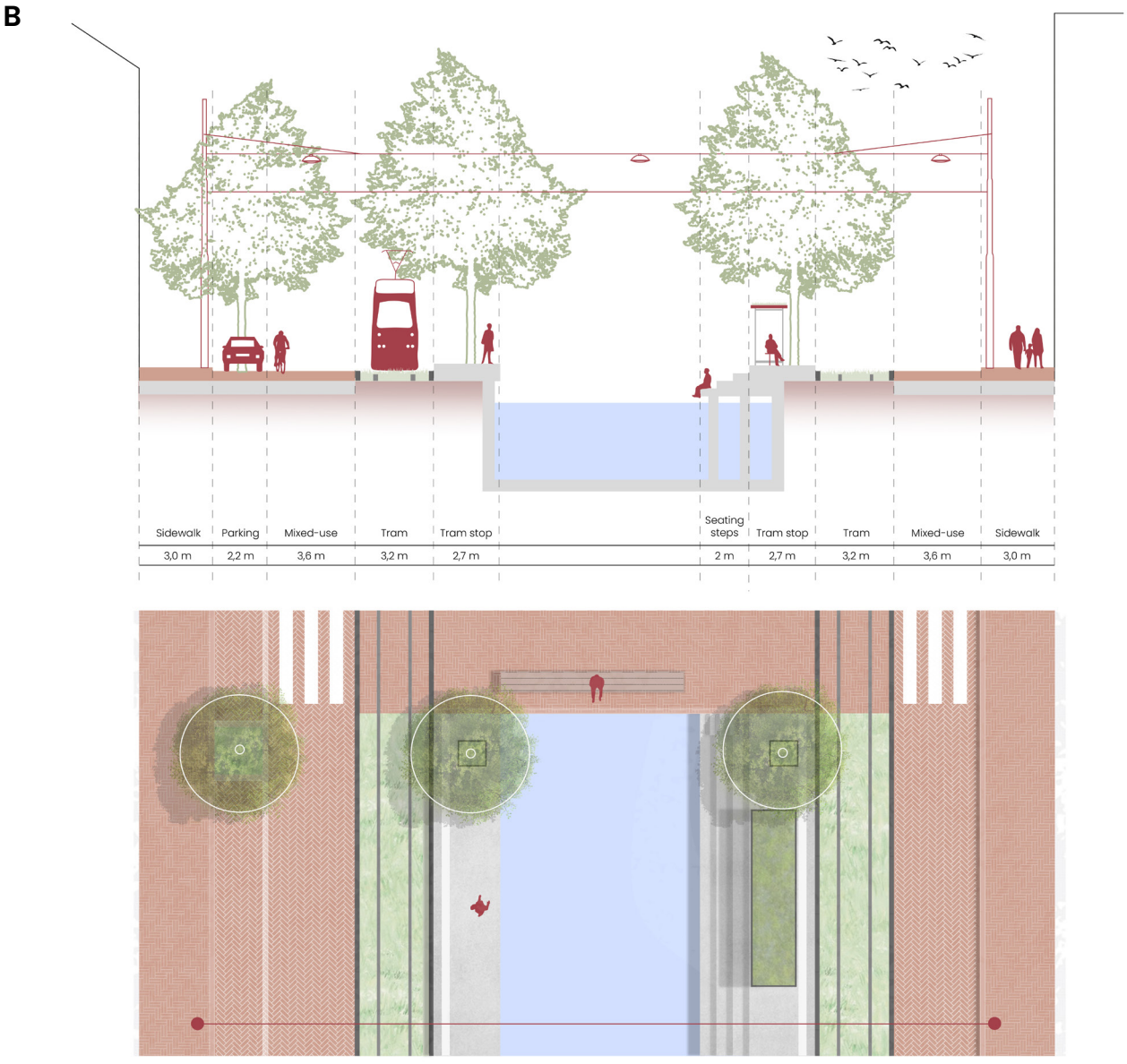


Figure 7.21. Detail of the Prinsegracht

This section and detailed map (Figure 7.21) depict the end of the canal where the tram makes a stop. To ensure that the waterway does not become narrower, the tram stop partially extends over the water. On the south side, there are stairs leading down to the water, enhancing accessibility and providing a resting spot for tram passengers.

These stairs are a reference to the historical design, as there were once stairs alongside the water for accessing boats that would dock here to sell their goods. At the end of the canal, there is a bench offering another view point overlooking the entire waterway.

Figure 7.22. Visualization of the path along the canal

The path and floating gardens

The path follows the monuments on the sides of the road which make it a varied walk. Where the path goes slightly into the side of the quay walls a bench is placed where people can enjoy the water and the view of the monuments. On the sides of the quay wall information signs are placed that tell the history of the canal and the narratives connected to it. These can be part of a larger route showing The Hague's water heritage.

Where the path goes away from the side there is a floating garden between the path and the quay. These improve the biodiversity and give a nice view of the benches on the outside of the path.

Figure 7.23. Visualization of the gutter

The gutter

The visualization in Figure 7.23 shows how the gutter will look. It is a small strip of water which will flow into a water playground. This playground represents the water system of The Hague as it branches out and has some smaller and wider parts. The flowing water invites children to play. They can use boats or floating objects and make them follow the stream.

In this area it was not possible to make any big changes to the street profile. The tram tunnel in the middle takes up a lot of space and here many trams and buses pass by. Therefore it is safer to keep the tram and bus lane and a separate lane for cars and bikes.

07.8
Detail and Planting

Figure 7.24 shows a detail of the boardwalk, floatland and the quay wall. The designed area will provide a larger green area then there was before. A visit to the current canals in The Hague revealed that one of the plants that grows here a lot is the butterfly bush. To further increase biodiversity native plants have been chosen that are suitable for public green spaces and are attractive to wildlife. These plants have a high nectar value and/or pollen value. Furthermore, some native plants for birds can been added.

The floatlands in between the path and the quay wall are made from floating mats of willow branches. The plants need to root in the water, so the bottom must have an open structure. These floatlands offer a resting place and nesting area for water birds. They also have a positive effect on macrofauna and fish stocks (Keizer-Vlek & Verdonschot, 2019).

For the trees along the water the king lime was chosen. This tree has a relation with the royal Dutch family making it an appropriate tree for the Prinsegracht.

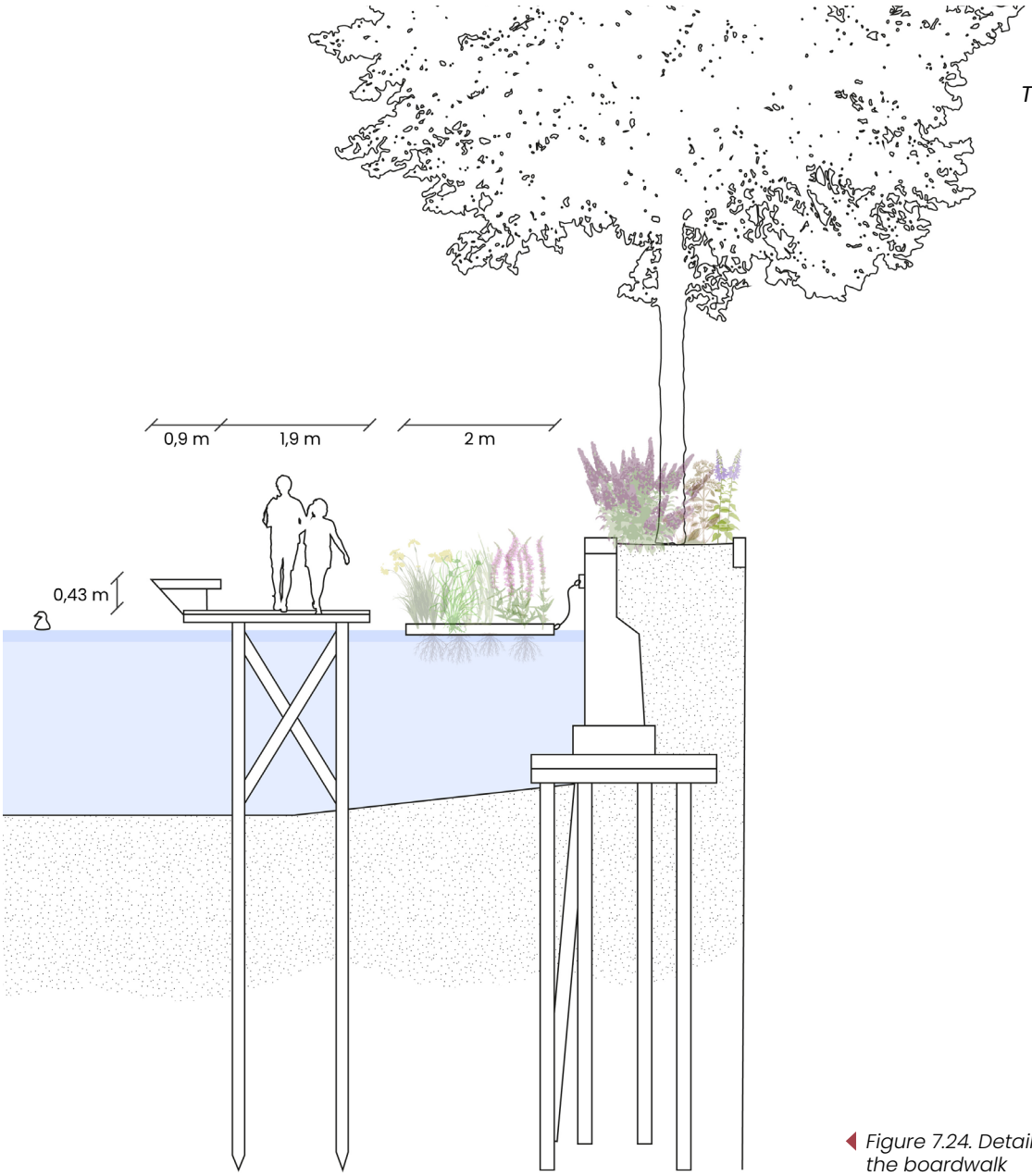


Figure 7.24. Detail of the quay wall and the boardwalk

Floatlands

Iris pseudacorus
Yellow iris

Acorus calamus
Sweet flag

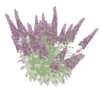
Lythrum salicaria
Purple loosestrife

Alisma plantago-aquatica
European water-plantain

Carex bohemica
Bohemian sedge

Glyceria maxima
Great manna grass

Quay plants



Buddleja davidii
Butterfly bush

Campanula rapunculoides
Creeping bellflower

Armeria maritima
Thrift

Geranium sanguineum
Bloody cranesbill

Althaea officinalis
Marsh mallow

Hypericum perforatum
St John's wort

07.9 Conclusion

The interventions
The main goal of the design for the Prinsegracht and Brouwersgracht was to make it relevant again for the water system, raising awareness and improving climate adaptation. This meant that first the historic connection needed to be restored. By reintroducing water and enhancing public access, the design raises awareness of the historical significance of these waterways, making them relevant again in the context of The Hague's water system. While a complete restoration was not possible, the design restores key heritage values.

