LIVEABLE WATER

A SENSORIAL & GREEN
INNER NØRREBRO


WELCOME

ABSTRACT

Liveable Water is a project aiming to design a better, healthier, and more liveable Inner Nørrebro, by transforming the urban public space to resolve climate adaptation at the surface, and at the same time create sensorial experiences. The project builds upon a holistic approach emphasizing four parameters relevant to the urban environment: water, the grown, materials, and the performative. As a unity, they offer a healthy environment beneficial to the urban dweller and create green, diverse experiences accentuating water in favor of the wellbeing of people.

Through a complementary approach, focusing on the rational and aesthetic, a strategy for water management has been developed to support the conceptual design for a delay area in Hans Tavsens Park, and two detailed designs concerning a zoom in at Rantzausgade and Askovgårdens Plads.

Coniferous tree with long evergreen needles at Frederiksberg Nye Bymidte, 2016.

PROJECT TITLE
Liveable Water
A sensorial & green Inner Nørrebro

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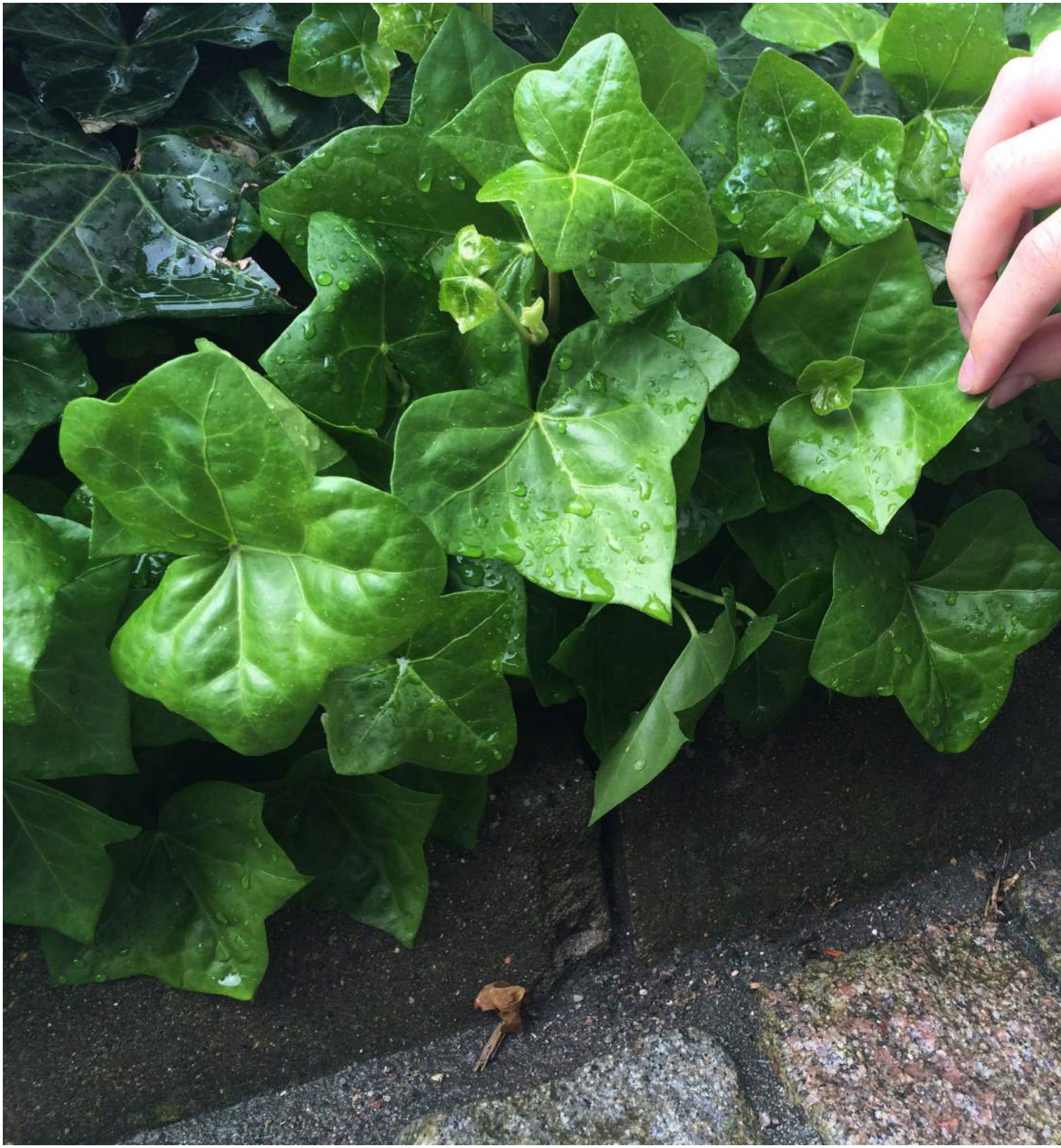


Complementing elements - water, materials, the grown, and the performative. Sydhavnen, Copenhagen, 2016.

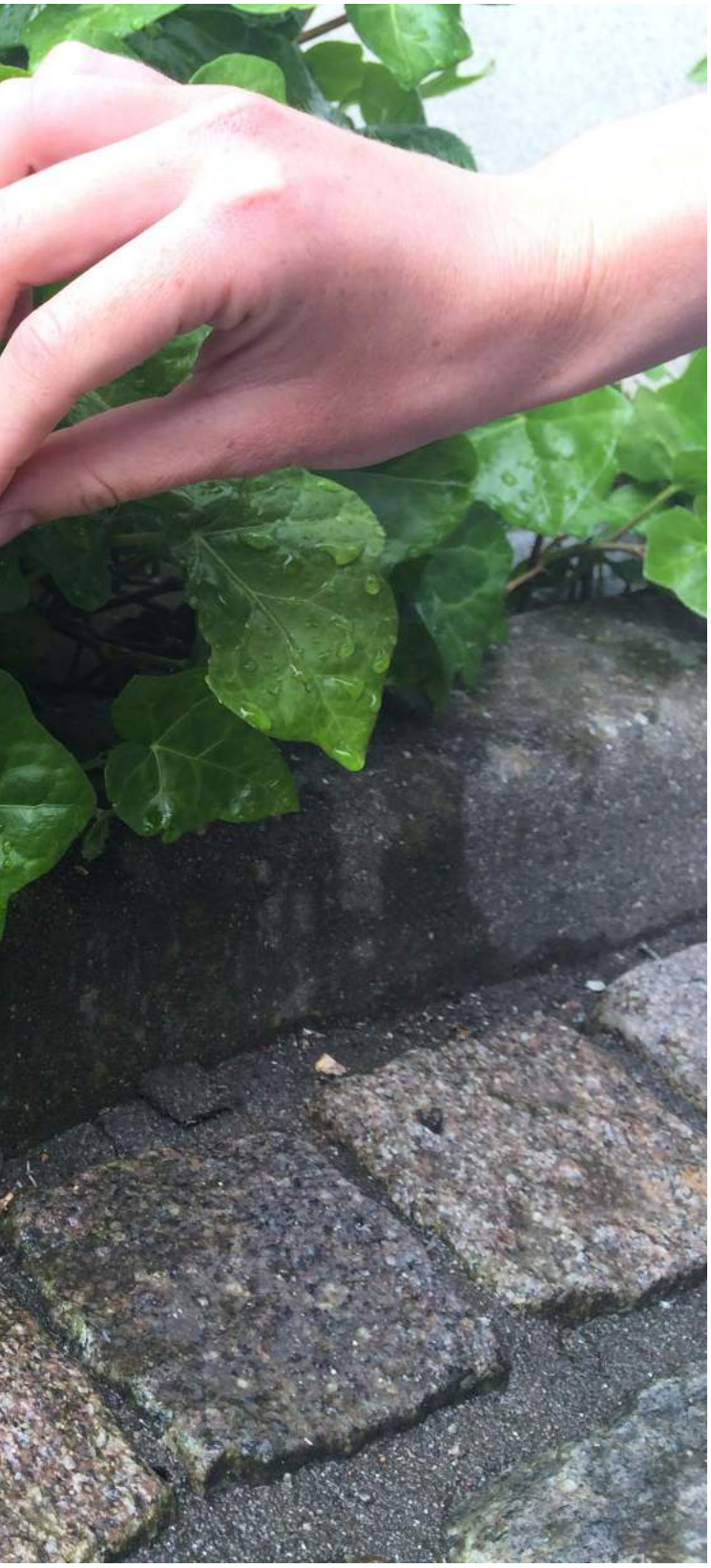
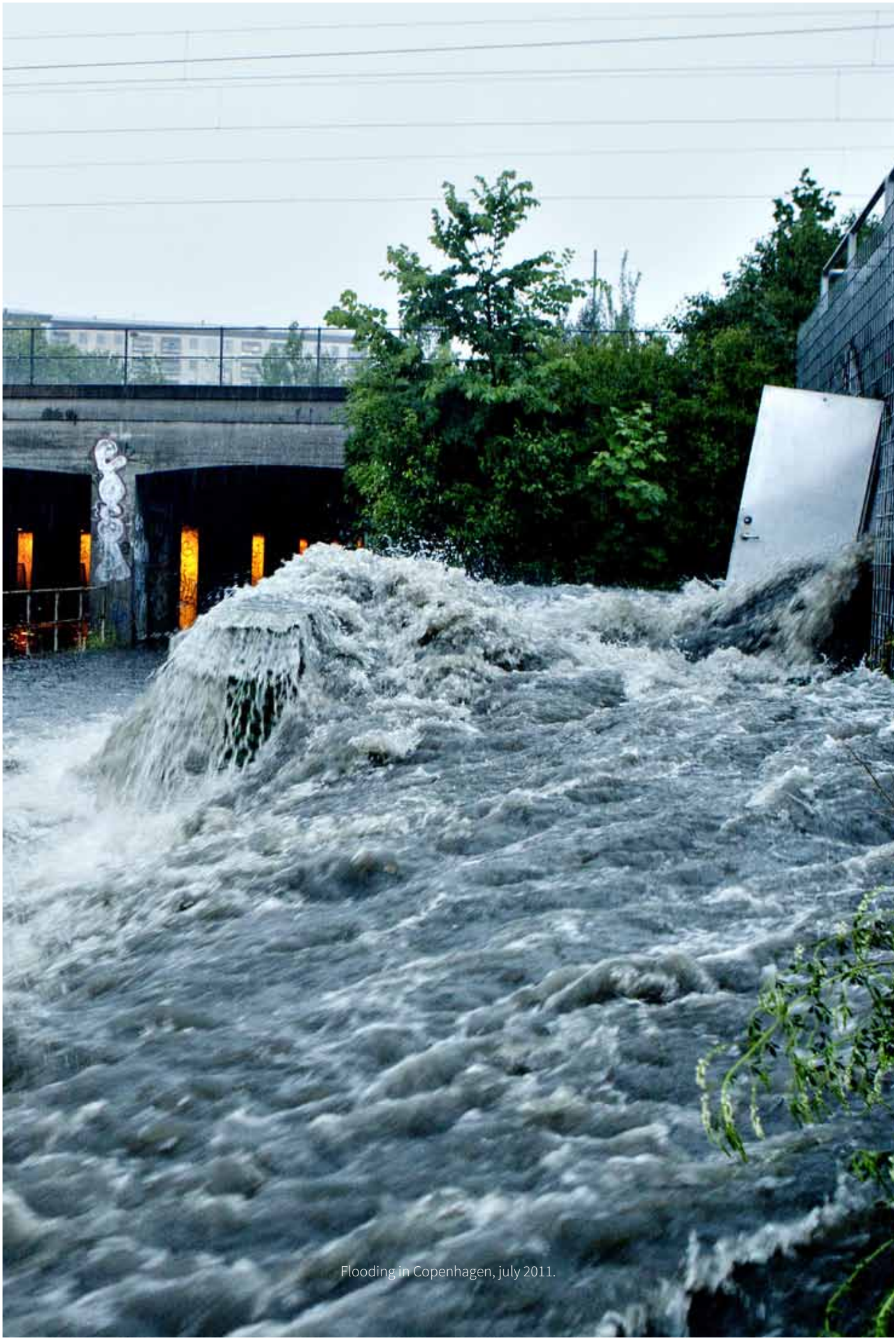


TABLE OF CONTENTS

BETTER CITIES

This master thesis project believes that a good life requires quality in the surrounding environment. We believe cities are to be designed for the wellbeing of people creating sensuous experiences in public space by means of materials, nature, and spatiality, that have the ability to touch people and make them aware of all the small wonders offered by each season, the weather, and fellow citizens. We believe great solutions combine aesthetics with function, as when a flooding scenario is prevented by a design, changing the experience of a street, square, or park until the water has been cleansed and served a purpose. We believe in the local, the sustainable and the recyclable, because everything has value when it is put in the right context. We believe we can create spaces for the natural conversation and induce adults to play by creating spaces with opportunities and unexpectedness. We believe you will stay a little longer on the street, in the park, and on the square, when those places offer layers of experiences to explore. This thesis wishes to develop answers meeting the motivation by coping with the open, public structures of a city neighborhood.

A well functioning urban space with green and performative elements. Superkilen, Copenhagen, BIG, 2011.



Flooding in Copenhagen, july 2011.

CHALLENGE

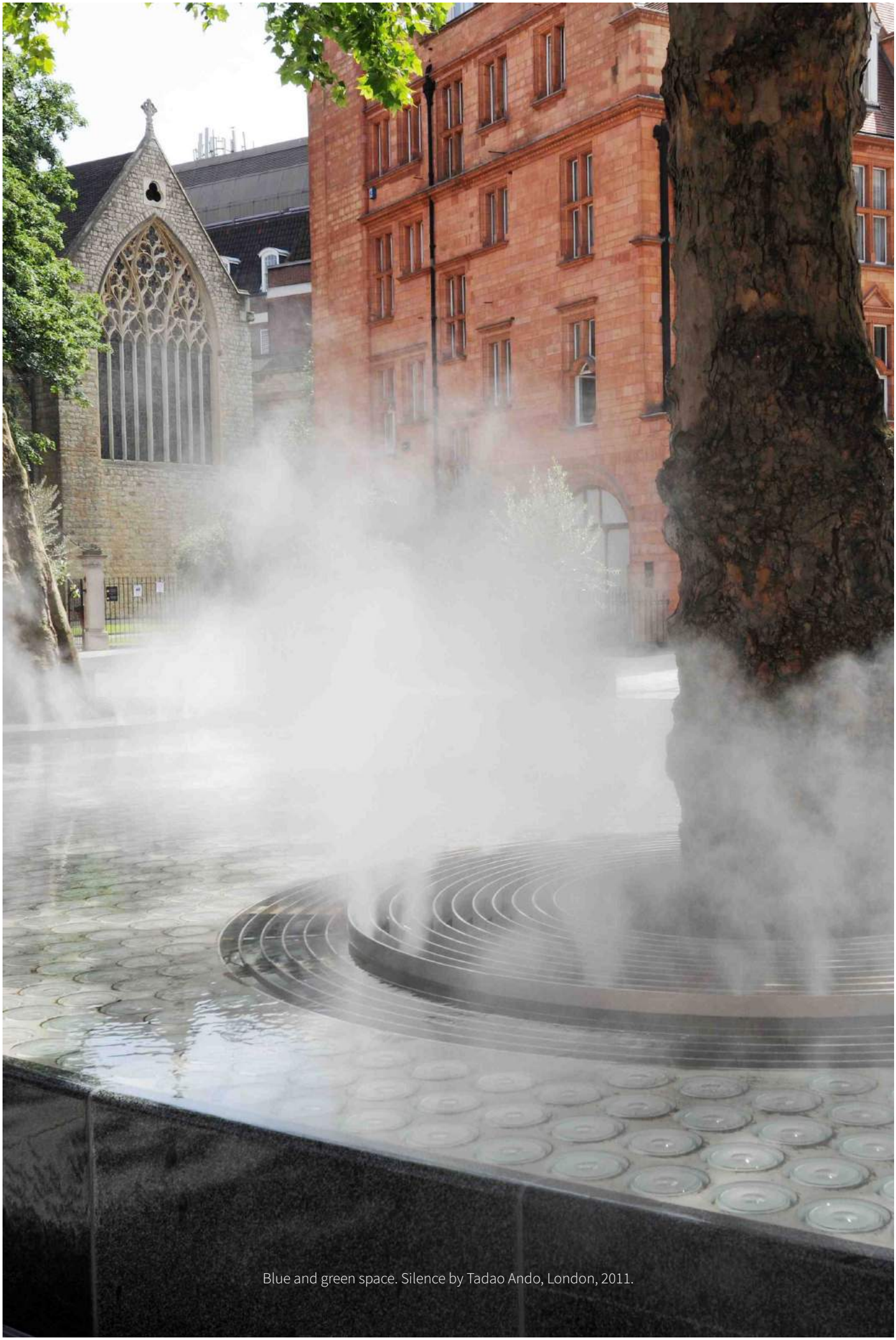
CLIMATE CHANGE AND URBANIZATION

We live in new and interesting times demanding change. Geopolitical and climatic changes are representing largest challenges of today. The challenges of climate change, people moving to the cities, refugees, and overpopulation demands innovative solutions separated from the common notion of urban spaces. We are living in a time where city and country are no longer two separate things but play together in a unity of strength. Many demands have to be met and layers of complexity will have to fuse and unite.

The changing climate affects people all over the world. We experience an increase in extreme weather conditions and within the next decades global temperatures are expected to rise. The consequence is sea levels rising around 0,5 meters and evaporation leading to 40 % more intensity at extreme precipitation events, which cause floods (CRES et al., 2014). These facts are to be put against the increasing urbanization – 54% of the world's population lives in cities today and by 2050 the proportion is expected to be at 66% (un.org., 2016). The rapidly growing number of people living in cities demands planning and climate adaptation solutions to prevent catastrophes as flooding and heat waves making the cities uninhabitable.

In Denmark 87,5% of the inhabitants lives in urban areas (Globalis.dk, 2016). The predictions of consequences caused by global warming is clear; the Danes have to adapt to more intense cloudbursts and expect more and longer periods of drought in summer and an increased amount of precipitation in winter (klimatilpasning.dk, 2016). These changes will affect country and city, ecosystems and infrastructure. Within the past years it has been evident that one of our biggest issues are floods in the densely built parts of our cities. Copenhagen has experienced a 100 year rain event 5 times since 2010! The damage costs are estimated to 9 billion DKK due to floods and landslides (City of Copenhagen, 2015). Increased intensity of cloudbursts are not only a serious economic problem to society, it also affects safety, mobility, and the private economy of citizens.

40 % INCREASED INTENSITY AT EXTREME RAIN EVENTS TOWARDS 2100



Blue and green space. Silence by Tadao Ando, London, 2011.

Copenhagen's Climate Adaptation and Investment Report has made a socioeconomic assessment of cost and advantages from climate adaptation in Copenhagen. The results are calculated for rain events over the next 100 years with an estimation of construction and running costs:

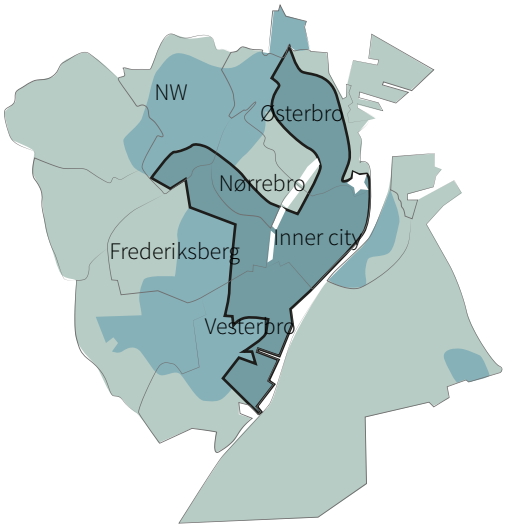
16 BILLION KR. (DAMAGE COST WITHOUT ACTION)
20 BILLION KR. (RECONSTRUCTION OF SEWER SYSTEM)
13 BILLION KR. (CONSTRUCTION OF SURFACE SOLUTIONS)

The numbers states how cost beneficial it is to take action and create surface solutions to handle run off water at ground level instead of in pipes under the ground. At the same time it creates better spaces for the inhabitants of Copenhagen.

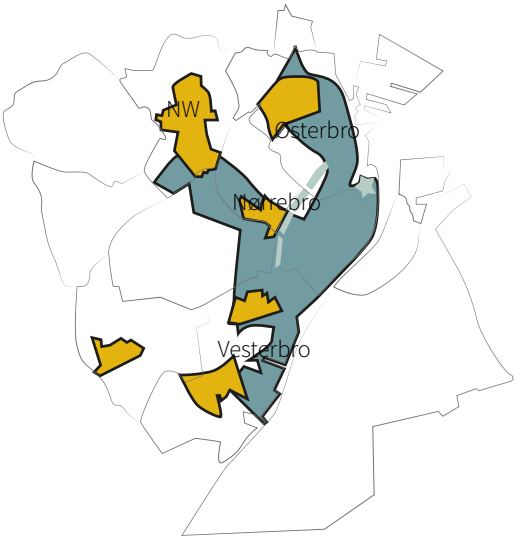
"Vi kunne godt grave hele København op og så lægge større kloakker under byen, men det ville koste op mod 20 milliarder kroner og kun komme københavnerne til gode, når regnen falder tungt. I stedet laver vi nye løsninger, som skaber grønne og blå byrum, som københavnerne kan nyde godt af hele året rundt." (Environmental mayor, Morten Kabell (EL), Politiken.dk, 2016)

At the time of writing, 11 of 300 climate adaptation projects are on the drawing board in the City of Copenhagen. The ones to be constructed in the near future is the neighborhood of Skt. Kjelds/Bryggervangen on Østerbro and Enghaveparken on Vesterbro. The remaining projects will be executed within the next 20 years to protect the city from floods. Engineers at Rambøll have developed plans for how to strategically solve Copenhagen's cloudburst issues at the surface in 2013. The result is two proposed master plan solutions concerning Ladegårdsåen, Frederiksberg East, and Vesterbro (Rambøll, 2013). The first plan is to use the lakes as a retention basin, and the other plan proposes create a rainwater tunnel under the city. Due to the great potential for interesting urban spaces it is decided to go with the first proposal using the lakes as a retention basin. By accepting the report's data (Rambøll, 2013; Rosted & Christensen, 2016), there is a point of departure for the design of an overall cloudburst management with specific points of impact at Inner Nørrebro.
The question is what kind of solution is needed, and how to solve occasional massive bodies of water and at the same time improve quality of life in the city? In the next chapter we will unfold aspects of important parameters to us as a design tool when creating better, healthier cities, for the wellbeing of people.

HIGH RISK AREA DURING CLOUDBURST



CITY RENEWAL AREAS

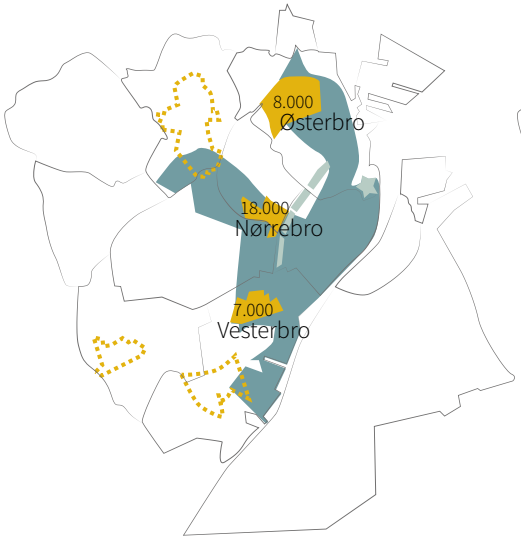


In 2012 the Municipality of Copenhagen started a strategic plan for cloudburst managing, Skybrudsplanen, which pointed out the high-risk areas of floods in Copenhagen and thereby where action must take place first (City of Copenhagen, 2012). Central Copenhagen, Østerbro, Nørrebro, Frederiksberg, and Vesterbro have high priority.

Simultaneously to the cloudburst strategy, areas are picked out for city renewal, which means the areas are worn down and need renovation. The areas are: Central Vesterbro, Fuglekvarteret, Kulbanekvarteret, Nordvest, Inner Nørrebro, Skt. Kjelds Kvarter, and Sydhavnen.

POPULATION DENSITY

SOLVING CLIMATE ADAPTATION IN A DENSE CITY CONTEXT



Inhabitants per square kilometre

Areas of city renewal and areas of high priority are pointed out and the population density becomes a new factor. The three areas have the following amount of inhabitants per km2: Vesterbro 7.000, Østerbro 8.000, and Nørrebro 18.000. (Velfærdsanalyseenheden, 2016)

Inner Nørrebro is located in the high priority area and has the highest population density in Denmark. This makes Inner Nørrebro an interesting case for a study on how to create public spaces that enhance quality of life and solve floods.

A MANIFOLD NØRREBRO

Almost 80.000 residents, 18.000 residents per km2,
26,7% of the citizens are immigrants

INNER NØRREBRO STATUS

13.600 residents, most children per m2, 20% receiving SU, 13,1% unemployed.

68% bilingual on Blågård School, 3 schools in the district, 18.000 registered CVR numbers (92% individual businesses), 6581 dwellings - 769 with installation deficiencies

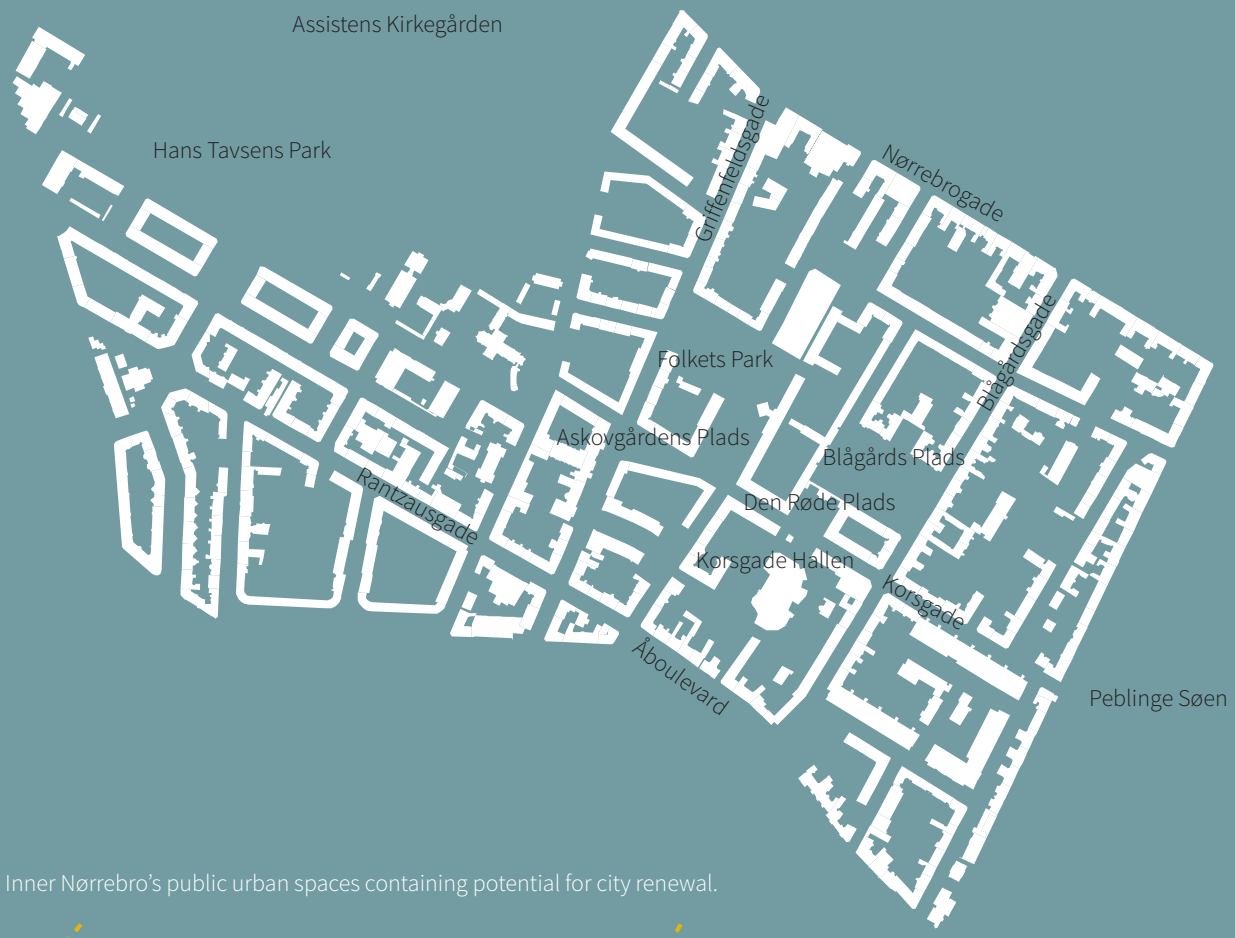
Rantzausgade: top 10 in traffic accidents per meter in CPH, new metro at Nuuks Square in 2018.

