ARCHITECTURE DESTROYS NATURE?

REBUILDING THE HUMAN-NATURE CONNECTION

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Department of Architecture and Civil Engineering

Examiner // Liane Thuvander
Supervisor // Walter Unterrainer

Image on frontpage (Figure 1). Metabolism of nature (Kraemer, 2020). All rights reserved.

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by Julian Kraemer
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Chalmers School of Architecture
Master's program in Architecture and Urban Design
Direction of Building Design for Sustainability

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I would like to thank my family, who accompanied me on my way and supported me during my Bachelor and Master studies. Who stood behind my decision to study architecture and encouraged me to study abroad.

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“I USED TO THINK THAT TOP ENVIRONMENTAL PROBLEMS WERE BIODIVERSITY LOSS, ECOSYSTEM COLLAPSE AND CLIMATE CHANGE. I THOUGHT THAT THIRTY YEARS OF GOOD SCIENCE COULD ADDRESS THESE PROBLEMS. I WAS WRONG. THE TOP ENVIRONMENTAL PROBLEMS ARE SELFISHNESS, GREED, AND APATHY AND TO DEAL WITH THESE WE NEED A CULTURAL AND SPIRITUAL TRANSFORMATION.“

(Speth, as cited in Woo, 2010, p. 1)

INSPIRATION FOR THIS THESIS

The inspiration for this thesis has been sparked by two well-known climate activists. James Gustave Speth, an environmental lawyer and founder of the World Resources Institute, as well as David Suzuki, a Canadian academic and founder of the David Suzuki Foundation. Speth said that the true danger to our planet, the true environmental problems are not of a scientific but cultural nature and that science cannot solve these problems. Instead, a cultural and spiritual transformation is necessary (Speth, as cited in Woo, 2010). David Suzuki, a very spiritual person, also mentions this spiritual transformation as a crucial component towards a sustainable future.

> *“The way we see the world shapes the way we treat it. If a mountain is a deity, not a pile of ore; if a river is one of the veins of the land, not potential irrigation water; if a forest is a sacred grove, not timber; if other species are biological kin, not resources; or if the planet is our mother, not an opportunity — then we will treat each other with greater respect. This is the challenge, to look at the world from a different perspective.”*
>
> (Suzuki, as cited in Benjamin, 2009, p. 2)

Of course, these quotes romanticize nature and present it as something divine, however, I think that both quotes bear a message that is important for the discourse on sustainability. Speth and Suzuki both speak about a cultural and spiritual transformation, without giving advice on how to achieve this change. This opens up the question of whether architecture can contribute to it, and if so, in which way? I believe that architecture is not only relevant but crucial to this transformation and affects our culture on many dimensions. Dense city environments that lead to an extinction of nature experiences (Lumber, Richardson and Sheffield, 2017) and a rural to urban shift that expects 60% of people living in cities by 2030 (United Nations, Department of Economic and Social Affairs, Population Division, 2019) raises the significance of urban planning and architecture that fosters a strong human-nature connection even more. Thus, finding strategies, implementing them in a concrete design proposal, and documenting the process in this master thesis, will contribute to the goal of achieving a sustainable society.

ABSTRACT

Does architecture destroy nature? According to the United Nations, about 60 percent of the world population is soon to be expected to reside in urban environments. This unprecedented development does not only drive forward the urbanization of rural areas but also the densification of cities. A progression that promises better housing, education, healthcare, productivity, and opportunities for the population, however, it is also a progression largely responsible for the disconnection between people and nature.

This thesis emphasizes the importance of the human-nature connection and explores an alternative approach to sustainability within the field of architecture. It explores ways to reconnect to nature or strengthen the connection between people and nature to foster pro-environmental behavior, rather than focusing on “sustainable” building performance or materials.

While nature connectedness has been identified as a central determinant for well-being and health, for pro-environmental behavior, and positive child development, there is a need for further investigations on how nature connectedness can be achieved or how strategies for the reconnection with nature could be developed. Architects realized their responsibility and are using biophilic design elements to bring back nature experiences to the urban setting. However, the experience of nature alone does not lead to a strong human-nature connection. Research suggests that the relationship between humans and nature is strongest when developed from an early age. Thus, introducing strategies for reconnection to the context of child development will be further investigated.

This thesis aims to transfer evidence and research on the human-nature connection from philosophical, psychological, socio-economical, ecological, and sustainable sciences into concrete design strategies relevant to the future discourse on sustainable architecture. Finally, these design strategies will be implemented in the context of an urban interpretation of a forest kindergarten, that has the potential to affect the whole area and society.