Through interventions, such as rainwater collection systems and climate-adaptive measures, the design also addresses contemporary challenges, such as climate change and urbanization. By reintroducing water and adding more green infrastructure, the design mitigates the impact of drought and waterlogging, contributing to the overall resilience of the urban landscape.

With this design the layout of the street had to be changed completely. Analyzing the site it was found that the speed limit could be reduced to 30 km/h. This creates more space and made the reintroduction of the waterway possible.

Another challenge was making the water accessible. This is done with viewpoints and a boardwalk along the edge of the water. Because the original design was made in combination with the surroundings, the path follows the locations of the monuments found along the streets. On the edges of the water and from benches long the path people can sit near the water and enjoy the view.

Approach to heritage conservation
For the Prinsegracht and Brouwersgracht a combination of approaches. to heritage have been used. By reopening the canal and restoring it to a form close to its historical appearance, this aligns with a more literal interpretation of heritage. The straight quays, reminiscent of the old canal structure, respect the original design and serve as a physical reminder of the past.

By making adjustments to the historical canal through the addition of green spaces, a boardwalk, and seating the site also represents a figurative interpretation of heritage. This aligns with the heritage as factor approach, where heritage is integrated into contemporary urban needs and functions. The historical feature is not just revived, but it is also meets modern requirements and enhances public access to the water. This approach acknowledges the canal's historical importance while making it relevant and functional in today's context.

At last there has also been tried to use the historical narratives. This involves both the landscape's history and the stories of the people connected to it. Where it was not possible to restore the original waterway, I added a gutter to symbolize the presence of water. This figurative reference aligns with the heritage as vector approach, emphasizing the narrative and symbolic aspects of the canal within the urban landscape.

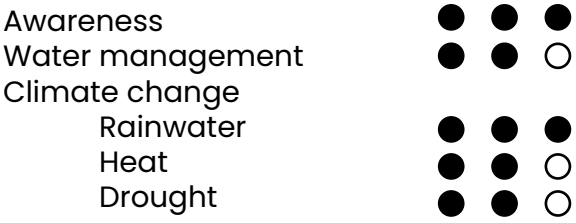
To further connect the community with their heritage, I included signs along the canal that explain different stories about the waterway and the people who have lived and worked around it. This aspect aligns with the heritage as actor approach, which emphasizes the role of community engagement and the importance of intangible heritage.

Assesment of the design
To analyze if the design was successful the site is assessed again for the criteria found in Chapter 6 and for the heritage values. This shows how and if the design honored the sites history while also meeting contemporary needs.

First the design has been scored on the same criteria used in Section 07.1. It can be stated that the design scores high on awareness. The design has brought back the historic waterway which is quite a drastic intervention that you cannot ignore. This will show people the way the street was intended to look and maybe make them realize that there once was a larger system of canals in the historic city of The Hague.

The water management of the site has also greatly improved. It has made the water system less vulnerable and provides extra storage. However in the greater system this would probably not make a very big difference for the drainage capacity which is one of the biggest problems in the water system of the city.

However it is a great impact for limiting rainwater damage as this is collected in the canal or with the gutter. Giving the trees more growing space will make them grow larger and provide more space and the added green can help prevent drought.

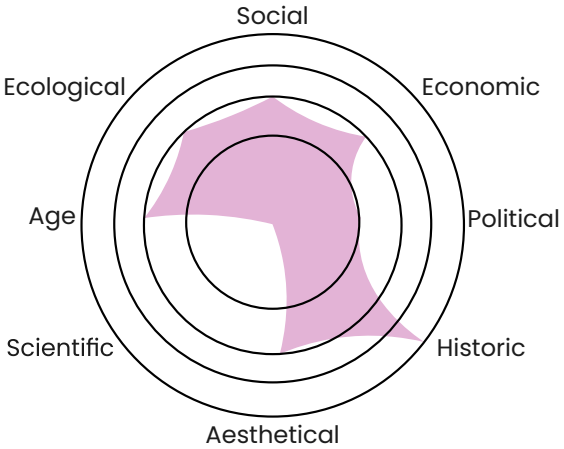


Then to asses if the design has brought back some of the lost heritage values a new analysis of the site has been made. The ecological values have been increased by creating more space for nature. The social values have increased because of the new meeting spaces that were created and the street's new function as a public space, rather than solely for traffic.

The economic values have risen as the design now serves a function that could attract tourists. The political values have remained the same, and this also applies to the scientific and age values.

The historical and aesthetical values have been restored, as there is once again a canal with straight quays and trees on both sides.

In conclusion, it can be said that important lost values have been restored and new values have been added to meet contemporary needs.



08
Design Location II

08.1 Introduction

This chapter goes into the design of the second location. First an analysis was made to better understand the location, followed by an assessment to evaluate the current state of the area. Next the history of the site is explained and this is used to define the heritage values. These insights are then combined in the final design, which is further explained with details, sections and visualizations.

08.2 Analysis of the Hanenburgvaart

The Hanenburgvaart was a waterway that lay right next to the current Hanenburglaan. However, after the reconstruction after the Second World War, this waterway was placed underground in a culvert. This means that the water system is still intact, but the analysis in Chapter 4 revealed a very low capacity.

The reconstruction plan was made by Dudok and an important part of his design was the connecting route, parallel to the coast, between Westland and Wassenaar. This route along the Segbroeklaan and the Sportlaan was used as a structuring element, a 'parkway', which is a landscaped scenic ride (Rijksdienst voor het Cultureel Erfgoed, 2016). This is currently one of the main roads in the city for cars and for bikes.

As can be seen in Figure 8.2 the Hanenburgvaart has disappeared an now lies underground in a culvert. In Dudok's design he did include the waterway and put it right next to the Haagse Beek. As mentioned in Chapter 4 the Haagse Beek is a stream through which groundwater from the dunes flows. In times of drought, water is pumped into the stream.

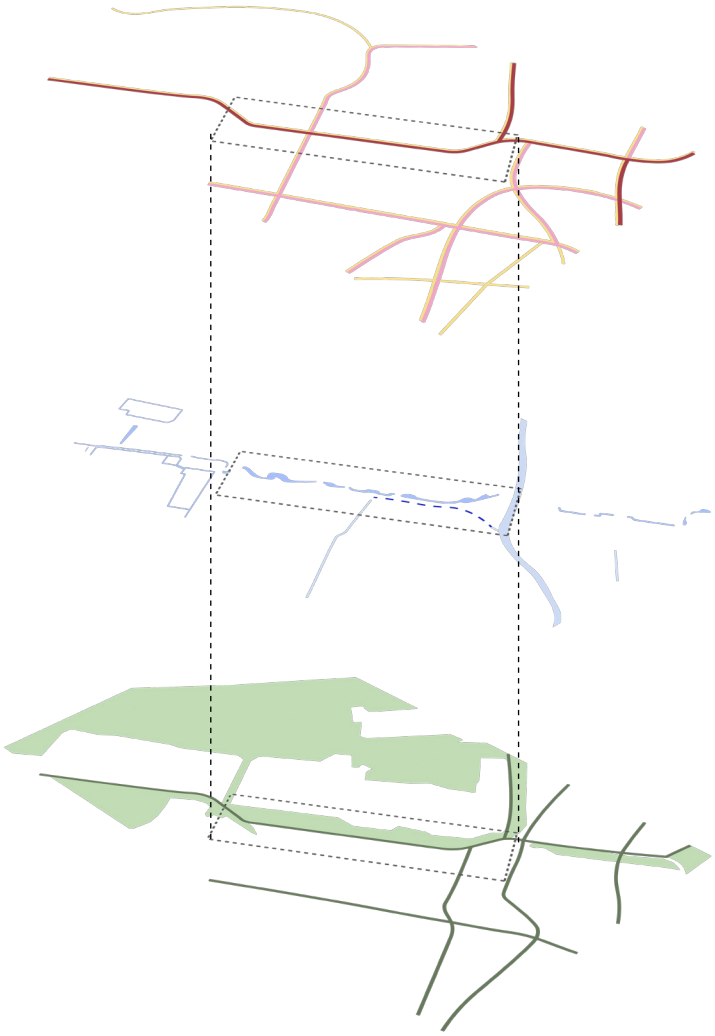
The design location for the Hanenburgvaart currently lies largely within the area of the Haagse Beek. The brook is one of the main continuous green corridors in the city and is part of the main ecological framework of the city. Situated in the western part of The Hague, the Haagse Beek connects various large green areas. In many places, the original brook has been reconstructed, resulting in the disappearance of the original nature (Dienst Stadsbeheer & Hoogheemraadschap van Delfland, 1999). However, around 1999, efforts were made to restore nature. The tidy lawns and banks with sparse vegetation have been replaced in many places by flower-rich hay meadows and nature-friendly banks (Dienst Stadsbeheer, 2003).

Figure 8.1. De Haagse Beek.

Figure 8.2. De Hanenburglaan, on the right the flats under which the Hanenburgvaart now lies (Van Reeken, 2018).

Considering the location with the same criteria used in Chapter 6, it becomes clear that this location scores higher than the first location on most aspects. The area has a lot of green and trees, which work good against heat and drought. The area also has surface water which can retain extra water during heavy rainfall, however there is still some waterlogging on the Segbroeklaan. The water is no longer present above ground and due to the reconstruction there are no traces of its history.

Awareness	○ ○ ○
Water management	● ○ ○
Climate change	
Rainwater	● ● ○
Heat	● ● ○
Drought	● ● ●



Infrastructure

Main roads
Neighborhood access roads
Main bicycle routes

Water

Existing boezem water
Boezem water underground
Polder water

Green

Green main structure of The Hague
Main tree structure

Figure 8.3. Spatial analysis Hanenburgvaart and surrounding area.