5 m2 green per resident (low compared to the rest of CPH), approx. 25% is backyards, 15% of the backyards are run-out, 85% of the backyards are green.

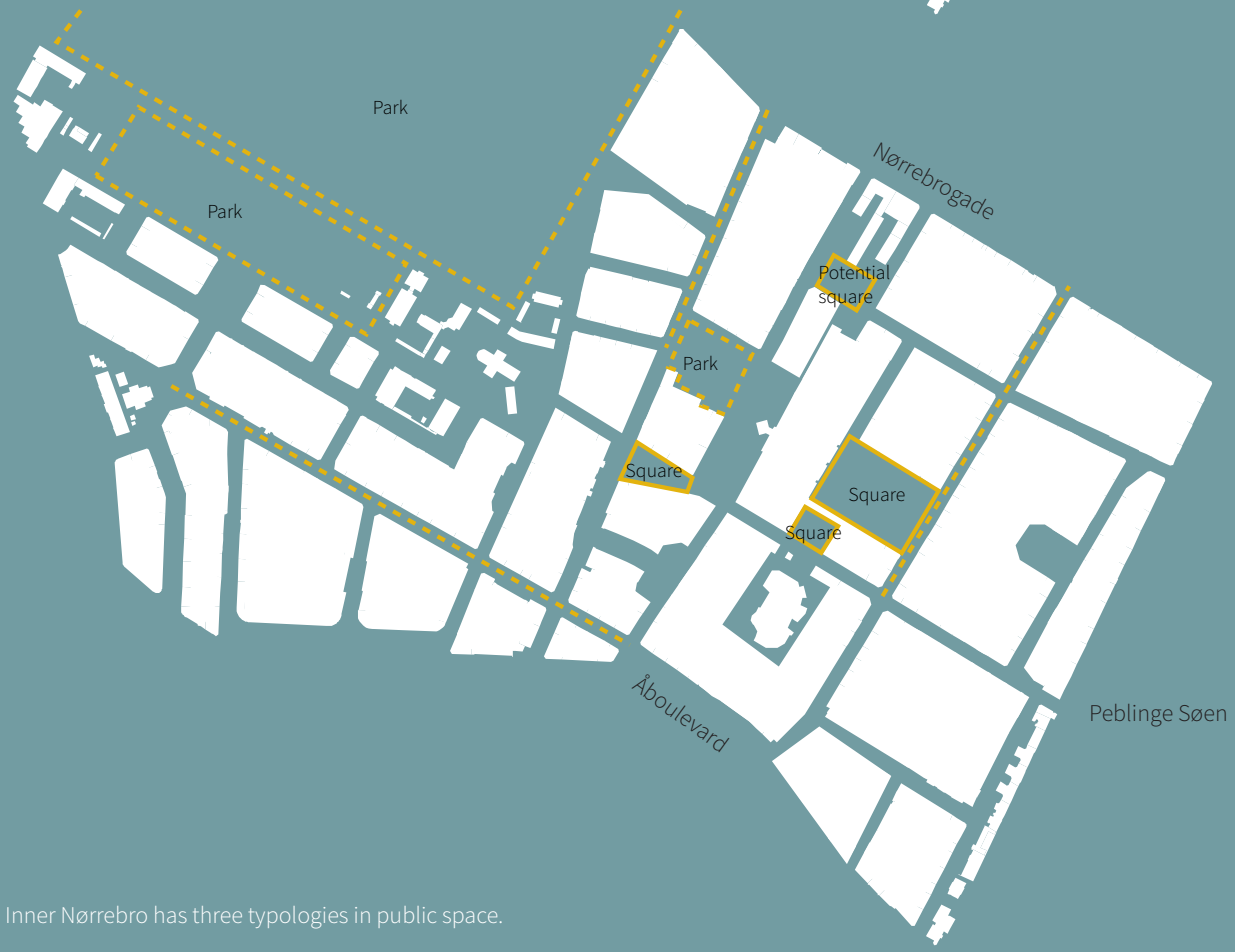
Blågårdsgade one of three streets for trade on Inner Nørrebro

The neighbourhood is characterized by graffiti among other things.

Nørrebrogade is a hectic street with a mix of different cultures.

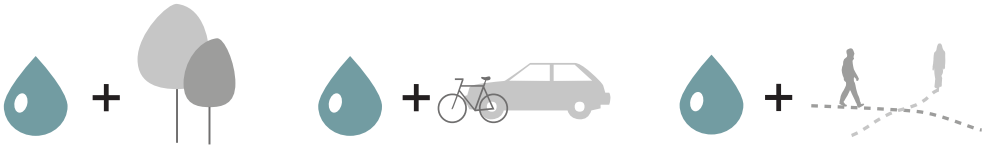


Inner Nørrebro's public urban spaces containing potential for city renewal.



Inner Nørrebro has three typologies in public space.

3 TYPOLOGIES



Park *Street* *Square*

A high density of built structures characterizes Inner Nørrebro creating limited public space, as shown on the top diagram. It is decided to consider the public surface as an option for climate adaptation and city renewal, which leaves out the opportunity for working with green facades, rooftops, and backyards. Three typologies remain - the street, the square, and the park.

The parks comprise three different sizes and functions - Folkets Park, which has been recently renewed and functions as a meeting point for homeless people as the two centers for homeless are close by. The second is Assistens Kirkegården that contains graves of many famous people as H.C. Andersen and Niels Bohr. The cemetery functions as a recreational area and have a museum. The third is Hans Tavsens Park that previously worked as a plague cemetery. Today it is a relatively big park with mown green grass and old trees serving a variety of people. From the ones walking their dog to families celebrating a kid's birthday, the elderly sitting on the benches and the young picnicking on the green grass.

Hans Tavsens Park and Korsgade are a part of the Nordic Built Cities competition focusing on lack of resources, climate change, and increase of population in cities. The competition runs as a parallel to this thesis involving three prequalified teams – Tredje Natur, SLA, and Effekt. The overall aim of the program is to visualize and export innovative Nordic solutions for smart, liveable, and sustainable cities (nordicbuiltcities.org; tredjenatur.dk, 2016).

The streets at inner Nørrebro can be divided in two categories. Firstly the ones functioning as mixed trade and housing, and secondly the streets with housing. The streets with trade opportunities are marked with a dotted line on the bottom diagram. Examples of streets opportunities are Blågårdsgade, Griffenfeldsgade, and Rantzausgade. Blågårdsgade, is a pedestrian street which is characterized by a mixture of shops, restaurants, and cafés. Griffenfeldsgade is partly a pedestrian street with the nickname Little Mogadishu, while Somalian shop owners have turned a few hundred meters into a Somalian meeting point. Rantzausgade is a busy vehicle street with 15.000 bicycles a day and a blend of supermarkets and places to eat.

The squares in the area are of different sizes and uses. There are three official squares and one place, which have the possibility to be turned into one. Currently, it functions as unpaved parking. The biggest square is Blågårds Plads. Blågårds Plads is an important meeting point being the center of demonstrations. It also makes a popular venue for events in summer and features an ice skating rink in winter. Den Røde Plads functions as transit and parking space for locals with Korsgade Hallen on the other side of the street, whereas Askovgårdens Plads functions as a transit space with bicycle parking.

HOW TO COPE ADAPTATION IN DENSE POPU

WITH CLIMATE DENMARK'S MOST LATED AREA?

APPROACH & POSITIONING

CHAPTER 2

LIVEABLE CITIES

What makes a good city? And what defines an ideal place to live? The liveability term seeks to describe the frame conditions of a decent life for all of the cities and communities of inhabitants. This includes physical and mental wellbeing (crcresearch.org, 2016). In general, a liveable city requires policymaking and good governance to bring the best value to society, the top down resources focus on culture, infrastructure, education, and healthcare. While quality of life, soft values and inclusive cities that work for all are in focus from both a top down and bottom up approach. From our perspective, life and vitality on the streets are one of the most important parts of the liveable city. Life is unfolded and lived on the streets. People meet each other, go from A to B, and feel a sense of community.

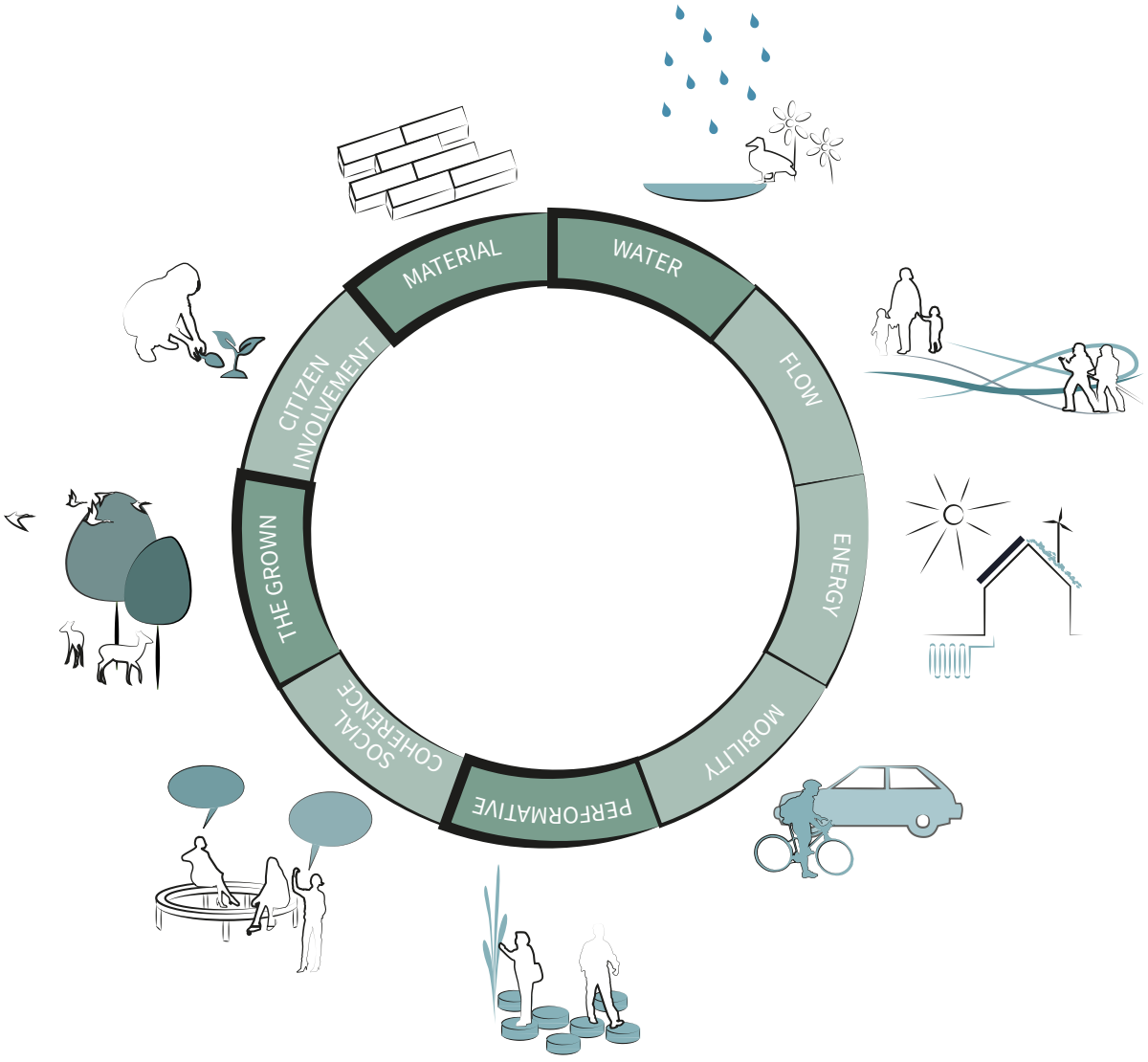
In the book Byer for Mennesker (2010), Jan Gehl describes how the liveable city has four objectives, which need to be fulfilled to obtain a city for people – the living, safe, sustainable, and healthy city.

"Bylivet i de levende, trygge, bæredygtige og sunde byer har som forudsætning, at byerne er gode at gå i, men det mere vidtrækkende perspektiv er, at styrker man livet til fods, følger en lang række værdifulde sociale og rekreative muligheder med." (Gehl, 2010: 29)

According to Gehl the liveable city is about inviting to walk, bike, and improve qualities of the city. Furthermore, it offers protection, safety, a fair amount of space, furniture, and visual quality. These are all specific parameters to design with aiming for the liveable city. Though understanding the city in its entirety and knowing the complexity and layers are just as important as Jane Jacobs refers to:

"The look of things and the way they work are inextricably bound together, and in no place more so than cities." (Jacobs, 1961: 14)

To the right, a holistic diagram shows an interpretation of the parameters concerning the liveable city. Some of those parameters will be defined in chapter 3. There are many different positions on liveability depending on field of interest and understandings. For this thesis, Gehl and Jacobs inspire a personal comprehension on liveability. This involves the natural; as water, materials, and the grown, the people minded; as user involvement, social interaction, and the performative, while energy, mobility, and flow belongs to movement in different pace. All parameters might belong under the sustainability term, depending on how they fit issues of the social, economical and environmental aspect. An aim to recycle and spent resources wisely is preferable, thus it can be intricate and demand know-how on processes.



A holistic diagram displaying an interpretation of city parameters from an urban design perspective.



CHOOSING FOCAL PARAMETERS

The diagram visualizes a holistic approach to sustainability in urban planning. All parameters are taken into consideration as a necessity for understanding when to start up a project. In this case we decided to focus on water as the essential and obvious parameter, considering climate changes, that would go well with parts focusing on the physical environment – that be materials, the grown (trees and plants) and the performative (interaction by people). These four elements constitute the foundation, together with the complementarity approach, equalizing the rational and aesthetic. The concepts of the grown and the performative will be further described in this chapter and chapter 3.

METHOD AND INSPIRATION

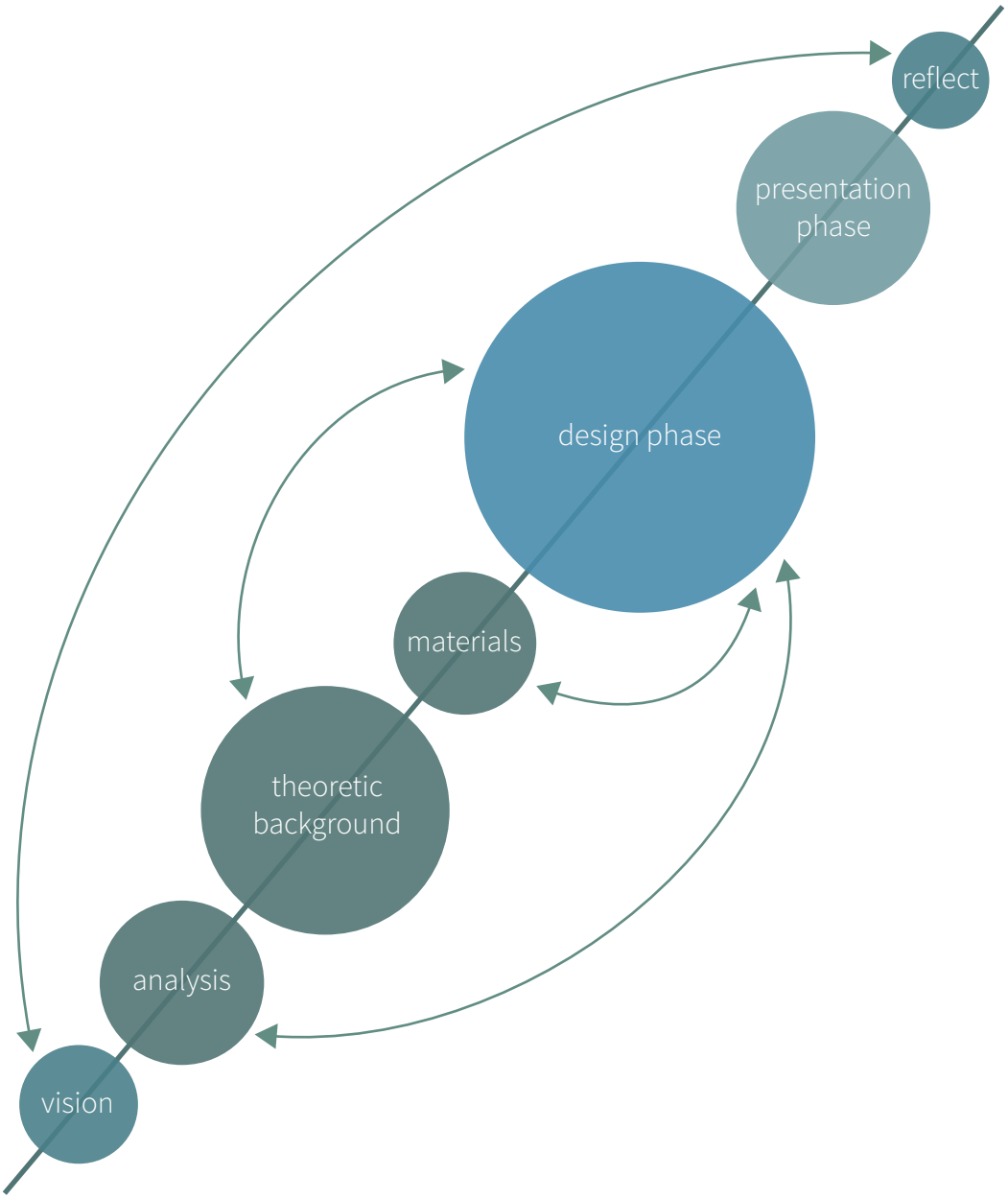
Working with detail and urban scale simultaneously has been an integrated part of the project. As have different writings spanning from city planning to philosophy, manufacture descriptions, and books on biotopes and trees. All parts are components from fields not obvious to design. The above is relevant, when moving from societal thoughts to materials and urban spaces, where a choice of focal points are made – in this case creating liveability in urban spaces by enhancing sensuous experiences.

The thesis project, Liveable Water, links various interests to achieve designs solving water management and implementing well-founded materials, grown elements, and the performative aspect on a basis of personal experience and motivation, theory, analysis, and technical investigations as displayed in the diagram to the right.

Study trips to Faxe Kalkbrud, Stevns Klint, and several urban projects within the outskirts of Copenhagen, such as Lommeparken, Frederiksberg Nye Bymidte, Copenhagen Towers, Vester Voldgade just to take a few examples, have informed an elaborate understanding of potentials and existing expressions. The work throughout the project is characterized by a constant change between scales to achieve a better city environment at Inner Nørrebro by thinking all aspects into an entirety. The result is presented in chapter 4-7 displaying strategy, concept of delay and detailed design of a street and a square, managing different extents of water amounts and offering experiences that seek to induce vitality, life, atmosphere, and various spatiality.



As a part of the material investigation we have visited Møns Klint, Faxe Kalkbrud, and Stevns Klint.



Work flow demonstrating how the thesis period have been spent with focus on theory and design.

THE BUILT AND THE GROWN ENVIRONMENT

Attractive urban space with complementing green and grey elements. Vester Voldgade, Copenhagen.

"The world in its essence adheres to the concept of complementarity: Everything has two sides" that constantly complement one another." (Andersson, 2014).

Perceiving the world through a rational and aesthetic focus within the built environment as two sides of the same coin is pertinent, as both sides are constantly present without always noticing (page 22). One side is not more important than the other and by thinking the two together it is possible to get the full understanding of the world, according to architect and thinker Stig Lennart Andersson, who is the founder of the architecture company SLA, which will be referred to later on. Andersson reinvents the complementarity approach and uses it as a fundamental basis to solve green urban spaces and landscapes. It saw the light of day back in 1917, when the Danish landscape architect G.N. Brandt developed a theory of complementarity between the grown environment (trees, plants) and the built environment (buildings, structures, constructions) (Andersson, 2014).

"...architecture too in its essence is complementary. Architecture is not just the built environment: The built environment constitutes only half of the complete essence of architecture. The other half, the grown matter, must be seen as equally important, equally essential. Architecture is both the built and the grown. Only by acknowledging this can we achieve the full understanding of architecture." (Andersson, 2014: 14-15).

Thereby the two complementary environments are the built, which is understood as structures and constructions, whereas the grown is harder to define. Anderson defines it as trees and plants, even though it seems reasonable to define the grown as 'nature'. In chapter 3 the grown will be discussed and defined using the philosopher Hans Fink's ideas of nature as point of departure (page 39).

The grown and the built are equally complementary as stated above, so are the rational and aesthetic. The approach offers a way to design for both functional and aesthetic quality, aiming for a holistic result that succeeds solving technicalities and creating better spaces for people. As a result, it is decided to put the complementarity approach to a test and combine it with theories and methods from other actors and fields as described later on to achieve an innovative design proposal.

THE RATIONAL AND AESTHETIC

A rational approach can be either based on reasoning and logic or mathematically as quantity. Andersson describes the rational thinking as; *"common sense, the deductive practice in which conclusions are logically obtained on the basis of pre-established and well-known terms."(Andersson, 2014: 12).* It is the sensible and scientific and will be used to inform the functional and practical part of design for urban spaces.

The aesthetic term refers not only to the beautiful, visually pleasing, or the sense of sight. It should additionally refer to all senses as aesthetics deal with the entire sense register – those which make us feel, smell, taste, look, and hear the surroundings, and increase the experience of city and nature (will be unfold in chapter 5-7). Aesthetics is not defined by how things look, but how effectively it captures our senses and emotions. It is the way we perceive materials and spatiality, and how they make us feel! (Andersson, 2014).

In many existing cities, touching and feeling are often underappreciated, as essential ways to experience. "Our skin is … designed to experience pressure, vibration, light touch, pain or temperature." (Beatley, 2011: 36). This is why it is of high relevance to focus on aesthetics with equal importance to all five senses as; "qualities of space, matter and scale are measured equally by the eye, ear, nose, skin, tongue, skeleton and muscle" (Pallasmaa, 1996: 41).

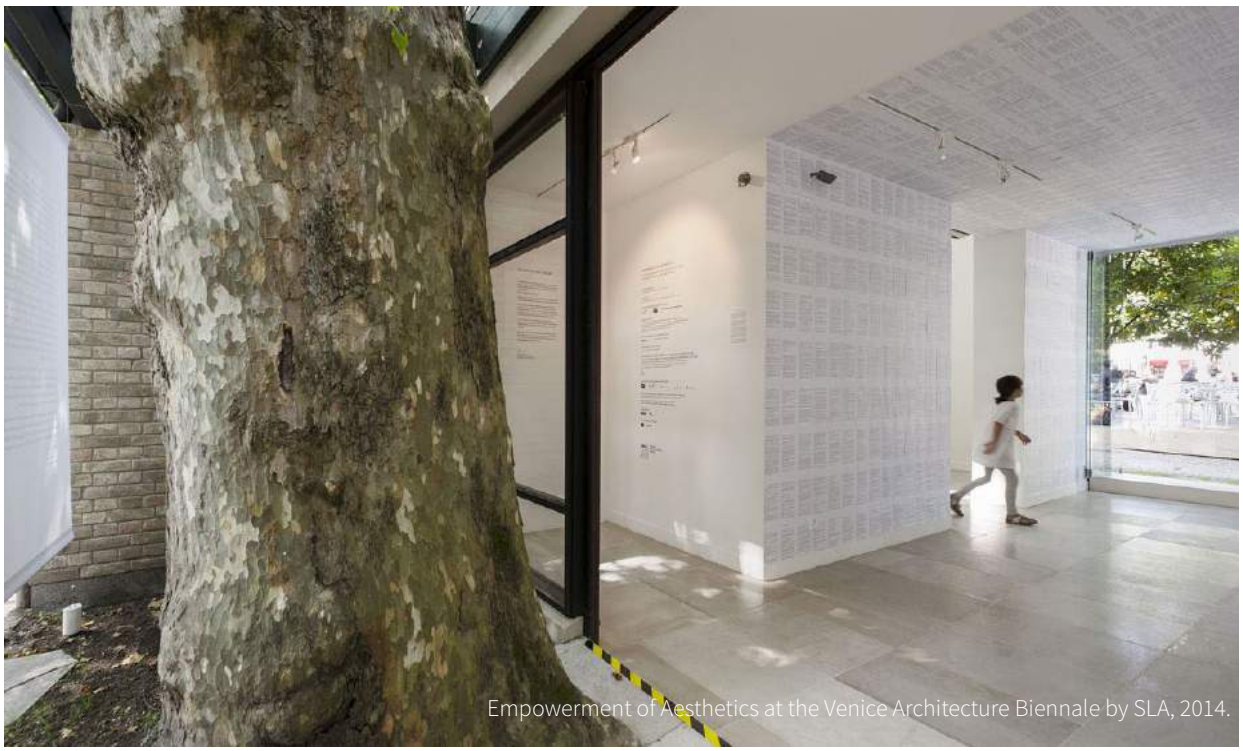
SENSE OF PLACE

Therme Vals by Peter Zumthor, Switzerland, 1996.

Andersson engages in design for senses and emotions. Thereby he enrolls in the group of contemporary architects and thinkers focusing on sensorial experiences as Juhani Pallasmaa and Peter Zumthor. All of whom have been inspired by the period of critical regionalism (1983) invented by the postmodern architect Kenneth Frampton. The phase of critical regionalism came as a response to the modern architecture with hard spaces designed for function and cities designed for trade and meeting. Frampton drew attention back to the historic and experiential aspects of place, though it was Christian Norberg-Schulz who came up with a clear theory of sense of place and wrote about genius loci - the spirit of place (Norberg-Schulz, 1980). Furthermore he wrote about an authentic relationship between the built and the natural - architecture and place - that closely links to Andersson's interpretation of the grown and the built.

One who truly engages in the local is Zumthor, who carefully chose local materials with authenticity for Therme Vals (1996), which combine modern architecture with the local landscape and tradition. Zumthor achieved to explore the materials and use them to enrich and diversify his design, which adds a story connected to place and tradition. Anderson did the same in the exhibition for the Venice Biennale, 2014, where elements of nature, the grown, and the built, were exhibited to tell a story about local and sustainable potential. Another example of the relation between the built and nature is demonstrated by Snøhetta's Petter Dass Museum in Norway, 2007, where the natural landscape frames the site of the building and becomes walls melting building and nature together. From a critical perspective, it is easy to find sympathy for local materials and sense of place, it becomes disparity when the story of a place or nation have a fixed genius loci and materials end up representing national icon projects (Hvattum, 2009). As Snøhetta's embassy in Berlin (2001) with its 14 meters high and 120 ton granite slice – cut in one piece and placed as the head subject of the building with national and iconic significance. A statement like this turns into a problem by equalizing the relation between material and meaning and thereby forcing a narrative, telling the story of a nation's fixed genius loci.

The natural and the local contrast with the global and the generic. Although identity made from the local works as a brand on the global market tied up to its image – like a product to its logo (Hvattum, 2009). The natural, the local, genius loci meet one's opposite with 'the generic city' Rem Koolhaas' defines in his book of the same name.



Empowerment of Aesthetics at the Venice Architecture Biennale by SLA, 2014.

Petter Dass Museum by Snøhetta, Norway, 2007.

