METAMORPHOSIS OF A RIVER

- Exploring the educational dialogue between
anthropogenic and natural landscapes -

MASTER'S THESIS BY ANNA SOPHIE KRASSUSKI | 2021 | CHALMERS UNIVERSITY OF TECHNOLOGY
RURBAN TRANSFORMATIONS | SUPERVISOR: SHEA HAGY & MARCO ADELFIO | EXAMINER: NILS BJÖRLING

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Master's Thesis by Anna Sophie Krassuski
Direction: Rurban Transformations
Gothenburg, Spring 2021

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Architecture and Planning Beyond Sustainability

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abstract

With the beginning of the Anthropocene, the relationship between human and nature in cities has changed essentially. The increasing expansion and densification of urban developments has led to a disconnection of anthropogenic and natural landscapes with severe consequences for human activities and ecosystem-dependent processes. While natural environments become less accessible within the urban fabric and climate-related risks an increasing threat for the urban population, the future generation faces decreased opportunities to connect and learn about natural processes. In the context of Gothenburg, Sweden, this continuous transition is particularly challenging urban-water-interfaces. In the researched case of the river Säveån, the disconnection of landscapes emerges to an ever greater conflict about space. A conflict, where a river system demands space for its natural processes, and a city, that asks to grow and provide safe public spaces for its future inhabitants.

This Master's Thesis aims to create a dialogue between anthropogenic and natural landscapes through education. By investigating the perspective of both representative actors, the river and children, the following research question is approached: How can we design an educational and recreational river space with its site specific natural potentials to promote a resilient rurban life?

The unpredictable future in times of climate change, crowded spaces and Nature-Deficit-Disorders are current threats that often come into collision with the developmental needs of children (Louv, 2008, p.36). Simultaneously, threats like the rising sea level, increased precipitation and land erosion endanger many river systems and their processual needs (Prominski et al, 2012, p.21). This results in a necessity for an inclusive landscape design that bridges the gap between the children's and river's spatial demands.

Based on the evolving adaptation strategies from the river‘s and the child‘s perspective, the out coming design proposal for the chosen site of Gamlestaden in Gothenburg, Sweden tackles climate-related risks and enhances site-specific natural potentials.

The design strives to nurture environmental education in children within a nature-driven learning landscape. By unwrapping the complexity of human-nature interdependencies the learning landscape aspires to make a contribution to social and ecological resilience.

about the author

Academic Experience

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content

chapter one: introduction

purpose

The aim of this Master's thesis is to design an educational and playable environment for children and to unwrap the complexity of human-nature interdependencies. This complexity, expressed through the relationship and spatial conflict of anthropogenic and natural landscapes, will be explored within the context of the Säveån river and the site of Gamlestaden, a district of Gothenburg, Sweden. The main driver of the exploration is the aspiration of gaining an in-depth understanding of the conflict involved key actors. In this work, these key actors are the river and children. With the ambition of unfolding river- and child-specific strategies, the thesis strives to create a landscape of learning, where the key actors have the spatial opportunity to pursue their developmental and processual needs. By creating a dialogue through environmental education, conflict-related risks will be tackled and insights in the human-nature connection in times of climate change will be gained. Studying carefully the site-specific natural potentials is important to achieve the desired expression of outdoor activities and to contribute to social and ecological resilience.

research question

How can we design an educational and recreational riverspace with its site specific natural potentials to promote a resilient rurban life?

relevance for rurban transformations

In the discipline of landscape architecture the focus often lies on the development of sustainable designs for cities and on the spacemaking for natural environments in urban areas. Additionally, rural locations are barely addressed among other design professions, which leads to the issue that fringes of urban and rural transitions often loose pace in regard to sustainable planning practices. And even rural areas with a richness of ecological potentials and recreational and health promoting environments, can often be stated as forgotten landscapes.

Now, and more than ever before, where rural and urban fringes are challenged with unpredictable consequences of climate change, the need of rethinking climate adaptation is urgently arising. It is essential to reveal the importance of human nature connections and to lift environmental awareness in society for establishing planning practices that are ecologically and socially resilient. Making natural processes, such as the water cycle, visible and approachable in an educational and playful way can encourage children to engage more with their environment. It can, furthermore, evolve a higher appreciation for natural resources within urban societies which is a valuable asset for the development of sustainable rurban contexts.

This Master's Thesis approaches rurban transformations of anthropogenic and natural landscapes and sustainable opportunities found in rural and natural environments.

theory and methods

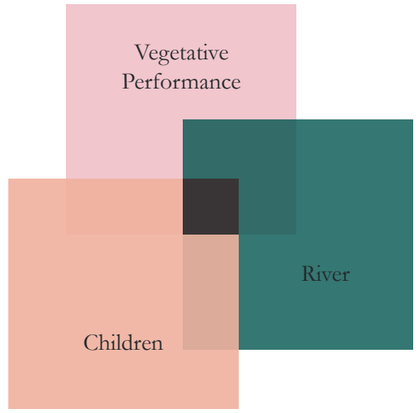
During the development of this Master's Thesis, the primarily focus was on research by design and research for design methodologies. To approach a holistic perspective on the project site's context, a variety of analogue methods such as sketching, mapping and modelling has been used throughout the process. By investigating different case studies, further research evidence and information in relation to the superordinated themes: river, children and vegetative performance in landscape architecture could be gained.

Since the performance of water and vegetation played a prominent role in the design project, the site analysis particularly drew attention to the composition, atmosphere and tension which is created by the ecological system.

For setting a productive and reflective work mode, even with the challenges of the ongoing global pandemic, the Master's Thesis has been consistently discussed with fellow students.

delimitations

Design with Nature
Vegetation as Design Material
Site Specificness
Human-Nature-Connection
Anthropogenic Traces
Biodiversity
Ecosystem Services
Hybrid Landscapes

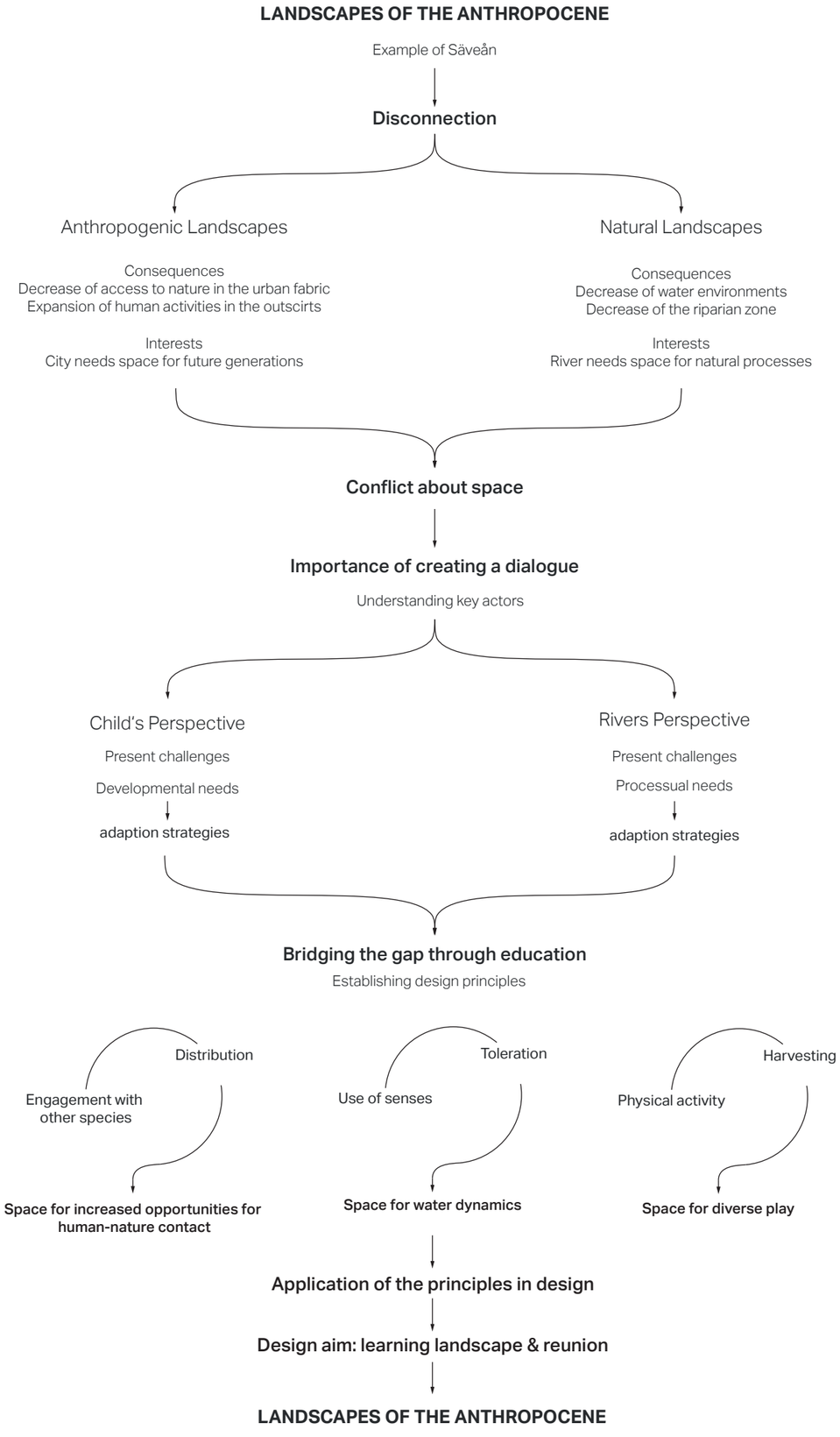


Climate Adaptation
Resilience
Stormwater Management

Child Education
Well-Being and Health
Outdoor Activities
Physical Movement
Recreation

Figure 1
Delimitation Diagram

logic of the thesis



chapter two: the disconnection of anthropogenic and natural landscapes - a conflict?

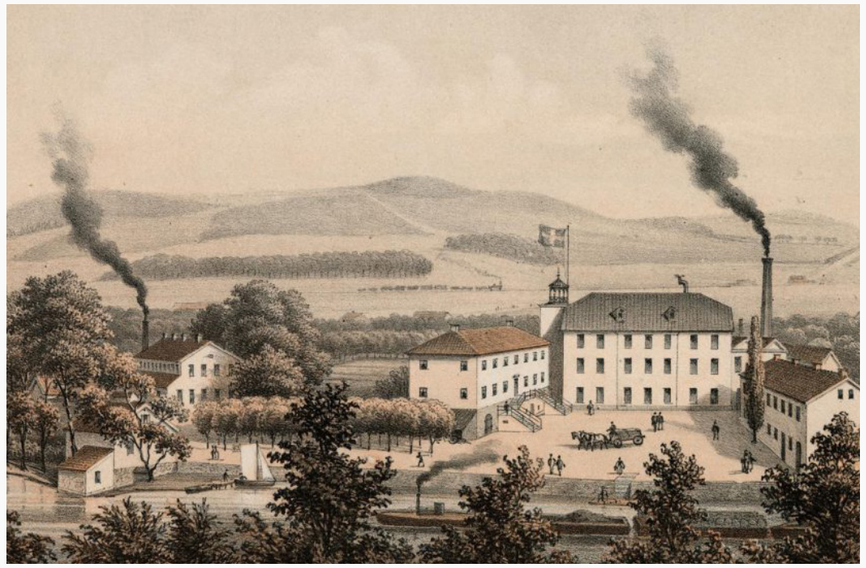


Figure 2
Industrial Revolution along Säveån | Gamlestaden 1800

about anthropogenic systems and natural landscapes

We are living in a period where our environments become an increasing reflection of human activity. This period is geologically defined as the Anthropocene, an epoch of "[…] [human dominance] on the earth's climate and ecology (Oxford English Dictionary, n.d.). Many scientists, ecologists and educators are concerned about the unpredictable consequences and embedded risks this "dominant influence on the environment" may have for future generations (Oxford English Dictionary, n.d.).
In times like these, where the environment is increasingly changed by human, the question evolves of how such transformational landscapes can be described and differentiated.