08.3 History of the Hanenburgvaart

The Hanenburgvaart, visible on Figure 8.6, originally served as a zanderijvaart, a canal designed for transporting excavated dune sand necessary for urban expansions on peat in the late 19th century (Hilberts, 2015). The canal was given a landscape design with green banks and diverse vegetation (Figure 8.5). However, the onset of the Second World War caused significant changes in the area. With the escalation of Allied threats from the west, Hitler ordered the construction of the Atlantikwall, a vast chain of fortifications and defensive works spanning from Norway to Southern France along the Atlantic coast (Monumentenzorg Den Haag, 2004).

Tank ditches cutting through the city formed important components of this coastal defense, leaving deep marks in the environment and among the population. In The Hague, a total of 135,000 people had to leave their homes. For the construction of the 'Stützpunktgruppe Scheveningen', a tank ditch was dug between Kijkduin and Zorgvliet (Figure 8.7), largely following the route along the Haagse Beek that could be realized within the urban area with relatively little demolition work (Monumentenzorg Den Haag, 2004).

Figure 8.5. Hanenburglaan en Hanenburgvaart (1935).

Architect and urban planner W.M. Dudok was tasked by the municipality of The Hague in 1945 to draft reconstruction plans for both the bomb-damaged Bezuidenhout and the areas affected by the tank ditch zone. Dudok had been intimately involved in The Hague's development plans since 1934. In December 1947, the reconstruction plan for Sportlaan-Zorgvliet I was presented to the city council. The Sportlaan-Segbroeklaan area and its surroundings showed the most differences compared to the pre-war landscape (Monumentenzorg Den Haag, 2004).

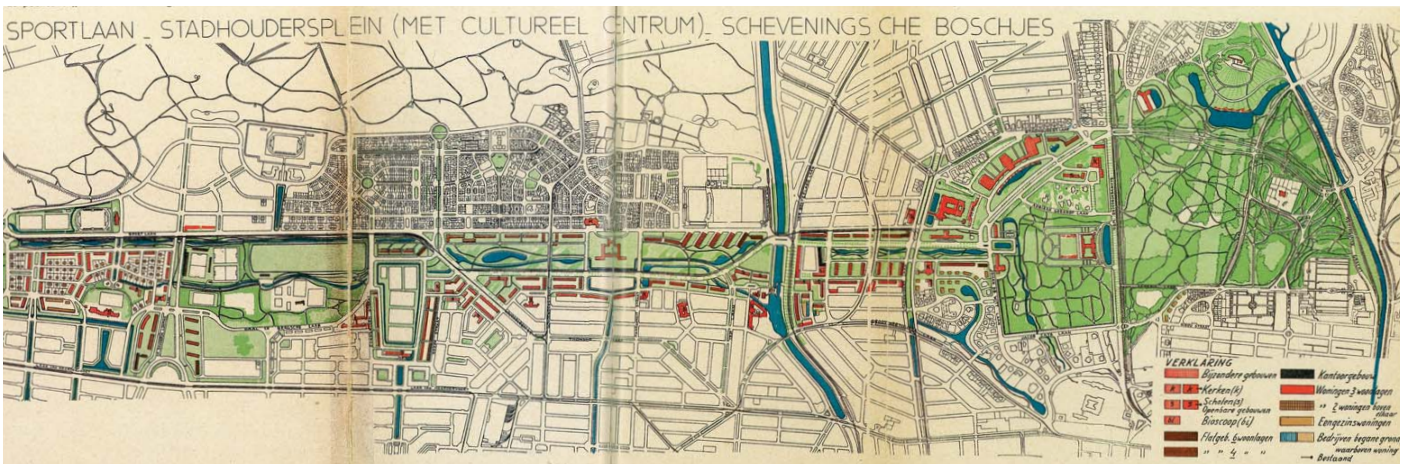


Figure 8.4. Plankaart bij het herbouwplan Sportlaan – Stadhoudersplein – Scheveningsche Boschjes, 1946 (Rijksdienst voor het Cultureel Erfgoed, 2016).

Dudok conceived the reconstruction of The Hague as a repair of the existing city, a welcome change in the uniform part of the city that had been demolished. According to Dudok, The Hague had a distinct character, a city with allure, the characteristics of which Dudok also wanted to incorporate into the design of the rebuilt Atlantikwall zone. He therefore shaped this part of the city with beautiful green strips with water features, bordered by new, tall and medium-rise apartment buildings (Rijksdienst voor het Cultureel Erfgoed, 2016). While Dudok's design, as depicted in Figure 8.4, included the incorporation of the Hanenburgvaart, a feature that had survived the Atlantikwall, this aspect was not realized as intended (Figure 8.8).

The Segbroeklaan, now the main traffic artery, serves as a parkway linking Ockenburg Park to the Scheveningse Bosjes, offering a seamless blend of built and natural environments (Rijksdienst voor het Cultureel Erfgoed, 2016). The linear watercourse of the Haagse Beek within the park is complemented by bayonet-like offsets, enhancing its visual appeal. Despite its significance as a public space for adjacent residents, the original design of greenery and water features, characterized by long sightlines and scattered trees, has been disrupted by current ecological management practices, removing retaining walls and allowing nature to follow its course to restore the image of the old dune creek (Monumentenzorg Den Haag, 2004).

While this area prominently showcases Dudok's design, the absence of visible war heritage has resulted in an underrepresentation of the Atlantikwall's stories. However, there are indications of change. The province has designated the Atlantikwall as one of the seven 'heritage lines', aiming to enhance the visibility and tangibility of the landscape's history through these geographical markers (Provincie Zuid Holland, n.d.).

Figure 8.6. Situation 1930 (Based on Rijksdienst voor het Cultureel Erfgoed, 2016).

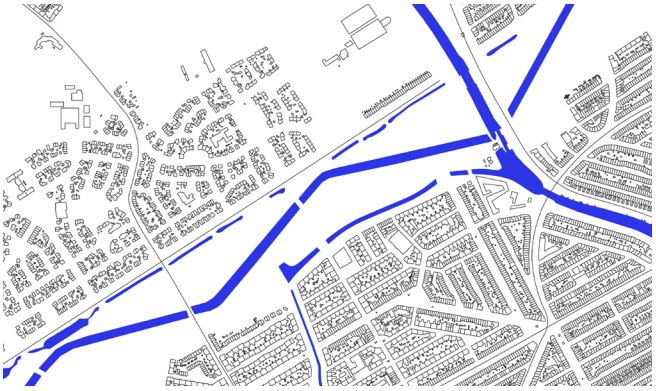


Figure 8.7. Situation Second World War (Based on Rijksdienst voor het Cultureel Erfgoed, 2016).

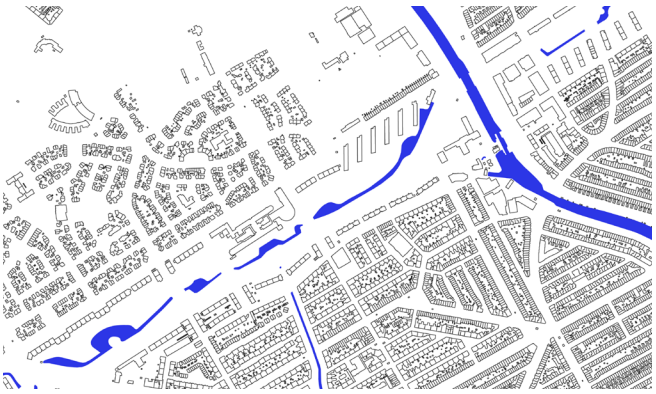


Figure 8.8. Situation 2010 (Based on Rijksdienst voor het Cultureel Erfgoed, 2016).

08.4
Heritage Values

To design with history, it is essential to understand the values inherent to a place. This can be achieved by assessing the site as a whole or by examining its individual components. By doing so, the crucial aspects of a site become apparent, guiding decisions on what to restore and how to enhance its overall value through design interventions. This assessment encompasses both the historical design and the current state of the site.

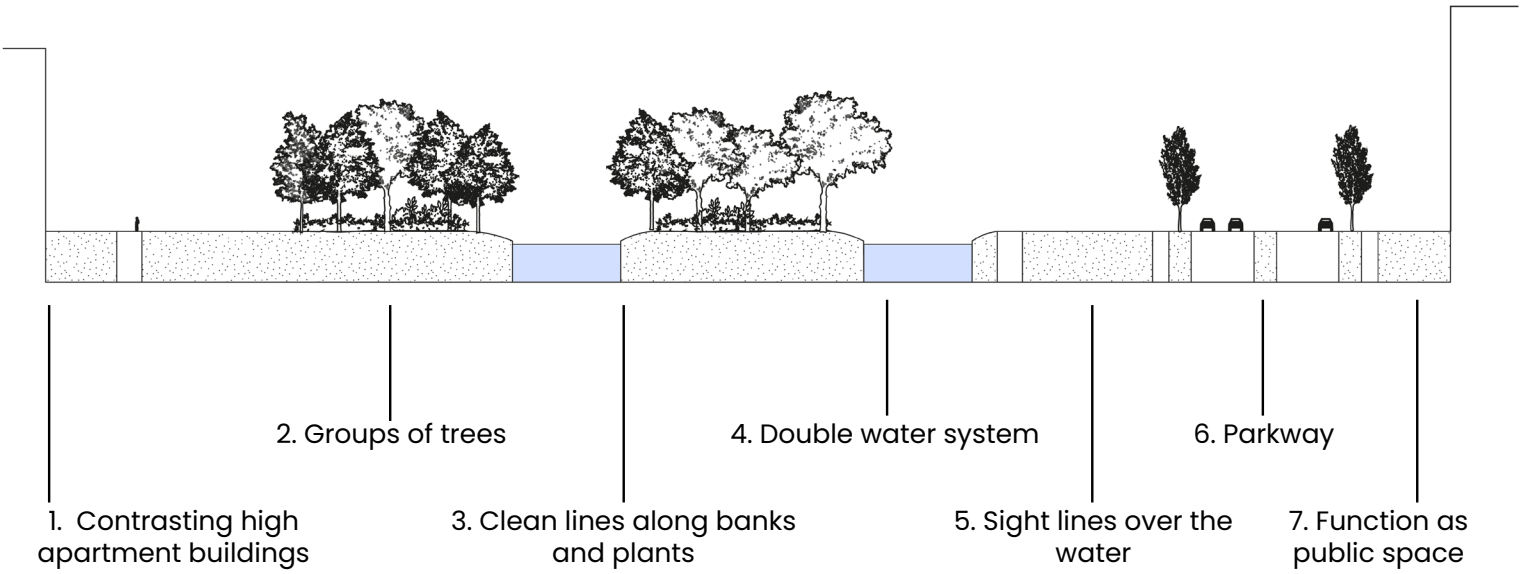
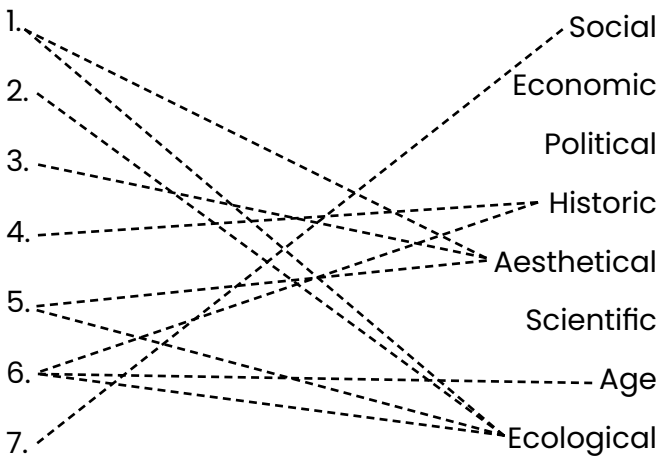
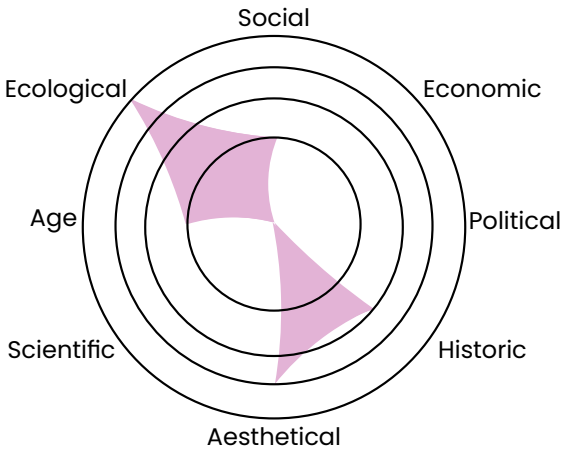