THE GLOBAL INFLUENCE

"The generic city points out the overpowering importance of infrastructure for urban life in the coming decades. Not proximity but connectivity, not history but adaptations are the key variables." (Hajer, 1999: 141)

The generic city theory does not care about identity, though it is functional parameters like infrastructure that take up attention and the interpretation of cities as networks and systems. The theory is radically different and distances itself from life lived in human scale in favor of globalization and architecture as a global phenomenon instead of local (Hvattum, 2009).

"The generic city is the city liberated from the captivity of center, from the straitjacket of identity." (Koolhaas in Hvattum, 2009: 47).

However the generic city thinking triggered the development of new studies and approaches to architecture, thus the pragmatic architecture company, MVRDV, started mapping the world situation to analyze and use the results as a parameter for new architecture and urban form. Taking distance to the 'straitjacket' of identity that Koolhaas considers to be present in cities and creating global factors for design instead of local - thereby both positions reduce architecture to a product defined by factors, hence sense of place or global market forces (Hvattum, 2009).

Another development inspired by the generic city theory is the mobilities thinking and networks, which makes the city work fluently and is crucial to the life of an urban dweller. Though mobility theories are not only rational, but involve aspects of sociology and aesthetics from strategy to human scale it takes interest in everyday movements and moments as accidental street ballets performed by people. Those moments caused by chance, that change the rhythm of movement, and the coherent understanding of networks and flow are part of the comprehension we are engaged in today.

Some architectural projects of today like the Norwegian National Tourist Route, focusing on emphasizing the beauty of the landscape, and Realdania's 'Yderområder På Forkant' (ex. Ringkøbing K), which work with potentials of peripheral areas. Those projects understand the importance of network but zoom in to look at place and quality of the context, asking what is unique. Thereby a result is created with respect for the existing landscape and interventions working aesthetic mechanisms into the projects.

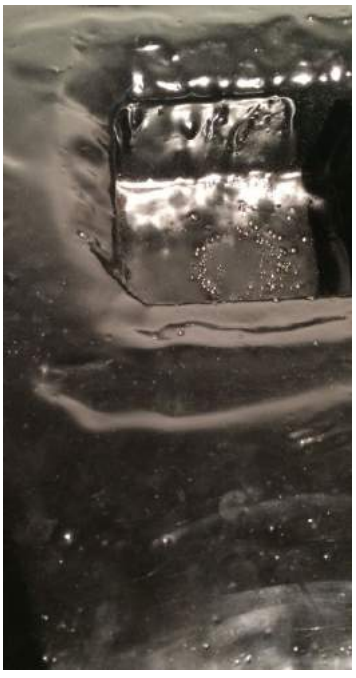
TO EXPERIENCE

When we focus on aesthetics and defines it, as how one senses the world with the body, it is inevitable to link the subject to other professions to gain a deeper and fuller understanding of the possibilities and meaning. Aesthetics has a profound connection to the field of art that intentionally works with sensory experiences and phenomenology. Certain mechanisms are applied to performances and art interventions that deliberately move people or make them act differently. A relation is created and the act of doing something becomes part of a piece of work, which is a phenomenon adding a new perspective and relatable to the field of urban design.

Performativity suits the need to describe an installation in public space staging a piece of work and creating interaction and relation to its spectator, as described later in chapter 3. Though the definition 'performative design' is chosen to describe a project working with the same mechanisms as art yet based on a background of architecture principles as Hans Kiib and Gitte Marling introduce in Experience Design, 2010, taking these theoretic principles of experience design and performativity theory to an urban design context give an opportunity to refine the design, and to place it in the cross field of architecture and art. Thereby sensory and aesthetic experiences are thought into performative design and will add a new angle to the approach of the project.

Dan Graham, Image courtesy of the National Tourist Routes of Norway, Lofoten Islands.






Exhibition by Studio Mumbai at DAC, 2016. Materials - concrete, brick, tar, and paint.

The grown element meets a concrete surface where the city centre of Frederiksberg is connected to CBS for soft road users.

Water jets on the square inviting to interaction.

The water wall turns into a styrry sky at night.

FREDERIKSBERG NYE BYMIDTE

Staging oneself through performative design is in focus in Frederiksberg Nye Bymidte, permitting the spectator to go through various sensorial experiences across transit zones, which, depending on the desire and time from the spectator, can function as a single-minded or open-minded space, with places to stay and interact. No program is present, but a freedom to understand and use the rooms individually is at stake, as we as individuals have different preferences and experiences (Marling, Kiib & Jensen, 2009).

The structure of the design consists of 5 connected urban spaces with specific functions and visual expressions, focusing on sensorial architecture and open sense of place. The approach imitates how buildings are structured, with individual rooms with doors in between. In a building you open a door and walk into a new room, forgetting the previous, which is conducted by diversified materials in the spaces of Frederiksberg Bymidte, staging different nature experiences, creating room for dreams and sensorial impressions to arise for the individual (Marling, Kiib & Jensen, 2009). It have not been found necessary to use a lot of expensive materials and urban furniture in the project, as it concerns spaces and spatialities in coherence with the built structures, by using existing or designed terrain curves shaping sitting options (Marling, Kiib & Jensen, 2009).

The first parameter, which attracts attention, is a concrete surface connecting the site to CBS. Dissimilar sizes of circles are cut randomly into the concrete surface to capture green elements, forcing passers to slow down and be aware of the specific space. Alongside the concrete surface a hilly terrain planted with pine trees shoots up, inviting both the students and passers-by to take a break as the hills are dividing the space in smaller semi-private rooms. Different numbers of trees make the space unpredictable making you engage even further, with unique pine trees inviting to touch because of their dissimilarity.
Sounds are dragged in by 32 sound wells popping discreet from the ground sending out music and animal sounds at specific moments, working as an element of surprise, dragging in nature in a city context of hectic movement. Bird song can also be recognized from the treetops even though there are no birds in sight due to sound installations. Andersson states, that this was exactly the thought. To make people wonder on the sound and smells disconnected from the normal cityscape, meaning people are acquiring new acknowledgement (Marling, Kiib & Jensen, 2009).

Lighting for effect creates a specific atmosphere by staging nature, getting inspiration from the theatrical world creating a performative nature experience. It appeals to our senses instead of functional parameters differentiating it from a functionalistic perspective on nature (Marling, Kiib & Jensen, 2009). Individual pine trees are lit up with red light, which orchestrate and display them in a light normally disconnected from nature, inducing the spectators to examine it.
Water jets along with a water wall is at night time transformed into a starry sky making the spectators observe the real night sky above. Light poles throw cones of light on the surface inviting to perform in the spotlight, while others cast long shadows when entering in the right position. All these parameters invite to interaction and change the experience completely from daylight to nighttime. The space changes all the time, depending on weather, time of the day, and time of the year. It invites you to come back again, with no right or wrong time to be there, states Andersson. Also rain elements are dragged in with circle engravings in the surfaces for water to pile up reflecting the sky.

The design is thought through to activate all senses, with diversified experiences every time the place is visited. Various elements are incorporated, which implies that special features only are visible in specific hours, or when the light have the right setting. This means the space moves you differently every time due to a constant change telling new stories at every visit, referring to Andersson's statement concerning; there is no right time to visit the space, only different experiences (Marling, Kiib & Jensen, 2009).

29 Red House by JVA, Norway, 2002; Høse Bridge by Rintala/Eggertsson, Norway, 2013; Schouwburgplein by West 8, Netherland, 1996; Tverrfjellhytta, Norweigian Wild Reindeer Pavilion by Snøhetta, Norway, 2011; Superkilen by BIG, Copenhagen, 2011.

RETHINKING

"An architectural work is not experienced as a collection of isolated visual pictures, but in its fully embodied material and spiritual presence." (Pallasmaa, 1996: 44)

Pallasmaa refers to the built environment as something experienced with all senses. However, many places are likely to be dominated by sense of sight, due to lack of tactility and variation. Not just the architectural work (buildings); but also urban spaces consist of embodied materials and might as well be equally part of a built environment.

Movement is part of experiencing life in the city and should offer designs that invite people to interact. Life between buildings has the possibility of being meaningless, as experiences have been neglected by the absence of sensory stimulation (Gehl, 1971). Rethinking the way we design our cities is relevant to achieve more versatile experiences both at small and larger scale. At the moment, there is a discourse recapturing a position that states the importance of place, materials, and aesthetics. The architecture company SLA, who work with urban design and landscape, is gradually changing towards projects implementing the grown to become more 'wild' and green - borrowing elements from the rural, blending nature into the city, making them play together.

Looking at sense of material, Studio Mumbai has reinvented old artisanal tradition by combining good workmanship with the skills of architects and engineers. At the same time companies like Snøhetta, JVA, and Rintala/Eggertsson, just to mention a few, cultivate artificialness with many layers, obtaining meaning as contrast to nature and the place, instead of being a continuity or imitation of it (Kjeldsen et al., 2012). That way architecture evolves into something apart from, though inspired by, the past. Meanwhile, projects like Frederiksberg Nye Bymidte, Superkilen, and Schouwburgplein in Rotterdam are focusing on the added value created by performative elements changing rhythms of flow by inviting to interaction. Public space is going towards richer experiences and offers more than expected.

A HEALTH PROMOTING PLACE

Urbanized areas are in many cases characterized by an imbalance between the built and the grown. Few places offer a sensorial experience in everyday life as an urban dweller, while the city is designed for cars and functionality. This affects the lifestyle of urban dwellers. Throughout the last generation's, life has changed and many jobs have turned into sedentary work, which affect health and impacts society.

"An increasing number of future health hazards relate to our lifestyles, which are more sedentary, more stressful, and increasingly oriented indoors. A large part of the population is overweight and many diseases are related to this. Depression and pain are in greater focus, as they have a major impact on the number of years lived in good health" (Nilsson et al. 2011: 5).

Our comfortable life in urban settings has left us with health complications. WHO have made a calculation predicting that 70% of all diseases causing death, by 2020 will be a consequence of our lifestyle! Lifestyle factors responsible are primarily smoking and inactivity (Stigsdotter et al., 2011). As a result one of the most important challenges of today is to find solutions improving people's mental and physical health. Urban designers have a responsibility to shape future urban spaces for the welfare of people, simply because of wide founded knowledge making us capable of incorporating the right design choices for the physical environment supporting an active lifestyle.

The cost of lingering disease caused by lifestyle issues is an enormous discharge to the society. Solutions found to prevent ill health and improve the general mental and physical health would be a big win for

Bicycling as a daily and natural way to get around the city of Copenhagen.

every society considering the welfare of the human race as a practical objective (Meier, 2016). Recently, a study, published in the science magazine The Lancet, investigated how the organization of the city has crucial influence on the lead of an active life. The study took place in 14 cities divided on 10 countries, where every step was measured. The result showed that:

"På baggrund af et omfattende globalt datamateriale kan vi direkte dokumentere, at byers fysiske indretning i sig selv afspejler, hvor meget folk bevæger sig. Og dermed har byer og bydele en direkte indflydelse på den enkeltes beboers risiko for at udvikle livssygdomme som hjerte-kar-lidelser, fedme og diabetes." (Jens Troelsen, Politiken.dk, 2016)

The conclusion of the study (politiken.dk, 2016) states that it is completely vital to have a high density of people, a fair amount of intersections, many stops for public transportation, and green areas close to home to lead an active life. The result relates closely to Gehl's interpretation of how to shape liveable cities as mentioned above. A design that invites people to walk and bicycle is crucial to prevent bad health, yet mental health and overall well being is an ambition partly solved in the physical environment adding quality to urban spaces.

This chapter has made an attempt to summarize the present challenges and potentials of the urbanized environment and introduce an approach that positions itself in the present. The following chapter will unfold the previously mentioned parameters – water, the grown, materials, and the performative.

Green areas to help promote exercise. Sønderboulevard, Copenhagen.

PARAMETERS

CHAPTER 3


THE BLUE

WATER OF FUNCTION

Water is the fundamental element for life on Earth - all living organisms are dependent on water in one way or another. Water flows in a cycle by changing condition from liquid to vapor. It evaporates from surfaces and transpires from the grown creating condensation and falling down again as precipitation.

Urbanization pressures the ecosystem of the water cycle by agricultural intensification, grey infrastructure, hydrological modifications to water bodies, intensification of forestry and the destruction of wetlands (Horizon, 2015). Less water is generally infiltrated and sewer systems transport water to rivers or the ocean, which speed up the natural process of groundwater flow. By treating much more water at the surface for evaporation, and plant trees to absorb and transpire the water, a result can be accomplished closer to the natural cycle of water.

Additionally water is an elementary resource for everyday life. Cleansed and collected run off water could be used for toilet flush, showers, washing machines or road sweepers in the context of Inner Nørrebro, as modern sustainable building projects implement just now. A solution is presented in chapter 4-7. Handling water in a responsible and sustainable way is important and might as well be a part of the consideration when changing spaces to adapt to climate changes and create liveable spaces.

Water as an element of various functions.

POETICS OF WATER

Water is a life-giving source with many faces. It shows as a functional part of our lives, though humans have ascribed metaphors and meaning to water by means of religion, culture and language. Thus water is not only a fluid mass, but also matter of poetry and meaning, which the French philosopher and phenomenologist Gaston Bachelard looked into when he wrote Water and Dreams (1942). This work contains some interesting observations on how water is perceived depending on the scenario and connects it to western culture. Bachelard links the perceived to reverie and imagination as a way of describing how one relates and associates to experience and cultural knowledge. One may perceive a phenomenon of water different from another depending on the level of experience and frame of reference. Here Bachelard describes the way a phenomenon as water is perceived by an individual:

"... certain forms born of water have more attraction, more compelling force, more consistency. That is because more material and profound reveries intervene, because our inner being is more deeply engaged, and because our imagination dreams more specifically of creative acts. Then the poetic power, which was imperceptible in a poetry of reflections, appears suddenly. Water becomes heavier, darker, deeper; it becomes matter. And it is then that materializing reverie, uniting dreams of water with less mobile, more sensual reveries, finally builds on water and develops a more profound and intense feeling for it." (Bachelard, 1942: 25)

Water can be pure and gentle, despite a thousand faces; it comes from a source and runs downwards. It is soft, grave, passive, and reflective. It shows up in many forms; as clear, trickling, water, and springtime water that are allied with the renewal of spring, coolness, youth, purity, and clarity. Whereas a lake, a pool, or stagnant water is deeper and darker - it stops you near its bank and let's you watch. You cannot go further. It is a barrier. However, stagnant water mirrors and attracts the narcissism in the self, while moving water reflects the surroundings and enhances them. The lake, river and stream move as on a journey, while raindrops are as tears dissolving landscapes; lines and forms melt away by the characteristic liquidity of water.

It is a multifarious element, which can be fascinating and memorable with views of scenic quality, closely related to the perception of beauty and perfection. Looking out over the ocean represents infinity and compelling attraction, whereas the stagnant water in lakes is contrastingly quiet and calm. At the same time water encourages activity. Children cannot help playing in a puddle of rainwater, shooting at each other with squirt guns or splash around at the beach in summer. Water is the one thing people cannot resist, no matter their age.

The associations are manifold and interpretations vary regarding to the perceived phenomena of water. The approach of Bachelard adds to the meaning of water as something more than functional and provides a useful tool for designing with water.

Water as a playing element.

THE GROWN

NATURE AND THE GROWN

The philosopher Hans Fink has developed definitions on seven ideas of nature – the untouched, the wild, the rural, the green, the physical, the earthly, and the entity. 'The grown', as to be understood here, is close to Fink's definition of 'the green' and thereby the living, organic as trees and plants. Thus, the green nature is not limited to rural areas, but includes 'the green' in cities, gardens, parks, and along streets (Fink, 2003). However, 'nature' as a wider concept, is like 'the physical' format, where nature is specified by natural law and includes the fundamental, materials, and energy related in everything that exists. It is the process of life and includes both the grown, water, and the human organism, whereas human culture and thinking somehow stands as something else (Fink, 2003).

Adding a broader perspective to the understanding of nature as 'the physical', it includes ecosystem services and biodiversity securing variety among and within animal species that strongly relate to the character of the grown. The science of ecology is concerned with the interrelationship of organisms and their environment (Merriam-webster.com, 2016). The benefits we receive from nature are ecosystem services - these are resource services such as food, water, energy, purification of water, carbon sequestration and climate regulation, waste decomposition, crop pollination, pest, and disease control. All these benefits can be thought into city planning's complexity and catalyze valuable advantages for society – creating a better place to live.

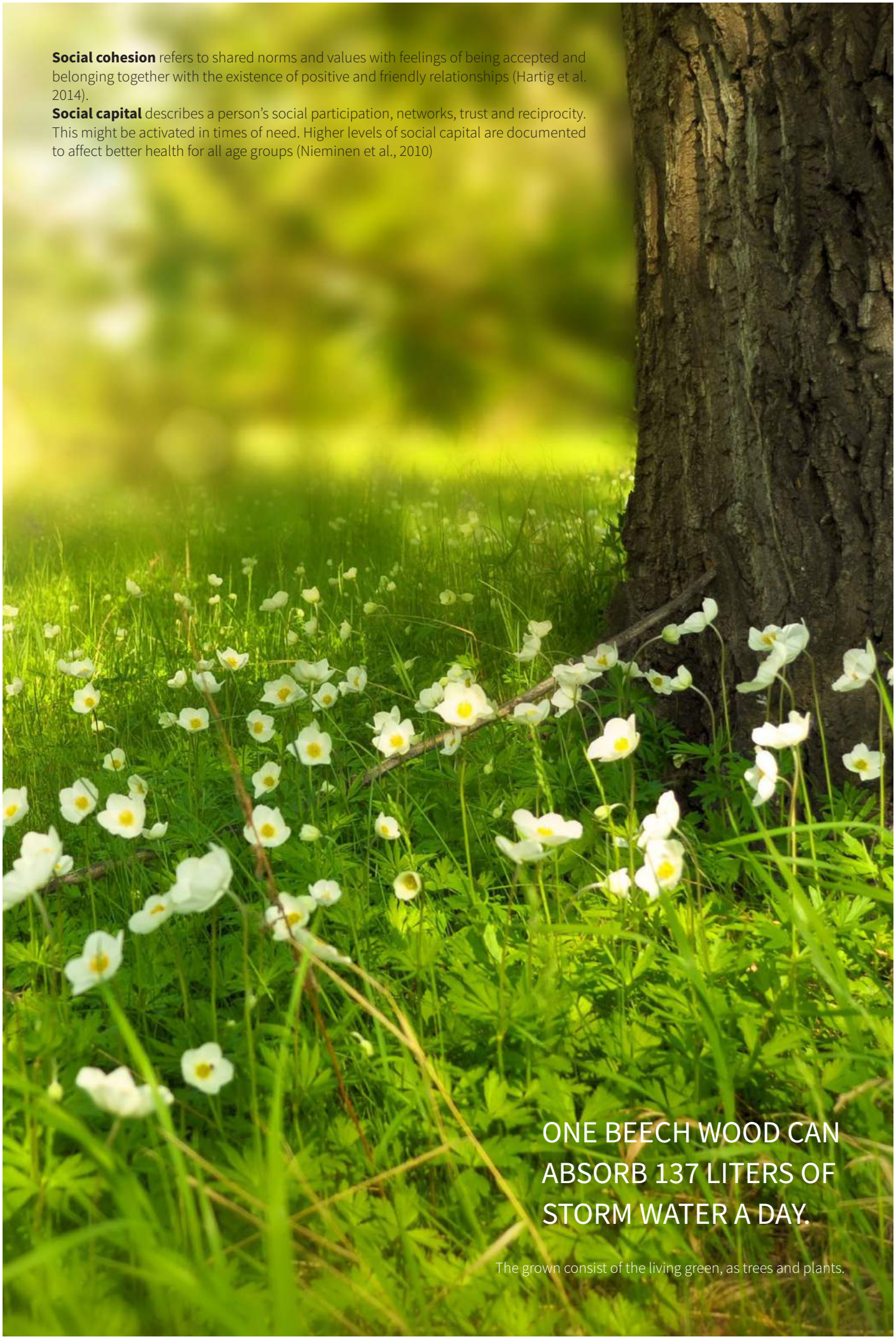
"Nature in the city must be cultivated and integrated with the varied pursuits and purposes of human beings; but first it must be recognized, and its power to shape human enterprises appreciated." (Spirn, 1984: 64)

Ecosystem services should be easy accessible and used by a greater set of city inhabitants in order to be a good place for daily nature encounters, noise reduction, and absorption of pollutants in water and air (Andersson et al, 2014: 447). Hereby 'the grown' will represent not only trees and vegetation, but also infrastructure of biodiversity and the dynamic process of nature's grown elements, which expands the interpretation of the term.

EXAMPLE 1 - CHICAGO

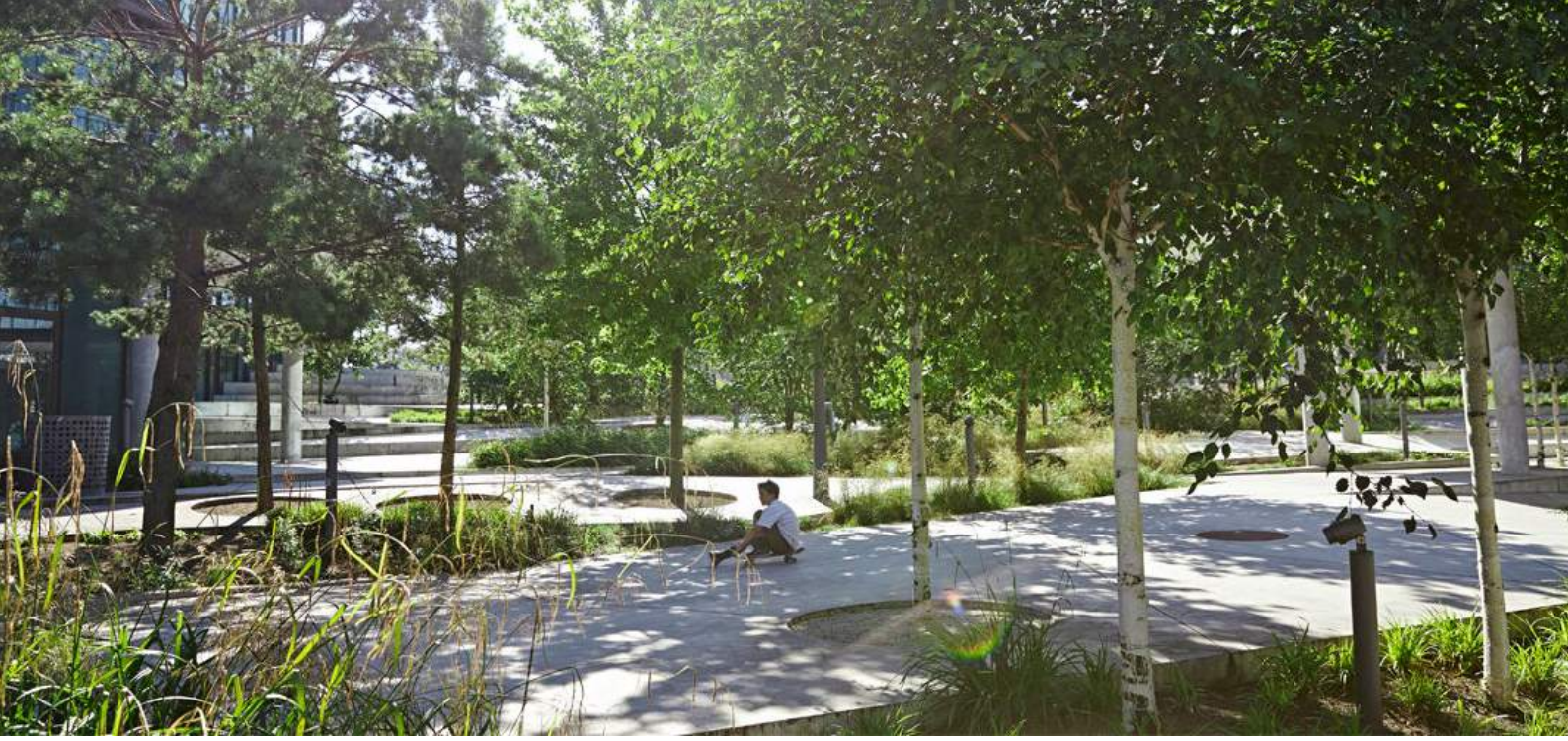
A study in Chicago (Kuo et al., 1998) has taken advantage of circumstances creating a natural experiment. They compared public housing residents to dwelling units in architecturally similar high-rise buildings with a varying amount of vegetation outside. The researcher found a positive connection between the presence of trees and grass and the common use of spaces leading to informal social contact with neighbors. *"The relationship between greenery and social contacts appeared to be mediated by the use of the common spaces." (Kuo et al., 1998)*. Furthermore it was documented that social contact is positively related to the sense of safety and spaces containing more green elements as trees and grass near the buildings had residents displaying less aggressive behavior and the buildings were associated with fewer crimes! (Hartig et al. 2014)

Social cohesion refers to shared norms and values with feelings of being accepted and belonging together with the existence of positive and friendly relationships (Hartig et al. 2014).
Social capital describes a person's social participation, networks, trust and reciprocity. This might be activated in times of need. Higher levels of social capital are documented to affect better health for all age groups (Nieminen et al., 2010)



ONE BEECH WOOD CAN ABSORB 137 LITERS OF STORM WATER A DAY.

The grown consist of the living green, as trees and plants.



A green urban space in the middle of Copenhagen. Bymilen by SLA, 2011.

THE ENVIRONMENTAL

Scientifically it is possible to measure and calculate how the grown affects the environment by natural processes belonging to ecosystem services. This is a rational approach based on natural science with no concern of how people experience, feel, and connect to each other in the presence of nature. Nevertheless, it contributes to know-how on improvements, which will benefit the health of urban dwellers. The list below of advantages from natural systems is long. This section will briefly sum up the most crucial effects on the environment from the grown's ecosystem services.

The grown benefit the environment by; (Meier, 2016)

- *Reducing air pollution through foliage.*
- *Affect the urban hydrology by holding tremendous amounts of water, which evaporate through the leaves.*
- *Clean polluted soil by the natural process of phytoremediation (neutralizes and stabilizes soil).*
- *Reduce CO2 emission by the photosynthesis (transforms CO2 into glucose and oxygen) and store CO2 in the biomass.*
- *A better microclimate from evaporation that lowers temperature and trees break the wind and dampen turbulence.*
- *Cities with green infrastructure profit from less energy use as trees provide cooling, insulation, and reduce the urban heat island effect. Furthermore, green roofs and green walls are capable of decreasing the need for heating and air conditioning (Horizon, 2015).*
-

A study conducted on the hydrological effect of urban forests in 2001 showed that: *"...the greatest influence on the ecological value of urban areas was the percentage of green space, particularly of trees."* (Nilsson, K., 2011: 30). Another study found that a park filter up to 85% of the air pollution out while a street with trees filter up to 70%. Furthermore the amount of water absorbed by trees gives a reduction to the rates of polluted run off into the drains and water systems (Nilsson, K., 2011).

Another measurable fact is that the grown has a healing effect on people and promote recovery by lowering blood pressure, increase the ability to concentrate, reduce the level of stress hormones, and reduce ADHD in children (Meier, 2016).

WELL-BEING OF PEOPLE

This part addresses the benefits of contact with nature in an urban setting with emphasis on social aspects.

An increasingly strong evidence base, from academic journals, shows that access to green qualitative spaces within the city, such as streetscape greenery, green urban spaces, and parks, affect health, well being, social cohesion and community support (Hartig et al., 2014; Kuo et al., 1998; Sigiyama et al., 2012). Additionally, nature stimulates physical activity and promotes the development of social ties, due to the attractiveness of green public spaces that bring people together. Also, the grown are found to be related to people's perceived happiness and general health, which contribute to the social dimension of sustainable urbanization, and makes it worth investing in on the long run, because

EXAMPLE 2 – SUSY GRØN, DENMARK

SUSY Grøn is a study conducted by Skov & Landskab and Statens Serum Institut for Folkesundhed comprising interviews and questionnaire on 21.832 Danes above 16 years regarding use of green areas. The study found similarly to Maas et al. that individuals living more than 1 km from green areas averagely score lower points on eight health related fields, than people living within a 1 km radius. Looking at self-perceived stress, the result shows higher levels the longer people live from a green area, and correspondingly the level drops the more people visit green areas. Physical activity and overweight are factors related to distance to green areas as well as how frequent people use green spaces. There is a tendency to have a good physical and mental health when living less than 300 m from a green area (Stigsdotter et al. 2011).

the grown adds value way above the money it costs to construct and maintain (Meier, 2016).