INTRODUCTION

BACKGROUND

Arguing from a philosophical perspective on sustainable development and environmental problems, I want to emphasize the cultural meaning of architecture and its’ potential to transform our current connection to nature. To understand the importance of this connection to be strong it is necessary to take a look at the reasons that led to the weakening of it. The way our society evolved and the living environments we have created contributed to an unbalanced relationship between mankind and nature (Smith and Harvey, 2008). This relationship presents the background for many current research papers (Ives et al., 2017) and while first studies have been focussed especially on the effects of nature experiences on health, the importance of feeling connected to nature has become more clear (Lumber, Richardson and Sheffield, 2017). This nature connectedness does not only enhance the positive effects of nature experiences on health but also promotes a pro-environmental behavior which in return fosters a sustainable society and future (Davis, Le, and Coy, 2011). The rising significance of the human-nature connection brought up the question of how such a connection can be achieved or strengthened (Abson et al., 2017; Ives et al., 2017; Lumber, Richardson, and Sheffield, 2017). This thesis puts architecture in front of the same background to explore how the design profession can contribute to the human-nature connection.

PURPOSE

Bringing attention to the necessity of a paradigm change and a cultural transformation, to achieve a sustainable society and to the potential as well as the responsibility that the architectural profession has to reach that goal is the main purpose of this thesis. Furthermore, this thesis proposes a research-based toolkit of design strategies that intend to strengthen the human-nature connection; a connection that has been identified as a strong leverage point to bring about pro-environmental behavior.

RESEARCH QUESTION

Can architecture reconnect people to nature?
Even though sustainability in architecture has gained a lot of popularity and shapes the requirements for buildings in many competitions, architectural designs rarely focus on creating an enhanced human-nature connection. In fact, architecture usually disconnects us from nature while providing shelter and protection for people. So how can architecture reconnect people to nature? To answer this question a better understanding of nature, our connection to nature and its importance, as well as disconnecting and reconnecting elements, in general, is necessary and led to five guiding questions and objectives.

QUESTIONS & OBJECTIVES

What is nature?
It is important to understand the concept of nature and to define its meaning before investigating further relationships and effects that are based on nature.

What is our connection to nature?
Analyzing the human-nature connection is necessary to grasp the full scope of interactions with and dependencies on nature.

Why is our connection to nature important?
Investigating the consequences and effects of the human-nature connection reveals it's relevance, potential, and range.

What disconnects us from nature?
Exploring reasons and drivers that interrupt the human-nature connection is necessary to define leverage points for intervention.

What reconnects us / strengthens our connection to nature?
Once leverage points and strategies that strengthen the human-nature connection have been identified they can be used to develop design strategies for the architectural profession.

METHOD

The method of this thesis can be described as a three-step process (Figure 2). First, the underlying knowledge base is built from various sources like research papers, books, and philosophical theories. As a second step, design strategies are developed based on readings and reference projects relevant to the biophilic design and the human-nature connection. The third and last step implements the design strategies in an existing building as well as the surrounding urban environment.

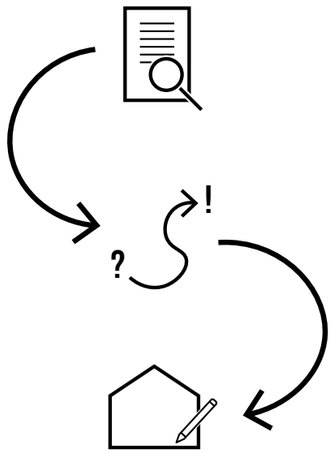


Figure 2. Literature - strategy - design (Kraemer, 2020). All rights reserved.

THEORY

The references used in this thesis acknowledge the need for a stronger connection between humanity and nature or criticize our current relationship to nature. This ranges from comments on our economic systems to the way our cities have been and will be designed. To introduce the reader to the philosophical mindset, I chose to reference popular philosophers like Cicero, Karl Marx, and Erich Fromm but also ecologists like Murray Bookchin who puts this mindset in the context of the economy, society, and cities. The transition to the design profession starts with a compendium of established literature on biophilic design followed by current research findings on the human-nature connection and pathways or strategies to achieve the same. Edward Wilsons *Biophilia* from 1986 laid ground for many books on biophilia, roughly 22 years later Stephen Kellert published the book *Biophilic Design* that offers a broad perspective on how biophilia can be incorporated in the design profession and why it is relevant. Further readings by Timothy Beatley deal with the theme of biophilia on a city scale. The mentioned references help to build a general overview of biophilic attributes that can lead to a biophilic, thus nature emphasizing, architecture. Further research papers by, for example, David Abson, Jody Davis, Christopher Ives, Ryan Lumber, and more, focus on defining strategies to achieve a strong human-nature connection and categorize, as well as prioritize biophilic attributes and nature experiences depending on their potential impact.

DELIMITATIONS

Defining the scope of this thesis requires limitations. Only answering the question of what nature is could be a thesis on its' own. However, this work is not supposed to question whether certain worldviews are right or wrong nor does it aim at giving a true definition of nature. Instead, it explains a worldview with the underlying perception of nature. In addition to the theoretical limitations, the scale of the design project is restricted to an area that includes the proposed building design as well as important connections to the surrounding area. Building codes and regulations are not in the focus of the design.