Figure 8.9. Historic design





Through this analysis, it is evident that some values have been lost over time or have not been executed as intended in the original design, such as the double water system with both polder and boezem water lying side by side.

In other cases, the values remain, but their execution has evolved. Previously, the design only included clean lines, but with new insights in ecology, the area is now managed to allow nature to take its course.

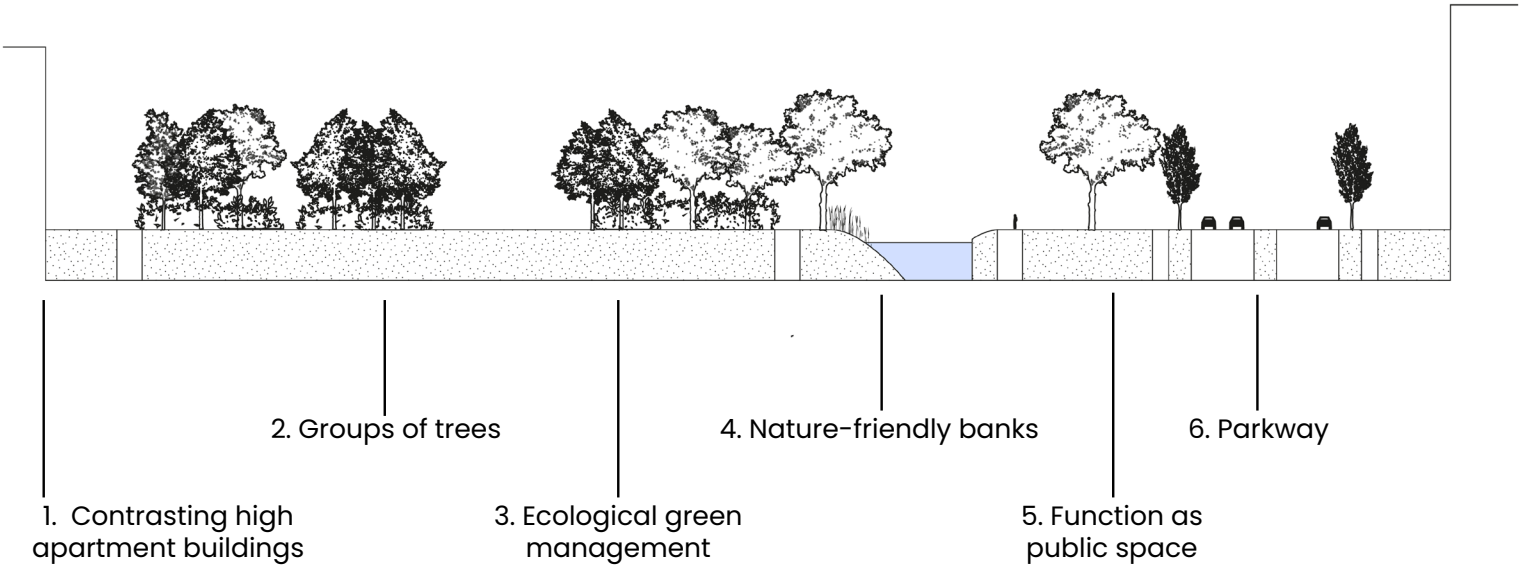
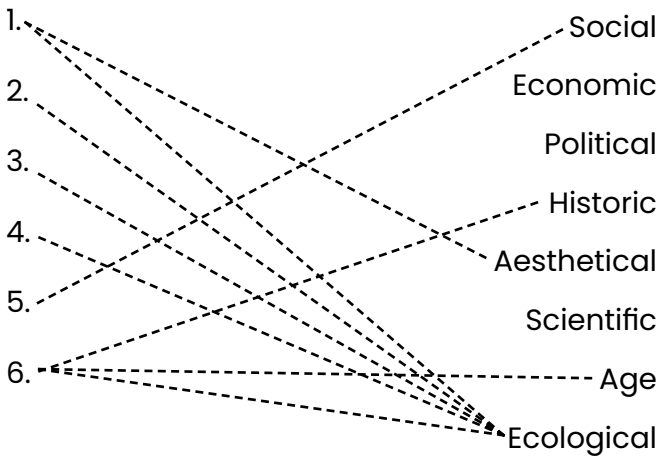
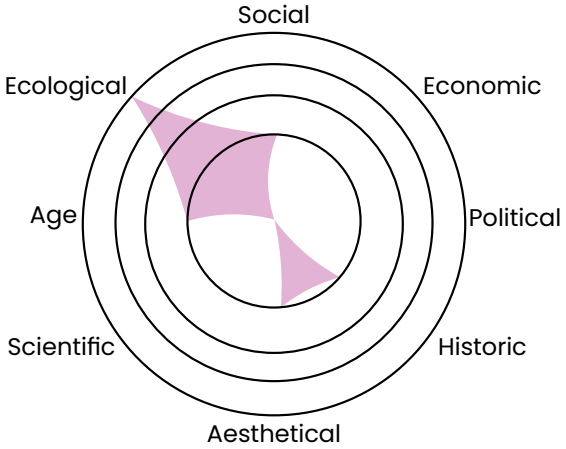


Figure 8.10. Current situation





08.5 Design of the Hanenburgvaart

Larger design concept
As mentioned before, the area has a lot of layers. Combining all these layers on this location could be done but when zooming out it can be seen there are other sites where these layers can be shown as the area is quite large. The concept for this design is to show these different layers on different parts of the larger site, visible on Figure 8.11. This way each layer can be shown without interfering with each other. The three layers that can be found are the Haagse beek, the Atlantikwall and the design made by Dudok.

The location for the Haagse beek is the part closest to the beach. Here there has already been a lot of work to make the area more natural and look like the dune creek it once was. The part along the Duinlaan is one of the few places where the The stream is still in its original bed (Dienst Stadsbeheer & Hoogheemraadschap van Delfland, 1999).

The layer of the Atlantikwall is the one that is now the least visible in the landscape. As a result of all the interventions, the stories of the Atlantic Wall remained underexposed, only visible for those who know it. The site chosen is the one on the right of the Verversingskanaal. This location offers enough space to showcase this story.

The layer of Dudok is showcased on the chosen design location. This area is the most successful part of his reconstruction plan as the original qualities are still largely present. That is why it makes the most sense to use his designs as starting point for this location.