"In England, the benefits of urban green spaces for physical and mental health have been estimated to reduce treatment costs by £2.1 billion. Such benefits appear to be stronger for vulnerable groups: children, elderly, and people of low socioeconomic status." (Horizon, 2015: 8)

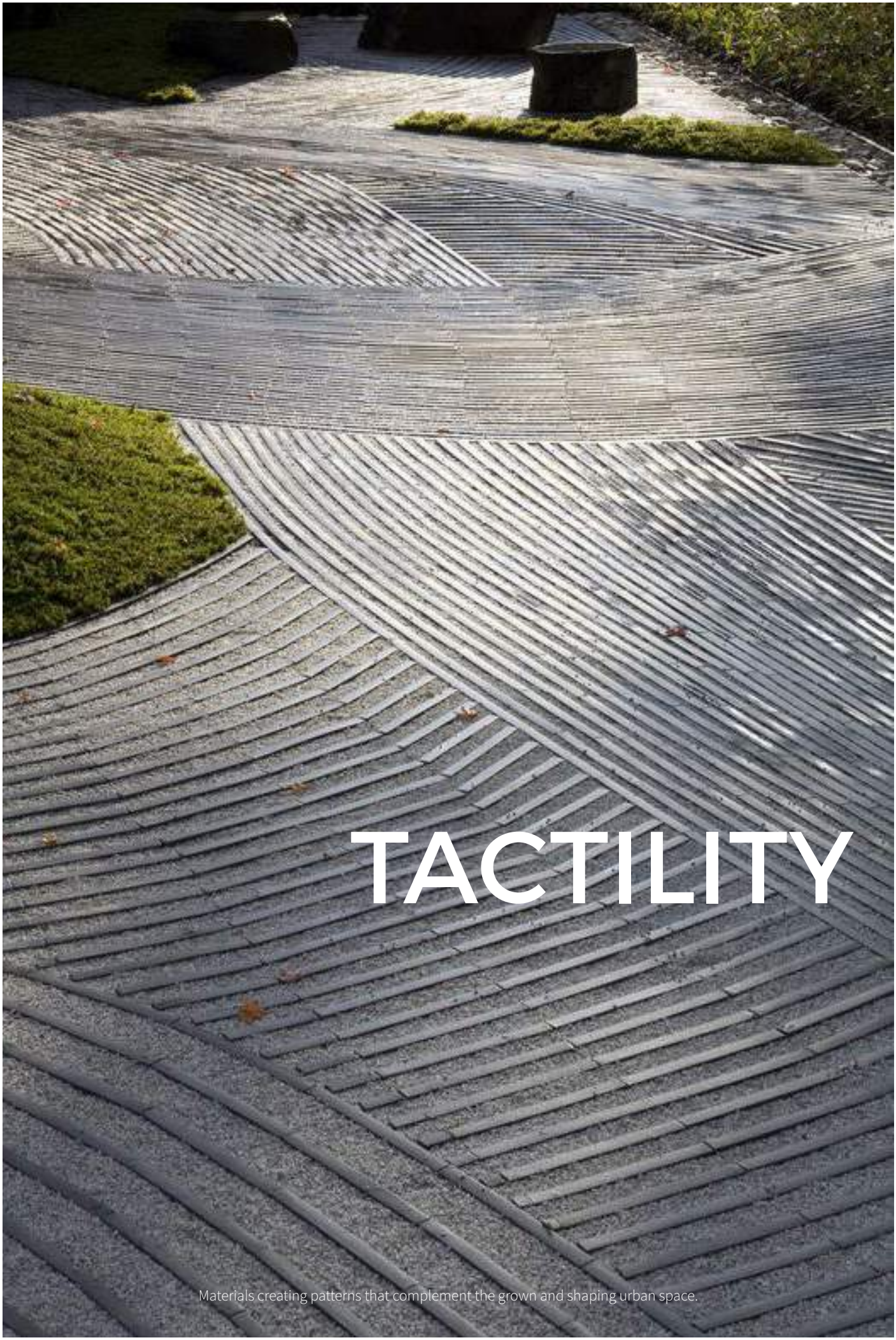
It appears that quality of social relations and perception of cohesion and safety affect health (Baum et al., 2009). As stated above, certain groups like children, elderly, and people of low socioeconomic status, tend to benefit more from the availability of greenery close to their home than the people with a high level of social capital. However, green spaces within a 1 km radius around a person's home matter on everyday basis and are directly related to positive self-perceived health and physical activity according to the study mentioned earlier about cities enhancing impact on exercise and Maas et al. (2009) and de Vries et al. (2013) (page 31).

"...studies found significant associations between green space and supportive interactions were less to do with actual contacts with neighbors than green space's ability to strengthen sense of community via place attachment and identity within its residents." (Francis et al., 2012: 407)

Furthermore green space invite people out on the streets, which afford more eyes on the street and raise the sense of safety (Baum et al., 2009). Residents that share values tend to feel more mentally healthy (Nieminen et al., 2010). The grown could be one of the things resident would want to talk to each other about. Although a study conducted by Francis et al. (2012) conclude that views to green spaces from home have a high effect on mental well-being (Francis et al., 2012).

Grown features might have negative effects; as well as they can be aesthetically pleasant and attractive, parks must be well maintained and provide good recreational facilities to fulfill the potential of developing social cohesion. Usually we combine green environments with positive feelings, though enclosed green spaces may feel unsafe especially when it is dark.

Scientists from the EU Expert Group on Nature Based-solutions and Re-naturing cities and the collaboration of experts publishing Forest, Trees and Human health agree that nature advantages contribute to a better physical environment and health and well-being of people. Various scientific articles, referenced to above, accept the compelling evidence that negative effects of urbanization can be reduced with green spaces. Cities are more habitable, healthier, and suited for the human environment, when air quality, biodiversity, and climate are improved, which at the same time create vibrant and attractive urban spaces for the people.



TACTILITY

Materials creating patterns that complement the grown and shaping urban space.

"Natural materials – stone, brick, and wood – allow our vision to penetrate their surfaces and enable us to become convinced of the veracity of matter. Natural materials express their age and history, as well as the story of their origins and their history of human use. All matter exists in the continuum of time; the patina of wear adds the enriching experience of time to the materials of construction. But the machine-made materials of today – scaleless sheets of glass, enameled metals and synthetic plastics – tend to present their unyielding surfaces to the eye without conveying their material essence or age. Buildings of this technological age usually deliberate aim at ageless perfection, and they do not incorporate the dimension of time, or the unavoidable and mentally significant processes of aging (Pallasmaa, 1996: 31-32).

MATERIALS

As Pallasmaa states, materials are not to be understood as dead and treated elements, even though we live in a high technological society with new methods of production. Materials are a part of the 'physical' nature as described previously, although separated from the grown in this project (page 39). Tiles are a 100% natural material, consisting of clay from Earth followed by a burning process with no further elements affecting it. Numerous materials Pallasmaa introduces, are machine-made and are often treated in various ways, making them differ from their origin. Over time they age and start telling of life in the space they inhabit. Quality is seen in patina. It tells something about the use of an urban space. Take flow lines in a pavement created by rate of wear as an example – the usage shown by patina and marks in the surface can be beautiful.

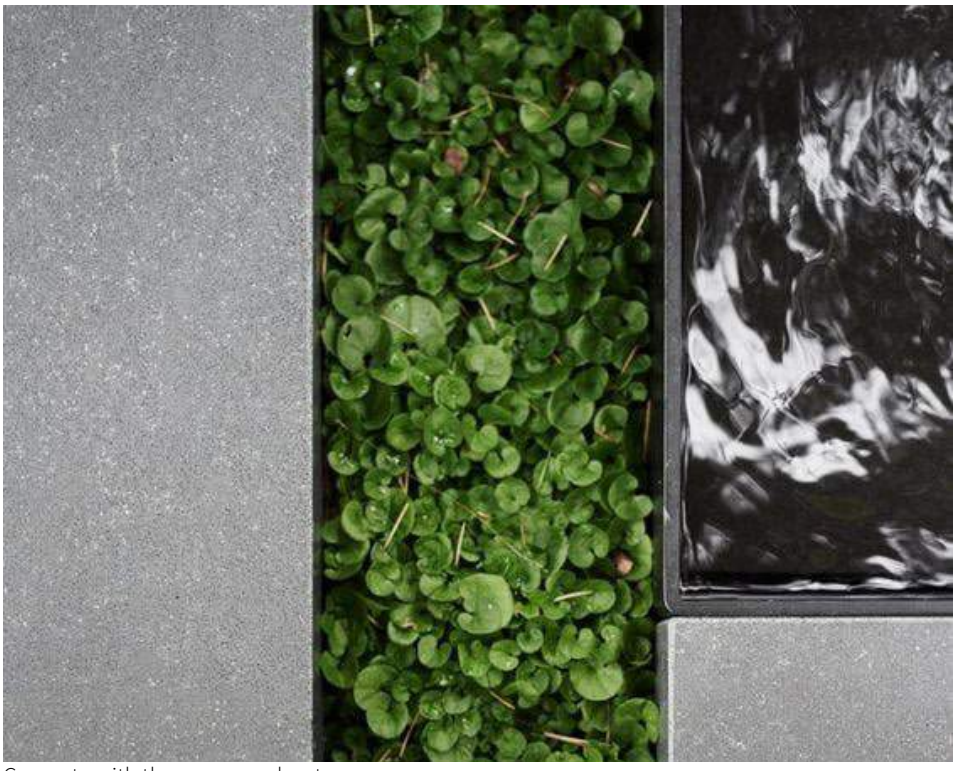
The choice of materials is an important step for a well-functioning and interesting urban space and has the ability to complement and in some cases accentuate existing qualities. Zumthor speaks for an awareness to enroll a design in the right context by being able to enhance existing qualities, and to a great extent use existing materials to accentuate new.

"I as a designer have to go through the same procedure every single time: to look and really see, to admit love, to take care..." (Zumthor, 1998: 99).

The process of considering the right choice of materials imposes knowledge on abilities and potentials. Materials play an important role when it comes to the aesthetic perspective, but also when it comes to the more functional part. They differentiate greatly, with individual potentials and disadvantages, and by using them in the correct context materials will shine and appear in optimum manner (Zumthor, 1998).

Climate changes demand a conscious choice of materials to manage storm water. This could involve a deliberate knowledge about production, treatment, maintenance, and of course sustainability. Both the placement of materials but also the ability for water to infiltrate is of importance, when designing for adaptable urban spaces.

Great urban spaces mediate the complementarity of the grown and the built environment to create a unified entity. The grown develops in size and appearance over time and has a varying role depending on the season that complement the materials of pavement and interior. This unity of parameters creates a harmony with possibilities of affording more vibrant and exciting urban spaces that surprise and create time for reflection. To take an example concrete is a widely used material due to its many uses. It is plastic with boundless possibilities in regard of form, and offer opportunities for coloring and casting textures, (appendix 5). Anyway, by casting concrete with a wood



Concrete with the grown and water.

structure the appearance will change depending on the distance to the object, as textures reach our senses – the eye discover and the sense of touch are activated by memory. Placing the concrete object next to grown elements will affect the patina and complement the material in a positive way, which make them belong to each other. A known material placed in a different context or used in a new way surprise or wonders the observant.

A transformation of predictable, grey surfaces can turn into interesting ones, by means of variation in texture and appearance. A surface with the ability to change appearance in different weather situations creates unexpected scenarios. A selection of materials, based on function, is consequently relevant to the experience, as both the rational and aesthetic are complementing one another when designing a long-lasting urban space.

Urban spaces with different tactility and grown elements.

Water jets on the square invjting to interaction. Frederiksberg Nye Bymidte, 2005.

PERFORMING SPACES

AN ART INTERPRETATION

To be able to work with performative design, it is essential to understand the performativity theory, which will inform architecture's experience design. The following part aims to unfold the meaning of performativity theory and discuss whenever art becomes performative urban design in an everyday context.

The art historian, Camilla Jalving, has examined the meaning of performativity, first in a PhD thesis and the results have been published in the book, Værk som Handling (2011). Jalving invents a theory of performativity that puts performance (the act of doing) and performative (recognizability) under the umbrella term performativity. The theory builds upon phenomenology but expands the concept and can be described as Jalving does here:

"...går den (performativitetsteorien) et skridt videre end fænomenologien, idet den i højere grad medtænker det sociale og historiske rum, sansningen udspiller sig i. .... Performativitetsteorien …, er et forsøg på at nytænke fænomenologien med et udvidet blik for den sociale, kulturelle og historiske ramme, inden for hvilken sansningen finder sted." (Jalving, 2011: 252)

To experience is not only dependent on senses, it relies on norms of culture and social rules. Performativity embraces aspects going from the individual interpretation to public space and culturally decided norms and coding. The spectator is put in play to interact - suddenly it is not about the piece of art, it is about how the work influences the language of the body in action and movement, the performance one engages in without knowing it, caused by curiosity. A work of art is what it does. Work of art is action.

Performativity is about what happens in the space between the piece of art and the spectator, the personal recognition related to something in the past, the examination and reflection leading to new awareness and acknowledgement, which is the performative. This is a theory focusing on conditions in and around the work of art always in relation to the situation of the spectator.

SPACE IN ACTION/ ACTION IN SPACE

To achieve an understanding of performativity theory an example will be given. Have a look at Jeppe Hein's installation, Space in Action/Action in Space, placed on a main public square in Venice at the Biennale in 2002. The work consists of a square metal grid platform where water columns rise in a circle a few meters up in the air. The work is an object changing over time depending on how the spectator moves around and through the circle of water. Sensors controlling the water leaps register all movements. If you move close to the water columns, they will stop jumping, though as soon as you enter the circle they start rising again.

The materials of the work, metal, timber, sensors, and water columns, make up a frame staging both the predictable and unpredictable actions of the spectators. Though the work of art does not only consist of materials, it also consists of the actions made by people generating 'work as action' (Jalving, 2011: 135). Thereby the work of Hein stages the performative interaction, taking place in the fountain. Although essentially the experience is not about how it looks, but how it is sensed - how is it to be in the work, stand in it, walk in it, and be alone or together with others? You do not just walk into a water circle. You observe it, before you enter, which means you discover parts of how it works before walking into it. The information is used to perform with the elements of the work. Thereby one uses prior experiences to be an act in this very moment with the water columns, and personal interpretations and understandings are developed as Marling writes about:

"Målet er, at vi hver især så at sige skal 'væve' vores egne fortolkninger, drømme og forståelser ind i rummene. Det kan blive til en mangfoldighed af oplevelser, der åbner for, at mange forskellige brugere kan finde identitet og tilhørsforhold til stedet på en og samme tid." (Marling, Kiib & Jensen, 2009: 198)

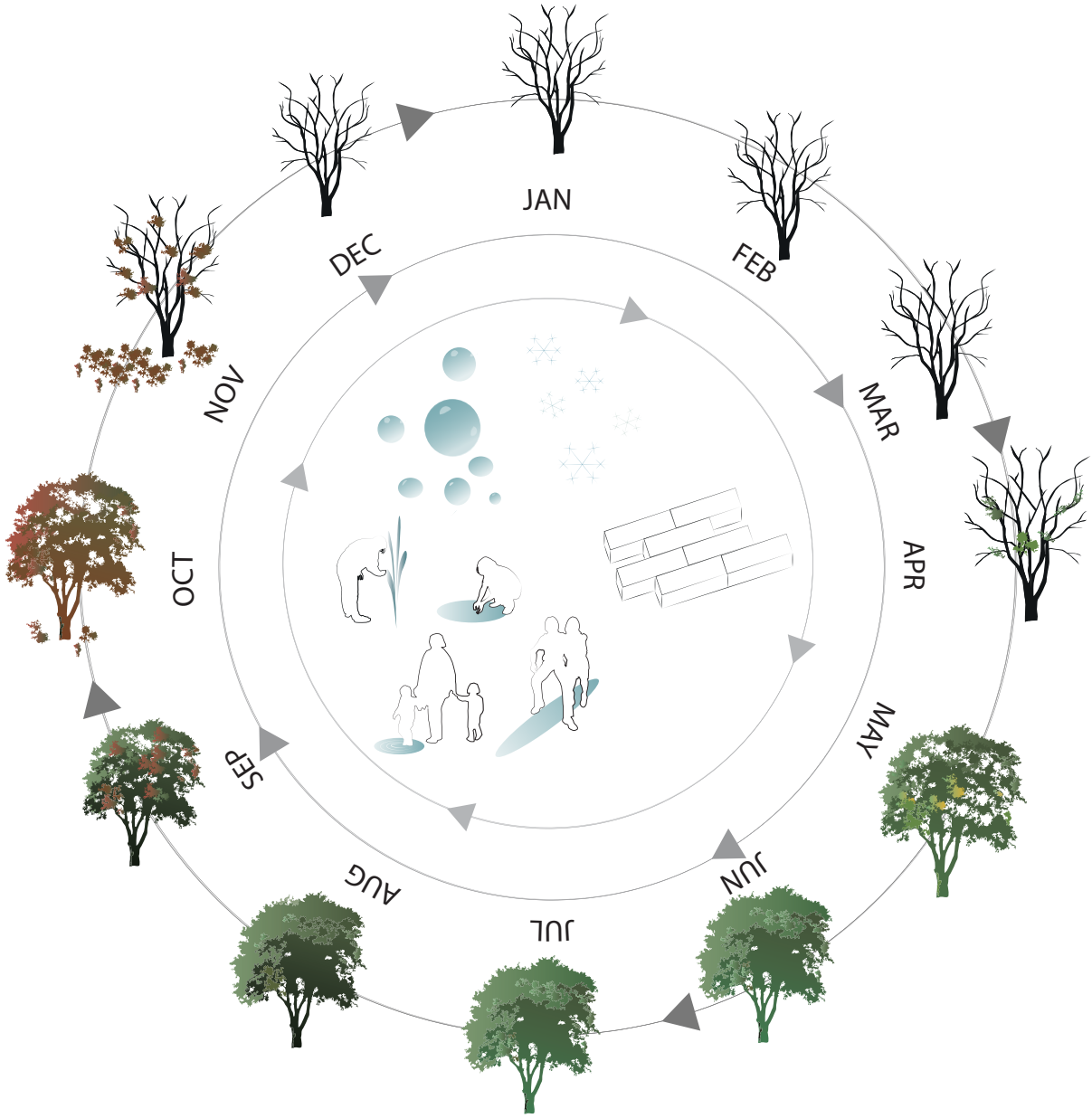
By experiencing, people obtain an understanding and might get to the point of wonder and reflection, which turns into realization. This is not certain for the experience, though getting to the point of realization is what moves to a new level of understanding. As a result urban spaces can be democratic and frame the development of experiences and thinking.
Jalving, as an art historian, defines Hein's piece of work as art, although it is uncertain where the boundary between art and performative urban design sets in, when placed in public space. An object, whether it is interactive or not, placed in an urban setting somehow becomes part of everyday life. It will not stand out the same way as a temporary installation does or the objects belonging to a museum. Walking into a museum demands time and a prepared open mindset receptive to information and expressions, which segregate the experience from the extempore one in public space. Performative urban design plays with another set of rules enquiring everyone no matter education or social background. It needs to talk to the natural curiosity to afford action by the spectator. Levels of interpretation and understanding can vary from individual to individual. Thus the most important thing is to invite the spectators to play.

People interacting in the water fountain. Water Pavilion Aalborg by Jeppe Hein at Kunsten, similar to the fountain described.

A DYNAMIC PROCESS

Water, the grown, materials, and the performative are all parameters finely weaved together and perceived as a unity in urban space. They influence each other and will constantly shift focus throughout the year as when the trees come into leaf in April and May and change to a rich variety of colors in October. The water will come into play whenever it rains and take focus when the storm water elements fill up and change the scenario of the urban setting. In addition the performative parameter is closely related to periods of increased precipitation. As will materials change appearance depending on season – the Nordic winter light will give everything a grey shade, and reversely lighten up the contrasts when summer sets in.

Thereby the parameters are perceived as an entity of complementing elements. Dividing the parameters, function as simplification due to the comprehension of concepts, which are not to be understood as a separation but a method. Through the next chapter the design proposal will be presented with emphasis on the parameters as a changeable entity over time, although some elements will be more prominent than others as they stand out visually.



A dynamic entity of parameters explained in this chapter, which are to be understood as interdependent. The outer circle show how the grown develops and change appearance throughout the year, whereas the inner circle display how water, materials, and the performative are perceived as parameters that closely belong to each other.

A PLACE FOR PEOPLE

CHAPTER 4


THE COFFEE COLLECTIVE
Risteri & Kaffebar
THE COFFEE COLLECTIVE

INNER NØRREBRO

Nørrebro is a district close to the center of Copenhagen, divided in Inner Nørrebro and Outer Nørrebro. It is not only the most demographically diverse district, but also the one with highest population density as described in the introduction page 8. It is an attractive part of the city characterized by multi cultural life and numerous cafés and restaurants alongside shawarma bars and halal butchers. Social issues, a high unemployment rate, and ghettos like Blågården and Mjølnerparken challenge parts of Nørrebro. Disturbances between the police and young people together with inquiries to the police happen more frequently here compared to the rest of Copenhagen. Consequently some people feel uncomfortable during nighttime (City of Copenhagen, 2014). From the perspective of local residents, the built environment is characterized by incompleteness and lack of coherence, leaving several places with unexploited potentials (City of Copenhagen, 2014).

WE HAVE TO ADAPT

WHY?

Safe money

Longer periods of precipitation in the future

Better recreational urban spaces emphasizing social coherence

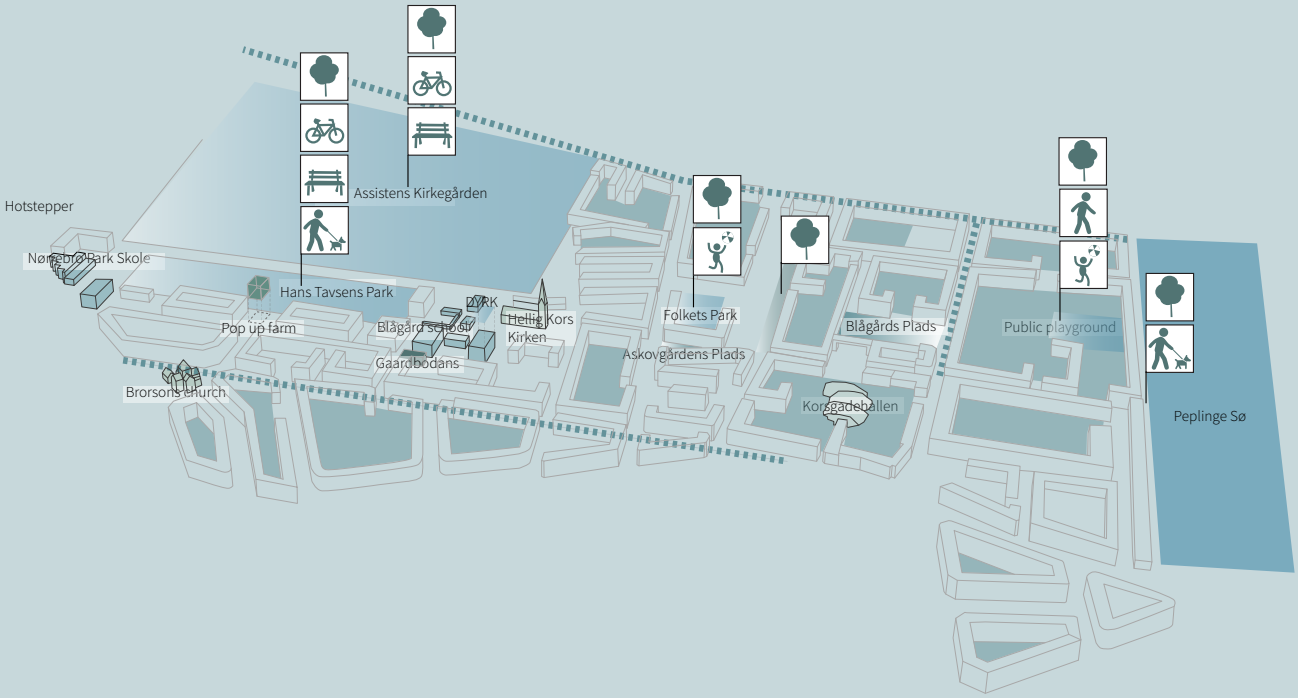


Diagram outlining the existing urban public functions and institutions at Inner Nørrebro.

EXISTING POTENTIALS

The built environment: Urban renewal projects in 1970-1980 developed run-down and incomplete areas of the city. New green areas were added and development of open green backyards, healthier dwellings with modern sanitary installations, and focus on minimizing car traffic.

Social initiatives: Small private projects are cultivating and integrating the grown with focus on citizen involvement all around the city. Bottom-up strategies are present on Inner Nørrebro with interventions like the pop-up farm next to Hans Tavsens Park and "Dyrk", a vegetable community (Fælleshaver, 2014). Also, TagTomat is a project connecting food and neighbors, showing how to cultivate plants and herbs and thereby create a foundation for new green communities (TagTomat, 2014). The residents hold a big potential and engagement turning backyards into green spaces with animal life and vegetables in favor of everyone (City of Copenhagen, 2014).

"Kvarterets fremtid er børn og unge, og de skal inddrages i udviklingen og lære at deltage og tage ansvar for deres kvarter og deres egen udvikling" (City of Copenhagen, 2014, 3).

Actors: Two dance studios are located in the area with potential of training and performing publicly instead of behind closed doors on the 4th floor. The schools and institutions are user groups relevant to the urban spaces with potential of adding more life during daytime.

Green areas: The neighborhood contains a few green public areas with a recreational purpose and potential for infiltration of storm water as shown on the diagram above. An essential part of climate adaptation is to use all the small potentials available to meet increased precipitation in the future, which is why existing green structures should be used to a wide extend.

Storm water management diagrams for a 1 year and a 100 year rain event displaying the strategies for run off water managed in surface solutions.

STORM WATER MANAGEMENT

Taking point of departure in the calculations made by Rambøll as mentioned in appendix 1+2, Hans Tavsens Park will have to accommodate a delay basin handling 18.000 m3 and streets will work as "canals" for the storm water to run off in Peblingesøen (City of Copenhagen 2015). The solution suggested for the Liveable Water project rely on Rambøll's numbers for storm water management. However, the result is interpreted differently in this project with a focus on water as part of everyday life enriching the spaces by being present occasionally. The solution solves storm water management and changes the scenario of the urban setting, allowing the water to be visible although not a barrier to the functionality of city life.

The top diagram to the left display how management of a **1 year rain event** will work on a conceptual level. The catchment area, North-West of Assistens Kirkegården, leads the storm water to Hans Tavsens Park, where a delay basin (a permanent lake) will collect all 6.000 m3 of water. From this point the water will slowly be lead down the cloudburst boulevard, Korsgade, ending up in Peblingesøen. At the same time a smaller amount of water will be directed down Rantzausgade ending up in "the lakes".

Looking at the other scenario, a **100 year rain event**, displayed to the left, the amounts of water to be managed are significantly higher pushing the capability of the system near its limit. To meet the demands the lake in Hans Tavsens Park will take up 10.000 m3 of water and fill up the lowered play field with 2.000 m3. The remaining 6.000 m3 are to be handled in the street's storm water intake (see concept in the storm water strategy page 63 plan and calculations in appendix 1).

The management of water offers a countless number of possibilities for recreational green and blue structures at Inner Nørrebro. By preparing our cities for intense precipitation, the water will not be a barrier and a problem, though rather a welcoming factor influencing the city in a positive way.