A first approach of differentiating natural environments according to their influence by human activity goes back to the American nature activist and poet Gary Snyder (Louv, 2008, p.8). Snyder takes the view, that there are two primary meanings associated with the word "nature". One of his interpretations from 2004 considers nature as the entirety of the material world including "all of its [natural as well as man-made] objects and phenomena". On the contrary, Snyder equates nature with the term "the outdoors" and draws the line between man-made and natural objects. "By this connotation, a man-made thing is not a part of nature, but apart from nature." (Louv, 2008, p.8).

Following up on Snyder's second definition, where the focus lies on the dichotomy of natural and man-made environments, a translation for landscapes in the rurban context can be generated. Thus, landscapes that are primary shaped and influenced by human activity can be described as *anthropogenic landscapes* whereas landscapes that contain more natural than man-made objects and processes rather define *natural landscapes*.
Within the scope of anthropogenic and natural landscapes, the second chapter of this thesis will explore the changing development of anthropogenic process shaped landscapes along the river system of Säveån and further investigate contemporary conflicts of human-water intersections (see figure 3).

Figure 3
Traces of the Anthropocene

Säveån
from sæva och sæver
1- calm, still
2 - the smooth river

how the relationship was formed historically

The history of Säveån's river landscape was, simultaneously to the national urban developments in Sweden, a history of diversification (Gunnartz, 2017, p.9). The rapidly shaped and changed surrounding river landscapes illustrate a contrast to the river itself which was flowing ever so calmly and still through Gothenburg's periphery (PRISMA Västra Götaland, n.d.).

One initial driver of Gothenburg's transforming landscapes was the industrial and agricultural revolutions during the 18th and 19th century. Where previously pastures, fields and cultivated forests shaped the landscapes anthropogenically, new emerging infrastructures and factories were dominating the landscape scenery in the 1800s (see figure 2). The invention of the steam engine and the concomitant expansion of the rail and steamship network transformed Gothenburg to a hub of production and transhipment in the global market. This development entailed an accumulation of economic, social and educational advantages within the city but simultaneously a sharp population decline in many rural areas (Gunnartz, 2017, p.11).

In contrast to the majority of Sweden's rural locations, the disappearance of human activities in the outskirts of Gothenburg was hardly visible. The area of Partille and Jonsered experienced a significant economic and educational growth in the begin of the 19th century. The evolving work opportunities in Partille's factories led to an expansion of residential areas and further to a shift in the rural landscape composition. Anthropogenic activities in form of living, commuting, manufacturing and s elling were covering more and more the natural traces of the Säveån valley (Partille Kommun, n.d.) (see figure 4 and 5).

Figure 4
Begin of Rurbanisation | Partille 1960

how humans and nature meet today

Today, the river landscape of Säveån is shaped by the expansion of Gothenburg's residential, industrial and infrastructural areas to the outskirts and the development of smallscale municipalities such as Partille, into urban areas. The rising of new economical forms in Gothenburg (Gunnartz, 2017, p.11) as well as the development of new branches of industry in Partille and the evolving shift from agriculture to tourism in Jonsered (Partille Kommun, n.d.)., showcase a transformation of the mosaic of anthropogenic landscapes. Yet, the influence of human activity on Säveåns watershed persists.
The continuous transformation of Säveån's river landscape results in a constant change in the human-water relationship. This leads to the question of how change effects landscape intersections and further how the capability of adapting to water dynamics is influenced.

Figure 5
Rurbanisation today| Partille 2012

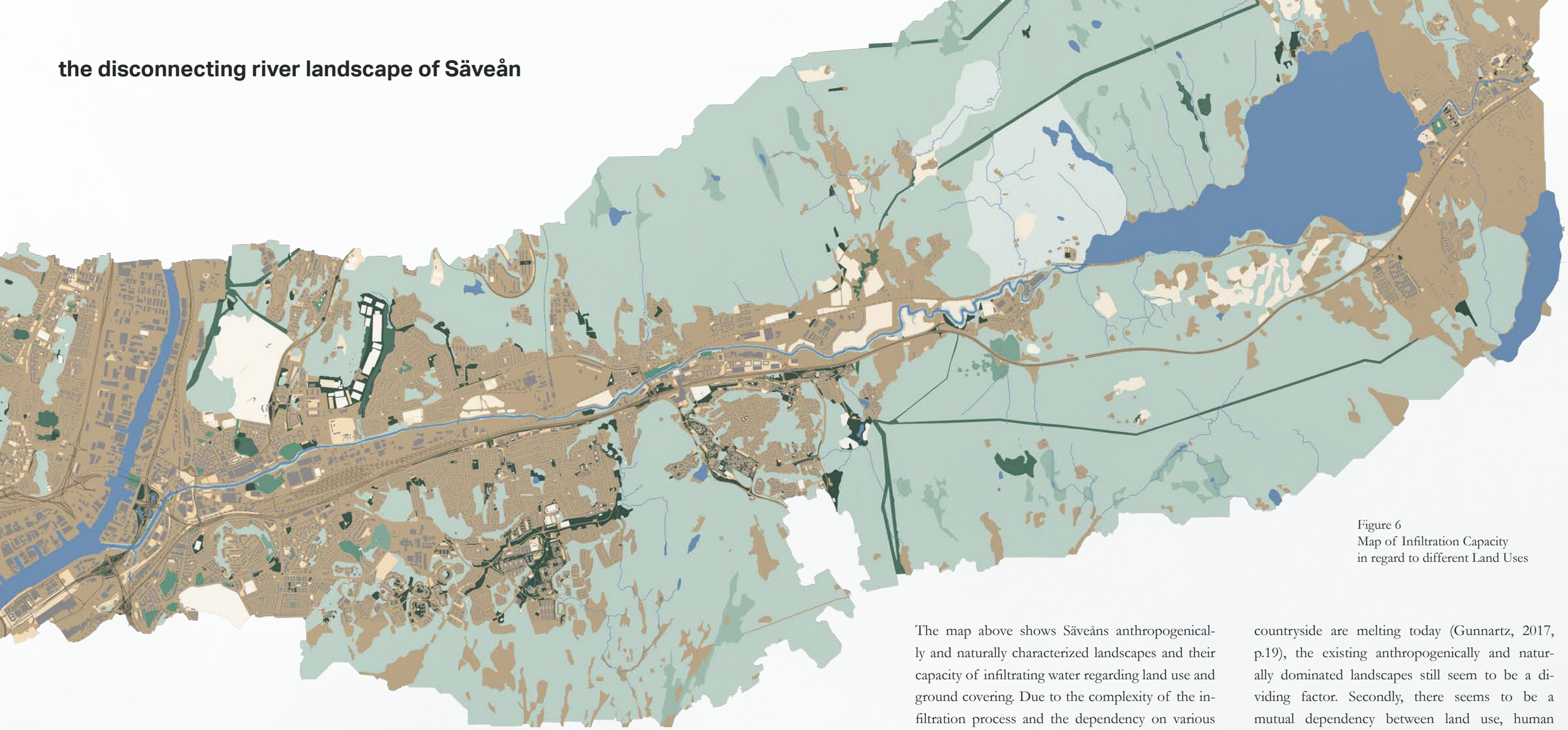


Figure 6
Map of Infiltration Capacity
in regard to different Land Uses

The map above shows Säveåns anthropogenically and naturally characterized landscapes and their capacity of infiltrating water regarding land use and ground covering. Due to the complexity of the infiltration process and the dependency on various factors (Venegas, 2018, p. 15), parameters such as soil composition, compaction and antecedent soil moisture have not been investigated.

Considering the infiltration rate of the studied landscapes, two apparent trends become visible. Säveåns adjacent landscapes within the urban context and its outskirts in Partille are dominated by a concisely low capacity of water infiltration. The river landscapes of Gothenburg's rurban periphery showcase, on the contrary, a significant increase of high infiltration rates. Simultaneously, a distinct difference between urban and rurban land use in relation to human activity is identifiable. The rurban periphery is less characterized by cultivated land and human activity than its urban neighbour. These trends illustrate firstly, that although the boundaries between the city and the countryside are melting today (Gunnartz, 2017, p.19), the existing anthropogenically and naturally dominated landscapes still seem to be a dividing factor. Secondly, there seems to be a mutual dependency between land use, human activity and the capacity of water infiltration. Causes of this interdependency are rooted in factors such as the amount of sealed surfaces but also the proportion of vegetation and green corridors (Venegas, 2018, p. 15). For Gothenburg, where cultivated landscapes are the norm, this interdependency is particularly relevant when considering the long-term consequences of embedded risks. The increasing densification and frequent moving of human and vehicles will result in more and more compaction of the topsoil, impermeable surfaces and less space for accruing water (van den Akker, Soane, 2005). Space, that is urgently needed considering the prediction of sea level rise and the future increase of heavy rain events (Gelin, 2015, pp. 4).

a local conflict

The analysis of Sävåns landscape composition showcased clearly that its continuous changes affect both, human activities as well as natural ecosystems. In comparison with other urban developments in Sweden, it becomes apparent that similar dynamics have occurred in the past centuries. Hence, one could argue that change and its embedded transformations have significantly contributed to today's identity of Sweden's river cities (Gunnartz, 2017, p. 9). However, rethinking these historical and contemporary developments on a global scale rather casts a critical light on the landscape related shifts. "The exponential growth of human activities […] could destabilize critical biophysical systems" so severely, that environmental changes become irreversible and cause catastrophic living conditions for human and their wellbeing, stress Rockström et al. in 2009.

Knowing that changes in landscape intersections can drive positive developments on a local scale and simultaneously negative processes on a global scale, raises the question why the latter seems so hard to grasp and communicate in public space. The difficulty of identifying most changes in complex natural processes is linked to time. So far, it is unpredictable when such anthropogenic pressures on key Earth System processes, that Rockström et al. are addressing, will show their consequences.
In the case of Säveån it is, from a global perspective, more than likely that the lacking infiltration capacity of man-made surfaces will flood and erode Gothenburg's urban spaces. Yet, these process changes seem locally so intangible, because their neither visible nor temporally assessable.

The disconnection of anthropogenic and natural landscapes of Säveån emerges to an ever greater conflict. In particular it is a conflict about space, where a river system is asking for space to follow its natural course, and a city, that aims to grow and provide safe public spaces for future generations.

reflection or the importance of creating a dialogue

The emerging conflict between anthropogenic and natural landscapes which includes for instance the collision of residential areas and river systems, industrial spaces and forests or agricultural fields and wetlands, needs to be addressed locally and sustained by site-specific strategies in order to unwrap the complexity of human-nature interdependencies. It must, in particular, be brought up in spaces which are predicted to be exposed to risks and which have the local acceptance to be transformed.
This is important, because the targeted focus on local changes, interrelationships and tensions can only become less ungraspable when gaining insights about the respective needs of human and nature. Strengthening a local discourse is further important, because the "public understanding of climate change lags far behind the consensus of the scientific community" (Spitzer, 2014, p.89). By approaching the river landscapes of Säveån from a local perspective, urban planners and landscape architects as well as the broad society can be guided to a comprehensive understanding of the site-specific social and ecological resilience.

The need of a child's and river's perspective

A first step of understanding the conflict between Säveåns anthropogenic and natural landscapes is to explore the conflict involved actors. It is significant, to investigate how a river system adapts to changes and disturbances in nature, and which landscape characteristics are needed to provide future generations a secure urban fabric. To further create a discourse between the river system and the urban fabric it is methodically helpful to create a toolbox, a mediator so to say, which "help[s] bridg[ing] the gap between [the river] and the public, promoting effective public discourse about important environmental issues" (Spitzer, 2014, p.90). In the case of Säveån, education will play the primary role as a dialogue creating actor between the river and the city. As "we know from cognitive and social science research, […] learning is integrated with […] social development and [can] activate […] connections (Spitzer, 2014, pp. 90). In the inner-city landscape of Gothenburg, such activation is urgently needed. Not only because of the continuous disconnection of anthropogenic and natural landscapes, but also because of the lacking access of educational institutions to blue environments (see figure 7).