THESIS STRUCTURE

The content of this thesis can be divided into three parts, a research part that focusses on building a philosophical and scientific foundation, a transfer of this knowledge to the context of architecture including an overview of design tools, and finally, a design project that utilizes the compiled knowledge.

The research part aims at answering the five questions about nature and our connection to it. Answering these questions creates a foundation that allows understanding the departure point for this thesis, as well as the following process. The second part focusses on the architectural relevance of the built knowledge base, offering an overview of design strategies that are based on research, evidence, and experience. The design project makes use of both, the researched theory as well as the design strategies, to showcase how architecture can aid in building a stronger human-nature connection.

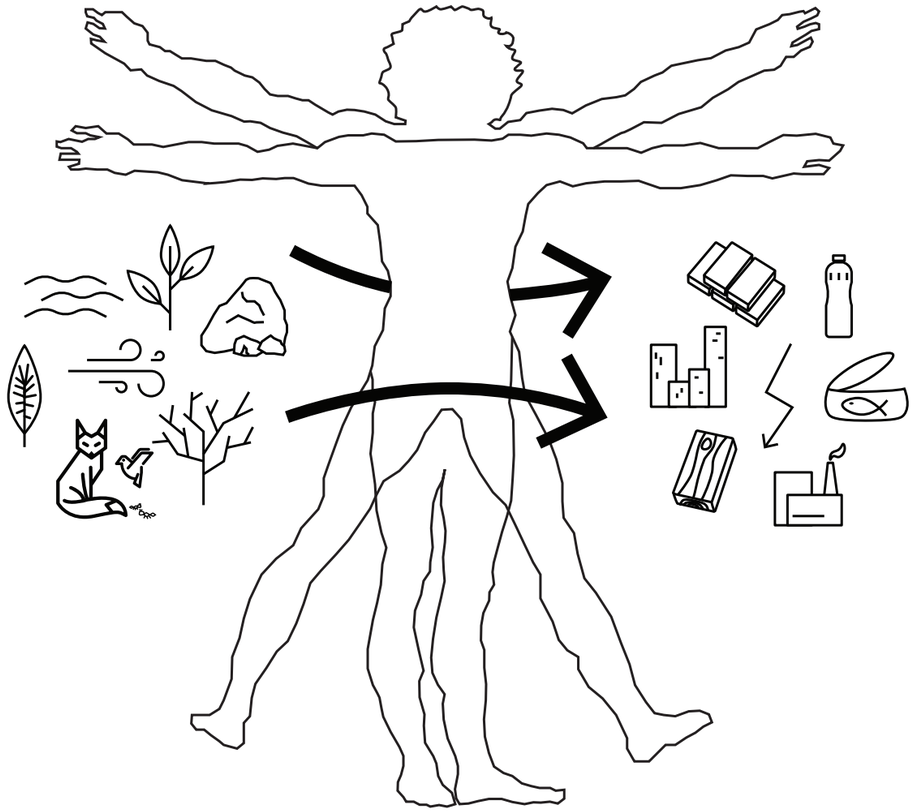


Figure 3. Transformation of nature through humans (Kraemer, 2020). All rights reserved.

NATURE

WHAT IS NATURE?

To understand the aim of this thesis it is essential to have a clear definition of what "nature" means in its' context. It is a question that has been discussed by many great thinkers and philosophers throughout history, often together with what humanity's place is in nature and how we affect it. One of the earliest descriptions of humanity's relation to nature was made by Cicero, reflecting on how mankind treats, manipulates, and shapes the land, he differentiates the natural environment into a first and second nature (Cicero and McGregor, 1972). A wild, pristine, and untouched external nature which, through the human conquest and domination, becomes a different, manmade nature (Smith and Harvey, 2008) (Figure 3). This dualistic view of nature turned out to be one of the fundamental concepts for the future discourses on ecological, economic, and social development.

For simplicity's sake, I am only going to mention the views and visions of nature that I found most interesting and relevant to this thesis, especially Alfred Schmidt's interpretations of Karl Marx's description of humanity's relationship with nature. In The Concept of Nature in Marx (Schmidt, 2014) Schmidt analyses Marx's understanding of nature and draws connections to other important philosophers like Bacon, Hegel, and Kant. According to Schmidt, "Nature was for Marx both an element of human practice and the totality of everything that exists."(p. 27). Schmidt further refers to Marx's concept of the metabolism between man and nature, a transformation of the external nature to a manmade nature that represents society. The similarity to Cicero is obvious and at this point, it may be logical to conclude that nature is universal, but in different conditions. However, this definition would not be sufficient for the aim of this thesis. Furthermore, the distinction between the external or first nature and the internal or second nature may not apply to the current state of our planet anymore, in fact, humanity's second nature already fully absorbed the first nature and to some degree holds almost all non-human lifeforms in custody (Bookchin, 2017a).