A selection of references with emphasis on advantages water possibly can provide.

The three areas on Inner Nørrebro are the above shown - Hans Tavsens Park, Rantzausgade, Askovgårdens Plads, which will be further explained and developed throughout the next chapters.

3 TYPOLOGIES

As mentioned, in the introduction at page 12, three typologies were found on Inner Nørrebro - the street, the square, and the park containing different potentials and challenges. The selection of the three points of impact give an opportunity to work with three different storm water management solutions, and create more liveable urban spaces by integrating the dynamic entity of parameters from chapter 3.

The park

The three opportunities, Folkets Park, Assistens Kirkegården, and Hans Tavsens Park, leave the last one with extraordinary potential to turn into a cloudburst park with opportunity of storm water delay. The park consist of 24.000 m2 green potential and scenic, beautiful, old trees.

The street

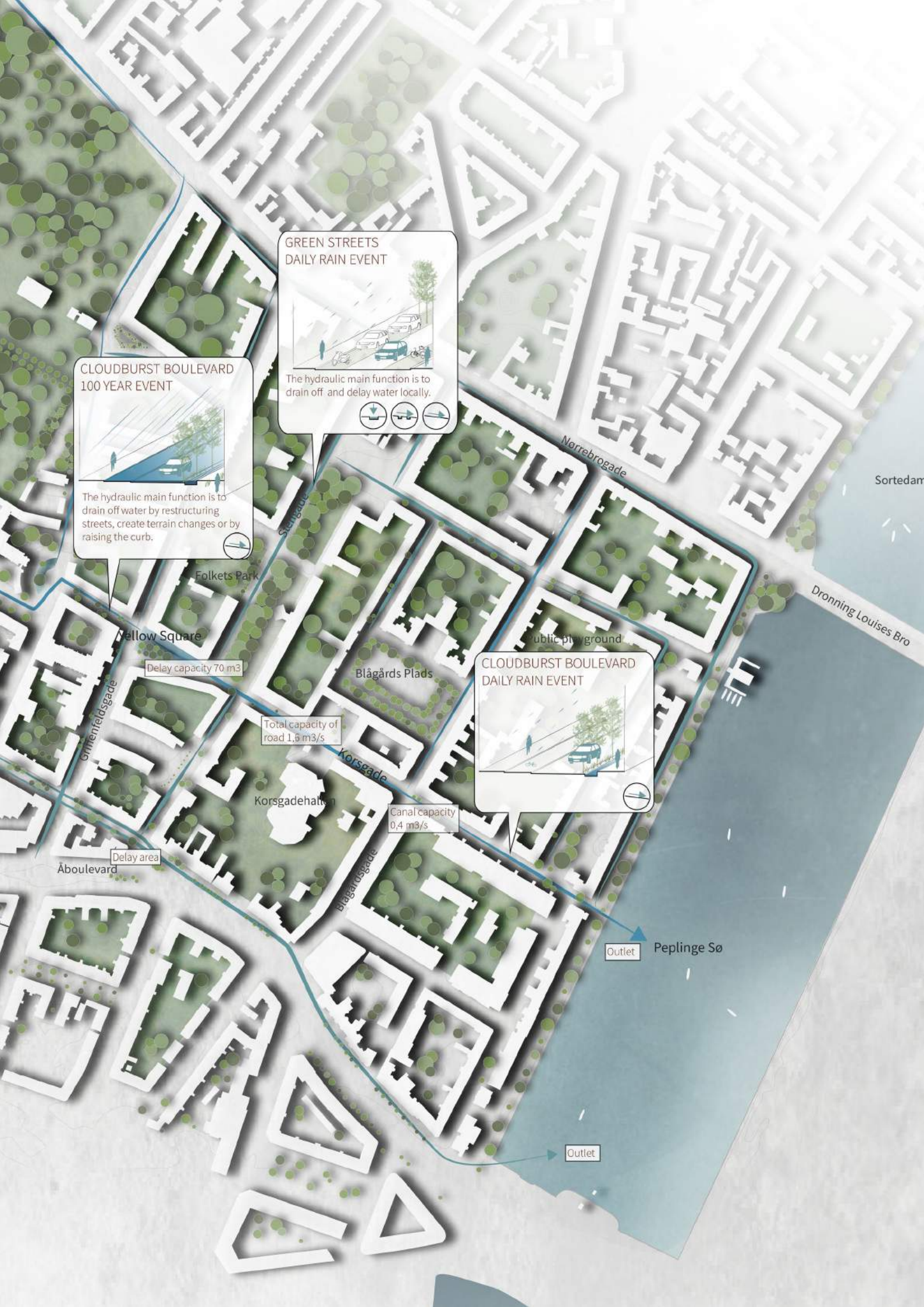
The three trading streets; Griffenfeldsgade, Blågårdsgade, and Rantzausgade have been examined potentials and challenges. Rantzausgade are chosen due to critical traffic issues that demand management of 15.000 bicyclists a day sharing the road with cars. Looking at the street from a climate perspective, infiltration is non-existent. The street needs to be multifunctional to handle a high intensity of users, solve storm water management, and create a vibrant place with life.

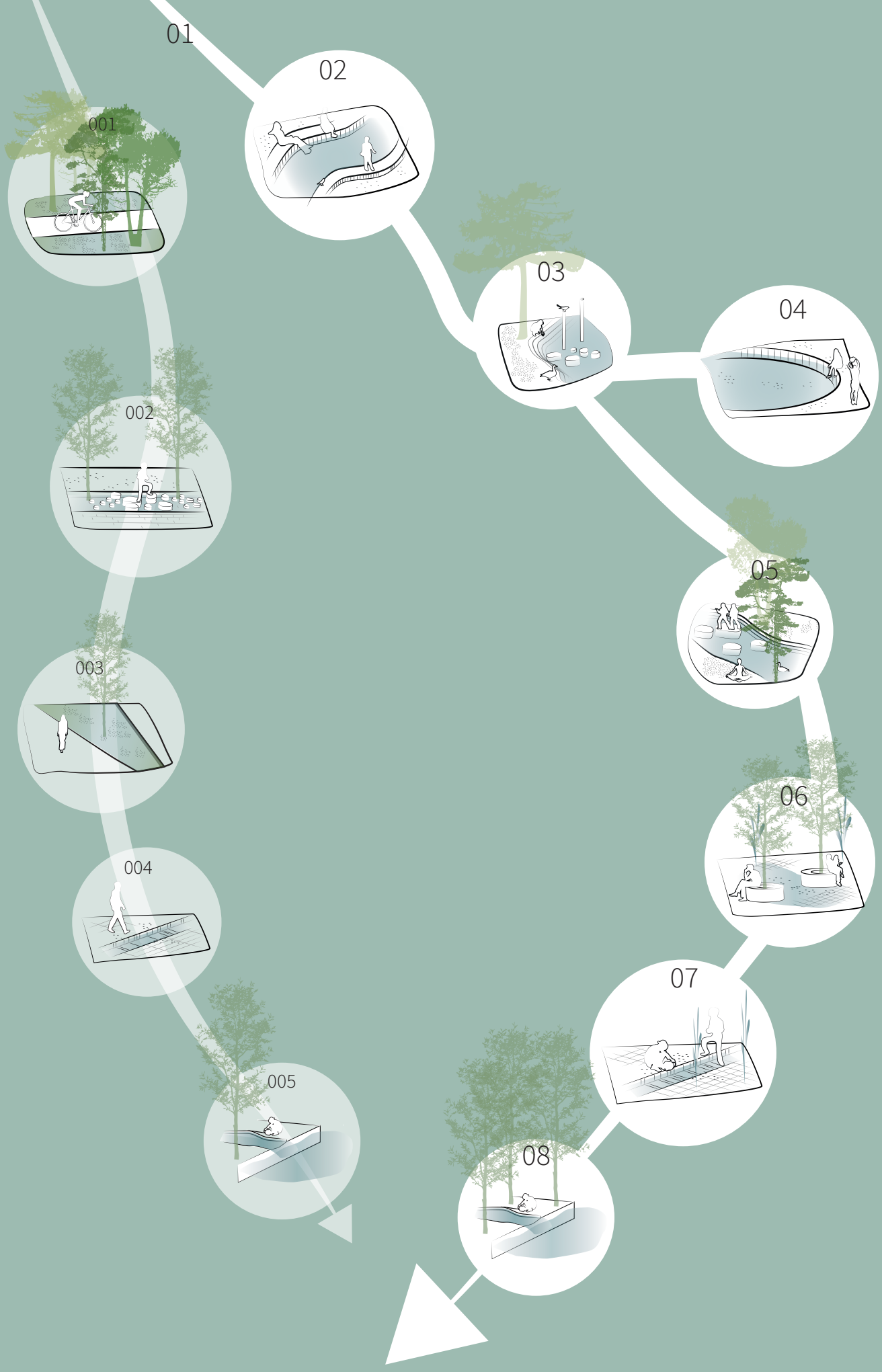
The square

The squares vary in size and context with different potentials. Although the cloudburst strategy developed by the City of Copenhagen (2012) and Rambøll (2013) together with the storm water management on the previous page emphasis Korsgade to turn into a cloudburst boulevard. Thereby a decision to work with Askovgårdens Plads as a square handling storm water to a wide extend where made. The square consists of approximately 1500 m2, 8 lime trees and 1 horse chestnut.

STORM WATER STRATEGY

A strategic plan drawn in 1:2000, shown in 1:4000, displaying conceptual solutions of the storm water management at page 59.


GREEN STREETS
DAILY RAIN EVENT
The hydraulic main function is to drain off and delay water locally.
CLOUDBURST BOULEVARD
100 YEAR EVENT
The hydraulic main function is to drain off water by restructuring streets, create terrain changes or by raising the curb.
CLOUDBURST BOULEVARD
DAILY RAIN EVENT
Nørrebrogade
Sortedam
Dronning Louises Bro
Folkets Park
Yellow Square
Delay capacity 70 m3
Blågårds Plads
Public playground
Total capacity of road 1,6 m3/s
Korsgade
Canal capacity 0,4 m3/s
Delay area
Åboulevard
Blågårdsgade
Outlet
Peplinge Sø
Outlet



A conceptual diagram. The storm water travels through various urban structures and becomes an element adding value to Inner Nørrebro.

TRAVELLING WATER

Storm water running on the surface travels and is collected by various climate adaptation solutions. This section aims to tell how the storm water dynamically runs from one solution to the other and thereby generate experiences with water.

01 CATCHMENT AREA
1,5 kilometre run off distance corresponding to 20,5 m3 of water per second in a 100 year event and 5,6 m3/s in a 1 year event.

02 URBAN CREEK IN HANS TAVSENS PARK
An urban creek in the park leads water from the catchment area to a permanent lake in the park. It is capable of handling 3,8 m3/s in a 100 year event, and 1 m3/s in a 1 year event on the surface.

03 LAKE IN HANS TAVSENS PARK
A permanent lake in the park will hold a volume of approximately 1200 m3, giving the lake a radius of 30 meters. In a 1 year event the lake will change in radius from 30 meters to 46 meters, handling almost 6.000 m2 of water and change the use of the park into a playful climate park with stepping-stones.
In case of a 100 year event, the lake raise and expand to 54 meters in radius, which increase the capacity to a total amount 10.000 m3 on top of the permanent water level. This makes it harder to jump around on the stepping-stones, as some will be covered by water and increase distance between visible stones.

04 PLAY FIELD IN HANS TAVSENS PARK
Amounts of storm water beyond a 1 year event, will start to fill up the lowered play field. This area can handle 2000 m3, and will turn the play field into a water mirror.

The numbers fit the conceptual diagram to the left.

05 NATURE CREEK IN HANS TAVSENS PARK
When the park manages storm water, it will slowly be let into a creek, which directs the water towards canals going to the lakes.

06 YELLOW SQUARE IN KORSGADE
The Yellow Square will be able to handle a volume of 70 m3 in a lowered terrain and even more under the ground. Water columns will reach a certain height imitating the amount of water stored underneath the square.

07 CANAL IN KORSGADE
The canal in Korsgade will handle storm water along the street and lead it to a delay area at the end of Korsgade, as part of the cloudburst boulevard. 1,6 m3/s of water will run through the street in a 100 year event and 0,4 in a 1 year event.

08 OUTLET TO LAKE AT THE END OF KORSGADE
Water will be collected in a delay area at the end of Korsgade, and inflated to the level of Peblinge Søen, where it will be lead out or used for household purposes after purification.

The smaller green streets are assumed to handle half of the water falling in a 100 year event. Thereby 6.000 m3 are to be managed by green streets (appendix 1).

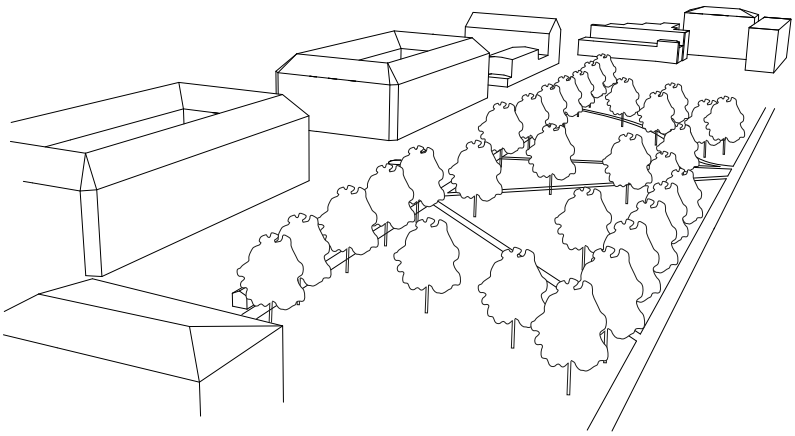
001 DEN GRØNNE STI
A green path will handle local storm water due to the existing permeable surface.

002 CANAL IN RANTZAUSGADE
Canals in Rantzausgade will manage 1 m3/s in a 100 year event and 0,3 m3/s in a 1 year event, turning it into a delay street with green elements along working as brake blocks. This reduces the speed of running water and thereby detains water for a longer period of time taking pressure of the surface systems.

003 DELAY AREAS
The canals in Rantzausgade will end up in an area delaying and purifying the water before leading it further.

004 OPEN CANAL ÅBOULEVARDEN
An open canal in Åboulevarden will lead storm water to the Skt. Jørgens Sø.

005 OUTLET TO THE LAKE
The storm water is collected and purified in a delay area before it is lead out into the lakes.



The park

The spatiality of Hans Tavsens Park today with existing trees.

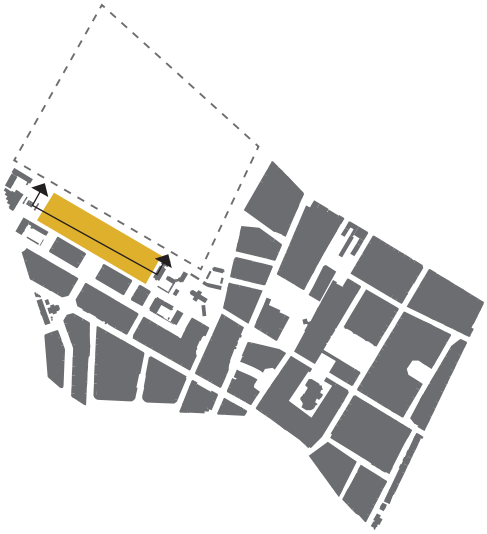
THE CLIMATE PARK

CHAPTER 5

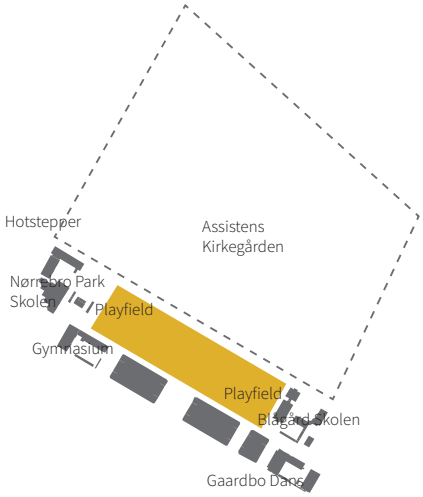
Splashing water fountain in Hans Tavsens Park

Austrian Pine with a dense wide treetop

Austrian Pine with greyish brown bark



Hans Tavsens Park in the context of Inner Nørrebro



Surrounding institutions

Fresh green leaves with red rowanberries.

Challenges and potentials

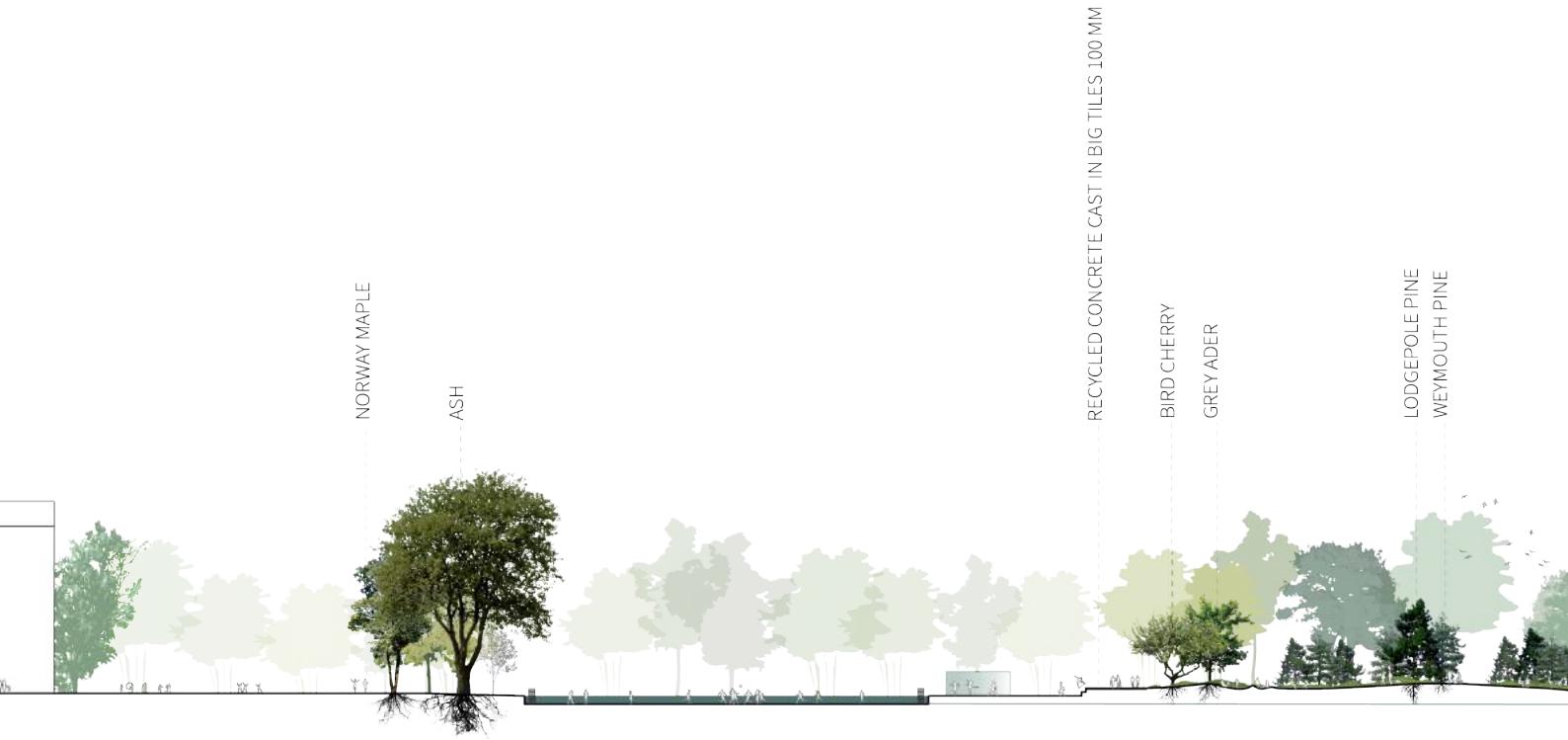
Hans Tavsens Park is close to trading streets, and several educational institutions as Nørrebro Park Skolen, Blågård Skolen, and a common gymnasium. Dance studios as Gaaardbo Dans, a private owned dance studio, and Hotstepper, a versatile dance education with focus on hip hop, urban dance styles, and classic training, is also placed in the surrounding neighborhood. The dance studios have potential to become drivers for performing space in the park.

The park appears as a break from a hectic day, with statues from the beginning of the twentieth century complementing the beauty of old trees and flowerbeds. It is a place to relax due to the spatiality and works a stress reductive factor. A playground is in the western part is a popular meeting point for youngsters from the surrounding schools, while a playground towards the east invites the 0-10 year old to play, and feed rabbits with dandelions. Mowed grass covers most of the surface abrupt by vertical solitary trees and flowers, generating a foreseen course with limited change in terrain and pockets for stay. Potential is seen in accentuating the beautiful old trees with places to stay, encouraging the social aspect founded in the positive influence of nature, as described in chapter 3. The rational potential is the capability to handle a large amount of water by changing the terrain. The size of the park gives the storm water strategy advantageous.

Within the next pages a proposal will be unfolded, turning the park into an adaptable climate park that change spatiality over time, due to different water levels in the lake. A variation in density of trees creates spatiality and pockets for relaxation and gatherings. A changed terrain, locating the middle area higher, stages the playing field with room for the dancers to rehearse publicly. An invitation to playful behavior is created by various water elements inviting all target groups to join. The existing old grown elements contribute to an extraordinary landscape of smells.


100
year event

The lake filled to the maximum makes it harder to jump from stone to stone, and helping each other can be nessesary to not get your feet wet.
A wooden bridge ensures easy access on top of the surface for everybody, while swings in the trees intive to play.



Wooden deck for the twirling bridge.

Austrian Pine with a greyish-brown bark and long green pines.

G

Section through Hans Tavsens Park, drawn in 1:200, shown in 1:1000.

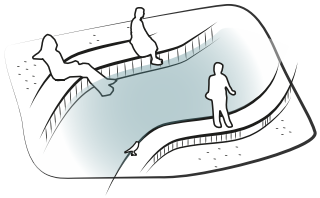
rey alder with short-stalked cones.

Recycled concrete cast texture.

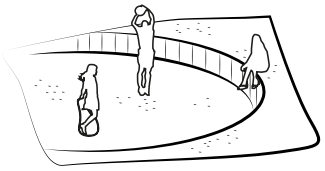
Sycamore with hanging clusters of green-yellowish flowers.

Bird Cherrys with white petals in beginning of May.

Staun and Møller (2001)
Jørgensens and Rune (2005)



URBAN CANAL
Trickling water in an open water canal attracts attention. The shiny, swirling surface is disturbed when dipping your toes, before the water is delegated to the mirroring lake.



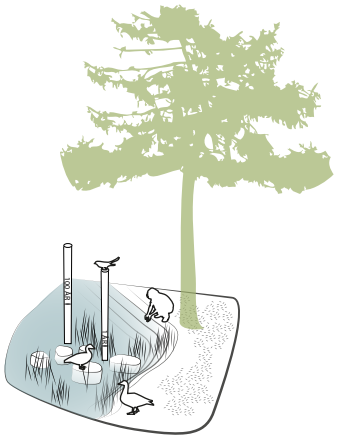
PLAY FIELD
The lowered play field naturally shape barrier boards around the edge, which handle 2.000 m3 of water in case of a 100 year rain event that turn the play field into a reflective water mirror. The varying function makes users aware of changing weather situations in the park.

PINE FOREST
Raising the terrain and planting several pine trees create a small pine-forest with pockets for stay to increase social cohesion in the neighborhood. By offering barbeques, people meet and talk more casually between the rough, grey bark and the egg shaped cones (appendix 4), as grown structures promote the natural conversation to arise.

Experiencing the climate park

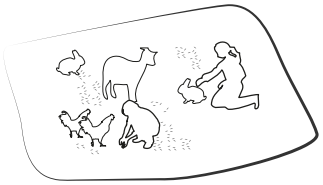
Different textures, scents, and tastes influence us unconsciously by its presence, as senses are used to create colorful, sensorial urban spaces, and parks to awaken curiosity. Because of already well-known sensorial data in our memory, it is achievable to feel texture and temperature of materials, only by the sense of sight, and a specific sound tells something about the material even on distance.

Particularly when it comes to dense vegetation the sense of smell and taste is greatly activated. Blossoming trees activate the senses and by the time of defoliation new smells arise. Smells vary from day to day throughout the year in the park, and several new pine trees in the central part offer a natural smell of pine needles with intense fragrance in the particular area. By preserving the existing beautiful large trees, a multitude of odors will coexist, changing depending on the path and wind.



LAKE

When looking over the lake calmness arises as stagnant water have the quality of quietness. A wooden bridge permit to walk on the static surface, while stepping-stones invite to break the surface with ripples and calls for a playful behavior. Information pillars direct attention to the varying water surface.



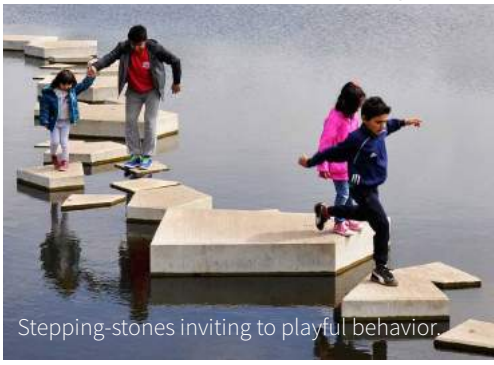
ANIMALS

In The Climate Park rabbits, sheeps and chickens re-energize the eastern playground, making it attractive for different groups of users to take care and visit the animals on daily basis. Space is limited in small Copenhagen apartments and public space generates life, when providing subjects of interest.

Canal inviting to sit on the edge.

Pillars indicating the expected water level.

Barbecues creating places to meet.

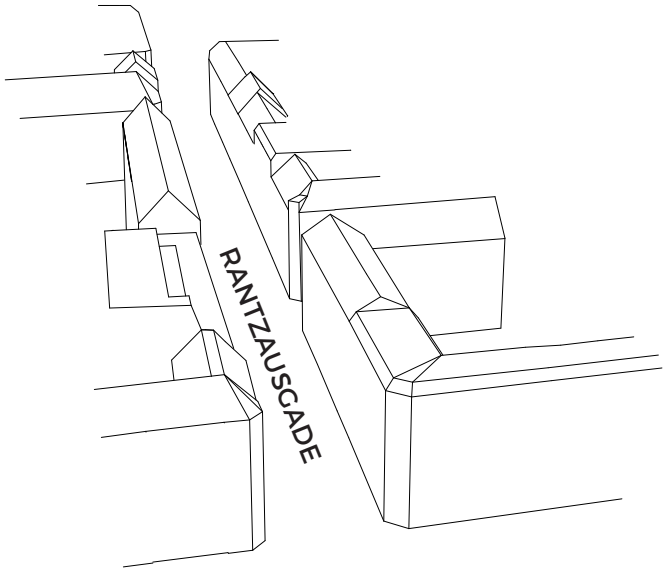


Stepping-stones inviting to playful behavior.

To smell: It is only possible to smell within a quite restricted area. At distances under 1 meter, it is manageable to intercept relatively poor smells (Gehl, 1971). As human beings we can distinguish as many as ten thousand distinct smells with the smellscape varying from city to city. Smells are not always the most obvious ones in cities, but it is hard to overstate the importance of natural odors (Beatley, 2011).

To taste: Defining the sense of taste, as an individual sense is difficult. This is due to the fact that our perception of taste is not only influenced by our taste buds, but the combination of visual impressions, the temperature, our mood and so on. There is a strong connection to the sense of smell as it is possible to perceive more smells than flavoring (Gehl, 1971).

Playing field with an organic fencing.



The street

Rantzausgade today with four-storey high buildings surrounding the trading street.

THE CRACK

CHAPTER 6

Fairy lights light up at nightfall.

Københavnerfortovet

Rantzausgade in the context of Inner Nørrebro

Colorful buildings on Rantzausgade.