The following chapters will investigate the perspectives of the conflict involved key actors which in this Master's Thesis are represented by the river and the child. Subsequently and based on the empirical findings of both key actors, an educational design will be proposed.

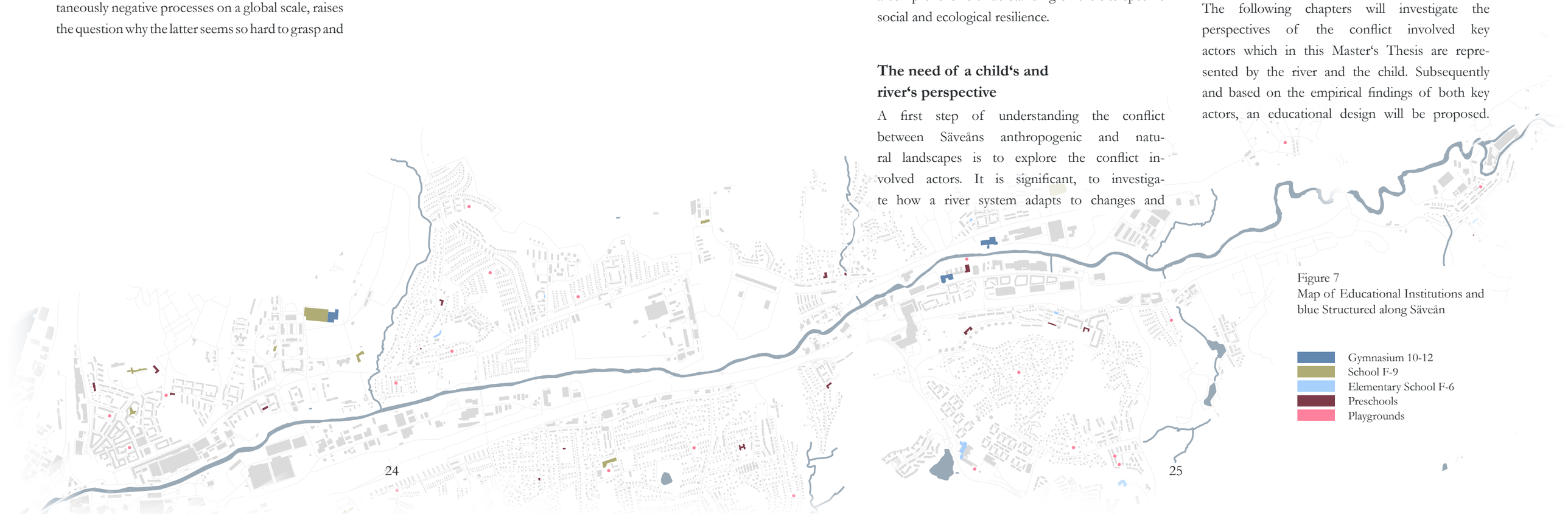


Figure 7
Map of Educational Institutions and blue Structured along Säveån

chapter three: the river and the anthropocene - a river‘s perspective

present challenges for (r)urban rivers

The previous chapter showcased that shifts in the landscape's composition along Säveån changed the relationship between human and their natural environment and challenges both anthropogenic and natural processes in Gothenburg. To gain a deeper understanding of the spatial conflict and the disconnection behind it, it is essential to investigate the perspective of the river system as representative actor in this scenario. The following chapter will approach the contextual threats that the river of Säveån is facing today, and furthermore explore the processual needs of a river system in order to unwrap potential strategies of tackling such threats.

The challenge of flood and sea level rise

Watercourses, lakes and the sea in the region of Gothenburg are expected to be more vulnerable to flooding in comparison to cities on the East coast of Sweden. The cause of this vulnerability is multi-layered. One layer showcases the geographical location. Due to its closeness to the sea and its topographical preconditions, streams and rivers such as Säveån are more "highly exposed to high water levels" in neighbouring coastal rivers than inland rivers (Gelin, 2015, pp. 4). Another significant layer constitutes the rise of temperature due to Climate change. The estimated rise of temperature of 3-5°C in Gothenburg is expected to affect the sea level and precipitation patterns severely (Gelin, 2015, pp. 4). It is severely, because changes in the sea level rise and precipitation patterns are the primary causes of flooding. "According to hydrological calculations", these changes are represented in an estimated sea level rise by 65-80 cm along Gothenburg's coastline until 2100 and a general increase of annual precipitation and a particular increase of heavy and intensive rain in western Sweden (Gelin, 2015, pp. 4). Reflecting this from a river's perspective means in effect that a higher amount of water will be supplied in the coming years, and often more than the river is "able to lead away" (Gelin, 2015, pp. 4). The increased volume of water coming from the sea and the rainwater runoff of the adjacent catchment area puts pressure on the river causing it to overflow its edges and flood within a couple of hours. This pressure often leads to a causal chain of events, threatening adjacent natural as well as anthropogenic landscapes. In the area of Gothenburg's river landscape, many hydrologists stress that increased flooding will potentially affect "contaminated land, water protection areas, one nature reserve and one Natura 2000 area" along Säveån. This, in turn, leads to unpredictable consequences for riparian ecosystems their species and hence all of its embedded natural processes.

That "watercourses around the Gothenburg region will more frequently be flooded during winter" (Gelin, 2015, pp. 4), occurred most recently in February 2020 and 2011 (Filipova, Rana, Singh, 2012, p. 176), when Säveån exceeded its riverbed in the city park of Partille (see figure 8).

Figure 8
Flood of Säveån | Partille 2020

The challenge of landslides and erosion

Flooding caused by heavy rain events will in addition to the impact on the riverbed also affect the "degree of erosion, landslides and mud flows" in the catchment area (Gelin, 2015, p.10). A recent landslide risk analysis of the Säveån river valley by the Swedish Geotechnical Institute could unfold findings that are not yet visible but a crucial factor for the river's future. The analysis could reveal that especially Gothenburg's areas "closest to the Säveån river", "predominantly on the north side of the river", are predicted to experience a high or substantial probability of landslides in the coming years (SGI, 2017, p. 12). An increased eroded catchment area often concurrently involves a deposition of contaminated soil particles into the river. For Säveån this means in fact that the risk areas which reach 50-150m from the riverbank, will deposit more and more eroded soil into the river causing a reduction in water quality (SGI, 2017, p. 12). This further affects all valuable ecosystem processes in, along and close to the river. From the river's perspective a loss of ecosystem processes can have significant consequences because once the adjacent natural and anthropogenic landscapes are in unbalance, the river is instable too.

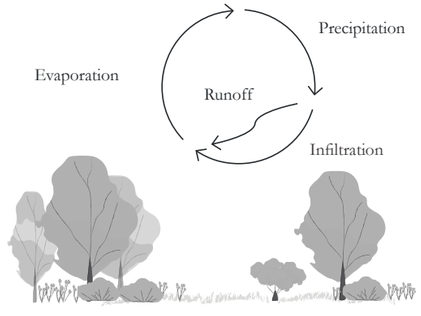


Figure 9
The Natural Water Cycle

The challenge of impermeable surfaces

Relating back to the infiltration map of the first chapter, another contemporary challenge, especially for urban river sections, showcases the high number of impermeable surfaces within cities. Researchers even coined the term of "the urban water cycle", underlining that it significantly differs from the natural water cycle in the rural outskirts. The part of Säveån which flows through the city of Gothenburg is predominantly surrounded by anthropogenic and natural landscapes with a low capacity of infiltration, as the preceding map reveals. The lack of surfaces that are capable of infiltrating water on site creates, moreover, a reduction of evaporation and "deterioration of the microclimate" (Papanikolaou, Liapi 2019, p. 575). Reduced opportunities of accruing rainwater to stay, infiltrate or slowly runoff locally builds up water stress on lower-lying and inner-city watercourses. From a river's point of view, an interrupted water cycle often entails a disturbed interaction with surrounding ecosystem processes, a decrease in biodiversity and an increase of unfiltered water supply from sealed surfaces. This aspect of disturbance is illustrated in figure 10.

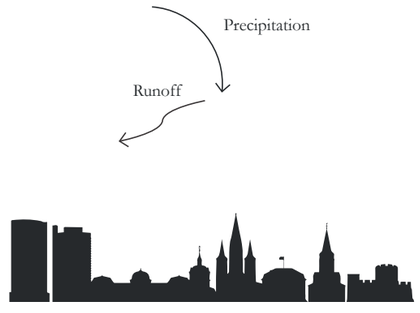


Figure 10
The Urban Water Cycle

the dynamics of rivers

An insight of the needs of a river system, how it is shaped and formed, gives the investigation of the internal processes.
There are two types of processes that are fundamentally shaping the river's course: Temporary flow fluctuations and Morphodynamic processes (Prominski et al, 2012, p.20). The following excurse will focus on the first process type.

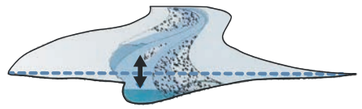


Figure 11
Vertical Water Fluctuations

Temporary flow fluctuations

Depending on the dynamics of the river discharge, which defines the "volume of water flowing through [its] channel" (internetgeography, n.d.), every river experiences periods of floods and withdrawal of water (Prominski et al, 2012, p.20). The expression of the process of water fluctuations is river-specific. Floods and dry periods are contingent on the local climate, periodical events such as snowmelt and seasons of rain, and on the adjacent catchment areas (Prominski et al, 2012, p.21). A special characteristic that every natural river is provided with, illustrates the reversibility of the fluctuations. Even when the fluctuations are expressed severely, the watercourse is capable of returning "to its original state" (Prominski et al, 2012. p.21).

Lateral spread of the water

This form of fluctuation especially develops through high water events. When changes of the river discharge exceed a certain point, the river "overflows its banks" and floods the adjacent catchment area (see figure 12). In natural flood plains with functioning riparian ecosystems, the velocity and energy of the floodwater is curbed through vegetation (Prominski et al, 2012, p.21).

Figure 12
Lateral Water Fluctuations

Vertical water level fluctuations

Changes of the river discharge and water level occur nearly every day. The interplay of the river and its catchment area play here a decisive role. If the catchment area provides available space for discharging accruing water, the water level of the river changes less. One could conclude that depending on "the space available" and other factors such as "the roughness of the riverbed, the banks and the river foreland, a certain discharge causes a corresponding water level (see figure 11) (Prominski et al, 2012, p.21).

Threats for Human and Nature

The internal dynamic processes can be dangerous for adjacent human activities and ecosystems. Flooding of extreme dimensions can affect the protective function of the riparian ecosystem and threaten anthropogenic settlements of the riverside. The design of a riverspace is therefore dependent on the processual limits of the river (Prominski, 2012, p.21).

how a riparian system works

The ecosystem of a river is strongly connected to its surrounding catchment area, which in natural environments is characterized by a protecting belt called the riparian zone. Defined as "strips of vegetation that border water bodies such as rivers, streams, […] and creeks (Grebner, Bettinger & Siry, 2013, p.137), riparian zones are "open to fluxes to and from river systems" (Dufour, 2019, p.2). Through the openness to fluxes, the riparian zone serves valuable functions in natural as well as anthropogenic landscapes. In a healthy riparian ecosystem, the riparian vegetation is capable of altering "flow conditions, […] sedimentary processes" such as erosion and preserving the river's bank (Dufour, 2019, p.4). Another characteristic of a healthy riparian zone is a richness of species and biodiversity.
Since the riparian zone is more exposed to floods than upland ecosystems, the riparian vegetation developed in the course of evolution specific strategies for reducing the water velocity and erosion in times of flooding. And although plant communities, their structure and composition differ between rivers (see figure 13), the capability of adaption to changes in the water level is a common ground of a riparian system (Dufour, 2019, p.5).
In order to maintain the protective functions of the riparian buffer against erosion and landslides, it is fundamental to maintain the interactions and connection with the adjacent river and upland (Décamps, Naiman & McClain 2009). An attempt of defining a recommendation for the area that needs to be maintained was developed by the European Union (EU) Joint Research Centre. Based on scientific literature "a fixed minimum buffer distance of 40 m from the stream" is recommended for rivers "at the European scale" (Dufour, 2019, p.15). Lind, Hasselquist and Laudon (2019) draw a slightly different conclusion from the analysed literature. According to their research findings, "a 30 m wide riparian zone ensures an 'Ecologically Functional Riparian Zone' […] with a high floral diversity that delivers sufficient […] bank stability". The subsequent design proposal of this thesis in chapter five and six, follows these recommendations and continues with a buffer distance value of 35m.