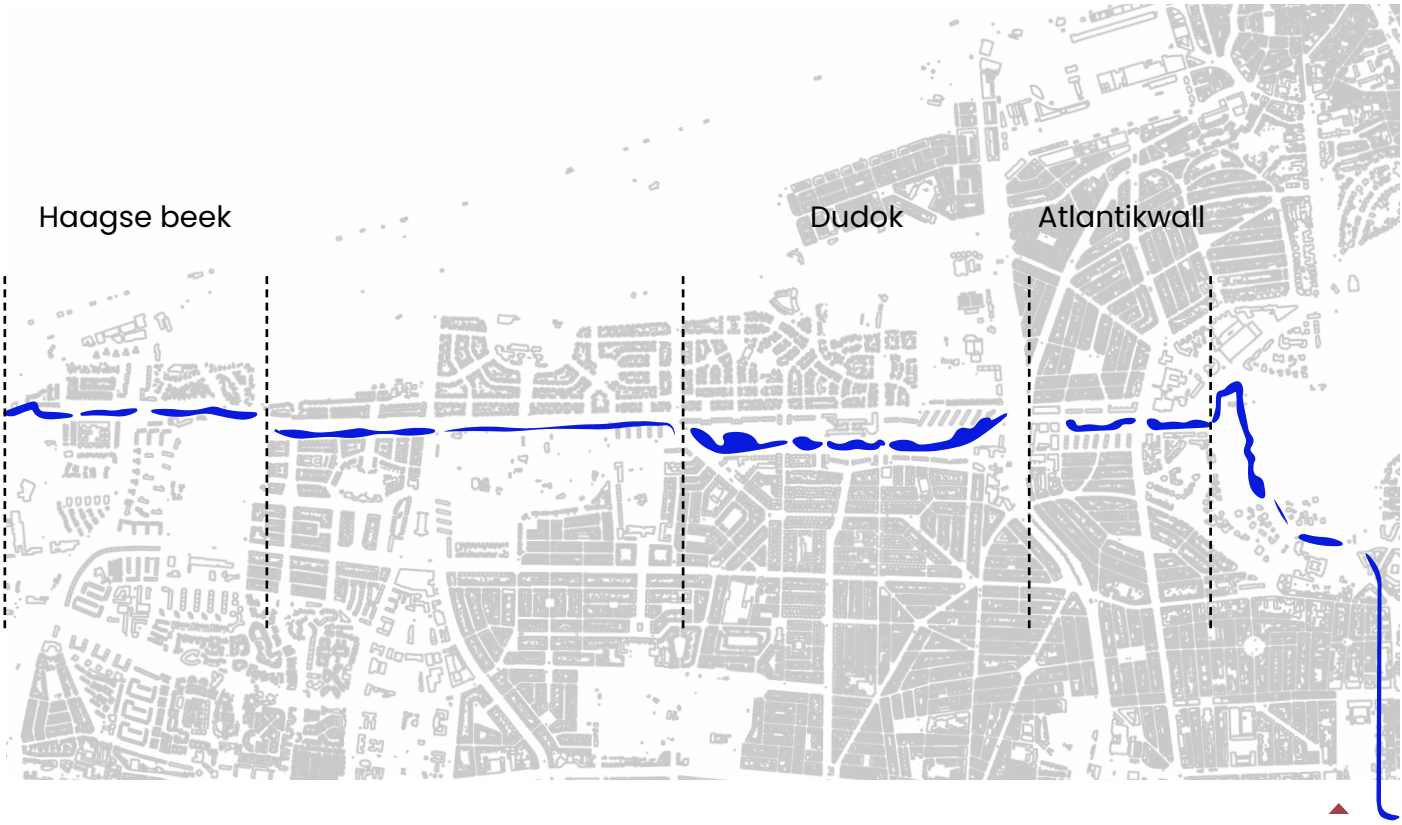


Figure 8.11. Design concept

The design
The designated area for design is the space assigned to Dudok. This means that his ideas for this area will be emphasized and efforts will be made to reintegrate them in a manner that also preserves the current values. His design has been used but it has been given a modern touch. The design is visible in Figure 8.12.

One of the most important functions of the site today is the unique biodiversity found here. Preserving the ecological green management practices is essential for the many species that inhabit this area. The design prioritizes the conservation of this vital green space while also incorporating the clean lines characteristic of Dudok's original design.

Awareness
From the analysis it was found that there is currently nothing visible to remind people that the Hanenburgvaart was once here. As it has been decided that this area will bring back the ideas of Dudok it is important that the waterway is reintroduced the way he saw it. For this location however an exact restoration would not be possible so the design had to be made in a slightly different way [A4].

To further explain the ideas and design of Dudok signs [A1] can be placed near resting places to inform about the history and to show the significance of the site for the water system of The Hague. Other small interventions, like detailed bridges referencing to the evacuation, can inform people of the history of the Atlantikwall. There will also be a monument where people can commemorate and learn about these events.

Another important aspect is enhancing public access to the water and providing recreational opportunities. The design does this by creating many meeting spaces near the water and paths that follow the edge of the water. These paths ensure the clean lines from the original design while also giving space for nature as the path is elevated. This way there is space for nature-friendly banks and people to closely experience the water.

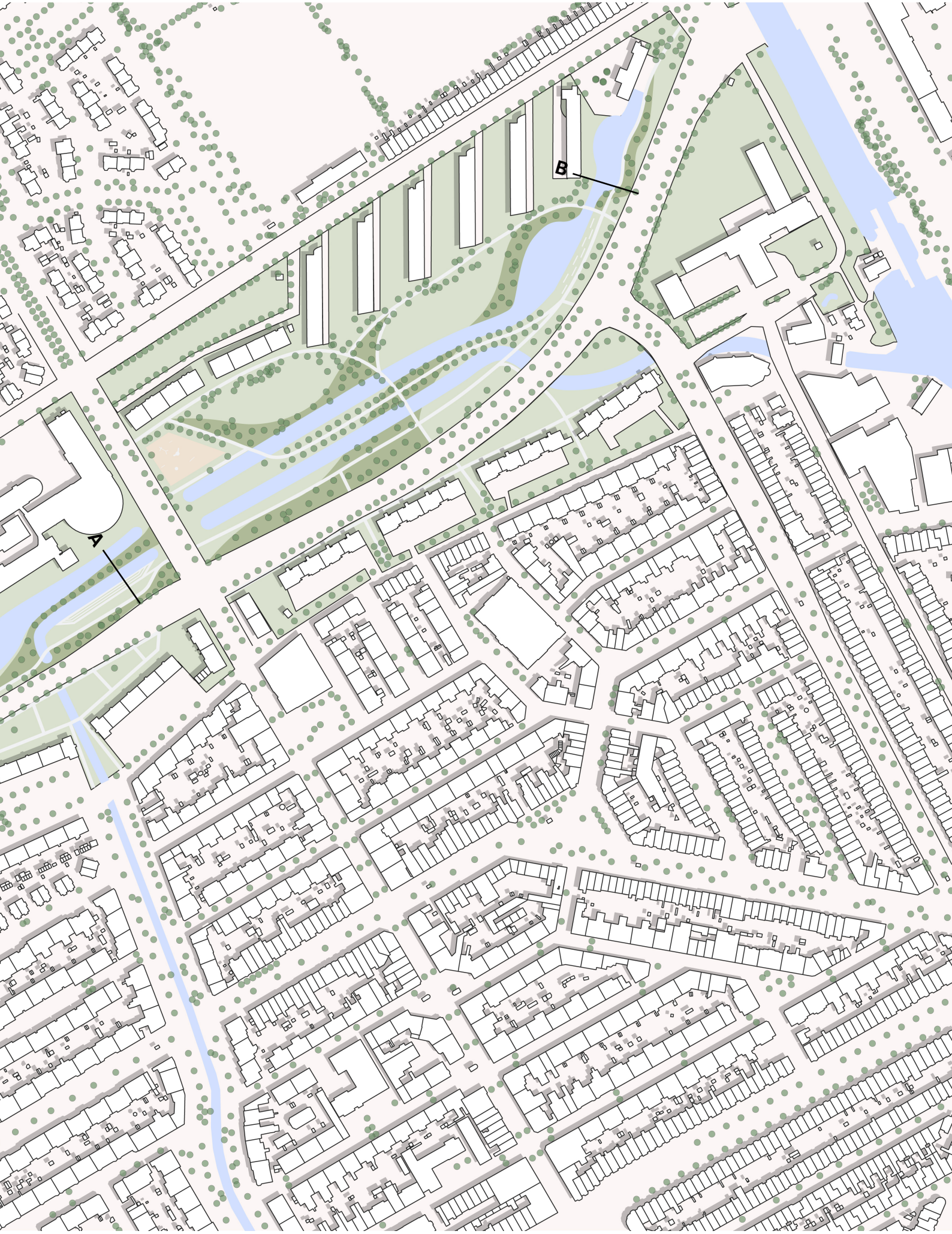
Water management
To restore the site's relevance to The Hague's water system, it is necessary to excavate the culvert [B3]. From the analysis, it became clear that this culvert significantly restricts the capacity of the waterway. By excavating it, it can provide the waterway with the necessary additional space, thereby enhancing its capacity to accommodate water flow effectively.

Digging up the culvert not only increases the physical space available for water but also improves the overall functionality of the water system. With greater capacity, the waterway can better manage water flow during periods of heavy rainfall or flooding, reducing the risk of waterlogging.

Climate change
As was found in the analysis, the area scored already quite high for climate adaptation. The site is very green which is why drought is not yet a problem here. There are also many trees which make this area experience a lot less heat during the day than surrounding areas. In the design Dudok had many open spaces with just lawns. In the design some areas get this openness back but to ensure the most shade, the trees [C3] next to the paths remain in place.

The area did experience some water logging on the streets, this can be solved by lowering the verge [C7]. By placing the verge lower than the road, space is created for water to fit and sink into the ground.

Figure 8.12. Design for reintegrating the Hanenburgvaart



08.6
Design Implications

Green structure and biodiversity
The design has several important implications for the surrounding areas. When zooming out, it becomes visible how important this area is for the larger green structure of the city. As was mentioned in the analysis around 1999, efforts were made to restore nature along the Haagse Beek. The tidy lawns and banks with sparse vegetation that Dudok designed were replaced in many places by flower-rich hay meadows and nature-friendly banks. For this design the open spaces were kept and the places where Dudok designed higher vegetation were connected to create a better connected corridor (Figure 8.14) for the different animals that make use of the green structure. Using plant that are native to the area will improve the biodiversity and creates an interesting place to walk.

Figure 8.13. Green structure

Figure 8.14. The green structure with the connecting green corridor

Water system

Figure 8.16 shows that the Hanenburgvaart is being restored to align as closely as possible with Dudok's original design. From the analysis, it became clear that as the water currently flows through a culvert, this significantly restricts the capacity of the waterway. By excavating it, the waterway now has the necessary additional space, thereby enhancing its capacity to accommodate a larger flow of water. This improves the overall functionality of the water system as the waterway can better manage water flow during periods of heavy rainfall or flooding, reducing the risk of waterlogging. Having the Haagse Beek and the boezem system lying next to each other will show how