The hectic life of Rantzausgade.

Challenges and potentials

Rantzausgade is a street with very high user intensity due to many grocery stores, cafés, restaurants, and coffee shops, surrounded by beautiful old and colorful buildings. Cars are driving in both directions while sharing the road with bicyclists, which creates insecurity for soft road users placing Rantzausgade on top 10 as one of the most critical streets in Copenhagen. For that reason the City of Copenhagen (2014) has a desire to turn Rantzausgade into an attractive bike connection, prioritizing soft road users and changing the traffic direction to a one-way street (Grontmij + GHB, 2015).

Rantzausgade is a well-known street to many Copenhageners with diverse demography. However there are only few places to sit and the street does not leave much space for pedestrians or offer any grown elements along the way. Here is a clear potential to invite soft road users to stay a little longer and provide different spatiality to create a more interesting street.
Looking at the street from a climate adaptation perspective, there is no infiltration. The storm water simply run off into the sewer system and disappears. Solutions must be found to handle storm water on the surface and create delay for recreational purposes in the street.

Within the next pages, a proposal will be presented enhancing the safety of soft road users, while creating coherence along the street. Limited space and the demand for multi functionality that satisfy different needs have turned the street into a one way street (Grontmij + GHB, 2015). Thereby the grown parameter complement blue structures (canals) and make room for different pace, which change the degree of understanding and level of experience throughout the street.

Experiencing the crack

A diverse scenario is present in Rantzaugade with green and blue structures enhancing physical and mental well-being by a conscious choice of grown elements. Materials offer the senses various experiences related to sense of touch and people passing down the street benefit from diverse spatiality that create different experiences. By narrowing specific parts of the bicycle path the sense of sight are affected and pace must be slowed down. Thereby details are within sight inviting bicyclists to jump of their bike to examine things more closely. The change of pace and spaces designed for soft road users invite to stay a little longer and create social gathering, which provide more eyes on the street and thereby sense of safety.

Two canals with trickling water make it possible to manage storm water on different levels. The cracked canal consists of 'Paradise Granite' from Bornholm, which turn darker when becoming wet (appendix 5). The changeability depending on weather conditions invites to touch the changed surface, even though it is possible by our sense of sight to know how specific materials will feel due to previous experience of touch. On a functional level the cracked granite surface lowers the speed of travelling water and is capable of storing water for longer periods of time, when intense precipitation occurs. The other canal functions for small everyday rain events. When reaching the limit of capacity the water will be lead into a cleansing areas consisting of soil layers - filter sand, limestone, sand, and gravel (see section on page 92) (Vejdirektoratet.dk, 2016). These layers purify the storm water and direct it to be used for household purposes in the surrounding buildings. Additionally, green elements create infiltration to the cleansing layers of soil and absorb storm water for evaporation.

The cracked granite surface is only present in Rantzausgade to create quality and identity along the street. The recycled concrete tiles used as pavement for pedestrians could be placed elsewhere on Inner Nørrebro to give the area a coherent identity. However, variation in size and color of the recycled concrete tiles create opportunity to make different patterns to avoid predictability and repetition, as the concrete tiles are a locally produced material and therefore an environmental advantage (for product description see appendix 5).

Strolling along the street with a changeable spatiality and patterns of concrete tiles affecting the rhythm of walking. Water babbles in the canals while passing by and make it an interesting place to investigate further, with seating elements raising from the granite rocks of Bornholm.

CONCEPT

Changing flow patterns

The approach of limiting cars by a one-way street is an attempt to change priority, which creates greater and bigger spaces for soft road users. Thereby pedestrian paths are extended and bicycle lanes introduced in both directions to enhance safety. Furthermore car parking has been moved and reduced by 76% in the street.

Bringing in blue structures

Water is managed locally by opening up the surface and thereby making room for running water in two canals, which contribute to a better city environment.

Introducing green

Natural infiltration is supported by grown elements, while adding different spatiality to the street. Trees and plants clean the air by absorbing CO2 and make people slow down to observe natural miracles that happen every day. It thereby enriches the experience and makes the street a healthier place to be.

Lighting elements

Lighting elements add an extra layer to the design of the street at night. Glow pebbles light up the bicycle path and grip onto the road, making cars aware to slow down at cross overs for pedestrians. The water canals are lit up to attract people and include safety. A variation of colors light up the trees to create well lit places to stay for everyone.

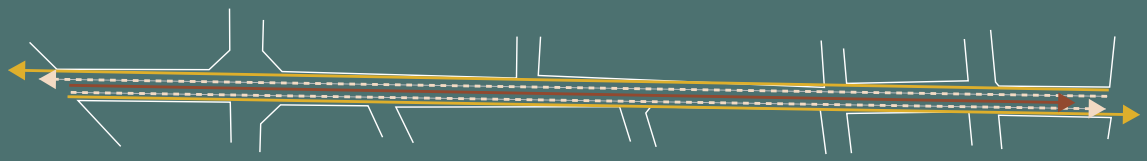
Sensing experiences along the street

Restaurants, cafés, and bars are a substantial part of Rantzausgade, sending out smells and sounds, which all together affect our senses. Seating elements are naturally created by a cracked surface of granite and located in front of selected places. Hereby meeting points are influenced and senses affected by the place.

Rantzausgade in the context of Inner Nørrebro

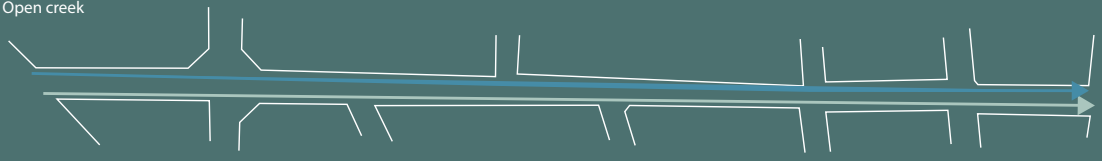
FLOW

Pedestrian
Bicyclists
Cars and busses



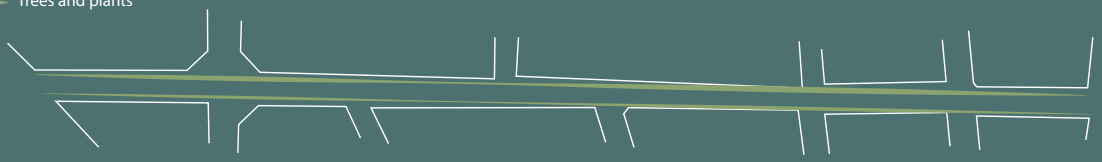
WATER

Creek with cracked surface
Open creek



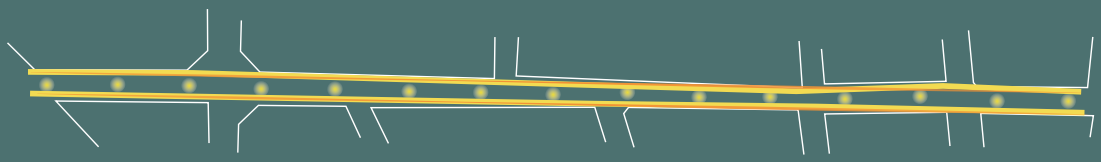
THE GROWN

Trees and plants



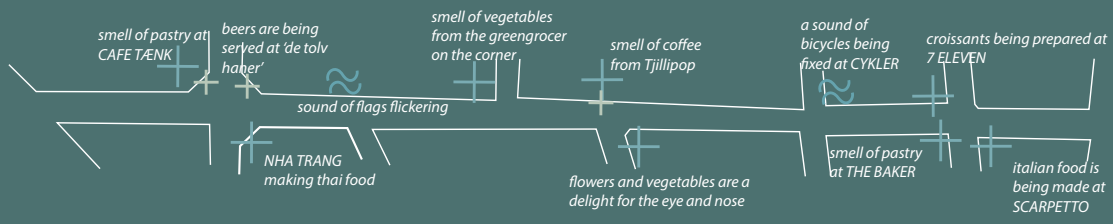
LIGHTING

street light
glow pebbles
ligting trees and channels



THE SENSING ORGANISM

smells
hangout places
sounds

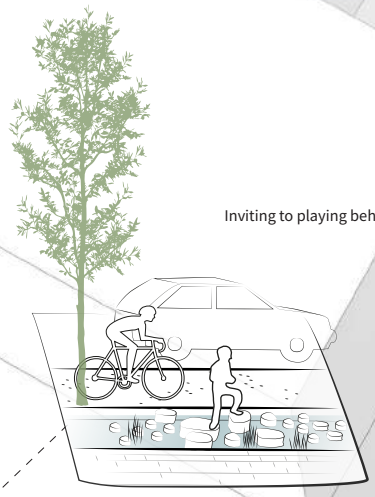


Concept diagram , The Crack .

The Crack on Rantzausgade works as a delay street, drawn in 1:100, here shown in 1:200.

The chosen section of Rantzausgade.

To hear: The sense of sound is working within a large field. Sounds up to 7 meters away can be noticed quit effectively. With distances up to 35 meters it is still manageable to hear people speak, but above 35 meters the sounds get reduced (Gehl, 1971).



Empty shop

WET LAND

Common alder

Hornbeam

Ash

bicycling in between the grown and slow down

Common elder

Etafs Salon

Recycled concrete tiles in 3 sizes with chalk

Royal Bagel

raised granite rocks create a spot with view in the sun

Spisebar Nr. 20

stringent designed seating elements are challenged by grown elements taking up space

Aspen

RANTZAUSGADE

Ash

space for rest and conversation

Alder buckthorn

Bird cherry

Weymouth pine

roughly cut Bornholm granite create a cracked surface down the canal

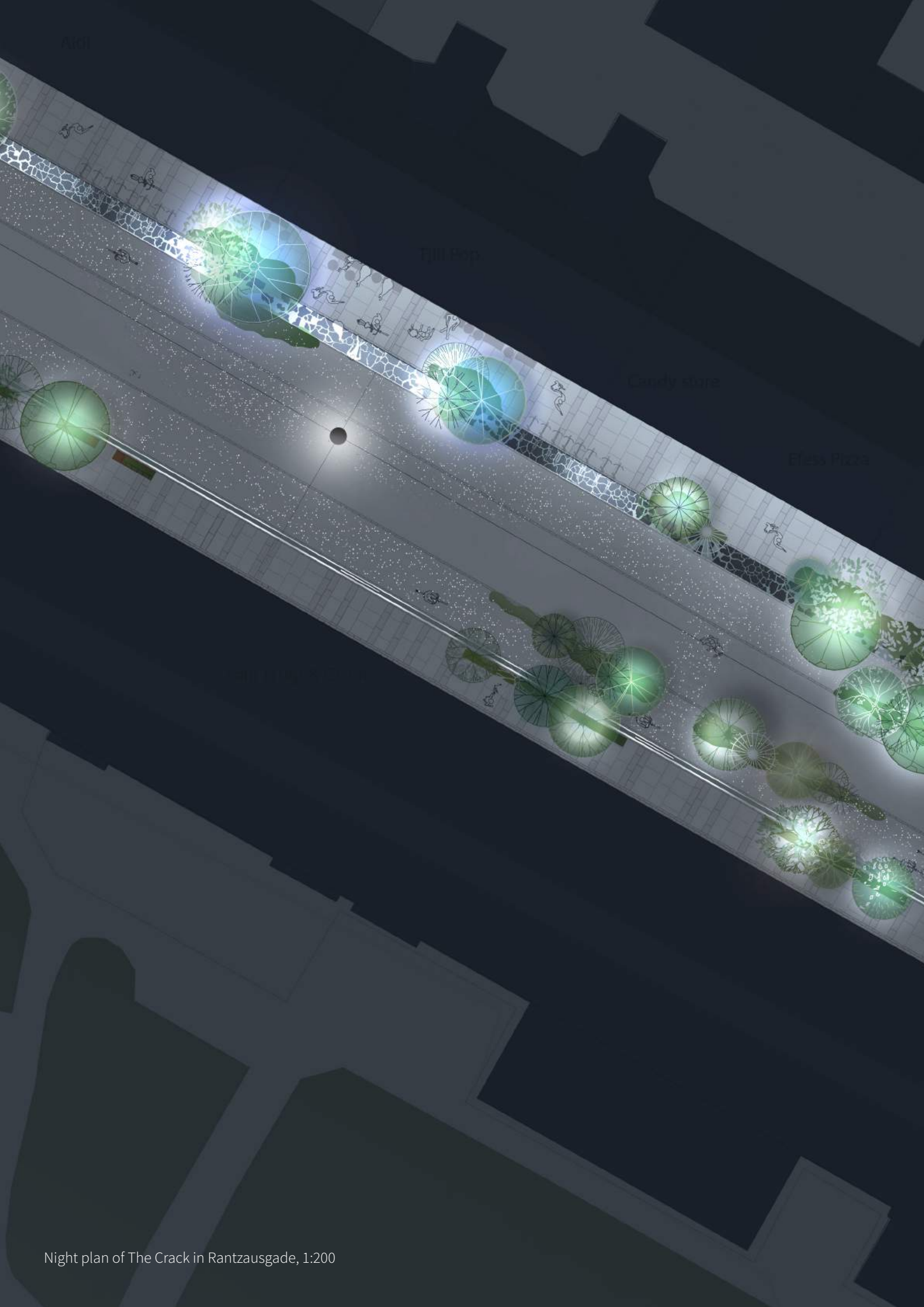
Grey poplar

Døgn Netto

Moss and flowers

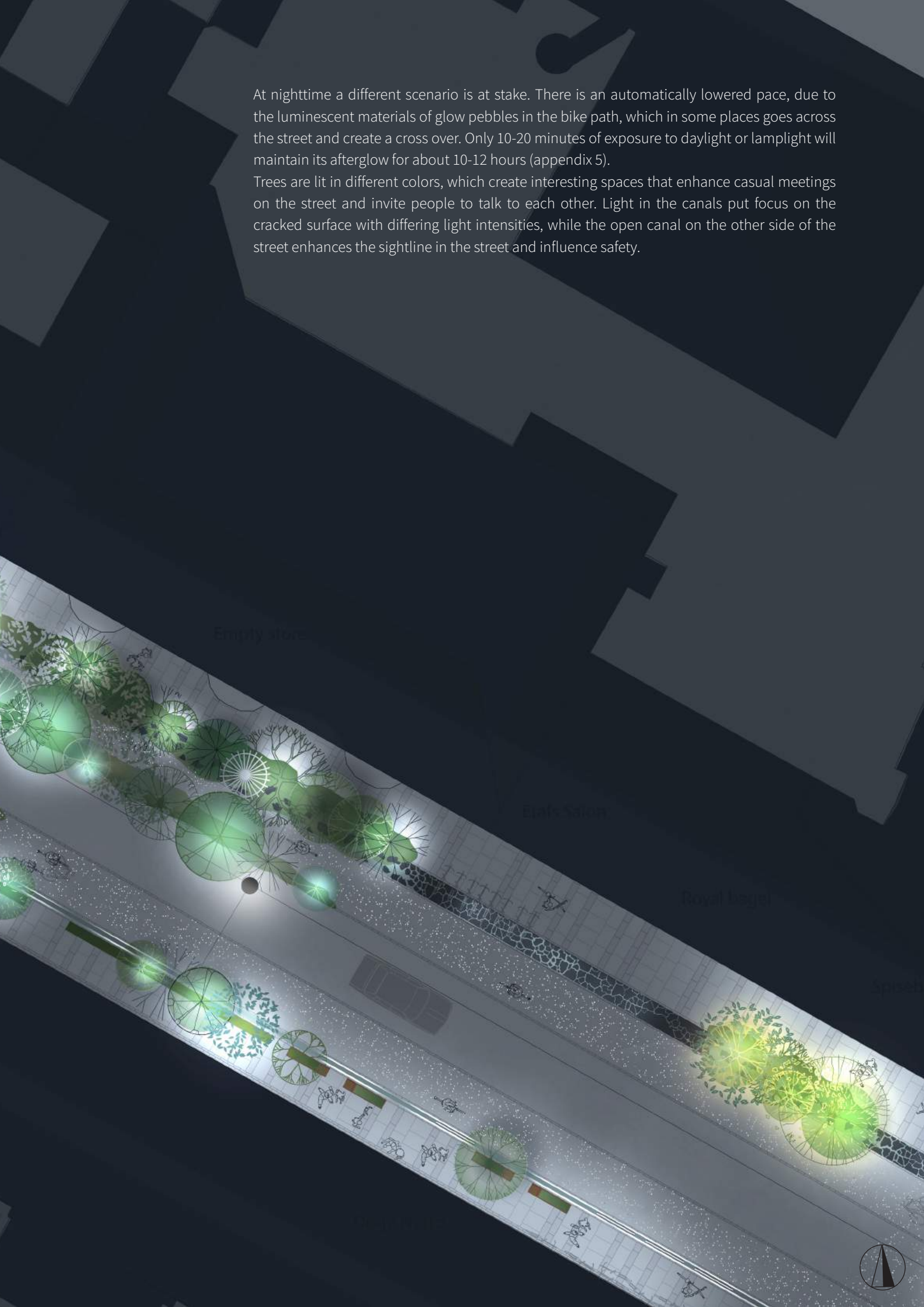
Continuous canal through Rantzausgade, W 1000 mm x D 500 mm

Continuous canal through Rantzausgade, W 300 mm, D 200 mm



Night plan of The Crack in Rantzausgade, 1:200

At nighttime a different scenario is at stake. There is an automatically lowered pace, due to the luminescent materials of glow pebbles in the bike path, which in some places goes across the street and create a cross over. Only 10-20 minutes of exposure to daylight or lamplight will maintain its afterglow for about 10-12 hours (appendix 5).
Trees are lit in different colors, which create interesting spaces that enhance casual meetings on the street and invite people to talk to each other. Light in the canals put focus on the cracked surface with differing light intensities, while the open canal on the other side of the street enhances the sightline in the street and influence safety.

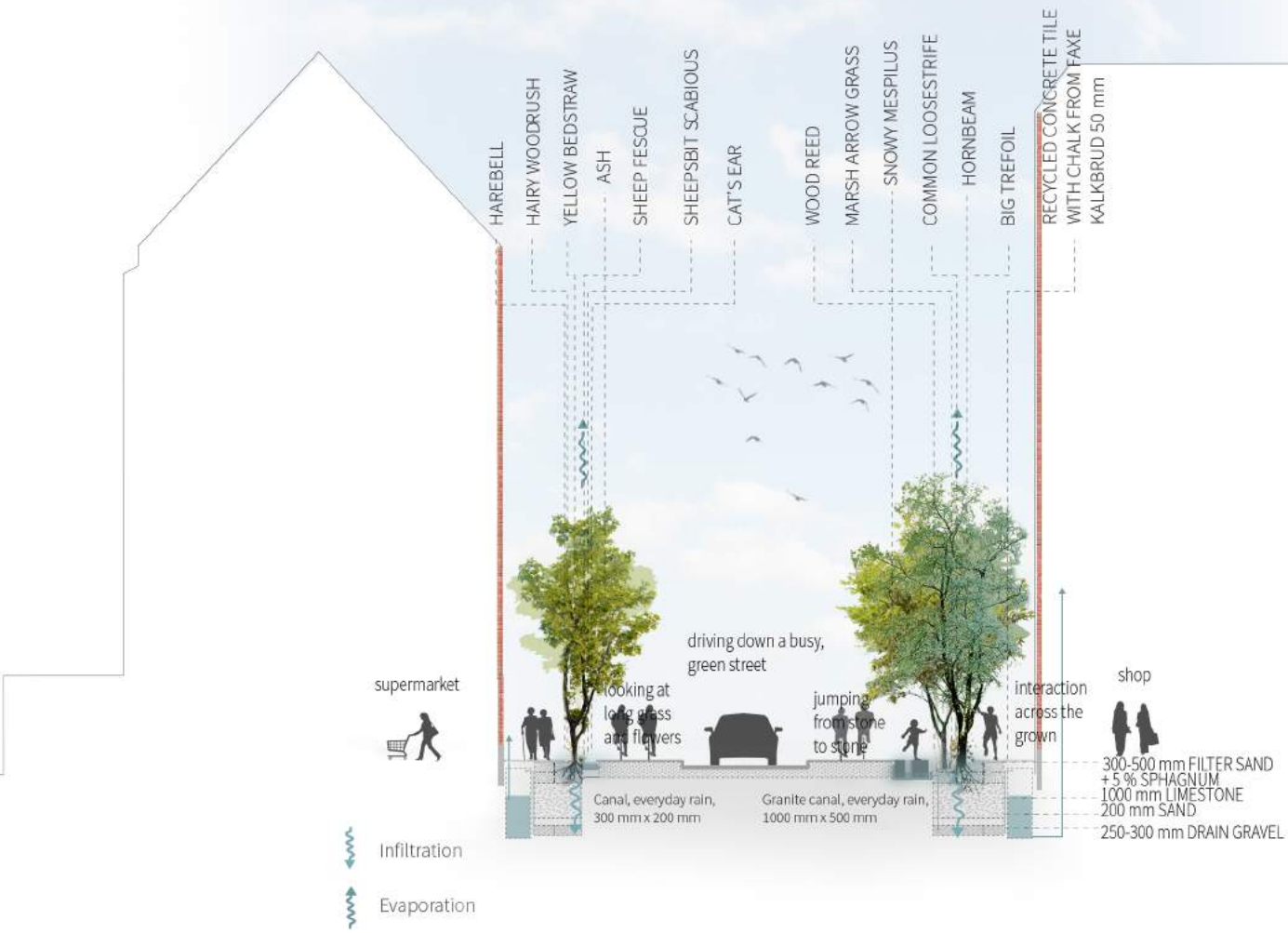


Greyish tree trunk of an ash with regular longitudinal grooves.

Paradise granite from Bornholm.

The smooth surface of concrete.

Beautiful serrated light-green leaves from a hornbeam.



Section across The Crack in Rantzausgade, in 1:200 with a rational and aesthetic focus.

BIOTOPES

WET MEADOW

The biotope is dominated by flowering herbs and grass vegetation with a few trees that tolerate moist soil conditions. The plants prefer nutrient-poor and constantly water-saturated soil and they absorb and evaporate great amounts of water, which make them suitable for adaptation to climate change.

The biotope's white and yellow flowers attract colorful butterflies, bees and buzzing flies. The bird cherry draws birds to the trees (Hansen, Hoffmann and Nissen, 2015).

The wet meadow boost the biodiversity and the presence of insects and birds.

GRASSLAND

The biotope needs light and heat to the low growing vegetation of grass and herbs. The soil is usually nutrient-poor and goes from dry to wet soil.

The vegetation contains many eatable plants such as culinary herbs and strawberries and the flowers range from purple and blue to yellow and white.

The trees carry berries for both human and birds. The grassland attracts a lot of butterflies, bees, buzzing flies, and insects (Hansen, Hoffmann and Nissen, 2015).

The biodiversity is boosted by the grassland's wealth of species and pollinating insects.

GRASSLAND 1. Harebell, 15-40 cm 2. Hairy woodrush, 10-25 cm 3. Yellow bedstraw, 10-60 cm 4. Sheep fescue, 10-30 cm 5. Sheepsbit scabious, 10-35 cm 6. Cat's ear, 20-40 cm 7. Common loosestrife 50-80 cm

WET MEADOW 8. Marsh arrow grass, 40 cm 9. Wood reed, 150 cm 10.Big trefoil, 20-50 cm 11. Common spiraea, 50-100 cm

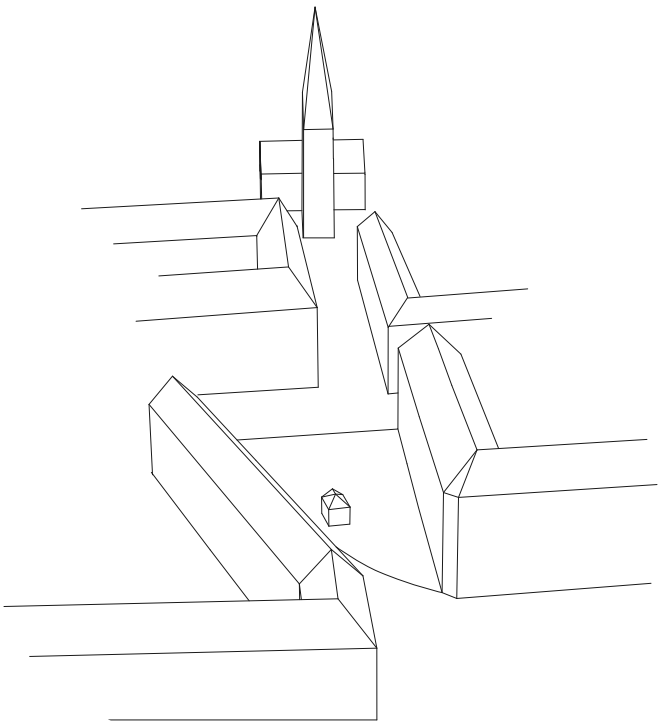
Hansen, Hoffman and Nissen (2015)

Creating diversity

Recycled concrete tiles, and glow pebbles are complementing grown elements in a variation of sorts, sending out several smells and sounds, affecting the already existing odors of the trading street and boosting the biodiversity. Recycled tiles made from the existing sidewalk are being used for new concrete tiles in the pavement. Thereby a sustainable choice has been made, by not throwing away old materials, but reusing them for new purposes placed in the right context. The strait forward built environment is equalized by the grown and water, which bring natural changes depending on time of season and weather.
The concrete canal alongside Netto and the grocery shop have textures casted into the surface of the concrete to create different sights along the street.

Harebell with hanging purple flowers.

Bioasphalt handling storm water by fast infiltration.



The square

Askovgårdens Plads with a view to Hellig Kors Kirken and sorrounding apartment blocks.

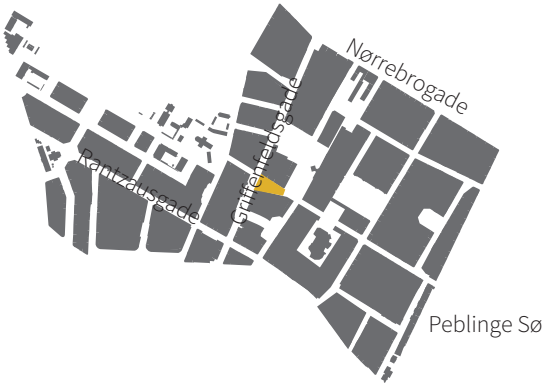
THE YELLOW SQUARE

CHAPTER 7

Common lime trees raising high up in the air.

The sightline along Korsgade.

Bicycle parking under the treetops.



Askovgårdens Plads in the context of Inner Nørrebro.

The view towards Peblinge Søen.

One of the facades on the square.

Challenges and potentials

Askovgårdens Plads is located in close connection to Rantzausgade, Nørrebrogade, and Peblinge Søen as a space offering a break along Griffenfeldsgade and Korsgade. Suddenly the open space of the square changes the spatiality of the narrow streets. Four-storey apartment blocks surround the square in Korsgade and create an enclosed space.

The square, Askovgårdens Plads, functions as a transit zone and bicycle parking space, with lack of possibilities to stay, as no further experiences or seating options are present besides to ordinary benches. Børnehuset and Fritidshjemmet Askovfonden are located with entrances to the square, which influence the activity level and decoration. In addition, kids from the kindergarden are picked up and driven out of town by a bus every day to visit Hvalsø Nature Kindergarten. Due to this fact a group of parents and children generate activity on the square on a daily basis.

A location between the beautiful Hellig Kors Kirke and Peplinge Søen create awareness of an attractive sightline, which could be enhanced more. Grown elements are represented by ten beautiful old trees, among these numerous are common lime trees with heart-shaped leaves, and an old horse chestnut. The trees shape a room under the treetops that change depending on season with white flowers in May and fallen chestnuts in October (appendix 4). The square consists primarily of non-permeable surfaces. New solutions have to be made in order to fulfill the vision of a cloudburst boulevard through Korsgade from the City of Copenhagen (2015), Rosted and Christensen (2016) and the storm water strategy at page 63.