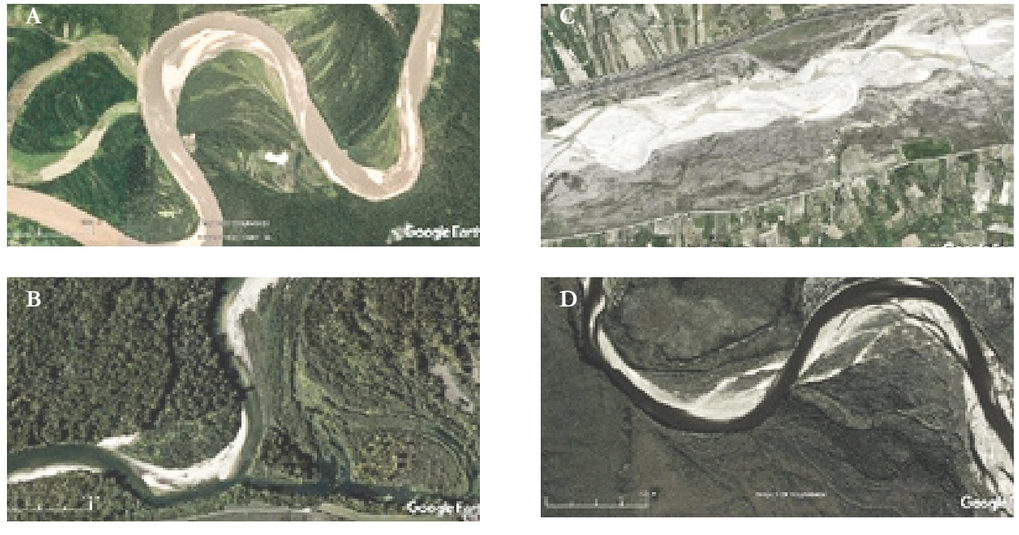


Figure 13
Variation of riparian Plant Communities | Brasil (A), France (B), Spain (C), Alaska (D)

how plants manage dynamics of water

Water, a “resource that keeps living things alive”, illustrates the primary environmental variable for the performance of plants. In the course of evolution, plants had to “evolve structures to support themselves” in order to survive in a changing climate (Beck, 2013). Consequently, there are hardly any environments where plants cannot exist. They are capable to grow in a broad spectrum of habitats and resist in extreme conditions such as deserts and arctic zones. (Beck, 2013).

The complexity of the vegetative performances led to a variety of classification attempts in the field of ecology (Kühn, 2011, p.61). The British ecologist Grime developed a theory, which differentiates plants according to their reaction to varying location qualities, the so called universal adaptive strategy theory. Based on this approach from 2001, plants respond to environmental influences in accordance to their genetic characteristics (Kühn, 2011, p.65). Influences from the environment are often categorised in exogenous influences such as soil, climate or flood events, and endogenous influences like all forms of competition and coexistence within plant societies (Kühn, 2011, p.65). Disturbances caused by external changes are natural and can even drive essential ecological and evolutional processes. However, if the ecological system is shifted “out of its current state”, disturbances become a threatening force with irreversible affects for the ecological resilience (Beck, 2013).
The investigation of the performance of plants and their response to disturbances is important for understanding their processual needs. It further can be helpful for landscape designers to make a plant selection which is in line with the ecological prerequisites (Beck, 2013).

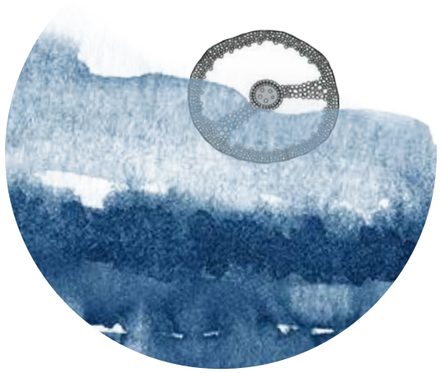
Knowing about the variety of species and their complexity of adaptation strategies leads to the question of what we as designers can learn and how these strategies can be supportive in the establishment of design principles for a learning environment.
The following excurse presents three essential adaptation strategies of plants, that are significant for the health of an riparian zone and river system.

“

You could not step twice into the same river.“

- Heraclitus-

(Stanford Encyclopedia of Philosophy, 2019)

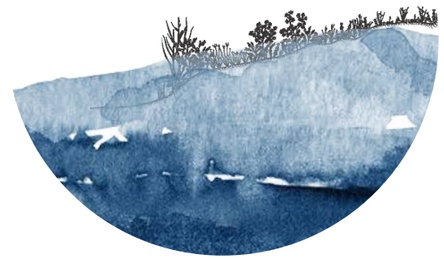


Tolerance and flexibility

The circumstance that many riparian plants have their roots under water, led evolutionary to a phonological adaptation towards flooding. The plant’s roots are provided with an intercellular tissue, the so called aerenchyma, which creates space for oxygen and enables the plant to perform flexible in its environment (see figure 14 to the left) (Fitch, 2014). Through this the supply of oxygen is ensured, even in periods of permanent flooding. Adaptation through tolerance and flexibilty also illustrates an essential strategy when it comes to landscape designs that are predicted to change.

Distribution and density

The biodiversity of the riparian zone creates a carpet of dense vegetation which often inhabits species with a high ratio of transpiration (SIYAVULA, n.d.). The ability of transpiring a high amount of water to the atmosphere is linked to the surface area of the plant’s leaves. Plants with rich leafage are capable to distribute accruing water in a short time span, which on the one hand improves the infiltration of storm water on site and on the other hand preserves the riverbank from the deposition of sediments (see figure 15 to the right). The strategy of increasing the vegetative surface by inhabiting leafy species in a dense formation is valuable to maintain the ecological resilience. It further showcases a interrelationship between species and water which can also be applied for the design of a landscape for children.



Harvesting and retention

Since the water cycle of the riparian zone is strongly connected to the river but also to the adjacent upland, the adaptation strategies of upland plants are of great importance for a hydrologic balance. In contrast to riparian plants, many upland species, which have less access to external water, developed adaptation strategies for saving water. Trees for instance are often equipped with deep roots in order to access groundwater in periods of dryness (see figure 16 to the left) (Plantopedia, n.d.). The depth of roots are further acting supportive for the stability of soils; a strategy that also demonstrates a valuable inspiration for design principles of landslides prevention.

Interim Conclusion I

The river‘s strategies for a learning landscape

Rivers in the Anthropocene are increasingly threatened by severe floods, intense precipitation periods, landslides and erosion. The interrupted urban water cycle is continously affecting the hydrological and ecological balance of rivers. The experience of water stress is often colliding with the processual needs such as having space for fluctuations and riparian functions. Nevertheless, the approach of the river‘s perspective could reveal that the representative actor has strategies to deal with disturbances to a certain extent. River systems are naturally capable to reverse fluctuations and cushion disturbances through tolerating, distributing and harvesting water. The evolving learning landscape of the design proposal will continue with these three adaptation strategies of the river.

chapter four: the child and the anthropocene - a child‘s perspective

Figure 17
„Sommarutflykt Längs Ån“ | Johan Krouthen, 1903

growing up in the anthropocene

On the 1st of January in 2020, a historic step for Sweden's future generations was taken. The incorporation of the United Nations Convention on the Rights of the Child (UNCRC) into Swedish law was paving the way towards a future where children experience more protection and more recognition as independent human beings (Regeringskansliet, 2020). While the UNCRC defines children as all individuals between 0 and 17 years (United Nations Human Rights, 1990), a more specific terminology has been established within the field of education. Jean Piaget, a pioneer in child psychology, coined the theory of developmental stages. According to his approach from 1936, childhood can be differentiated in four cognitive developmental stages: infants, toddlers and young children, young adolescents, and adolescents (Kopec, 2018, p.171). The following chapter will focus on the stage between early childhood and early adolescence (age 3 – 8 years).

The importance of adopting an international legal framework that applies only for children becomes further apparent when looking at their share of the world population (UNICEF, n.d.). Children constitute a significant part of today's society; they represent over one quarter of the world population (The World Bank, 2019), around one fifth of the Swedish (Sweden.se, 2020) and 18% of Gothenburg's population (see figure 18) (Stadsledningskontoret, 2020).

By addressing the child separately from the adult and as an individual part of today's society, it also becomes relevant to investigate how childhood is specifically shaped in the era of the Anthropocene.

The period of growing up, "the second fastest time in which humans develop during their course of life" (Kopec, 2018, p.171), is a challenge itself and appears even more challenging when setting this process in the Anthropocene, an epoch of rapid changes.

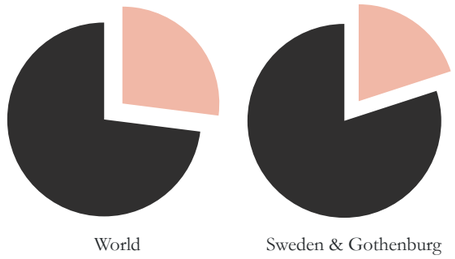


Figure 18

The challenge of crowded spaces

The majority of today's children spend their whole childhood in cities, an environment which is predominantly characterized by human activity (Child Friendly City Initiative, n.d.). The increase of urban processes such as densification, polarisation and digitalisation is accompanied by an increase of urban stimuli. Children that are daily confronted with this form of overstimulation, are more likely to experience mental and physical stress (Starzyk, 2020, p. 69). According to Evans et al. (1999), high-density and crowded developments are further linked to delays in the child's cognitive and verbal development (Kopec, 2012, p.129). Digital tools, which are easily and constantly accessable, can be an additional source of mental stress and imbalance (OECD, 2018). Although the use of digital tools is widely "suggested as being important in early childhood education", their "uncoordinated […] availability" holds many health-related risks (Wolff et al., 2020, p. 5).

Nature-Deficit-Disorder

Children that grow up in a world coined by urbanisation, a process that often "causes the direct loss of urban greenspace" (Colding et al., 2020, p.1), also experience "reduced opportunities for direct contact with nature" and free play (Wolff et al., 2020, p.9). The replacement of unstructured greenenvironments with fixed play structures creates inaccessibility to nature, forms social hierarchies and further endangers the mental and physical wellbeing of children (Kopec, 2012, p.199). Urban maladies such as depression, attention deficits and the "diminished use of senses" are often rooted in the lack of green environments (Louv, 2008, p.36). The author Richard Louv, who investigated the relationship of the child-nature-connection in the Anthropocene, coined this phenomenon as Nature-Deficit-Disorder. A disorder that "describes the human costs of alienation from nature" (Louv, 2008, p.36).

Education in the anthropocene

Environmental education of children is an important and sensitive process. Children are more vulnerable to threatening news than adults (Wolff et al., 2020). Therefore, the main challenge of sharing knowledge about possible frightening environmental topics such as Climate Change is to strike the right balance between teaching and protecting. The integration of environmental awareness in education and daily life routines is important as long as educators and parents respect the childs ability of processing sensitive topics (Wolff et al., 2020, p.15).

Wolff (2020) states that "the Anthropocene requires many kinds of knowledge and skills" which are especially challenging for the youngest of our society. Environmental education can be a tool to offer new ways of thinking and to "enable children to imagine and practice a […], safe and sustainable future".

how children learn today

To investigate the question of how education can influence environmental behavior of children, a deeper understanding of their learning processes is required. In the period between infancy and adulthood, children undergo different developmental stages. These stages are connected to different processes of learning. The following section will shed light on the development phases of early childhood and preadolescence and explore commonalities across these phases.