Regardless of the distinction between first and second nature and regardless of their current state they both contain elements that I would define as nature in the context of this thesis: biology, geology, and meteorology manifesting itself in the flora and fauna, in the (through humanity) unaltered material that our planet is made of, and the weather phenomena we experience every day. This definition of nature excludes the results of human activity, thus, they must be defined as something else. Human activity, with its' products, its' social constructs, and its' self-awareness creates what we refer to as our society, the environment where people work, learn, socialize, and live. I would define society as an opposing but dependent force to nature. The relationship between these two forces, between society and nature is often contradictory, where society negatively affects nature while being highly dependent on it.

NATURE IS THE NATURAL HABITAT OF WILDLIFE.
SOCIETY IS THE NATURAL HABITAT OF HUMANITY.

"MAN IS THE ONLY ANIMAL WHO DOES NOT FEEL AT HOME IN NATURE, WHO CAN FEEL EVICTED FROM PARADISE, THE ONLY ANIMAL FOR WHOM HIS OWN EXISTENCE IS A PROBLEM THAT HE HAS TO SOLVE AND FROM WHICH HE CANNOT ESCAPE. HE CANNOT GO BACK TO THE PREHUMAN STATE OF HARMONY WITH NATURE, AND HE DOES NOT KNOW WHERE HE WILL ARRIVE IF HE GOES FORWARD. MAN'S EXISTENTIAL CONTRADICTION RESULTS IN A STATE OF CONSTANT DISEQUILIBRIUM. THIS DISEQUILIBRIUM DISTINGUISHES HIM FROM THE ANIMAL, WHICH LIVES, AS IT WERE, IN HARMONY WITH NATURE."

(Fromm, 2013, p. 535)

WHAT IS OUR CONNECTION TO NATURE?

Humanity's relation to nature is complex, multidimensional, and includes both negative and positive relationships with the natural environment. As I pointed out before, society is an opposing force to nature, that, just like a parasite, is exploiting and relying on it at the same time. However, the relationship between society and nature is more complex than that and even though the general interaction is based on exploitation (Wilson, 1986), also exhibited in the example presented in *Natures Metropolis* (Cronon,1991), human society consists out of several social groups with various attitudes towards nature. In *The Anatomy of Human Destructiveness* (Fromm, 2013) German philosopher Erich Fromm describes the human behavior through the contrary concepts of biophilia and necrophilia, where necrophilia is destructive and "Biophilia is the passionate love of life and of all that is alive; it is the wish to further growth, whether in a person, a plant, an idea, or social group." (Fromm, 2013, p. 858). While this definition of biophilia represents an entirely humanistic and positive attitude towards nature as a whole, it generalizes behavior rather than investigating the different motives behind human interaction with nature. *The Biophilia Hypothesis* (Kellert and Wilson, 1993) the concept of biophilia is redefined and the variety of human relationships with nature are described more distinctively. They are defined through nine values that offer descriptions for views that range from utilitarian to negativistic (Table 1).

UTILITARIAN	WE USE NATURE.
NATURALISTIC	WE ENJOY NATURE.
ECOLOGISTIC-SCIENTIFIC	WE STUDY NATURE.
AESTHETIC	WE ADORE NATURE.
SYMBOLIC	WE UNDERSTAND NATURE.
HUMANISTIC	WE ARE NATURE.
MORALISTIC	WE PROTECT NATURE.
DOMINIONISTIC	WE CONQUER NATURE.
NEGATIVISTIC	WE FEAR NATURE.

Table 1. The nine biophilic values (adapted from Kellert and Wilson, 1993)

THE NINE VALUES OF BIOPHILIA

Each of the nine biophilic values represents a human relationship to nature that fulfills a certain function for humanity's evolution, development, and survival. Kellert and Wilson further argue that "the expression of the biophilia need may constitute an important basis for a meaningful experience of self." (p. 60). The detailed description of biophilic values presented in the book gives a better understanding of the interconnectedness between humans and nature.

The utilitarian value is restricted to the material value of nature; the extraction of resources to produce goods that benefit society.

The naturalistic value, on the other hand, reflects the satisfaction, fascination, and appreciation humans get from direct and intimate contact with nature.

The ecologistic-scientific value describes the urge to study and understand nature in its structures, elements, and organisms.

The aesthetic value represents the appeal that nature has to people, it is a value incorporated in most humans which "exerts a powerful aesthetic impact on most people, often accompanied by feelings of awe at the extraordinary physical appeal and beauty of the natural world." (p.49).

The symbolic value of biophilia refers to the metaphors and references from nature that human language is based on. Kellert and Wilson argue that communication and thought are based on these metaphors, thus, inferring that the symbolic value of nature is deeply rooted in humans.

The humanistic value encompasses emotional attachments to the natural environment or even the feeling of love for nature. However, strong feelings or attachments rarely occur between people and inanimate objects but between man and - especially domesticated - animal.