Experiencing the yellow square

The Yellow Square is an urban space influenced by the presence water and people. Storm water is the main parameter inviting to activity and thereby becomes performative and affect the sense of touch, by interaction with the water fountains and light. Water will be present no matter the amount of precipitation, though with extraordinary experiences generated by intense run off water, which affect the fountain to accumulate high water columns up to 3 meters. Certain water fountains will be changeable by the presence of people and thereby change height and rhythm to afford activity like described in chapter 3. The daily temperature is displayed by the height of one water column placed close to Griffenfeldsgade, which is encircled by luminous ribbons containing temperature numbers.

A storm water canal goes through the whole street emphasizing the sightline. Schist stones offer easy access across the canal, and light elements along the edge direct attention to the canal during nighttime, where the light will bright up when one gets close, and thereby stage the users of the square.
The lowered terrain between the existing trees will be transformed into a water mirror in case of intense precipitation. Colorful spots stage the old, tall trees encircled by seating elements of recycled concrete, and fairy lights invite to a moment of rest under the treetops in dry periods.

These effects turn The Yellow Square into a unique and changeable place, where the experience depends on the time spend on, time of year, and time of day. Only by staying a little longer and coming back again and again will give the full experience. The performative elements imitate the weather situations aside from the human interaction, and several sound wells imitate natural sounds adding a new layer to the experience. The sounds are primarily present outside a city context or in big green spaces, and a meant to encourage an investigating of the sounds, which cannot be seen.

A deliberate choice of warm yellow, coal-fired clinker brick was made in order to place a permeable surface, while still contributing to a city context managing daily transit. By choosing a special format of the clinker brick, the need for adjustments is minimized allowing them to be placed in an offset bond making the pavement solid enough to withstand the pressure of heavy traffic (Steffensten, 2016). In some places single clinker bricks will be placed a little lower to let water be stored and thereby create small water mirrors on the square attracting attention.

In case of a 100 year event the street around the square and parts of the The Yellow Square will be allowed of flooding. The storm water will be lead to areas further down the street where perma asphalt handles storm water by run through (appendix 5). The material is able to handle a 10 year event in 10 minutes taking pressure of the surface system. Though the everyday precipitation are of high priority and are supposed to be visible on Askovgårdens Plads, and accentuate storm water as a positive parameter that offer experience by the different elements that catch and delay the storm water.

A transit through The Yellow Square is influenced by various performative elements, as the splashing fountain raising a few meters up in the air. The light is affected by presence and invite to interaction. Extreme precipitation turn the square into a remarkable experience.

CONCEPT

Changing flow patterns

By changing car traffic from a two-lane street to a one-way street, soft road users are prioritized while at the same time creating better options for the liveable city to become more vibrant (Grontmij + GHB, 2015).

Water management

As part of a cloudburst boulevard a canal is made in order to handle storm water for both daily rain events and 100 year events. A delay basin between the trees and under ground will store storm water in case of intense precipitation, and a recreational blue structure are implemented along the traffic corridor in Korsgade.

Introducing green

Existing beautiful trees stand tall and upright on the square. By planting more trees and plants along the street infiltration gets easier, while at the same time creating better living conditions (chapter 3) for people and increasing biodiversity.

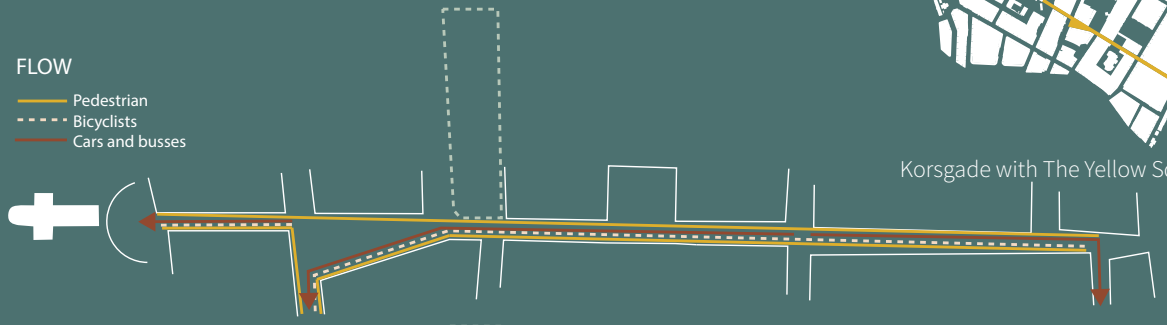
Lighting elements

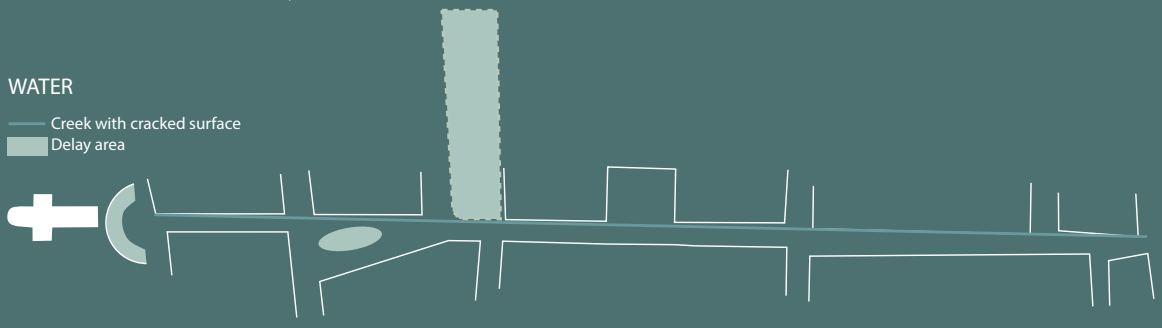
Existing streetlights contribute with light on the canal and make the street safe at night. A variation of lighting stages the trees on the square with its many water qualities and invites to stay after sunset.

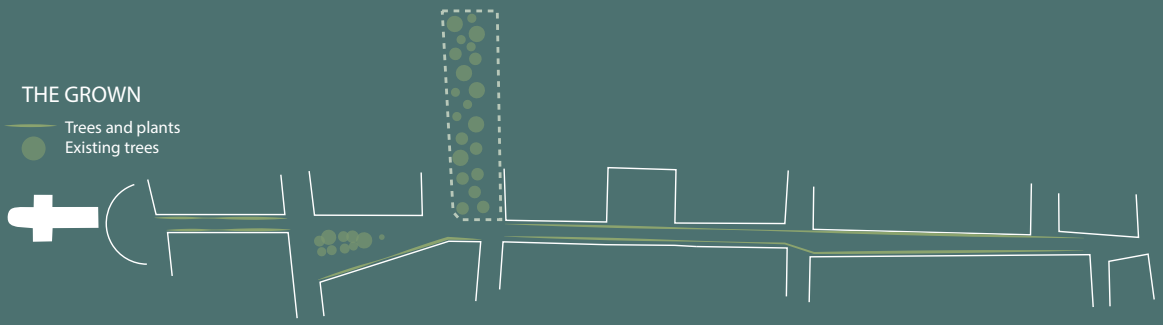
Sensing experiences along the street

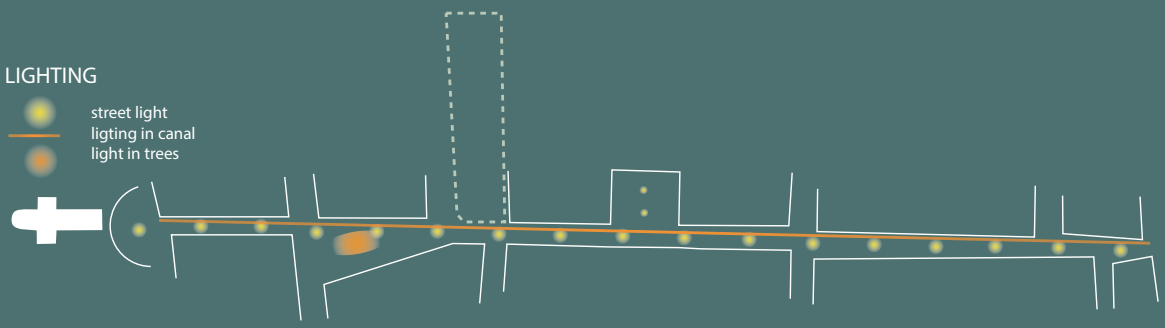
Bells are ringing from Hellig Kors Kirken making people in the neighborhood aware of its presence. Going further down the street whistling leaves in the wind directs attention to the beautiful trees, placed on the square and along the street. Sound wells interrupt the fast transit and invites people to slow down to investigate further. The extraordinary sightline is characterize Korsgade going from Hellig Kors Kirken to the lakes making the street unique.

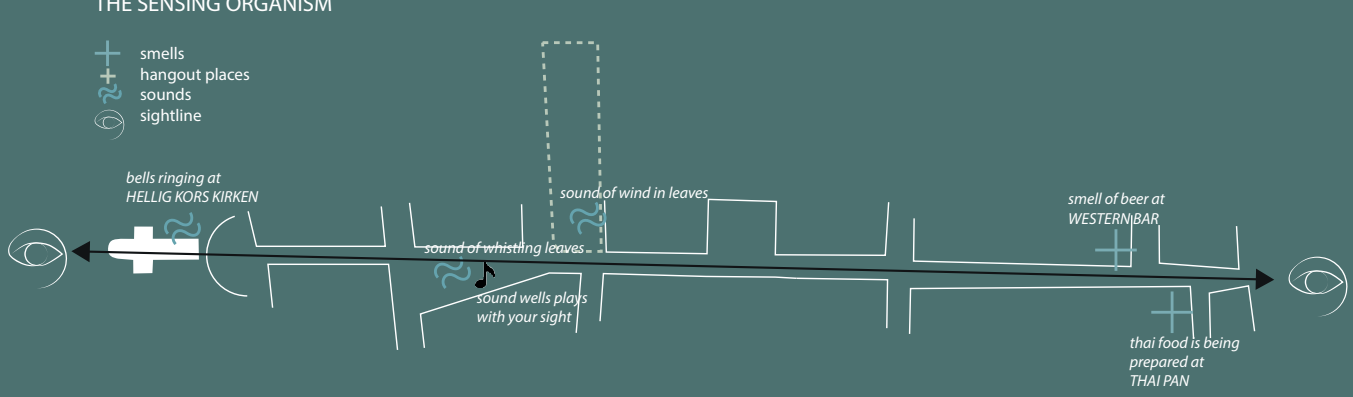
Korsgade with The Yellow Square.











Concept diagram , Yellow Square


GRIFFENFELDSGADE
Temperature
30
20
10
0
Recycled concrete tiles
in 3 sizes with chalk
KORSGADE
the pattern in the grate
provide views to the water
underneath
Water showing
temperature
parents waiting for
their kids to arrive
from the forest outside
the city
Børnehuset
Askovfonden
Water canal as a playing
element
Raised surface
read off the
temperature by
looking at the height
of the fountain
Sound well of ocean
waves at the beach
Yellow brick tile, Solera/Antik,
70 mm x 70 mm x 240 mm
Continuous canal through
Korsgade, 1000mm x 400 mm
the placement of
clinker bricks creates
flowlines
Large-leaved lime
Large-leaved lime
Large-leaved lime
Sound well of
whistling leaves
Large-leaved lime
Large-leaved lime
Sound well of
humming bees
Common lime
Large-leaved lime
Common lime
Sound well of a
squirrel cracking nuts
Common lime
GRIFFENFELDSGADE
KORSGADE
Concrete elements invites to
stay under the treetops
Recycled concrete tiles
in 3 sizes with chalk
Social housing

The Yellow Square in the context of Inner Nørrebro.

Housing

Water fountains gets higher in heavy rainfalls

schist stones creating a crossing

watch the column fountains jump up and down

heavy rain will make the fountains go up in heights of 3 m

Fritidshjemmet Askovfonden

Sound well of grasses in the wind

Sound well of birds chirping

Horse chestnut

HOFOR supply house

the density of fountains create space for play

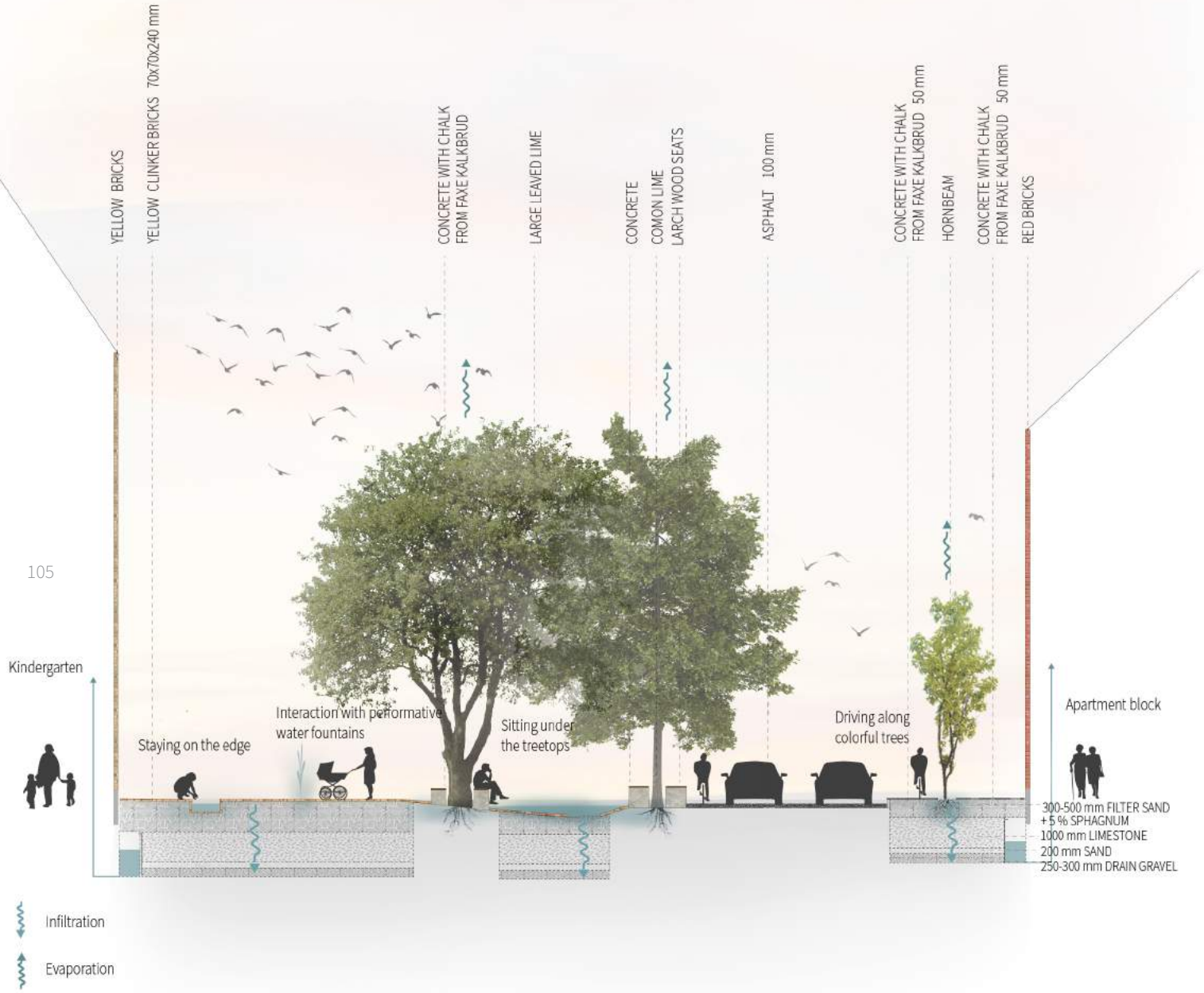
Large-leaved lime

long concrete tiles makes it easy to cross the canal

Recycled concrete tiles in 3 sizes with chalk

the pattern in the grate provide views to the water underneath

The Yellow Square on Korsgade, drawn in 1:100, here shown in 1:200.



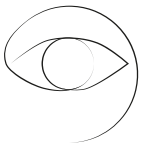
Section across the square, in 1:200 focusing on the rational and aesthetic qualities.

Dark green heart-shaped leaves on an old common lime tree.

Coal-burned clinker bricks complementing the soft wooden surface.

COMPLEMENTARITY

Coal-burned clinker bricks complement the existing brick buildings and grown elements on the square. The change in colors of the clinker bricks tells a story of a natural material, which over time will get patina. Flow lines are implemented in the placement of bricks and will be contrasted by the actual use of the square showing the veracity of matter. Various parameters are drawn together in a unity by complementing each other with different qualities, as the chattered bark in contrast to the smooth, sustainable, concrete surface creating an entity. Whereas the clinker bricks momentarily are covered with running or motionless water. Contrast are made with a diversified choice of materials making the square ready to handle storm water events by storing and using the water aesthetically on the square on an everyday basis.



To see: The sense of sight are working within a large field. It is possible to see the stars and aeroplanes, which is not recognizable to the ear. Other people gets identifiable in distances up to 1 kilometre away, but for the social coherence it is restricted to 100 meters. The social coherence exist when the human scale can be defined. Within a distance of 20 meters features get identifiable, and feelings and mood can be conceived. Within this distance experiences gets interesting in a social regard. At even shorter distances the experiences become even stronger, because the other senses starts to complement the sense of sight (Gehl, 1971).

Kidney Wetch with yellow flowers.

Horse Chestnut with fallen chestnuts in October.

WET MEADOW 1. Yellow everlasting pea, 25-100 cm 2. Red fescue, 25-60 cm 3. Beach arrow grass , 60 cm 4. Meadow avens, 20-40 cm 5. Narrow-leaved plantain 6. Common spiraea, 50-100 cm 7. Kidney vetch, 10-30 cm

See description of biotopes on page 92. (Møller and Christensen, 2002)

Recycled concrete elements create seating options under the treetops with larch wood improving comfort, next to grown elements as grasses and colorful flowers encircling large lime trees. The chattered bark is a contrast to the soft concrete surface making a perfect entity. In case of heavy rainfall events the space changes into a water mirror with space for the water to store, reflecting the beautiful treetops and yellow bricks, and thereby offer a unique and playful experience with social interaction.

CONCLUDING REMARKS

When designing urban spaces it is of high relevance to design with a holistic approach, as senses cannot be separated since they are constantly complementing each other (Pallasmaa, 1996). If the eye gets isolated from the other senses, it gets excluded and oppressed, as it reduces and limit our perception of the world. In general separating senses, fragments our sensory system, which has a native complexity and plasticity that leads to disengagement and alienation (Pallasmaa, 1996).

For that reason it has been important throughout the process to work with different kinds of senses that inevitably affect each other. Trees invites to touch due to the chattered bark, while whistling leaves in the wind affects the sense of hearing. During summer trees in the blossoming phase affects our sense of taste and smell, while the sense of sight always is designed for in some extend. For that reason it is important to make a conscious choice of materials, both when it comes to the grown and built, to be aware of the complementarity between the different senses and create interesting and innovative urban spaces.

By creating more quality and experience in our surrounding city, we believe the well being of people will be enhanced. We believe, by putting focus to nature and staging it differently that people starts noticing the small wonders of nature. This can make them stay a little longer and create the framework for the natural conversation to arise. By designing with focus on local and sustainable materials, we believe sensuous spaces can be created, when the materials are placed in the right context. By making people aware of a sustainable choice, we believe we can influence people to make more sustainable choices to affect our future in the best possible way, and thereby create better places for people. Simultaneously cities need to be prepared for climate changes by turning parts of the city into climate parks and open canals, we believe people it is possible to acknowledge the increased amount of storm water as a positive factor contributing to diversity in urbanized areas. We believe in better cities in the future.

EVALUATION

CHAPTER 8

CONCLUSION

The aim of the Liveable Water thesis project has been to improve three urban spaces in a densely populated area, being Inner Nørrebro, by use of 4 parameters: water, the grown, materials, and the performative in a holistic approach. The solution is a storm water strategy focusing on the travel of water throughout Inner Nørrebro with an outlet in Peblinge Sø. By managing water on surface, Livable Water creates recreational urban spaces with enhanced qualities in three points of impact being; the street, Rantzausgade – The Crack; the square, Askovgårdens Plads – The Yellow Square; and the park, Hans Tavsens Park – The Climate Park.

IN THE GAP

The storm water plans from City of Copenhagen, focuses on delay basins, with possible places to be flooded in extreme weather conditions without negative consequences to the surrounding area. The Liveable Water project works with the gap between the delay basins and the lake, as it is in the transportation of water, in between the collection and the final destination that people live and urban life unfolds. Therefore it is of high priority to focus on these spaces to make them function in extreme weather conditions and on a daily basis, while connecting functional needs with aesthetic and sensuous design decisions.

PARAMETERS

Liveable Water uses four parameters as a method for analysis and design. The four parameters are water, the grown, materials, and the performative.

Water is the overarching parameter that influences all three points of impact, being the main focus that combines the rational and aesthetic. The rational manages storm water making sure the area of Inner Nørrebro can handle the run off water. The aesthetic is in the design choices of the urban spaces that handle the relation to the human body.

The Climate Park intentionally put focus to the grown and the changeable landscape of water. The grown is present in already existing trees and in the planting of new. The new trees are placed on a raised level, making sure the roots are not drowned, when The Climate Park is under water handling a total amount of 12.000 m3. The fact that the size of the lake changes due to the amount of rainfall makes sure that the Climate Park has an ever-changing expression.

The Crack explore the constitution of materiality on limited space. Rantzausgade is a street full of rational functions, as shops and café's fill the street. The Crack places itself in this framework and uses materials to create identity in the street. The materials used at Rantzausgade are chosen for their ability to change character when becoming wet. The granite tiles darken and the sound of water becomes more evident when it trickles between the granite stones in the open canal. At a rational level, storm water management solutions make the two canals able to handle water from a 1 year event.

The Yellow Square has a focus on the performative. It invites people to interact with the water because of the waters changing character, by rising differently into the air. The height of the columns depends on how much rain has fallen and the presence of people, as water is being stored underneath the square. The Yellow Square also have an open water canal that acts as an element for play, and a changing soundscape that emerges from the trees and sound wells placed throughout the square imitating various sounds which cannot be seen. These elements create a space that invites people to interact, play, and explore further.

The three points of impact all have elements of the four parameters – water, the grown, materials, and the performative, but the parameters is scaled with different intensity on the three points of impact. This creates different expressions in each space and

provides diversity in the neighborhood, making it a more interesting place to move about.

RATIONAL & AESTHETIC

In combining the rational and aesthetic, deliberate choices have been made in designing tactile sensorial urban spaces. Water is not only visible as a recreational purpose but also as a rational purpose as it is used in households for toilet flushing, and laundry. The approach of the rational and the aesthetic have shaped the project and have created the foundation of reflection on the complementarity. The complementarity of different materials, the grown and the urban, the local and the global, and healthy urban living.

Designing not only for the sense of sight have been possible, by always referring to the approach of seeing the complex and layers of the city to shape the best urban spaces with focus to all five senses. Separating the senses and not always putting them in equal focus can create poor and empty urban spaces without experiences and life. By implementing sound wells and trickling water in canals, performative water fountains to touch, a sweetness of blooming trees and variation of textures, sensuously interesting urban spaces have been created that changes, what senses is in focus depending on time of year and day.

PROCESS

The three points of impact have been designed in the scales 1:2000 and 1:100. One scale gives an overview of the area, with the context in focus, the other puts details and material solutions into focus. By changing scale in the design process, Liveable Water creates a strategy for managing storm water that simultaneously handles materials and details. The different scales demanded a sense of the city in its entirety with its complexity and layers in a dynamic process weaving together the parameters of importance simultaneous, to create a better and healthier neighborhood for the wellbeing of people.

LIVEABLE WATER

Defining the good city is difficult, but by making deliberate and holistic choices with focus on complementarity of the rational and aesthetic, and by the same time solving water related issues with recreational purposes, is a way to create good cities. Liveable Water makes design choices that create great places to live containing many layers that, adds to basic function of an urban space, and at the same time it solves challenges presented by increasing storm water, due to climate change. By strengthening life on foot, a large number of valuable social and recreational possibilities are brought into play. A change of the daily bustle is reflected in different experiences at daytime and at nighttime. Light effects and a variation of grown environments are staged to create an experience of investigation, astonishment, and wonder.

REFLECTION

Livable Water is a project born by engagement and an idealistic hope for better, healthier, and more liveable cities in the future. Throughout the project various fields of interest have been examined in great detail. It has been prioritized to make a thorough theoretical study, giving a strong foundation to the project. Knowledge and pearls of wisdom from philosophy, social sciences, planning, and urban design all add value to the aesthetic comprehension, while numerous reports, product descriptions, and references have informed the rational. The acquired knowledge is of great value as it informed the design choices made in the project.

PARAMETERS

Choosing four physical parameters to regulate the approach, have shaped the Livable Water project to emphasis water, the grown, materials, and the performative. The parameters are scaled with different intensity on the three points of impact as described in the conclusion, which could have been different. Emphasizing the water even more would take the hidden Ladegårdså into account in Rantzausgade (even though it is located deeply under the ground and needs to be inflated to the surface) or implementing even more grown elements. The square has potential to be a green space, although the sightline would be endangered of disappearing by placing more trees. The park could potentially hold more water or turn into a space with less grown elements.

The choices made are based upon site-specific parameters and consider storm water management of high priority. Resultantly the project has turned in a direction creating spaces with controlled elements that are not provocative – meaning flooding areas unnecessarily or implement great amounts of grown elements reducing the functionality of other parameters. The project adapts easily to the existing functions of place and the high demand for multi functionality of space. Whereas a more extreme expansion of parameters might create a project, that could turn Inner Nørrebro into a tourist attraction as the park at Novo Nordisk with emphasis on “wild” green elements, the aim has been to develop solutions beneficial to the local Copenhageners living nearby, creating spaces for everyday use.

The physical environment frames life, though life is nothing without the social aspect. Through the design process, designing for the natural conversation and thinking urban spaces as social spaces, has been an integrated part of decision making. Yet designing for specific user groups different from the already existing have not been in focus. Nevertheless it is still interesting to imagine an approach focusing on the social aspect, which would have been just as relevant for Inner Nørrebro. This would of cause have shaped a very different project. Focus could have been directed towards homelessness or improvement of social capital by grown elements in urban space. Designing the physical urban environment obviously correlates with the social – thus social experiments and events merely rely on temporary physical installations.

THE BUILT AND THE GROWN

Making use of the complementarity perspective has turned out to suit the technical/aesthetic training from Urban Design. The approach constantly makes sure not to disappear in storm water calculations or become infatuated with sensorial experiences, without considering the opposite equal. By using this method, urban spaces are designed to be functional and aesthetically pleasing. A balance is created between the built and the grown, caring about life in urban spaces. The complementarity approach seem to have endless opportunities and fit scales ranging from strategy, to architecture considering the relation between inside and outside, over details as clinker brick's visual qualities to the absorption of water. From a critical point of view the approach are easily adoptable to a physical environment, though social conditions are not a natural part of it. Nevertheless, by understanding the aesthetical as not only the visual, but as influencing all the senses, it becomes social in terms of not only sensing the focal parameters, but also sensing and interacting with other people. Sensory experiences involve people around you, just as much as the built and the grown environment. When designing experiences and creating for the performative, a choice appear concerning the substantial part. Thus experiences are not only created by the physical, they are created with and among people. What is an experience worth, if not shared with others? Due to this fact an experience is designed to mainly involve more than one individual.

SUSTAINABLE MATERIALS

The sustainable aspect of developing urban spaces has been a factor concerning choice of materials. In case of the concrete tiles an idea of recycling Københavnerfortovet, which is already existing on Inner Nørrebro, is present and adds to a personal conviction of recycling rather than discard and produce from new resources, whenever possible. In the future the entire construction industry will have to adjust to the future lack of resources, which demand creativity and change of perception affected by circular economy. The culture of use and discard will shift towards a circular way of thinking and will demand new ways of up cycling waist to valuable product. Choices made when designing urban spaces regarding materials and sustainability is a layer important to have in mind when designing the spaces of the future. It is relevant to inform people about the possibly to push the development of sustainability in society.