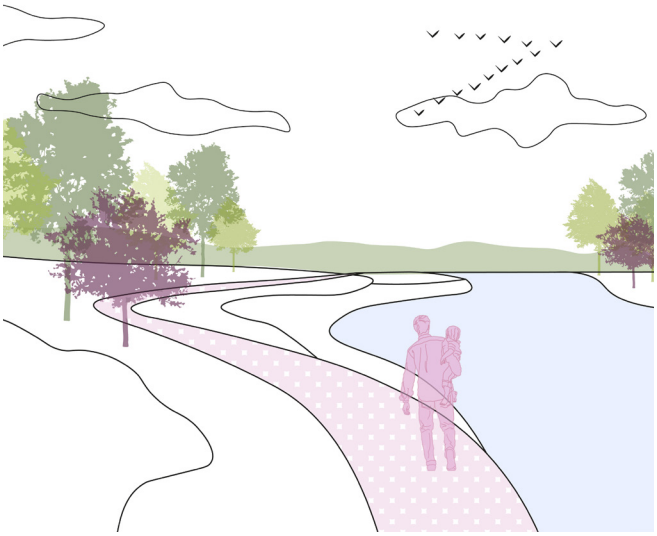


Figure 8.15. Water

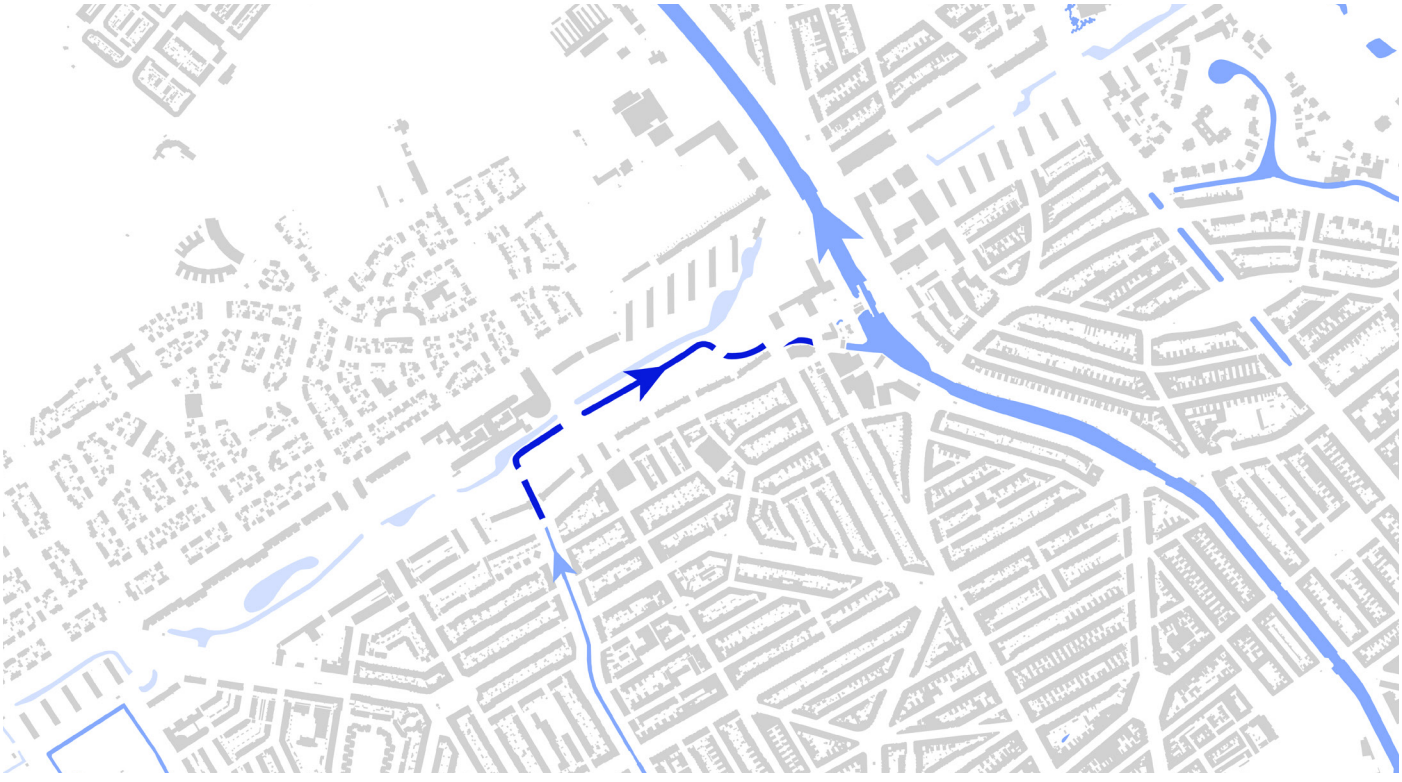


Figure 8.16. New water connection

08.7
Sections and Visualizations

A

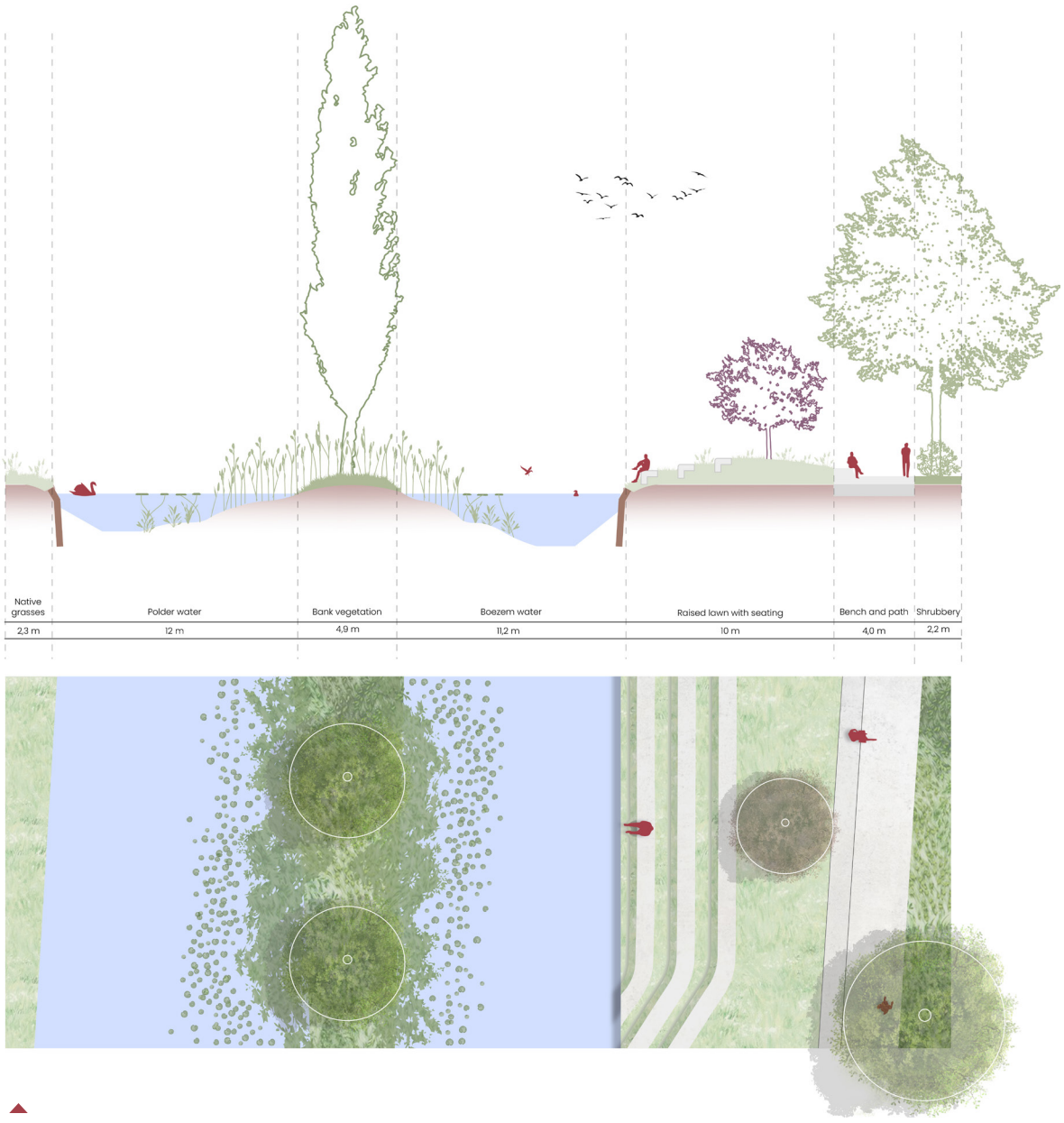


Figure 8.17. Detail of the double system

This section and detailed map (Figure 8.17) illustrate the way the two water ways lay next to each other. To emphasize the double water system long linear trees have been planted on the middle part. The middle part shows how a natural water edge looks and on the opposite sides there are hard edges.

Because of the all the extra soil that will become available after digging the new waterway it is possible to create some small height differences in the area. The section shows how the height difference is used to create seatings next to the water. On the other side the height difference goes over into a bench adjacent to the path.