The moralistic value describes a feeling of responsibility for the natural world. This view often appears in connection with indigenous people who have a strong connection to nature based on their philosophy, religion, or poetry. This value can also be connected to the more current concept of land stewardship, a concept where people feel responsible for a certain area and take care of the natural environment.

The dominionistic value represents the tendency of man to treat nature as a wild entity that has to be controlled to master the natural world.

The negativistic value could be described as the opposite of biophilia, it could be described as biophobia. It resembles the fear of nature that humans developed during evolution. Nowadays, this fear presents itself through the instinctive fear of spiders, snakes, or other animals that have been identified as a thread in the past.

The totality of biophilic values describes the relationship between humans and nature.

FIVE CONNECTIONS TO NATURE

In addition to the biophilic values described in *The Biophilia Hypothesis* (Kellert and Wilson, 1993) Ives et al. (2017) and Ives et al. (2018) define five categories of connection to nature, namely material, experiential, cognitive, emotional, and philosophical connections (Ives et al, 2018, Table 2). These connections can be categorized by two different measurements: the social dimension that indicates if a connection is subjective or applicable to larger social groups and the positioning of the connection that shows whether it is internal/mental or external/physical. Of course, the connection to nature is generally subjective and different for everyone, however, it is based on the same natural element perceived differently.

CONNECTION	EXPRESSION	SCALE
MATERIAL	USE & CONSUMPTION	INDIVIDUAL & SOCIETY
EXPERIENTIAL	INTERACTION	INDIVIDUAL & SOCIETY
COGNITIVE	KNOWLEDGE & AWARENESS	INDIVIDUAL
EMOTIONAL	ATTACHMENT & EMPATHY	INDIVIDUAL
PHILOSOPHICAL	PERSPECTIVE & WORLD VIEW	INDIVIDUAL & SOCIETY

Table 2. Different types of nature connections (adapted from Ives et al., 2018)

CONNECTIONS TO NATURE IN MODERN SOCIETY

Regardless of individual beliefs and values, there is a trend in modern society and modern lifestyles that weakens certain connections to nature while strengthening others. Knowledge and understanding, symbolic value, emotional attachment, and responsibility for the natural world yielded to the globalized, fast-paced society and a digital lifestyle (Bookchin, 2017b) which took over nature's role as an always present part of daily life. A lifestyle that is based on consumption - the utilitarian and materialistic connection to nature - and promotes nature connections as leisure activities rather than an integrated part of people's life.

"HUMANITY EVOLVED IN ADAPTIVE RESPONSE TO NATURAL CONDITIONS AND STIMULI, SUCH AS SUNLIGHT, WEATHER, WATER, PLANTS, ANIMALS, LANDSCAPES, AND HABITATS, WHICH CONTINUE TO BE ESSENTIAL CONTEXTS FOR HUMAN MATURATION, FUNCTIONAL DEVELOPMENT, AND ULTIMATELY SURVIVAL."

(Kellert, Heerwagen and Mador, 2008, p. vii)

WHY IS OUR CONNECTION TO NATURE IMPORTANT?

Research has shown that the experience of nature promotes good health and affects our well-being not only on a physical but also a mental level. Roger Ulrich, an american researcher who populized evidence-based design, conducted a study on the connection between pain drug doses and nature views of hospitalized persons and laid the ground for many more studies on the importance of nature for humanity. The results of the study suggested that patients with a view on nature need fewer pain killers than people with a view on a brick wall (Kellert, Heerwagen, and Mador, 2008). While this effect of our connection to nature is easy to measure and offers an easy to understand example of how nature can affect our well-being, it is very specific and limited in its' scope.
The interest in researching the effect of nature on health and well-being but also the importance of the human-nature connection as a driver to affiliate with nature has been the topic of many recent research papers (Ives et al., 2017). However, a new dimension of people's connection to nature has been added in many recent research papers. Besides benefits for health and cognitive development, a strong human-nature connection leads to pro-environmental worldviews (Figure 4) and an increased willingness to make sacrifices for environmental benefits (Lumber, Richardson, and Sheffield, 2017).

Health benefits
Nature experiences or contact with nature have been identified as a predictor to better physical and mental health (Zelenski and Nisbet, 2014; Cox, Hudson, Gaston, Shanahan, and Fuller, 2018). Stress, which relates to serious diseases like heart disease, obesity, depression, or high blood pressure, is often reduced by regular experiences of nature. Furthermore, these benefits are even bigger or more present if the connectedness to nature is strong (Cox et al., 2018). One reason for this can be the simple fact that people who feel more connected to nature are also more likely to experience nature, for example by taking walks in green areas or participating in urban farming projects (Cox et al., 2018).

Cognitive development
Further research has shown that a strong human-nature connection leads to better social skills, self-control, and a reduced risk of attention disorders (Zelenski and Nisbet, 2014). Reducing the probability of attention disorders is especially important during younger ages, thus, building a strong human-nature connection during childhood is most beneficial.