Early childhood

The first five years of the child's development are characterized by learning processes of basic cognitive and gross motoric skills (Kopec, 2012, p. 124). In this stage where toddlers and young children form their memories, play elements that support imagination and analysis are of great importance (Aljarrah, 2017). The learning process of this stage further requires the support of physical coordination and balance, since this is when children "learn how to use their muscles" (Kopec, 2012, p.124). Another aspect that is significant for strengthening the learning process of young children is the relationship to their parents (Kopec, 2012, p.124). . According to Kopec, it is a transitional phase between, on the one hand, gaining parental assurance and attention for exploration and, on the other hand, seeking for independence and separation through mimicking. This phase needs to be addressed in play (Kopec, 2012, p.124).

Childhood and preadoloscene

Between the age of six and twelve, children primary develop their self-image by comprehending the thoughts of others (Raburu, 2015). Within their play, they attempt to gain independence and responsibility and focus on adult behaviors (Kopec, 2012, p.125). Introducing play elements that promote imagination, exploration, and opportunities of taking control, helps to meet the needs of this developmental stage (Kopec, 2012).

about devlopmental needs

Sensory stimuli

Visual, auditory, tactile and olfactory stimuli are "one of the basic building blocks of human development" (Kopec, 2012, p.198). Particularly young children learn creative, language, memory and social skills through the engagement with various textures, patterns and sounds in their environment (reference). Moreover, the exposure to "multisensory experiences" strengthens the child's motivation of exploration, which constitutes an essential driver for the motoric learning process (Kopec, 2012, p.198).

Safety and risk

Most learning processes of children are dependent on the balance between safety and risk. It is important that the child's development is supported by explorative activities, which foster curiosity and creativity. By a certain age, children are seeking for temporary refuge to learn independency and being away from their parents (Veitch et al., 2020). The exploration process should be promoted by "risky" play activities such as climbing and jumping to strengthen the child's inventiveness, problem solving and interest, but in the same time "ensuring a sense of safety" (Kopec, 2012, p.125).

Physical activity

Physical activities are valuable for the child's well-being, its motoric and its cognitive development (Gao et al., 2018). Empirical research has shown that children who regularly practice activities such as running, jumping, climbing and swinging are less affected by stress, anxiety and depression (rGao et al., 2018). Physical activities further lead to less aggressive and hyperactive behavior (Gao et al., 2018). Especially in the first eight years of the children's development, unstructured and free playtime is important to strengthen their exploratory and creative skills (Kopec, 2012, p.128). By supporting their aspiration for adventure seeking through diverse sporting opportunities, social and emotional competences are encouraged (Kopec, 2012, p.128, p.199).

Being in nature

The child's development is significantly connected to the natural environment. Numerous studies have shown that the engagement with nature through playing, observing or simply being holds many "mental and physical restorative benefits" for the child's development (Kopec, 2012, p. 197,198). Further, children who spend time in outdoor spaces are more likely to play with other children which has a positive impact on their social learning processes (Acar, H., 2013). The exposure to natural settings fosters the attention capacity of children and reduces symptoms of children with hyperactivity disorders (Kopec, 2012, p.197)

> **"In nature, a child finds freedom, fantasy and privacy: a place distant from the adult world, a seperate peace.**
>
> **-Richard Louv-**
>
> (Last Child in the Woods, 2008)

learning landscapes and environmental education

Pedagogically supportive landscapes

The challenges that children face in anthropogenic urban environments often collide with their developmental needs. While, for instance, a diversity of sensorial stimuli is essential for the cognitive development of the child, stimuli related to the urban fabric often entail the opposite (Starzyk, 2020, p. 69). To meet the needs of the child in the Anthropocene, it is important to investigate how the landscape in which it grows up, can act beneficial for its learning processes and preventive against urban risks.

Today, the concept of the landscape as learning environment is widespread and much discussed among scientists, educators and designers. Despite the wide variety of pedagogical design approaches, two contemporary trends seem to play an important role for the design of playable landscapes. Firstly, many designers and educators emphasise the importance of establishing a relationship to natural elements through the learning landscape. Secondly, the availability of diverse play elements that foster structured as well as unstructured activities is advocated by most design professions..

The architect Anne Taylor argues that natural elements such as plants, sun and topography, are pedagogically indispensable today, because it "help[s] [children] participate in creating their own landscape" (Taylor 2008, p.324). Apart from natural elements, Taylor also considers the following features as important elements for a learning landscape:

- *Multisensory elements*
- *Agricultural elements*
- *Built elements*
- *Outdoor classroom elements*
- *Cultural elements*
- *Transitional elements*

The landscape architect Julie Johnson takes the view that „learning is enhanced when multiple senses are engaged [and] when children actively take part [...] in a setting that is part of daily life" (Johnson, 2000, p. 18). According to her, there are experience creating characteristics that account for an enriching learning landscape:

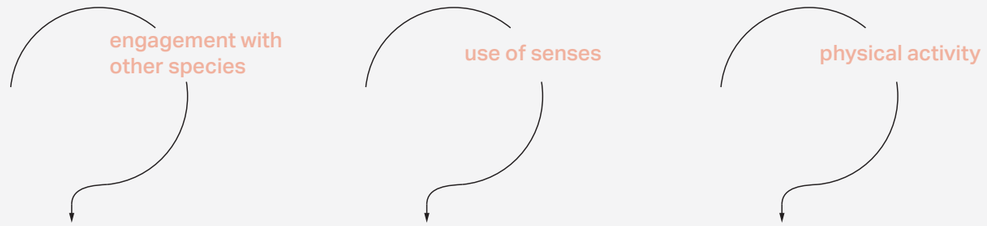
- *Rich and varied sensations*
- *Abundant choices*
- *Opportunities to make changes*
- *Personalized sense of place*

Besides of Taylors and Johnsons arguments there are many other designers which consider elements and experiences that strengthen the child's developmental strategies of engaging with other species, being physical active and using all senses as pedagogically supportive.

interim conclusion II

The child‘s strategies for a learning landscape

Growing up in the epoch of the Anthropocene means for the majority of children to cope with challenges such as crowded spaces, overstimulation and the lacking access to nature. The challenges embedded in urban processes often collide with the developmental needs of learning. However, if a landscape in which children learn and play provides opportunities of engagement with other species, the use of senses and physical activity, the child‘s capability of tackling stress can be facilitated.
These three adaptation strategies of the child will be the base for the subsequent establishment of the learning landscape.



chapter five: case study
- establishing the design principles

Figure 19
Branches of Salix alba, Alnus glutinosa and Acer spec

choice of site

18th of March 2021
Choice of a site in Gamlestaden; suitability through closeness to educational institutions and an endangered riparian zone and urban space

11th of February 2021
Meeting with the ornithologist Lars Erik Jevås in Partille; Discussion about Säveån's species andrisks of flooding

07th of February 2021
Walk on the south side of Säveån; Investigation of the vegetative potentials

Figure 20
Process Illustration of Choice of Site

project site Gamlestaden

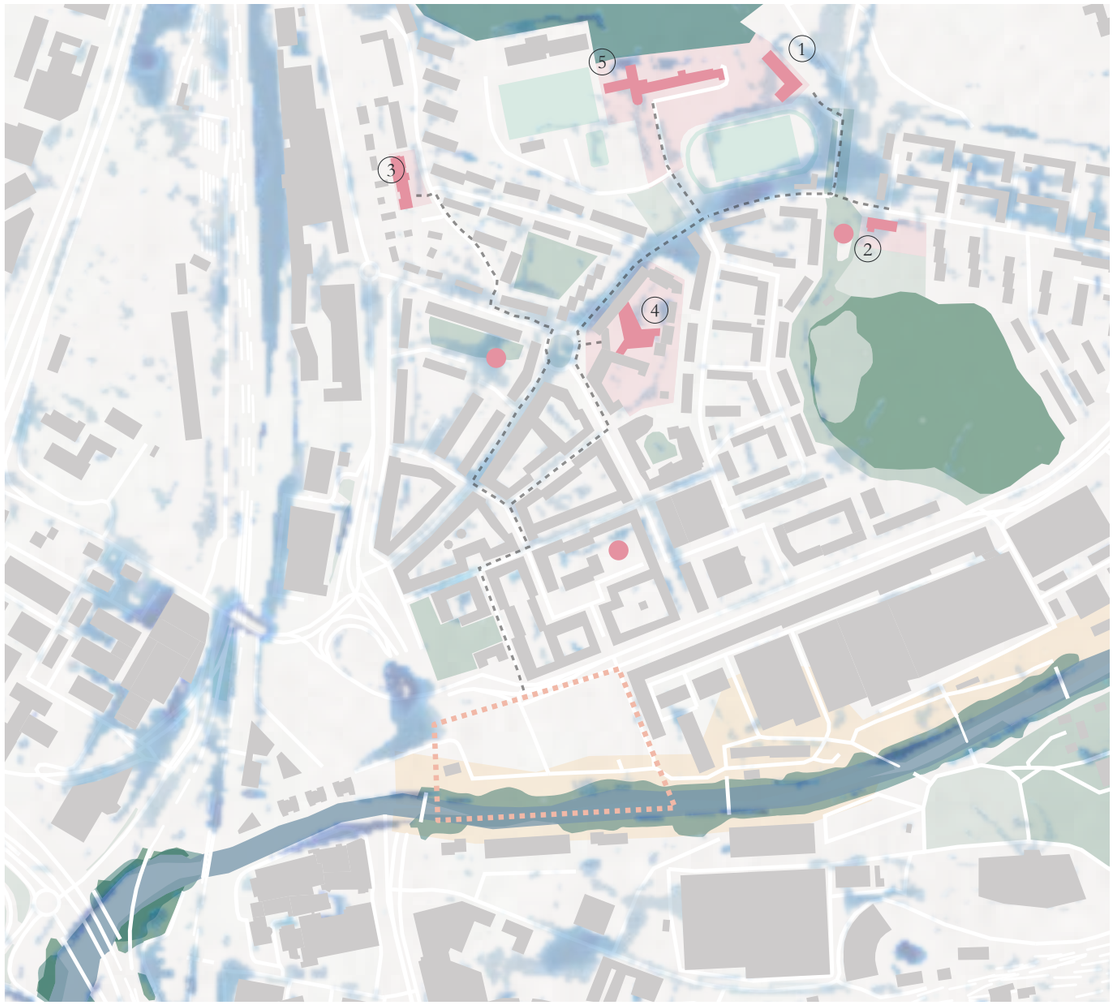
Figure 21
Project Site, west view | 29th of April 2021

Figure 22
Project Site, east view | 29th of April 2021

Figure 23
Project Site, parking spaces | 29th of April 2021

Figure 24
Project Site, riparian zone | 29th of April 2021

project site Gamlestaden



Children‘s spaces
1 Varnhemsgatan 2 förskola
2 Lars Kaggsgatans förskola
3 Måns Bryntessonsgatans förskola
4 Gamlestadsskolan
5 Brandströmska skolan Nylöse
Playgrounds

Nature‘s spaces
Säveån
Cultured forests
Parks
Lawns
Riparian zone
Sportfields

Risk areas
Landslides
Floods

Project site
Site
Way to school

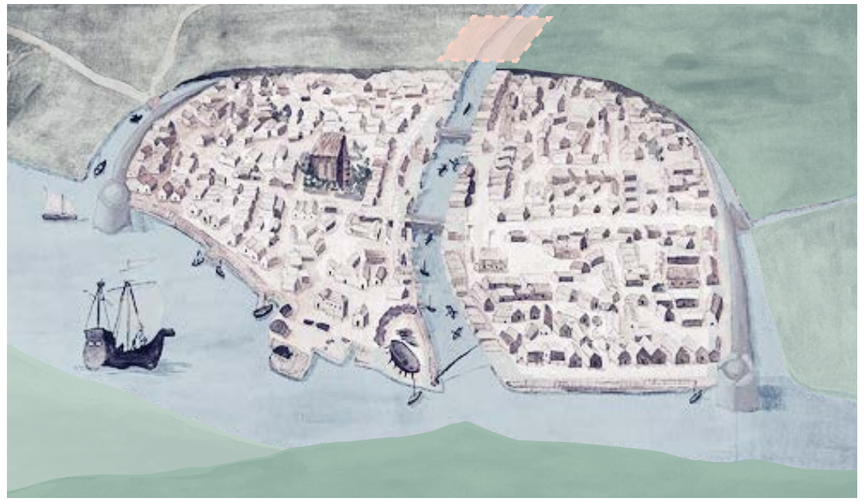


Figure 25
Nya Lödöse | 1500

The prerequisites

The project site in Gamlestaden, which was once a landscape of fields in the periphery of the medieval village Nya Lödöse (see figure x), is currently characterised by industrial, residential and commercial areas (SO rummet, n.d.). Today, it is spatially defined by a parking lot, a narrow green strip along the river of Säveån and three infrastructural axes: Gamlestadsvägen in the west, Artellerigatan in the north and Säveån Strandgata in the south.