B

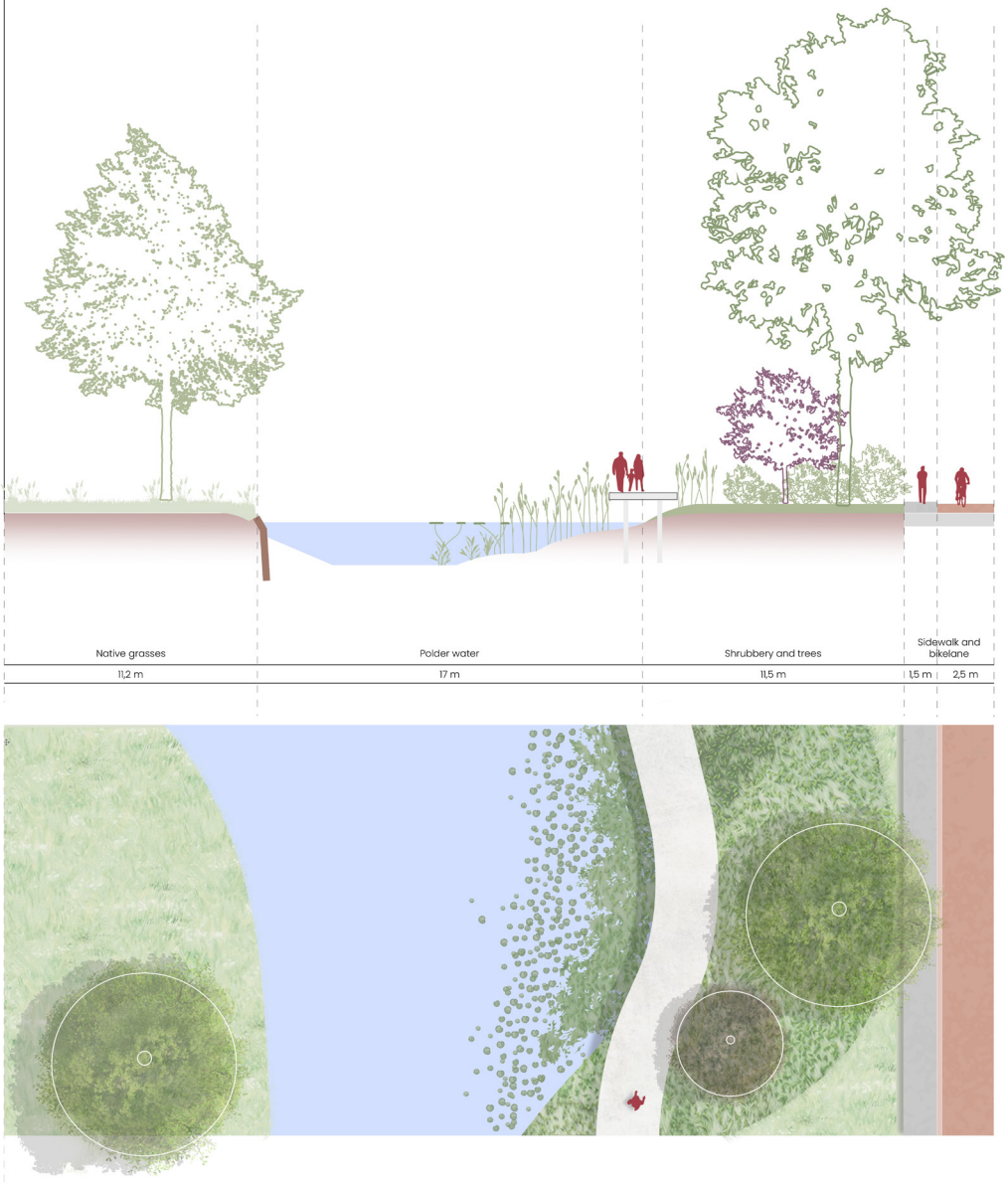


Figure 8.18. Detail of the path going over the nature-friendly bank

This section and detailed map (Figure 8.18) depict a spot where there is a nature-friendly bank and the path has been used to keep the clean lines. Placing the path directly along the waterway's edge creates a distinct, sharp boundary. This also gets people closer to the water, enriching the visitor experience.

Additionally, the section highlights the diverse vegetation present in the area. On the left you can see the flowery meadow (bloemrijk hooiland) with native grasses and flowers, and on the right there are higher plants and bushes. Mowing twice a year helps maintain these distinct edges, contributing to the aesthetic appeal and ecological balance.

Figure 8.19. Visualization of the benches along the water

Figure 8.20. Visualization of the path in between the two waterways

Figure 8.21. Visualization of the monument

Showing narratives

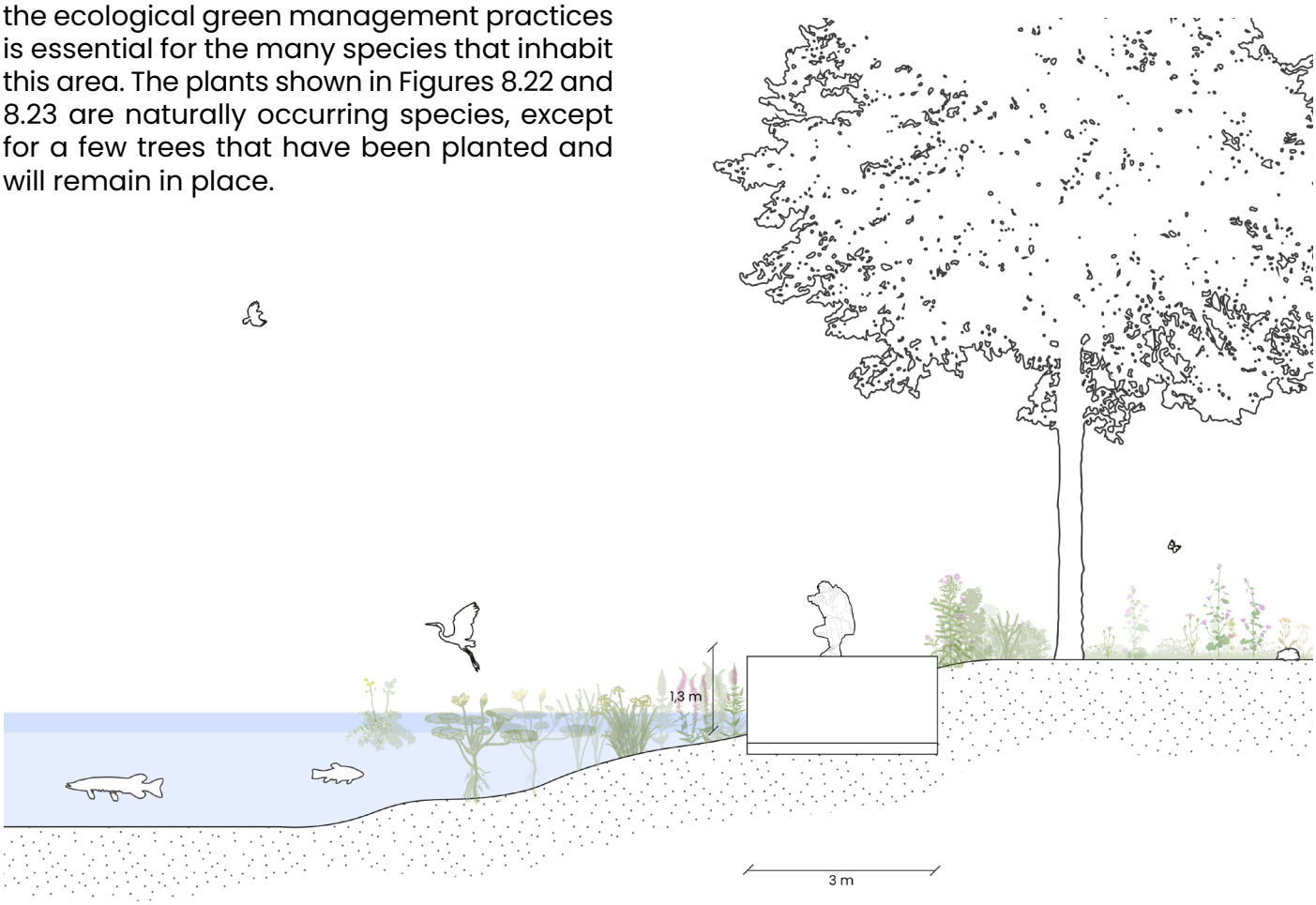
Residents have long wanted a monument about the consequences of the Atlantic Wall in the Duinoord neighborhood. In 2015 this idea was changed for a walking route that would run along the entire former demolition zone. However when following that route there is currently not much to see in this area. Therefore small interventions could change that and make people aware of the history of the site.

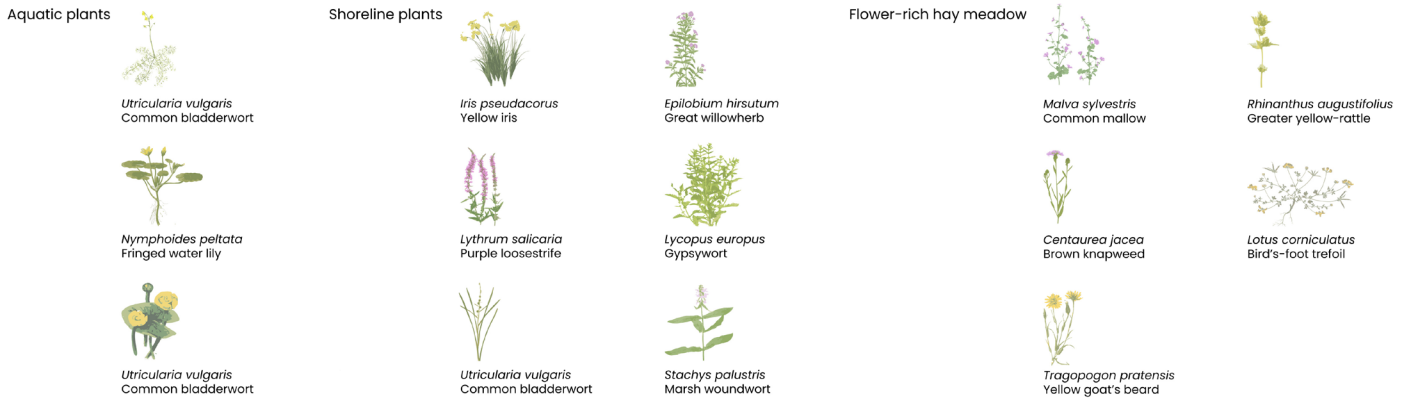
In this area that is done through small details. In figure 8.19 an example of this is given where the railing of the bridge represents the houses that were demolished in this neighborhood. There will also be a monument, shown in Figure 8.21, as the residents wished. Besides a route this can be a place where people can commemorate what has happened and it can be a place for people to learn about history. The monument is a boardwalk that follows the former location of the tank ditch. At the end of the boardwalk there are stairs leading to a place where you can sit below the water in an enclosed space. It is a place for reflection with a seating area and information of the evacuation on the walls.

08.8
Details and Planting

The designed area is part of the green structure in The Hague. The site has a lot of unique and important plants. These are found here because of the clean water that is supplied from dunes into the Haagse Beek. Preserving the ecological green management practices is essential for the many species that inhabit this area. The plants shown in Figures 8.22 and 8.23 are naturally occurring species, except for a few trees that have been planted and will remain in place.

Figure 8.22. Detail of the path along the water





Shrubs

Ribes uva-crispa
Gooseberry

Crataegus monogyna
Common hawthorn

Viburnum opulus
Guelder-rose

Trees

Quercus robur
Pedunculate oak

Fraxinus excelsior
Ash

Alnus glutinosa
Common alder

Betula pubescens
Downy birch

Prunus serrulata
Japanese cherry

Tilia × europaea
European lime

Figure 8.23. Detail of the path in between high vegetation and trees

08.9 Conclusion

The interventions
The design concept for this area is an integration of historical layers while addressing contemporary needs and challenges. By acknowledging the diverse historical layers present within the site, the design aims to create an urban environment that shows the area's rich heritage and improves its relevance for the water system.

The approach of showing the different historical layers on different parts of the larger site allows the history of each narrative to be shown without interference of one another. The Haagse beek, Atlantikwall, and Dudok's design are each given dedicated spaces, ensuring that their unique stories are told and appreciated.

The most important part of the design was to put the Hanenburgvaart back in the site the way Dudok had envisioned it. This brings back the special double water system which is highlighted with rows of high trees. The excavation of the culvert enhances the drainage capacity of the water system and increases storage.