Worldview
A worldview that promotes unity between nature and humans also creates empathy for our environment which in return leads to pro-environmental beliefs. Childhood exposure to nature creates a stable subjective connection to nature in adulthood. Experiences of and interaction with nature during childhood is one of the few pathways to a strong human-nature connection that is scientifically proven while strategies for reconnection during adulthood need further investigation(Lumber, Richardson and Sheffield, 2017)

Figure 4. Health, Cognitive development, and worldview (Kraemer, 2020). All rights reserved.

WHAT DISCONNECTS US FROM NATURE?

Humanity evolved from primitive tribes that had to fight nature to survive into a civilization that conquered nature and forced it into submission. Modern society reshapes landscapes, designs cities, and urban environments, and controls many natural elements at will. According to the United Nations, about 60 percent of the world population is soon to be expected to reside in urban environments (United Nations, Department of Economic and Social Affairs, Population Division, 2019). This unprecedented development does not only drive forward the urbanization of rural areas but also the densification of cities. A progression that promises better housing, education, healthcare, productivity, and opportunities for the population, however, it is also a progression largely responsible for the disconnection between people and nature. The competition for space leaves little room for nature and combined with busy modern lifestyles it is likely to result in a decline in experiences of the natural world (Cox et al., 2018). Already during the early 20th century, many architects demanded a reintegration of nature in cities and spread-out urban concepts like Ebenezer Howards "garden city" promoted a balance or even a fusion between town and country, between human society and beauty of nature (Bridge and Watson, 2002). However, the need for housing and the shift to a service-based economy lead to increased densification of the urban environment. The lifestyle that came along with modern cities and globalization is defined by consumption, mass media, and technocratic values that represent "city life" (Bookchin, 2017b). With food being bought and a constant availability of seasonal goods, the impact of resource consumption is hard to understand. Complex logistic chains further this confusion of humanities impact of consumption. This "urban culture" is produced, packaged and advertised as a part of citizens leisure time instead of being infused by the daily life and tradition (Bookchin, 2017b). The boundary between cities and rural areas begins to vanish as urbanization leads to homogenous entities of urban space that lost the distinctive values of the former concepts and replaces them with anonymity (Bookchin, 2017b).

The weakened connectedness to nature resulting from this urban environment can be held responsible for a weak human-nature connection, thus, also responsible for a lack of knowledge and empathy for nature. However, this does not mean that there is no nature in urban environments. In fact, nature can be encountered almost everywhere in cities. Contact with wildlife, flowering plants, trees, or beautiful sunrises and sunsets lets most people wonder at the beauty of nature (McEwan, Ferguson, Richardson and Cameron, 2020). On the other hand, cities and their fast-paced lifestyles often don't leave time and space for these encounters.

WHAT RECONNECTS US TO NATURE?

Developing strategies for reconnection to nature has been a topic of many recent research papers (Ives et al., 2017) but remains a difficult area due to the subjectiveness of the human-nature connection. Abson et al (2017) investigated an approach based on leverage points that are categorized by the possible impact they might have on people and society. The concept of leverage points is inspired by Meadows (2010) who described how various adjustments to parameters, rules, and information flows can change entire systems. This concept has been adapted to the five connections to nature - material, experiential, cognitive, emotional, and philosophical - and organizes these connections from shallow to deep leverage points according to their potential to strengthen the human-nature connection (Ives et al., 2018). The material connection holds the least potential to reconnect people to nature as it is based on the consumption and use of resources, thus, offering only little potential to connect people to nature. The experiential connection offers more leverage as it fosters direct interaction with the natural environment, however, just the experience of nature has less impact than the cognitive, emotional, and philosophical connection. Knowledge, awareness, and environmental beliefs are part of the cognitive connection. Empathy and feelings of attachment are part of the emotional connection. And finally, our worldview, which greatly defines how we behave and how we treat our environment, is part of the philosophical connection (Figure 5). These connections offer the best leverage point to transform individuals and culture towards a more sustainable society, however, changing the cognitive, emotional, and philosophical connection of people to nature is difficult, even more, during adulthood. Thus, targeting these connections during early childhood is more likely to lead to a strong and stable human-nature connection as an adult. For example, children that visited forest kindergartens created a deep connection to nature during their childhood and are more likely to have pro-environmental beliefs during adulthood (Ives et al., 2018). The potential of forest kindergartens will be explored further and put into an urban context. Combined with biophilic design and a partly public program, it aims at reconnecting a larger group of people to nature.