CITY NATURE

The City of Copenhagen has developed a vision and strategy for the city nature of Copenhagen in collaboration with external experts. The goal is to increase the amount and quality of city nature and to actively use the nature to strengthen climate adaptation and biodiversity. Additionally the political decision is meant to create the best possible frame inviting to an active urban life, which will benefit current and coming generations (City of Copenhagen, 2016). Liveable Water comes up with a specific proposal as by way of fit fulfill the wish for increased city nature in one neighborhood, and invite to urban life on the streets. The work with the grown suits the description of city nature in an interpretation useful to storm water

management. The grown are implemented as nature in between the “wild” level of rural areas and the mown grass and park design familiar to Copenhageners such as Frederiksberg Have and Kongens Have. Although the grown elements at The Crack look wild, it is controlled, though under another level of maintenance than the parks mentioned above. Liveable Water provides a picture of nature different from what urban dwellers are accustomed to; with water running freely on the surface and the grown growing apparently looking like it is wild.

CLIMATE CHANGE

A project created to solve challenges concerning climate change need to answer the question: what is the acceptable amount of water in case of a 100 year event? It is a vital question. Liveable Water emphasizes the experience of everyday precipitation as a more important factor. Thereby a compromise has been made between small frequent and large drastic events. As a result the three points of impact and the concepts are created to manage storm water on an everyday level without causing floods on streets. The tricky part is to design for the experience of precipitation and water, and at the same time avoid floods.
The material, perma asphalt, offers infiltration on a very effective level, but it is not a material suitable for creating a sensuous experience. The material does not work on the points of impact, where the water is meant to be visible on the surface. However in case of intense storm water events it offer possibilities with great advantage to avoid flooding.

Three urban typologies suggest different storm water management solutions. However other solutions could have been used distinctly, as the concept for green streets (page 64), where water infiltrates through rainwater beds or permeable parking (as perma asphalt) along the streets. Thus this solution does not emphasis the visible water. The canals could have been designed differently to accommodate more water, or The Climate Park could be more informative and clearly promote playing behavior like sØnæs in Viborg by Møller & Grønborg. There are many ways to design for climate adaptation and make it fit the context.

CHOICE OF FOCUS – DESIGNING FOR A CONTEXT

Liveable Water is created on basis of an interest in the context, which is why it has been decided to choose three points of impact for detailing. Another approach under consideration has been to develop principles for climate adaptation in a design guide, which would have made the project easy to apply in various climate adaptation projects within Copenhagen and in an international context. Analyzing sense of place and designing for a specific context would not be meaningful to a general climate change design guide, as it would hinder free use of it in other contexts. For this reason it was decided to rather engage in a site and create unique solutions that fit the context and meet the users. Thereby the result convince by its realism and detail that, should be the point of departure for a creation of principles adaptable to another neighborhood. Thus the project has ability to be transferred by principle and concept to other areas, where analysis of that specific site would add value to the implementation of principles.

LIVEABILITY

Liveability has become one of the primary goals and concerns through the project. The term involves many different aspects to consider. To solve the water problems caused by increased storm water, one project covering a neighborhood will not do the job alone. As the storm water calculations are made on the basis of water amounts that depend on storm water management in the areas North-West of Inner Nørrebro. Action must take place over a period of time, gradually transforming the city of Copenhagen into an even more liveable place. Liveable Water proposes a realistic transformation with emphasis on the specific liveability on Inner Nørrebro. Pedestrians and bicycles are of high priority and the urban setting invite them to join the daily encounter, which Gehl is a proponent of. The physical environment has big influence and many general subjects of best practice that inform the discussion of liveability, though factors as culture and target groups seem to be important on a local level. Liveability on Inner Nørrebro presumably imply very different interpretations, whether you are a Somalian shop owner in Little Mogadishu (Griffenfeldsgade), a parent taking the Christiania bike around, or a single walking the dog in the neighborhood. Everyone have different needs and presumptions on an everyday life basis. Maybe the Somalian shop owner would have liked something in the urban setting he identifies himself with? The design is envisaged to meet and respect everyone as a democratic urban space, where life and vitality take place offering experiences and small wonders year around. It has therefore been a continuous choice to make urban space democratic and available for everyone and not put focus on one specific user group. This also makes the project robust to future changes in the demographics of the city.

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The illustrations that are not mentioned in this section are produced or photographed by the authors.

Cover: www.creativemarket.com

VII: Table of content
Bicycles CPH: www.visitcopenhagen.com
Rain: powellriverdailynews.files.wordpress.com
Touching hand: www.nbk-burenie.ru

Page 2: Superkilen by BIG, Copenhagen, 2011: www.archilovers.com

Page 3: Flooding Copenhagen, 2011: kk.sites.itera.dk

Page 5: Silence, Tadao Ando, London, 2011: poggenpohlmagazine.wordpress.com

Page 9: Nørrebro: www.information.dk

Page 10: Nørrebro: multimedia.pol.dk

Page 13: Flooding, Copenhagen 2011: multimedia.pol.dk

Page 14: Density of people: www.independent.co.uk

Page 15: www.creativemarket.com

Page 21: Vester Voldgade, KBH www.kadk.dk

Page 23: Therme Vals by Peter Zumthor, Switzerland, 1996: www.simplicitylove.com

Page 24: Empowerment of Aesthetics at the Venice Architecture Biennale by SLA: www.arcspace.com
Petter Dass Museum by Snøhetta, Norway, 2007: snohetta.com

Page 26: Dan Graham, Image courtesy of the National Tourist Routes of Norway: www.nevadaart.org

Page 27: Frederiksberg Nye Bymidte, by SLA, 2005:
www.aok.dk
realdania.dk

Page 29-30:
Red House by JVA, Norway, 2002: heditionmagazine.com
Høse Bridge by Rintala/Eggertsson, Norway, 2013: www.dezeen.com
Schouwburgplein by West 8, Netherland, 1996: www.melk-nyc.com
Tverrfjellhytta, Norweigian Wild Reindeer Pavilion by Snøhetta, Norway, 2011: wannabemagazine.com
Superkilen by BIG, Copenhagen, 2011: www.architectmagazine.com
Into the landscape series by Rintala/Eggertsson, Norway, 2009:
inhabitat.com

Page 31-32: Bicyclists: www.wikimedia.org
Park: www.city.io

Page 33: www.creativemarket.com

Page 35: Water: www.ecoviarenewables.com

Page 38: Child touching fountain: pinterest.com

Page 40: The grown: www.poeticmind.co.uk

Page 41: Bymilen by SLA, 2011: www.sla.dk

Page 43: Tactility: www.land8.com

Page 45-46:
Materials, water & grown: www.thereseknutsen.no
Materials & grown: Pinterest.com
Wooden surface: interiordesignmagazine.tumblr.com

Page 47: Performing space, Frederiksberg Nye Bymidte by SLA, 2005: www.dac.dk

Page 50: Water Pavilion Aalborg by Jeppe Hein, Kunsten, www.kunsten.dk

Page 53: www.creativemarket.com

Page 55: Nørrebro: www.visitcopenhagen.dk

Page 57: Flooding, Copenhagen, 2011: www.bt.dk

Page 60: Fountain Place, by Dan Kiley, 1985: arkhitekton.net
Stepping stones, sØnæs klimapark, 2016:Kommune.viborg.dk

Page 67: www.creativemarket.com

Page 73-74:
Wood: www.texturemade.com
Austrian Pine: www.extension.iastate.edu
Grey alder: www.zoetermeeractief.nl
Concrete:www.sla.dk
Sycamore: ardinage.ooreka.fr
Bird cherry: upload.wikimedia.org

Page 76:
Canal: landscapeperformance.org
Pillars: oplevelser.viborg.dk
Park: s3.germany.travel
Stepping-stones: mgarkitekter.dk
Israels Square: www.visitcopenhagen.dk

Page 77: www.creativemarket.com

Page 79:
Buildings: mapio.net

Page 89-90: Treetop: www.knightstemplarinternational.com
Granite: www.zurface.dk

Page 91: Concrete: www.yatzer.com
Hornbeam: www.shopnicholsons.gb

Page 92: Danmarksflora.dk (2015) 'Danmarks Flora': www.
danmarksflora/0101.php
Page 93: Harebell: worldofblyton.files.wordpress.com

Page 94: Bio asphalt: pbs.twimg.com

Page 95: www.creativemarket.com

Page 97: Church: commons.wikimedia.org

Page 106: Common lime tree: gallery.nen.gov.uk

Page 107: Clinker bricks: allgemeinebauzeitung.de

Page 108: Larch wood: www.furnitureproduction.net

Page 110: Kidney Vetch: www.luontoportti.com
Horse Chestnut: static.giardinaggio.it
Chestnuts: omkarvanaspati.com
Danmarksflora.dk (2015) 'Danmarks Flora':
www.danmarksflora/0101.php

Page 113: www.creativemarket.com

Appendix 4:
Bay willow: www.british-wild-flowers.co.uk
Ash: www.extension.iastate.edu
Hornbeam: www.shopnicholsons.gb
Harebell: web.kalid.com

Appendix 5:
Concrete: formmastersqld.com.au
Bioasphalt: twitter.com
Clinker bricks: allgemeinebauzeitung.de
Permaasphalt: vimeopro.com
Glow pebbles: destinasian.co.id
Granite: www.zurface.dk

APPENDIX

CALCULATION OF STORM WATER MANAGEMENT

Calculation of canals and basins

	100 year (m3/s)	**1 year (m3/s)**	**Factor**
30 min duration (catchment area 1,5 km NV)	20,5	5,6	4

Canals:

Korsgade	1,6	0,4	
Rantzausgade	1,0	0,3	
Stream inlet to park	3,8	1,0	

Basin calculation:	100 year (m3)	1 year (m3)	Factor	Paved area (ha)
Hans Tavsens Park	18000	5951	3	17,6

Korsgade canal dimensioning	lenght (m)	width (m)	height (m)	Amount of water (m3)
1 year	**1,0**	**1,0**	**0,4**	0,4
	1,0	2,0	0,2	0,4
100 year	1,0	3,2	0,5	1,6

Cross sectional area calculation:	**Section area:**		**Amount of water (m3)**	
Korsgade, 100 year event	1,6	m2	1,6	m3 (potential of delay)
Korsgade 1 year event	0,4	m2	0,4	m3
Rantzausgade, 100 year event	1,0	m2	1	m3 (potential of delay)
Rantzausgade, 1 year event	0,4	m2	0,4	m3

The red numbers display, which numbers we got from appendix 2.
The yellow numbers to the right are crucial results concerning storm water management in this project.

Area in the streets capable of storing water:

Street	**lenght (m)**	**parking rows**	**width (m)**	**depth (m)**	**amount of water (m3)**
Hans Tavsens Gade	202	0	2,5	1	505
Korsgade inden pladsen	73	1	2,5	1	183
Korsgade ved pladsen	61	0	1	0,4	24
Åben kanal på pladsen					
Korsgade fra plads til sø	370	1	2,5	1	925
Korsgade 100 år	370				583
Korsgade kanal	370		1	0,4	148
Kapelvej	207	1	2,5	1	518
Griffenfeldsgade (plads til Rant.)	152	1	2,5	1	380
Gartnergade	150	2	2,5	1	750
Blågårdsgade	161	1	2,5	1	403
Smedegade	174	1	2,5	1	435
Tømrergade	90	1	2,5	1	225
Thorupsgade	246	2	2,5	1	1230
Struenseegade	391	2	2,5	1	1955
Jesper Brochmanns Gade	23	1	2,5	1	58
Rantzausgade (krakeleret)	607	1	0,5	**0,5**	152
Rantzausgade (åben kanal)	607	1	0,3	**0,2**	36
Henrik Rungs Gade	200	2	2,5	1	1000
Brohusgade	194	1	2,5	1	485
Jægergade	129	1	2,5	1	323
Total					9697 **m3**

Basin	**Volume (m3)**	**Height (m)**	**R1 top (m)**	**R2 bottom (m)**	
Korsgade - the Yellow Square	70				
The lake in Hans Tavsens Park	1591	0,8	30	20	
1 year event influencing the size of the lake:	5951	1,3	46	30	5981
1+100 year event:		0,46	54	46	3619
100 year event - the lake take up to:		1,76	54	30	10014
A 100 year event flooding the park:	18000	1	250	70	17500
Play field in the park	1963	1	25	25	1963

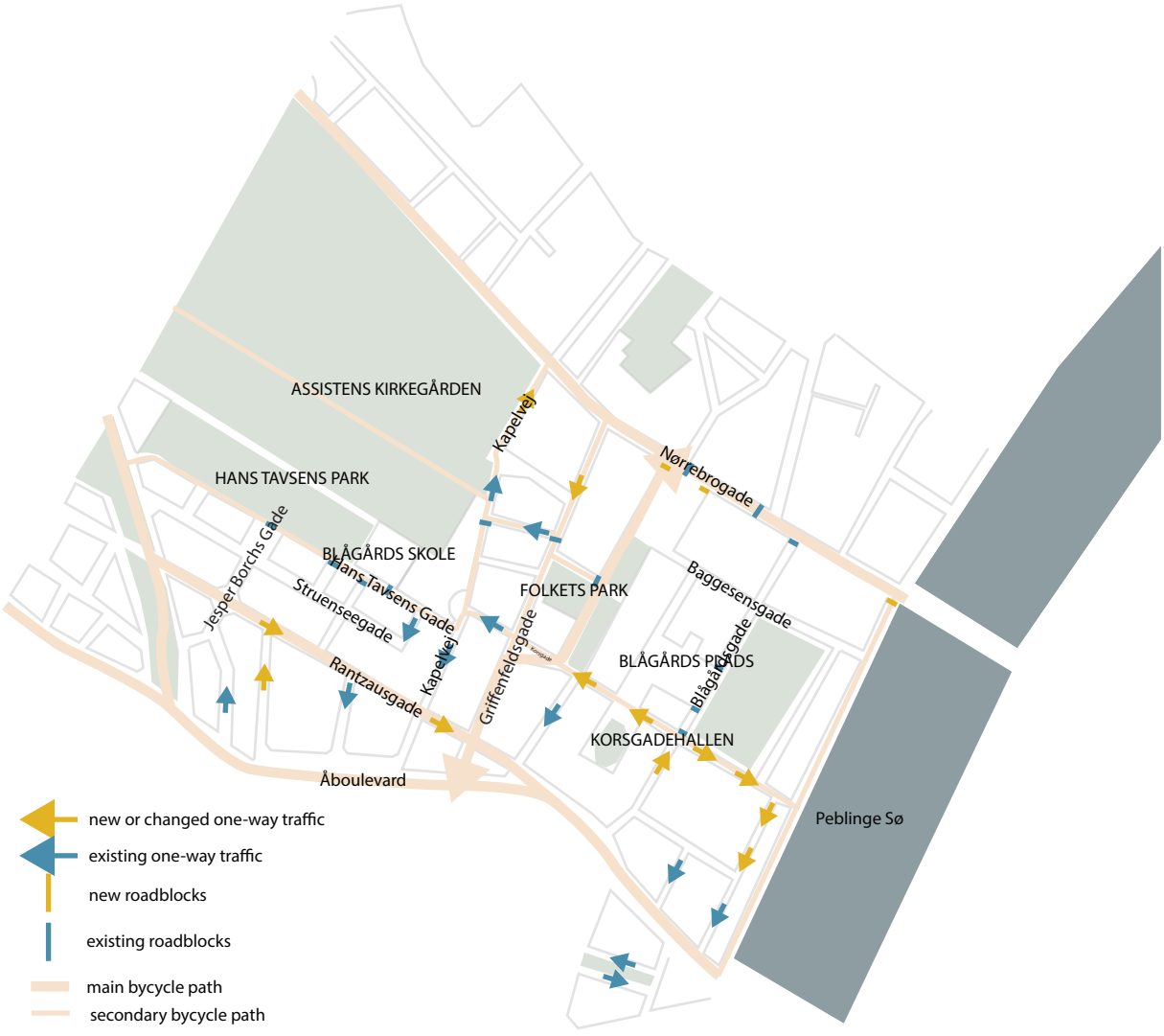
Truncated cone: V=1/3*pi*h*(r1^2+r2^2+r1*r2)

It is assumed that the streets can take up to 10.000 m3 of storm water as long as they are not full to begin with. Hereby the delay basin in Hans Tavsens Park accomodates 10.000 m3 of water and the play field take up to 2.000 m3, when a 100 year event occurs.

These numbers have been point of departure for calcution of storm water management (Rosted and Christensen, 2016) on basis of (Rambøll, 2013).

TRAFFIC

Parked cars and traffic are part of Nørrebro today, compelling the municipality to suggest a plan for enhancing safety for soft road users. The City of Copenhagen wishes to put Nørrebro on the map to be a prime example on how to unify an attractive and green neighborhood with cars, bicycles, and traffic of the city (City of Copenhagen, 2014). Today Inner Nørrebro is characterized by heavy traffic, making the soft road users feeling unsafe and putting Rantzausgade in the top 10 of most traffic accidents per meter in Copenhagen (City of Copenhagen, 2014). A solution concerns moving roadblocks further into the area and creating more one-way streets with cloudburst management in mind (Grontmij + GHB, 2015). Apart from that it is desired to test new parking solutions for cars and bicycles with more urban space qualities, to slow down traffic and bring in green structures and sitting options (City of Copenhagen, 2014). The city renewal has made campaigns to get as many opinions on the table as possible before decisions are made for the traffic management scheme. In a week camps were put up in Rantzausgade to talk to residents and passers-by, to get their wishes and experiences.



ASH

Ash is the forth most planted tree in the danish forests and can be as old as 200 years. Ash gets a huge treetop and a height of 35-50 meters and 1,5 meter in diameter. The bark is soft and greyish with close and regular longitudinal grooves. Black leaf buds blossom in the end of May. Ash has a green defoliation. It lives best on vigorous ground which advantageously can be wet.

AUSTRIAN PINE

Pine trees are getting 30 meters with long pins and a dense and wide treetop. The bark is greyish brown which quickly gets roughly and gradually deep furrowed. The cones are egg shaped with a violet light between the cone scale. It is resistant against frost, drought and wind and lives on many different soil conditions and has a lifetime of 150-200 years.

BAY WILLOW

Is a multi-pronged tree getting 10-15 meters. The bark is brownish with small orange-brown cracks. Blooming in the end of May with yellow flower vines

BIRD CHERRY

25 meters with a greyish bark and flowers of 25-35 mm with white petals in beginning of May. Cherries gets 10 mm and has a red or black-red color with a sweet taste. Lives best on calcareous mould soil especially in forests.

COMMON LIME

A big deciduous tree with a height of 30 meters and 2 meters in diameter with a dome-shaped treetop. The bark is dunbrown with rough longitudinal cracks. The leaves are almost heart-shaped and a nicely serrated edge. The upper site of the leaves are darkgreen and with a blue-green lower side. Blooming in June with green-yellowish flowers. Prefers a moist mould ground.

GREY ALDER
Gets up to 20 meters with a twirly crooked trunk. Bark is light-grey and is easy to recognize by its short-stalked cones.

HAREBELL
Colour: Purple
Habitat: Common in forest, cities and moorland
Characteristics: Rising branchy plant with 15 mm hanging flowers

HORNBEAM
Normal height is 15-20 meters with a twisting trunk. Blossuming is present around 10'th of May with yellow-green catkins.

HORSE CHESTNUT
Can get 30 meters with a diameter of 2 meters with a bell-shaped treetop with big leaves on a 15-20 cm long stalk. The blossoming is abundant in May with numerous white flowers gathered in 15-30 cm heigh upright tops. In October releases chestnuts.

KIDNEY VETCH
Is from the pea flower family and gets 10-30 cm. Yellow flowers is placed paired with subtending leaves.

SYCAMORE
A large tree which can get up to 35 meters and 1,5 meters in diameter. The bark is soft. Blooming in May with 10 cm long hanging clusters of green-yellowish flowers. Maricarps is spread separately by the wind in autumn as small helicopters.

Recycled concrete

With chalk from Faxe Kalkbrud

PRODUCTION & TREATMENT
Consisting of cement from Aalborg Portland (¾ chalk and ¼ clay), sand, gravel and water. Cement tiles is produced in stoves by burning chalk at 1000 degrees celsius. Hereafter the ingredients is mixed and the concrete is ready to use.

SUSTAINABILITY
Concrete consist of natural materials which is available everywhere on the planet and is therefore often locally produced, meaning the transport charges is kept to a minimum and is therefore an environmental advantage. When burning chalk tiles CO_2 is released and therefore the content of cement is reduced in new produced concrete to make it more sustainable. By re-using the concrete tiles which is present in Københavnerfortovet, new gravel is saved. Though concrete surfaces obtains CO_2 from the atmosphere and is thereby helping reducing the greenhouse effect while also obtaining around 60 % of the CO_2 which is released while burning the chalk tiles.

MAINTENANCE
Maintenance is kept to a minimum as it is an inorganic material and is therefore not contributing to rotting or rusting.

CHARACTERISTICS
Easy to work with as it is a fluid mass easily molded into shape under construction, and is after hardening weather resistant. Furthermore it has a high heat accumulating ability influencing a reduction of temperature change.
By chosing a pervious concrete tile with a sponge-like network water can pass through readily retaining stormwater runoff.

AESTHETIC QUALITIES
It is a strong and plastic material which almost makes boundless possibilities for the shaping, colors and structures. Casting can be made as a response to a smooth surface, as concrete is so easy to work with, with various possibilities for different aggregates making it unique.
(Concretenetwork.com, 2016) (Danskbeton.dk, 2016)

bioasphalt

PRODUCTION & TREATMENT
Made from non-petroleum based renewable resources such as sugar, molasses and rice, corn and potato starches, natural tree and hum resins, natural latex rubber, vegetable oils, and much more. Investigations are still made to produce bio-asphalt.
The non-petroleum based resources are heated with oxygen followed by a thermochemical process which yields two products: a liquid bio-oil and a solid biochar. The first can be used to manufacture fuels and asphalt and the other to remove greenhouse gases from the atmosphere.

SUSTAINABILITY
Perfect alternative for normal asphalt due to fading oil resources which is also low-cost and less polluting. When transformed into liquid there is a conversion efficiency of 55 %. It is not just green because it is made from plants, but because it also saves money and energy, as it requires lower temperature for mixing and paving in relation to conventional asphalt.

MAINTENANCE
As the product is faily new, no maintenance is documented yet.

CHARACTERISTICS
By changing the color of the bioasphalt it is possible to handle seasonal temperature swing

AESTHETIC QUALITIES
Can be colored effecting a reduction of temperature avoiding urban-heat-islands and gives a freedom in order to the aesthetic characteristics of an urban space. (ScienceDaily, 2016)

Clinker bricks

PRODUCTION & TREATMENT:
The slate clay come from Hagemeister in Germany and is hard baked with a temperature of 1000-1200 Celsius to ensure frost resistance as well as the very long service lifetime.

SUSTAINABILITY:
Clay for tiles is a naturally occurring material, which is easy accessible. When digging for clay, soil or groundwater is not affected negatively and the only energy used is the digging and the transportation of the clay to the factory. All the clay that is transported to the tile works is used and therefore the deposit is limited. The only significant environmental indicator for tiles is the energy consumption for burning the tiles. Furthermore tiles can readily be recirculated or deposited. In Denmark 95 % of all tiles are recycled as it can be crushed down to reuse and recirculation.

MAINTENANCE:
Without maintenance tiles lasts for several hundred years.

CHARACTERISTICS:
Low water intake between 1-3 %. Approved to traffic on areas with lighter traffic for example squares with a notch on minimum 3 mm.

AESTHETIC QUALITIES:
A use of different salts creates a play of colors together with a radiant heat with the tiles closest to the heat getting another color and a different surface. Supplying the burning with coal creates beautiful 'discolorations', which makes the tiles diversified together with addition of ochre. During the years the tiles gets a beautiful patina.
(Steffensten, 2016)

Perma asphalt

PRODUCTION & TREATMENT:
When constructing a perma road it is important not to pollute with other materials due to the drain quality. 350 mm DrænStabil is laid out and hereafter compressed. DrænAf is placed on top in 30 mm and is compressed with a pan vibrator. A sticking on the surface is made before a PermaVej in 30 mm is placed on top.

SUSTAINABILITY:
The expenses correspond to a normal asphalt road and by using natural crushed aggregates pollution is reduced. The expenses for base gravel (stabilgrus) and asphalt is higher compared to normal asphalt roads, but compensates as gratings and wells is needless.

MAINTENANCE:
Maintenance have to be made once a year by sweeping, washing down and absorbing dirt from the surface. If maintenance is made the drain ability will last for the same period as a normal asphalt road.

CHARACTERISTICS:
Can handle a 10 year event on 10 minutes with a water volume of 500 l/s/ha. Designed for passenger cars and low truck traffic. PermaVej has a large void volume which admits water to run through to take some pressure from the sewage system. The large drain effect keeps the surface free of water - even during cloudbursts. DrænStabil in 300 mm can handle 90 liters of water pr. m2.

AESTHETIC QUALITIES:
With this material outlet graining is irrelevant making the construction work easier. Because raindrops will pass directly through the surface new architectonic possibilities is at stake as no slopes for water to run down is necessary.

Glow pebbles

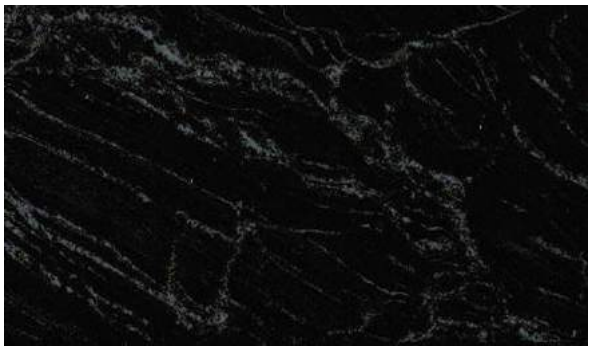
PRODUCTION & TREATMENT
Produced with a luminous material and synthetic resins. It is a highly efficient powder cultivated from the earth that enables light-storing.

SUSTAINABILITY
Eco-friendly light that requires no electricity or power meaning no carbon emission and has a living time of approximately 20 years. It is non-radioactive and non-toxic.

MAINTENANCE
When the glow pebbles are integrated in the concrete surface it needs no further maintenance.

CHARACTERISTICS
Only 10-20 minutes of exposure to daylight or lamplight the glow pebbles will maintain its afterglow in the dark for about 10-12 hours as the phosphorescent material gets affected.

AESTHETIC QUALITIES
Providing a magical experience by night imitating the night sky with a glittering afterglow which slowly dissipating as dawn arrives (Coregravel.ca, 2016).



granite

PRODUCTION & TREATMENT
Granite is quarried at Bornholm, as it is the only place in Denmark with granite. It consist of volcanic deposits evolving to mountains which since have been pushed close to Denmark creating the rocky island Bornholm with possibilities for quarrying granite today. Because the granite is evolved deep down in the earth's crust, a high pressure and heat have filtered many mineral effectively together.

SUSTAINABILITY
Granite is a nature material meaning no further treatment has to be made in order to the final product except maybe polishing of the surface. Therefore the only non-sustainable part of granite will be transport from Bornholm to the place of placement. Everything from a quarry, which is not useable for tiles or rocks, is used to coast protection and harbour piers, or crushed to aggregate, meaning no raw material goes to waste.

MAINTENANCE
Because of granite being produced deep in the earth's crust makes extremely weather proof. It does not disintegrate or perish no matter climate.

CHARACTERISTICS
The granite from Bornholm beautiful and hard, and is one of the oldest natural stones in the world.
The harder the granite is, the less it absorbs water.

AESTHETIC QUALITIES
No piece looks the same with different stories and living conditions. The chosen granite is of the type 'Paradis' which has an anthracite grey fine-grained surface. A distinctive mark of the granite is the pattern consisting of black, white, and greyish stripes looking like waves in the granite giving it a living expression. When the granite gets wet the grey granite will appear almost black (Zurface.dk, 2016).