The site is public accessable from all sides, integrated in the urban fabric and close to children‘s spaces. Within one kilometre there are three preschools and two schools.

The river bank contains a narrow strip of vegetation in its riparian zone and is surrounded by sealed surfaces of the adjacent parking space.

The derived knowledge about the child‘s and the rivers needs and strategies in combination with the presented prerequisites of the site leads to the following question:

Where are the site-specific conflicts and potentials and how can they be transformed into a dialogue creating landscape?

site-specific conflicts and potentials

Figure 26
Diagram of exsisting conflicts and potentials

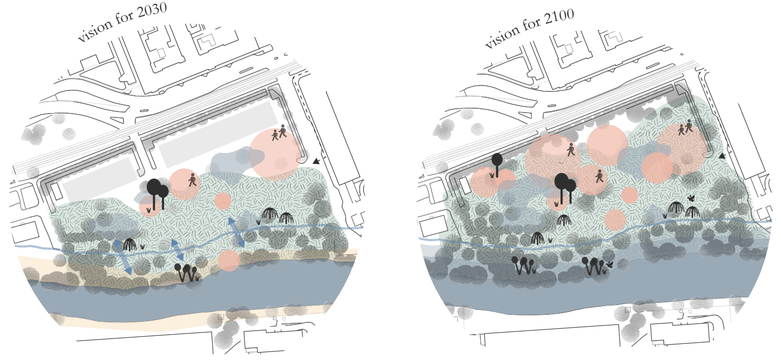


Figure 27
Visions for the Learning Landscape Gamlestaden

site-specific vegetation

An extract of Säveåns species

In relation to the ecosystem river, there are certain species that act like indicator plants for a healthy riparian zone. Derived from the interview with the ornithologist Lars Erik Jevås, the following species are characteristic for the riparian system of Säveån:

- *Alnus glutinosa (Common Alder / Al)*
- *Fraxinus excelsior (Ash / Ask)*
- *Salix caprea (Goat Willow / Sälg)*
- *Salix spec (Willow / Sälg)*
- *Crataegus sp. (Hawthorn / Hagtorn)*
- *Viscum album (Mistletoe / Mistel)*
- *Impatiens noli-tangere (Yellow Balsam / Springkorn)*
- *Phragmites australis (Common Reed / Bladvass)*
- *Phyteuma spicatum (Spiked Rampion / Vitrapunkel)*
- *Sambucus nigra (Elder / Fläder)*
- *Sambucus racemosa (Red Elderberry / Druvfläder)*

Species of gamlestaden

The on-site-analysis of the vegetation through the author could on the one hand reveal that the riparian zone is less species-rich than in other, especially rural parts, of the river. On the other hand two riparian indicator species could be found on site: *Alnus glutinosa* (Common alder) and *Salix alba* (White willow). In addition, another species that was probably introduced by the municipal park department could be identified as characteristic for the site: *Acer spec* (Common maple).

The importance of site-specific vegetation

To develop a holistic design approach, the establishment of the design principles needs, in addition to the theory-derived strategies, to consider the site-specific vegetation. This is important for creating a design that is in line with the ecological prerequisites.

The continuation of the Master‘s thesis focuses on the three presented species *Alnus glutinosa, Salix alba* and *Acer spec* to exemplify a site-specific approach. All three species have a distinct adaptation strategy towards water and symbolize a synergy of a anthropogenic and natural coined landscape.

Alnus glutinosa

The common alder is a riparian species that is due to its water resistent root system, tolerant towards changes in the water level. The widespread phenology of the roots further stabilizes the soil of the riverbank.

Salix alba

The white willow is a species with a rich and dense leafage which distributes accruing stormwater in many directions. This is helpful for strengthening a slow and directed infiltration process.

Acer spec

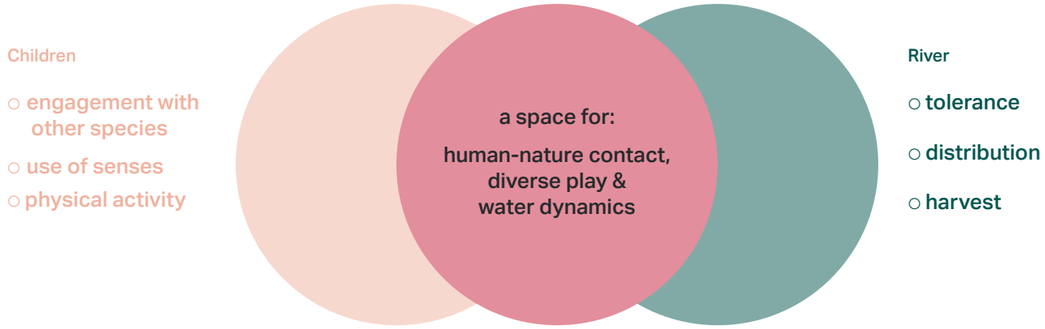
Through its deep reaching root system the maple tree is capable of saving water for times of dryness. The adaptation of harvesting water increases the local infiltration and enhances a healthy microclimate.

Figure 28
Adaptation Strategies of site-specific species

interim conclusion III

The design principles for the learning landscape

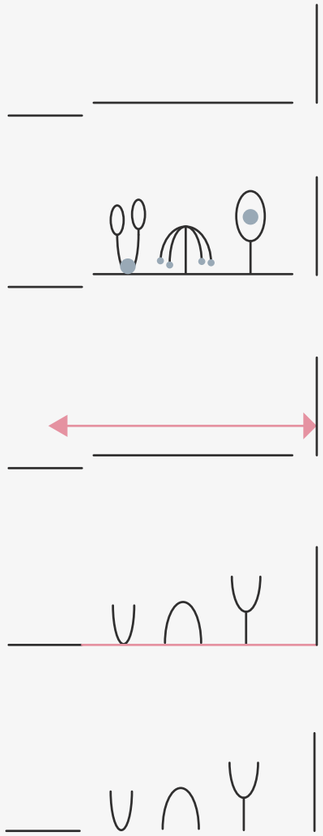
The theoretical investigation of the child- and river-specific strategies and the on-site-analysis of the riparian vegetation of gamlestaden led to three design principles. The learning landscape of gamlestaden aims to make space for human-nature contact, diverse play and water dynamics in respect of the child, the river and site-specificness.



chapter six: design proposal
- creating a dialogue or metamorphosis of a river

begin of the dialogue

The three established design principles are the point of departure for the design investigation. The following chapter explores how the gained knowledge about the child's and river's strategies and the aim of the design principles to make space for human-nature contact, diverse play and water dynamics can be applied on the landscape of Gamlestaden. The chapter begins with the design narrative where the landscape is spatially structured. Followed by the defining of the design which took inspiration from contemporary water playscapes, the evolved design proposal is presented in a learning landscape including plans of the site, the water sensitive vegetation, the play equipment and a map of improved surfaces and activities.



At first glance: a river, a parking lot and the urban fabric

The second glimpse: discovery of site specific processes - toleration, distribution and harvest of water

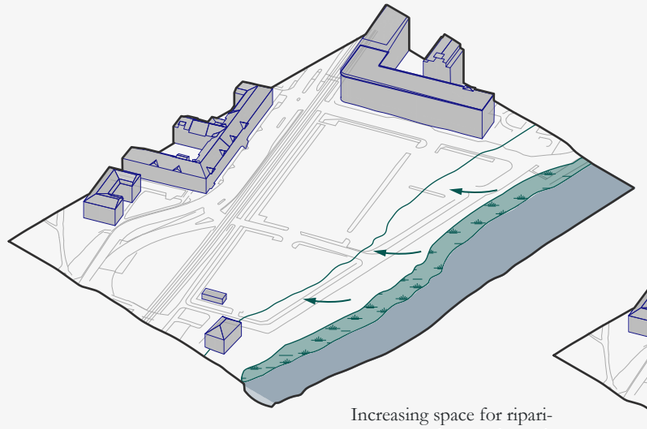
The objective: bridging the gap between human and nature

A landscape of learning: Combining the design principles with the natural site specificness

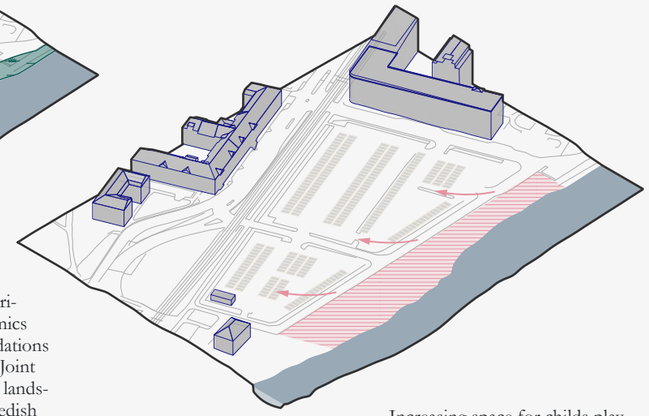
Metamorphosis of a river - seeing what is already there.

Figure 29
Recap and Agenda for the Learning Landscape Gamlestaden

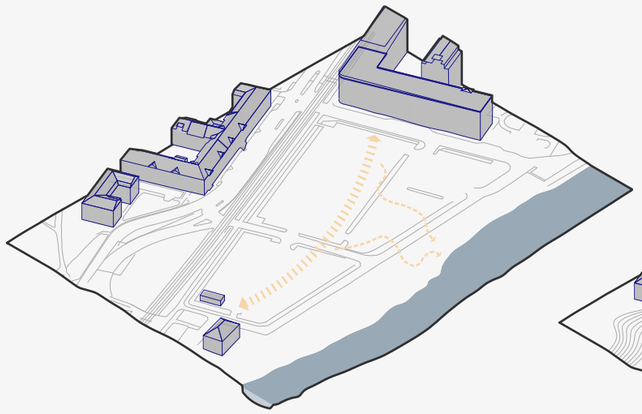
design narrative and zoning



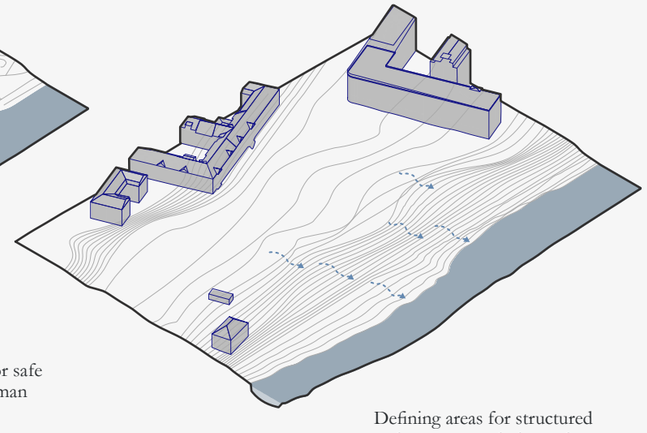
Increasing space for riparian zone and water dynamics according to recommendations of the European Union Joint Research Centre and the landslide risk study of the Swedish Geotechnical Institute (SGI)



Increasing space for childs play and public recreation; decreasing surface area of impermeable parking spaces