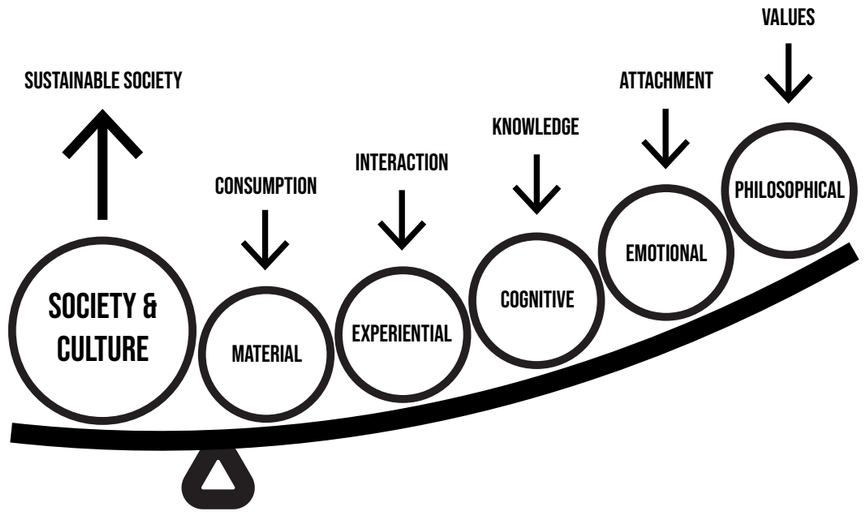


Figure 5. Leverage points (Kraemer, 2020). All rights reserved.

HOW CAN ARCHITECTURE RECONNECT PEOPLE TO NATURE?

The different levels of our connection to nature, the importance of that connection, as well as theories of why it became weaker and how it can be strengthened, have been well described in the previous texts but how can this information be implemented in architecture and building design? One of the answers to this question lies in the very beginning of all design processes - leaving space for nature and including it in the program of the design. As stated before, the rapid growth of cities is the strongest factor for the extinction of nature experiences in urban environments (Cox et al., 2018) and the trend to integrate nature in building design has just recently become popular. However, these attempts focus mostly on green facade systems and green elements that don't allow the same level of connection between people and nature as horizontal natural areas that can be explored and interacted with.

Seeing architecture as something that destroyed many natural environments in the way that it claimed its' space and transformed it into an entity of the urban development leads us to the question of how something that takes away nature spaces can reconnect us to it. I don't think that architecture alone can rebuild the connection between people and nature, however, I do think that it has an essential role in the process of reconnection. Using architecture to recreate nature experiences in the urban environment focusses on the experiential connection between people and nature, thus, using a weak leverage point to achieve changes towards a sustainable society. On the other side, using architecture to create environments that host pedagogical functions that build up emotional attachment and philosophical values towards nature can be an effective measurement to strengthen the human-nature connection. With the combination of architecture providing natural features in the urban environment and pedagogical functions or practices to make use of these features, there is an opportunity to foster change in our society.

However, the design profession alone cannot achieve this combination of space and functionality without convincing stakeholders of its importance. After all, architects design buildings and urban spaces based on the programs and functions defined by clients and stakeholders which makes it even more important for architects to argue for design elements that feature natural elements regardless of their practical functionality. As a conclusion, I would say that architecture cannot reconnect people to nature on its own but has a great responsibility to minimize the impact on nature. Being aware of that responsibility is a key factor in a sustainable society and urban environment. Too many projects that could feature natural elements and spaces did not implement them in their design because of cost reasons or challenges in the building process. Especially learning facilities like schools and kindergarten could benefit from more natural spaces as they foster cognitive development and benefit the learning environments.

ARCHITECTURES POTENTIAL TO AFFECT THE HUMAN NATURE CONNECTION NEGATIVELY IS GREATER THAN ITS POTENTIAL TO AFFECT IT IN A POSITIVE WAY.

THE FOREST KINDERGARTEN

BUILDING AN EARLY CONNECTION TO NATURE

Forest kindergartens focus entirely on the experience, exploration, interaction, and connection to nature. Letting children build up this intimate human-nature connection leads to pro-environmental behavior and a strong feeling of responsibility for nature in adulthood (Ives et al., 2018). While it is difficult to build this connection during adulthood, where people's characters and values are already shaped, the concept of forest kindergartens already starts at the very beginning of human development.

A PEDAGOGICAL CONCEPT

The forest kindergarten evolved during the 1960s in Scandinavia and gained popularity especially during the 1990s, with strong development in Germany. Nowadays, forest kindergartens emerge all over the world (Sobel, Kenny, Finch, and Bailie, 2016). Forest kindergartens put an emphasis on the natural outdoor experience and schedule 75% to 100% of the day for outdoor activities. The characteristic feature of forest kindergartens is the full immersion into the forest without any boundaries like walls or fences (Del Rosso, 2010). Nature preschools adapted this concept but put it into the context of urban nature centers and combine it with a mix of 50% outdoor activities and 50% indoor activities (Sobel et al., 2016). Both concepts became more popular recently and in times of dense urban environments, the benefits of open spaces, fresh air, and natural features are recognized by many childhood educators. The early experience and bond with nature serve as a foundation for environmental values that lets children mature into responsible adults (Sobel et al., 2016).