The design emphasizes the importance of ecological green management practices to preserve the area's biodiversity while incorporating elements of Dudok's original design to maintain its historical character. Additionally, awareness is raised about the site's historical significance and water system through emphasizing the double water system and details refering to the Atlantikwall. Places for recreation have been added to enrich the visitor experience.

The design also tries to minimize the effects of climate change further than it already does by improving the resilience of the area's water infrastructure and by integrating climate adaptation measures such as lowering verges and placing trees on strategic places.

Approach to heritage conservation
By designing the Hanenburgvaart according to Dudok's original design, my approach represents a literal interpretation of heritage. The waterway is reinstated as a vital part of the landscape, acknowledging Dudok's intent and rectifying the historical decision to bury it.

While respecting Dudok's clean and orderly aesthetic, my design adapts his vision to current ecological principles. Dudok envisioned pristine lawns and small patches of higher vegetation. However, the area is now an important part of The Hague's green infrastructure, characterized by ecological maintenance with nature-friendly banks and a richer variety of trees. To maintain this vital green space, ecological sustainability is prioritized over manicured lawns, incorporating flowery meadows and expanding small vegetation patches into a green corridor. This approach aligns with the heritage as factor approach.

The design also includes elements that honor the history of the Atlantic Wall and the impact of World War II on the area. This integrates a heritage as vector approach, where the focus is on the narrative aspects of heritage. For instance, bridges with railings depicting a map of the destroyed houses serve as a poignant reminder of the area's wartime history.

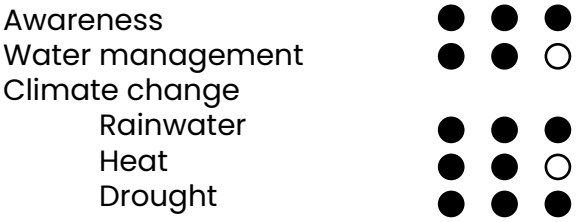
To create a deeper connection with the past, a monument is added to the site of a former anti-tank ditch, providing a place for reflection and learning about the historical events that occurred here. This aspect aligns with the heritage as actor approach, emphasizing the importance of community involvement and intangible heritage.

Assesment of the design
To analyze if the design was successful the site is assessed again for the criteria found in Chapter 6 and for the heritage values. This shows how and if the design honored the sites history while also meeting contemporary needs.

First the design has been scored on the same criteria used in Section 08.1. It can be stated that the design scores high on awareness. The design has brought back the historic waterway the way Dudok had envisioned. This will show people the way the park was intended to look and can help them understand how this water system works.

The water management of the site has also greatly improved. Making the water system less vulnerable, provide extra storage and increase the drainage capacity towards the pumping station. This can help the entire water system to work better during heavy rainfall.

It does not make much difference for climate adaptation as this already scored quite high. It does limit rainwater damage as there is more storage and waterlogging is minimized. For limiting heat the design will not make a big difference as the amount of trees remains around the same and this is also influenced by the surrounding gray area.

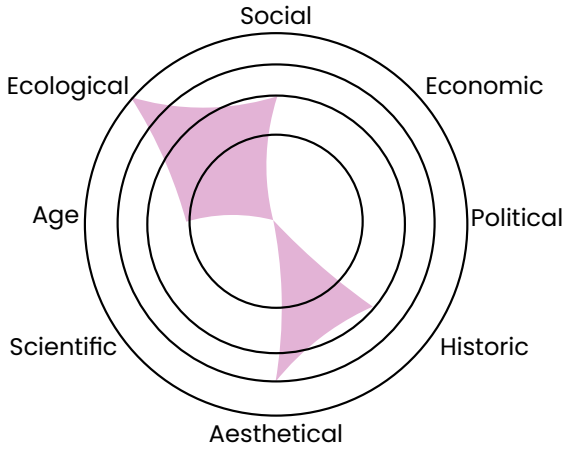


Then to asses if the design has brought back some of the lost heritage values a new analysis of the site has been made. The ecological values have remained the same by keeping space for nature to take its course. The social values have increased because of the new meeting spaces that were created.

The economic values have not increased as it is a space for the public. The political values have remained the same, and this also applies to the scientific and age values.

The historical and aesthetical values have been restored, as there is once again a double water system with clean lines and sight lines over the water.

In conclusion, it can be said that important lost values have been restored and new values have been added to meet contemporary needs.



09
Conclusion

09.1 Introduction

This chapter concludes this thesis. First an anwser will be given to the research question and summarizes the work done in the thesis. Then my view on heritage is shortly discussed and a reflection explains how the design process went, the relevance and what was learned.

09.2 Conclusion

The question that was asked at the beginning of this thesis was: How can water heritage strengthen the future water management system and its surrounding public space to improve climate adaptation and awareness in The Hague? This thesis answers that question and provides a method on how to use water heritage for this purpose.

The theoretical framework provided the information needed to start this thesis. It revealed that restoring the relationship with the natural system can make systems logical again and address issues such as climate change. There have been promising results in connecting heritage with water-related issues. By blending technological creativity and historic preservation, this allows for innovative solutions. It also revealed that heritage sites have the potential to promote circular practices, can contribute to better water futures and promote water awareness.

To find out what the water heritage of The Hague is, a landscape biography was made. The history of the most important waterways and water-related processes were revealed and showed how the water system came to be. This process revealed that there is an intricate network of waterways that expanded over the years. It also revealed that many connections were lost, especially evident in the center of The Hague. This historical context informed the analysis of present-day water system challenges, including inadequate water discharge during heavy rainfall and the impacts of combined sewer overflows.

Examining climate change implications revealed pressing issues such as waterlogging, drought, water safety concerns, and the urban heat island effect, underscoring the urgency of effective climate adaptation strategies.

With this extensive analysis a set of goals was formulated, encompassing water management, awareness and climate adaptation. These goals served as the foundation for developing a set of tools aimed at achieving them, serving as inspiration during the design process. To test the effectiveness of these tools in real-world scenarios, specific sites were selected based on the analysis, each exhibiting water system challenges. Two different sites were chosen that would ensure two entirely different designs, ensuring a comprehensive exploration of potential solutions.

The design have been made for the Prinsegracht and Brouwersgracht, and for the Hanenburgvaart. First these sites have been analyzed to better understand the location, followed by an assessment of the current state on awareness, water management, and climate adaptation. Next, the historical context of each site was explored to define their heritage values. With these insights in mind, the final designs were developed. Upon completion, a reassessment of the sites revealed notable improvements in raising awareness, water management and climate adaptation. Furthermore, both designs have managed to bring back some important heritage values.

In summary, this thesis has provided valuable insights and methodologies that offer a way to use water heritage to enhance water management, promote climate adaptation, and raise awareness in The Hague. Through a thorough analysis and innovative design strategies, the integration of heritage into water management practices shows how relevant this can be to create resilient urban environments.

09.3
My View on Heritage

Throughout this thesis, I have explored the multifaceted concept of heritage and the role that it can play for contemporary water management and climate adaptation in cities. Heritage, as I have come to understand it, is not a static entity confined to the preservation of physical structures. Instead, it is a dynamic and evolving concept that encompasses the tangible and intangible, the past and present, and the ecological and cultural dimensions of our environment.

In my designs for the Prinsegracht and Hanenburgvaart, I focused on bringing back historical features while also adapting them to meet today's needs. For example, reopening the Prinsegracht canal and restoring the Hanenburgvaart shows my commitment to preserving historical aspects. At the same time, I made changes to make these areas practical and relevant for modern use, such as adding green spaces and ensuring better water management.

Furthermore, heritage encompasses the social and cultural narratives that shape our collective memory and identity. The inclusion of commemorative elements and community engagement in both the Prinsegracht, Brouwersgracht and Hanenburgvaart projects highlights the heritage as vector and heritage as actor approaches. These elements ensure that heritage is not just a backdrop for urban development but a living, interactive aspect of the community that connects people to their history and each other. This approach helps ensure that heritage is a living part of the community, and in that way hopefully has the ability to raise awareness.

In conclusion, my perspective on heritage is one that sees it as a multidimensional and evolving concept. By integrating historical, ecological, and social dimensions, my approach to heritage ensures that it remains a vibrant and meaningful part of the urban landscape, capable of addressing contemporary challenges, like climate change, while honoring the past. Heritage, in this view, is not just about preserving the past but about actively shaping a resilient and inclusive future.

09.4 Reflection

Looking back on the design process, I have definitely learned a lot. The amount of freedom that was given for this thesis was nice but it was also a burden. I often felt that I did not know how to continue as there was no clear guide to follow. This also meant that I have learnt a lot on how to set up a project from scratch and how to define your own guidelines. The feedback from my mentors was very helpful and they really guided me in making the designs.

The beginning for me was the easiest part. The research leading up to the design went very well and I quickly knew how I wanted to structure that part of the thesis. This also gave me a good understanding of the site and helped in making the design tools. However when I finished making those I felt it was still a big step to making a design. After I started making the design my mentor guided me to take a step back and do some more research into the heritage values. This helped me a lot and gave me the last information I needed to finalize my designs and give them a good basis.

I assess the value of my way of working and methodology as effective in addressing the challenges that I posed in my graduation project. Using heritage to raise awareness and improve the water system has worked out really well and I think is something that should be done more often. The methods used were also effective as they helped me get a good understanding of the site and the theory. The landscape biography has helped me to organize the history of the waterways in The Hague and to use the heritage values has really helped me to finalize my design.

I believe my project is transferable to other sites as it offers insights and strategies that can be adapted and implemented in many other Dutch cities facing similar challenges. With this thesis I think the methodology offers a valuable resource for other landscape architects that want to include heritage in their design or are working on projects dealing with water and want to know how to do this. This is also why I think this thesis has academic value. It is a good example of integrating water heritage into contemporary urban landscapes for awareness and provides tools on how to do this.

Societally, the project has value for urban resilience, water management, and cultural heritage preservation, offering practical solutions that enhance the livability and resilience of urban environments. Ethically, the project prioritizes community engagement and climate adaptation, promoting access to green spaces and heritage resources while minimizing the effects of climate change on citizens.

The relation between my graduation project topic, my master track, and my master programme is closely intertwined. My graduation project topic, focused on water heritage and its integration into urban design for climate adaptation, directly aligns with the themes that have been introduced in my master track Landscape Architecture. Within the LA track, I have especially looked further into heritage and history, which is central to my project. Additionally, my master programme, MSc Architecture, Urbanism and Building Sciences, has given me the interdisciplinary knowledge and skills necessary to address complex urban challenges like those explored in my graduation project.

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