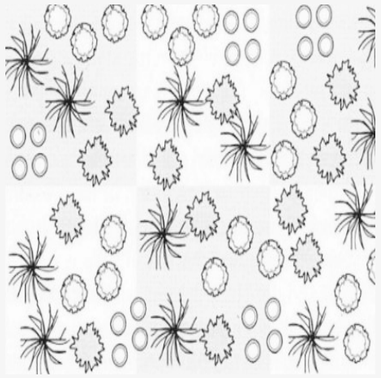
Create new connections for safe entrance and space for human nature engagement



Defining areas for structured and unstructured play and riparian processes in balance with the existing topography

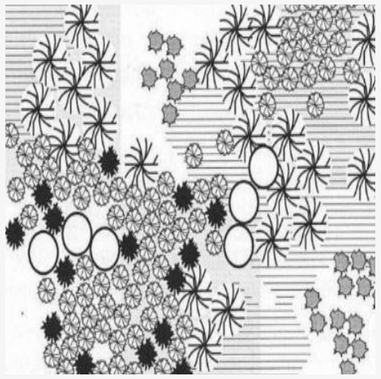
reference for design language

Kokkedal Climate Adaptation
by Schønherr
Inspiration:
Climate adaptation and shapes



Plant Matrix
by Hansen & Stahl 1987
Inspiration:
Structured formation of vegetation

Annonay Garden, Backnang
by Glück Landschaftsarchitektur
Inspiration:
Composition of water playscape



Plant Scheme
by Hansen & Stahl 1987
Inspiration:
Natural formation of vegetation

Figure 30
Reference Projects and Plant Designs

defining the design

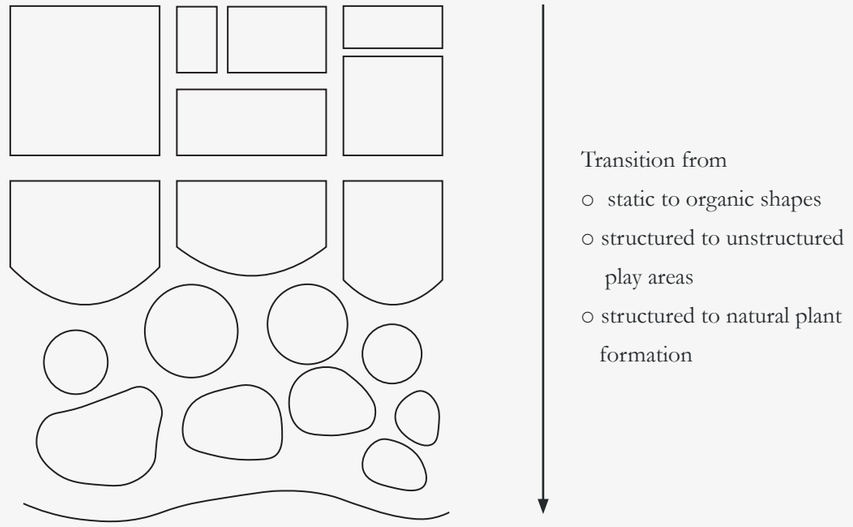


Figure 31
Diagram of Design Language

siteplan

Nature's Spaces
- Säveån
- Lawns
- Mixed perennials matrix
- Hedges
- Reed and grasses
- Mixed perennials unstructured
- Acer spec etc
- Salix spec etc
- Alnus glutinosa etc

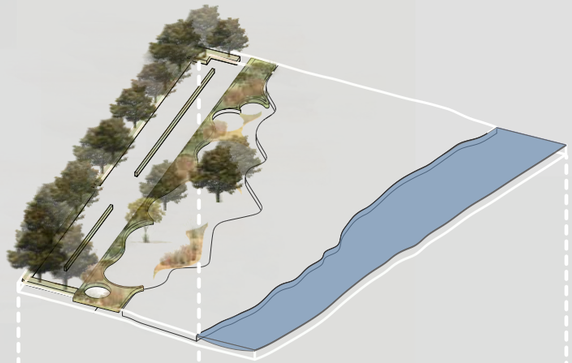
Children's Spaces
- Soft EPDM
- Sand
- Mulch
- Play equipment
- Safe crossing

1. Water playscape
2. Rain canopy
3. Balancing coins
4. Barfood path
5. Swing
6. Climbing poles
7. Observation staircase
8. Willow huts
9. Garden
10. WC

1:800

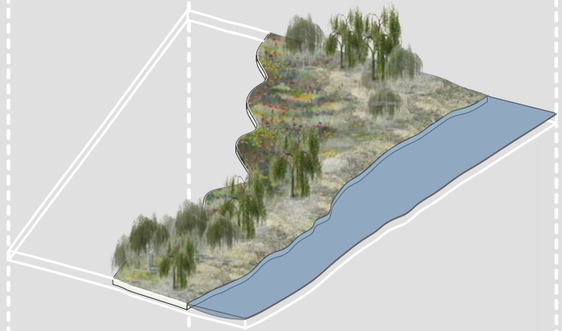
water sensitive vegetation

HARVESTING



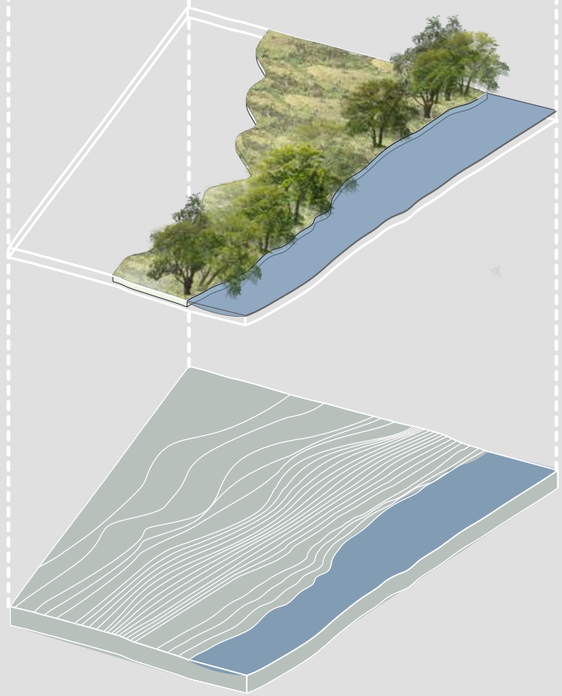
Trees and Hedges adapted to dryness
Structured formation

DISTRIBUTING



Leafy trees, mixed perennials and grasses adapted to flooding
Natural, untructured and dense formation

TOLERATING



Flood tolerant trees and mixed perennials and grasses adapted to high water
Natural and untructured formation

Topography

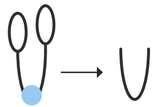
Acer spec, Stipa pennata, Phragmites australis etc.

Alnus glutinosa, Caltha palustris, Alchemilla vulgaris, Carex acuta, Carex pseudocypers etc.

Salix alba, Betula pendula, Stipa tenuissima, Deschampsia cespitosa etc.

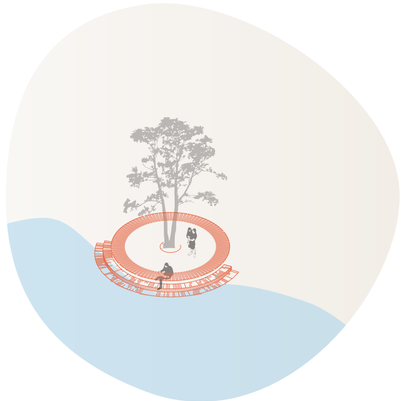
Figure 32
Plant Beds | A Carpet of Roots Protecting the Soil from Erosion and Landslides

play equipment

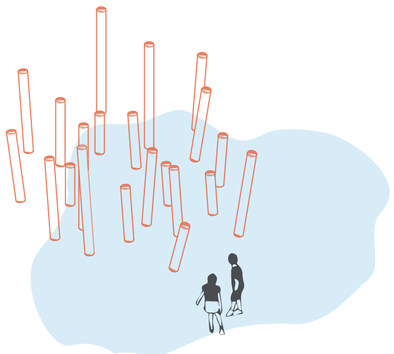


TOLERATING

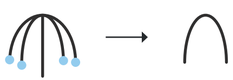
Inspired by the alder tree, the play equipment close to the river is adapted to water dynamics. The formation of the climbing poles is mimicking the alders stem, helping children to relate to their environment.

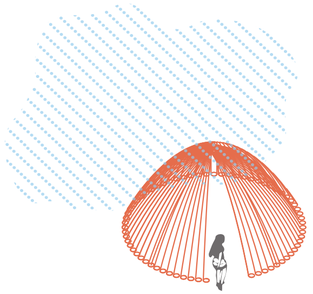


Floodtolerant platform

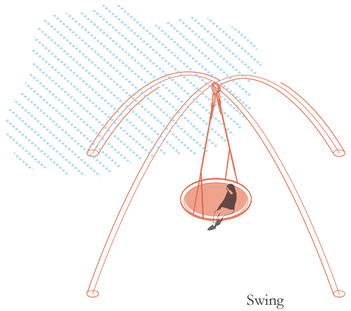


Climbing poles





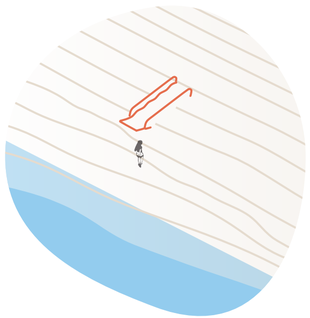
Willow huts



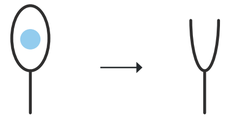
Swing

DISTRIBUTING

The play equipment in the unstructured area of the learning landscape takes its inspiration from the exsisting willow trees. The huts and the swing are mimicking the leafage of the tree and create opportunities for independent play, where the children can „distribute“ individually.

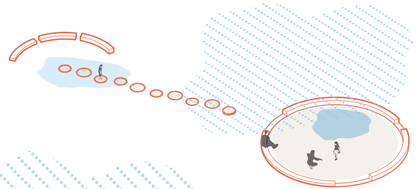


Slide embedded in the existing topography

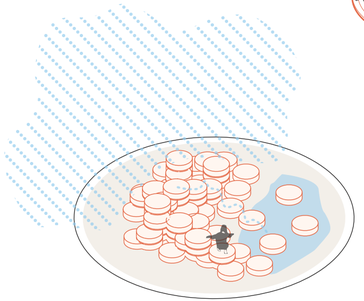


HARVESTING

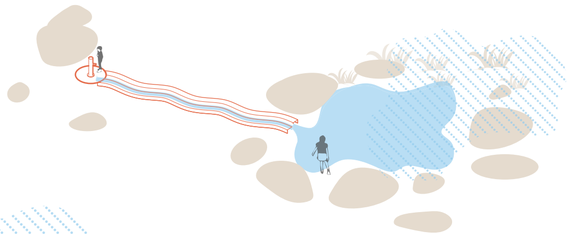
Playing while experiencing natural processes like infiltration is the theme of the defined play area of the learning landscape. Through permeable surfaces, a different materiality is created, showing children the importance of the water cycle. The rain canopy creates a shelter while simoultaneously harvesting the accruing stormwater.



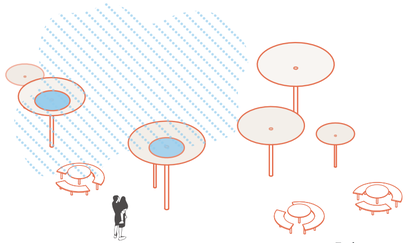
Barefoot path and sandpit



Balancing coins

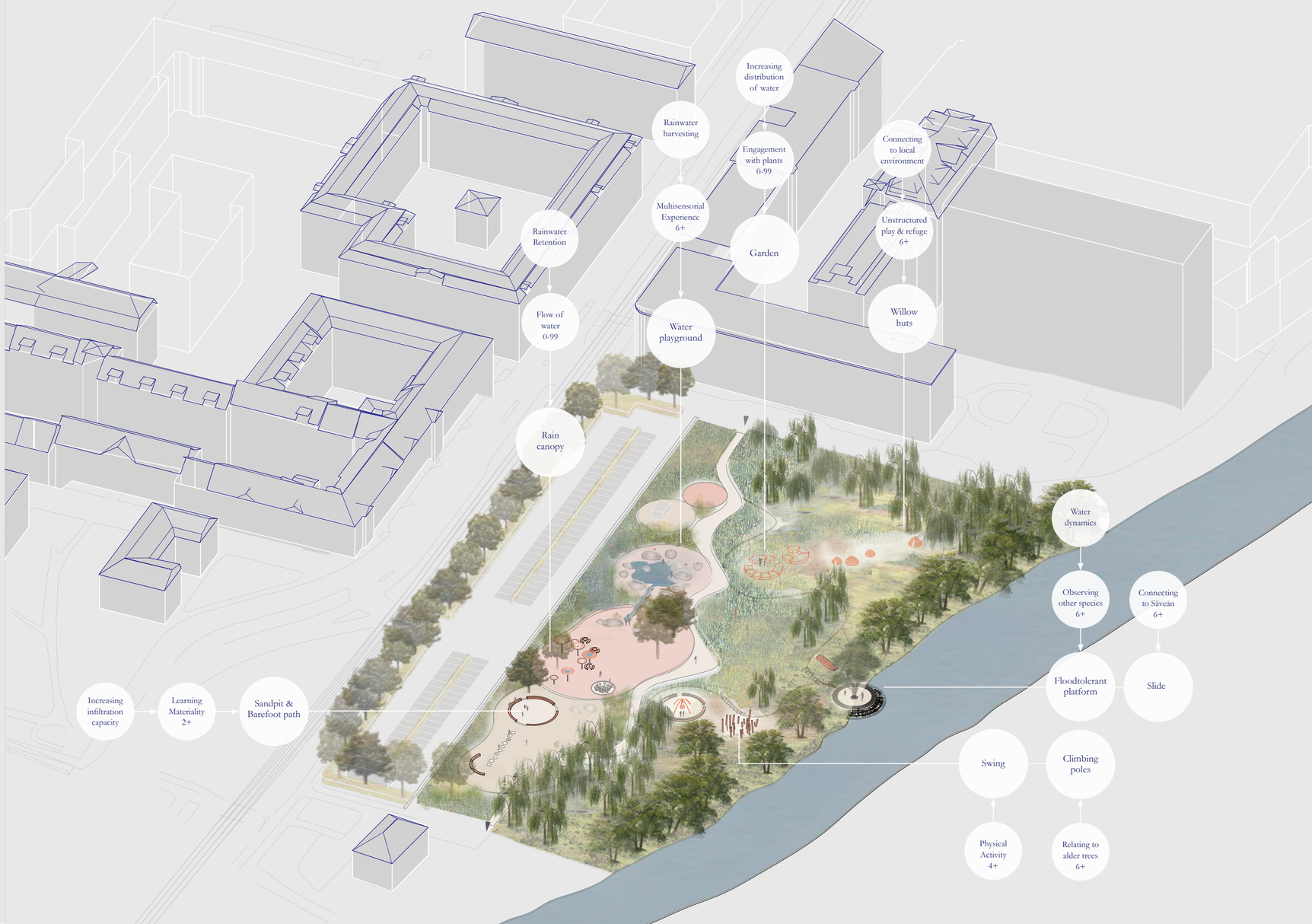


Water playground



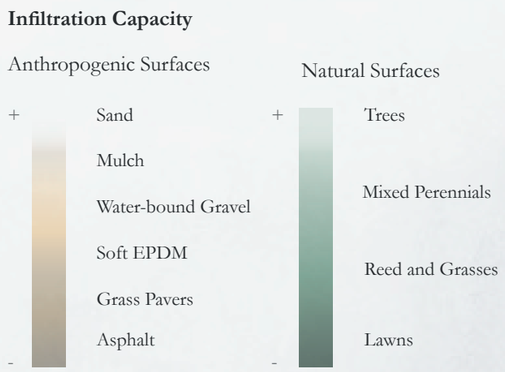
Rain canopy

activities and program



from impermeability to permeability

Following up on the analysis of the infiltration cpacity in chapter two, the maps to the left show how the impermeabilty of the landscape of Gamlestaden has changed through the proposed design. The increase of anthropogenic surfaces such as soft EPDM flooring, grass pavers and waterbound gravel improved the infiltration capacity of the site significantly. In addition, the increase of natural spaces and the variety of vegetation has led to a higher permeability of the site‘s surfaces.



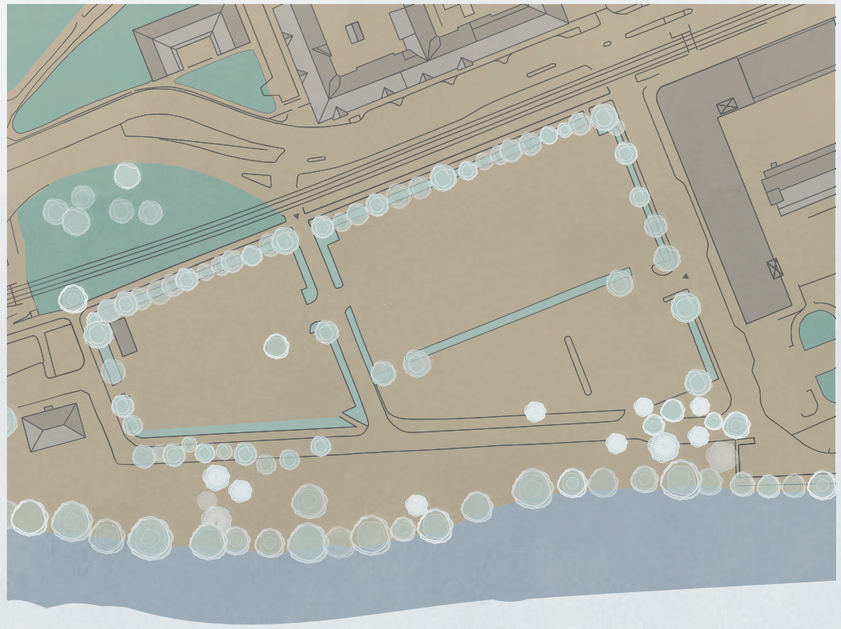


Figure 33
Impermeability of the exsisting hard surfaces

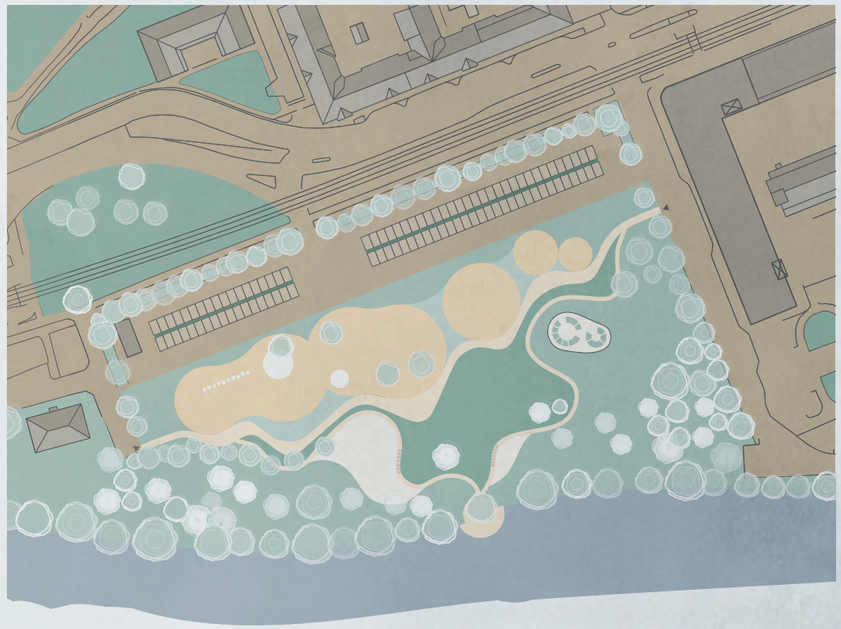


Figure 34
Permeability of the proposed soft surfaces

section north-south

chapter seven: summary

transfer of the dialogue

The design investigation could reveal that the enhancement of site-specific potentials of a landscape can act supportive for bridging the divide between anthropogenic and natural landscapes. The following map reflects how this approach can be applied to other conflicting landscapes in the river valley of Säveån.

The primariy conflicting landscapes in this part of the river are the road E20 and the riparian zone. In order to protect the natural processes and prevent the road from landslides, the alignment of the infrastructural axes needs to be rethought.

Figure 35
The Variety of Disconnections demands a Variety of Dialogues

In this part of the river, the landslide risk areas create a threat for adjacent buildings and the riparian zone. By transforming the exsisting landscape through implementing floatable elements and river bank protection or through moving built structures, an increased social and ecological resilence can be generated.

The closeness of agricultural fields to the river can cause an increased deposition of pesticides and toxic compounds. In this conflict between agricultral land and the riparian zone it is important to establish sustainable cultivation methods for a reslient rurbanisation.

discussion and reflection

The design proposal of this Master's thesis is a landscape architectural project for the ecological renaturation and social reintegration of the river Säveån in Gamlestaden. In this project, research for design, site analysis and plant analysis with the focus on the child's and the river's perspective have been the primary methodologies. By acquiring knowledge about the contemporary challenges, needs and strategies of both representative actors, an insight of the complex interdependency of children and nature could be gained. The site analysis including an extensive analysis of the site-specific vegetation could reveal conflicts and potentials which formed the point of departure for the dialogue creating learning landscape in Gamlestaden.

The main strength of this thesis is the inclusive character of the design approach. The proposal resulted in a landscape architectural space which, on the one hand, creates a bridge between the conflicting anthropogenic landscape of Gothenburg and the natural landscape of Säveån. On the other hand it makes space for a dialogue bringing children closer to nature and supporting nature through an ecological based design.

By strengthening both the child's as well as the river's strategies I aimed to showcase that one step of tackling climate related risks such as landslides and flooding is to learn and to take inspiration from the existing natural assets within an urban context. I further aimed to underline the importance of play and outdoor activities for children through providing a landscape that supports age-specific, unstructured and structured play equipment fitting to its natural context. I furthermore strived to address natural processes such as water infiltration which often work more sustainable in the rural outskirts than in urban contexts due to urbanisation and densification processes. I think there is a need of integrating local potentials like vegetative adaptation strategies found in rural environments into urban contexts, in order to increase the ecological resilience of cities like Gothenburg. Simultaneously it is significant to reconnect educational and social advantages of the urban to its rural neighbour. I believe that this represents one essential key for a fruitful synergy between the urban and the rural.

This Master's thesis has some limitations. Due to the ongoing global pandemic, associated therewith, time constraints and limited access to ressources, the development of the design reached an conceptual stage, where certain elements could not be worked out in detail. The technical feasibility and the safety of the playscape have not been addressed precisely and need to be refined in order to promote a realistic design approach. Furthermore, the design proposal is not to be seen as the only and one solution for the future of Säveån in Gamlestaden. It is rather to be considered as a scenario where certain significant and conflict creating aspects of the current site are intended to be improved. Creating a dialogue between human and nature is certain not the overall answer for counteracting climate change. Nevertheless, I believe that it portrays an essential first step. I further think that the conception of strengthening site-specific natural potentials can also be translated to other parts of the river.

How can we design an educational and recreational riverspace with its site specific natural potentials to promote a resilient rurban life? Retrospectively I would answer to my research question as follow: one determining factor that we as architects and landscape architects can influence significantly is the communication of values through design.

Our profession has the means but also the responsibility of communicating natural processes and social values through space and taking action against climate change. By investigating and supporting the site-specific natural potentials and making them visible for children and the public, a closer connection between human and nature can arise. A resilient rurban life means alongside of many other aspects, the comprehension of human as part of nature which this Master's thesis aspired to convey.

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