ORGANIZATION OF A FOREST KINDERGARTEN

Most of the time in a forest kindergarten is spent outdoors (Lysklett, 2017) which creates numerous requirements to the infrastructure of the kindergarten and to the children. Borders, clothes, equipment, and activities have to be defined, planned or thought out. A day in a forest kindergarten relies heavily on weather and other natural phenomena, thus, offering less potential for fixed schedules.

CLOTHING

Because of changes in weather and different seasons it is necessary to provide the right clothing to children to ensure that they can experience and enjoy nature regardless of climate changes. Lysklett (2017) observed that most forest kindergarten either hand out a list of necessary equipment to the parents or let parents decide what the appropriate clothing for the day is. The advantage of handing out a list of equipment is that it can be stored in the kindergarten facilities, thus, offering flexibility towards weather changes.

KINDERGARTEN ENVIRONMENT

Many examples of forest kindergartens abandon the concept of an enclosed environment for the children (Lysklett, 2017). Instead of fences or other built borders they often use symbols and landmarks to define areas that are not allowed to leave. This fosters a self-determined behaviour but also respect for rules.

EQUIPMENT

Usually, children, as well as staff, carry a backpack with necessary utensils (Lysklett, 2017) like toilet paper, first aid kits, snacks, drinks, blankets, and more. However, this depends on the infrastructre of the kindergarten. Some facilities only have small huts as a safe space, other might have a bigger scale building with kitchen, toilets, and community room.

CHARACTERISTICS

Lysklett (2017) found several characteristics of forest kindergartens in Sweden, Norway, Denmark, and Germany that distinguishes them. Swedish institutions stood out because of a narrative that is often used as a framework for activities. This narrative uses fictive characters that represent water, mountains, plantes, and other elements to create excitement and courage to explore. Swedish kindergartens also often have their own chef that prepares hot lunch for the children. Danish kindergartens stood out because of their frequent use of buses to make trips to more remote natural areas, which could be due to a denser urban environment. German forest kindergartens often had a special focus on learning activities, thus, adding a fixed element to the daily schedule. A special quality of Norwegian forest kindergartens is that staff members should especially support children in their spontaneous ideas.

URBAN ADAPTATION

A key question for every nature-based program is the location. Especially in dense urban environments, it is very difficult to find a space that can accommodate the functions of a forest kindergarten while being in reach to families and children. Thus, most kindergartens and schools tend to naturalize spaces instead of aiming for the full experience and character of forest kindergartens. Especially the feeling of a borderless environment that can be freely explored by the children is hard to achieve in an urban setting, however, it is mostly because of the scepsis of stakeholders, parents, and officials that alternative concepts like forest kindergartens are not implemented on a regular base (Sobel et al., 2016).

Figure 6 (top). Waldkindergarten, Dresdner Heide (Gebhardt, 2019). CC BY-SA 4.0.
Figure 7 (bottom left). Children playing in nature (majorbonnet, 2010).CC BY-NC-SA 2.0.
Figure 8 (bottom right). Children in outdoor cloth, Hürth (Schinkel, 2017). CC BY 2.0.

PROJECT CONTEXT

To explore the concept of the forest kindergarten in an urban context, an existing building in a dense urban environment is selected. The site is located in Gothenburg and combines features like water, hilly landscapes, historic context, and modern urban development. This combinations holds the potential to test implementing the forest kindergarten in a new setting.

SWEDEN

Swedens landscapes offer a great variety of nature ranging from mountains, tundras, and forests to lakes and long coastal areas (Figure 9). This abundance of nature is a direct contrast to Sweden's current urban development. While large parts of the country are predominantly natural and leave many opportunities for nature experiences, cities like Malmö, Göteborg, and Stockholm have become center points for urbanization.

Figure 9. Sweden and location of Gothenburg (Kraemer, 2020). All rights reserved.

GÖTEBORG

As Swedens second biggest city, Göteborg is a modern and industrialized city. With the Göta-älv river that runs through the city and the islands in front of Göteborgs coast, there is a strong topographic and historic connection to water (Figure 10). A large nature reserve that spreads out towards the south-east of Göteborg offers many opportunities to experiences forest flora and fauna. However, the city itself is shaped by the shipping industry, harbors, and dense urban fabric.

Figure 10. Göteborg and location of Masthugget (Kraemer, 2020). All rights reserved.

GÖTEBORG STIGBERGET

The site of the project is located in Gothenburg's city district Majorna-Linné in the area of Stigberget (Figure 11) . The district is in close connection to the Göta-Älv river, however, the entire waterfront is occupied by industrial buildings and thereby not accessible as a nature retreat. To the south-east, the terrain becomes higher, rocky, and forms a relatively high hill that accommodates the church Masthuggskyrkan. To the south, there is a recreative green area with a small playground for children and to the west, a rather dense residential area starts. The center of this area is an old market place that is located in front of the historic Gathenhielmska building. Directly connected to that marketplace, a parking lot and the old Kaparen Biograf, a cinema from the 1940s, present a good opportunity for new development.

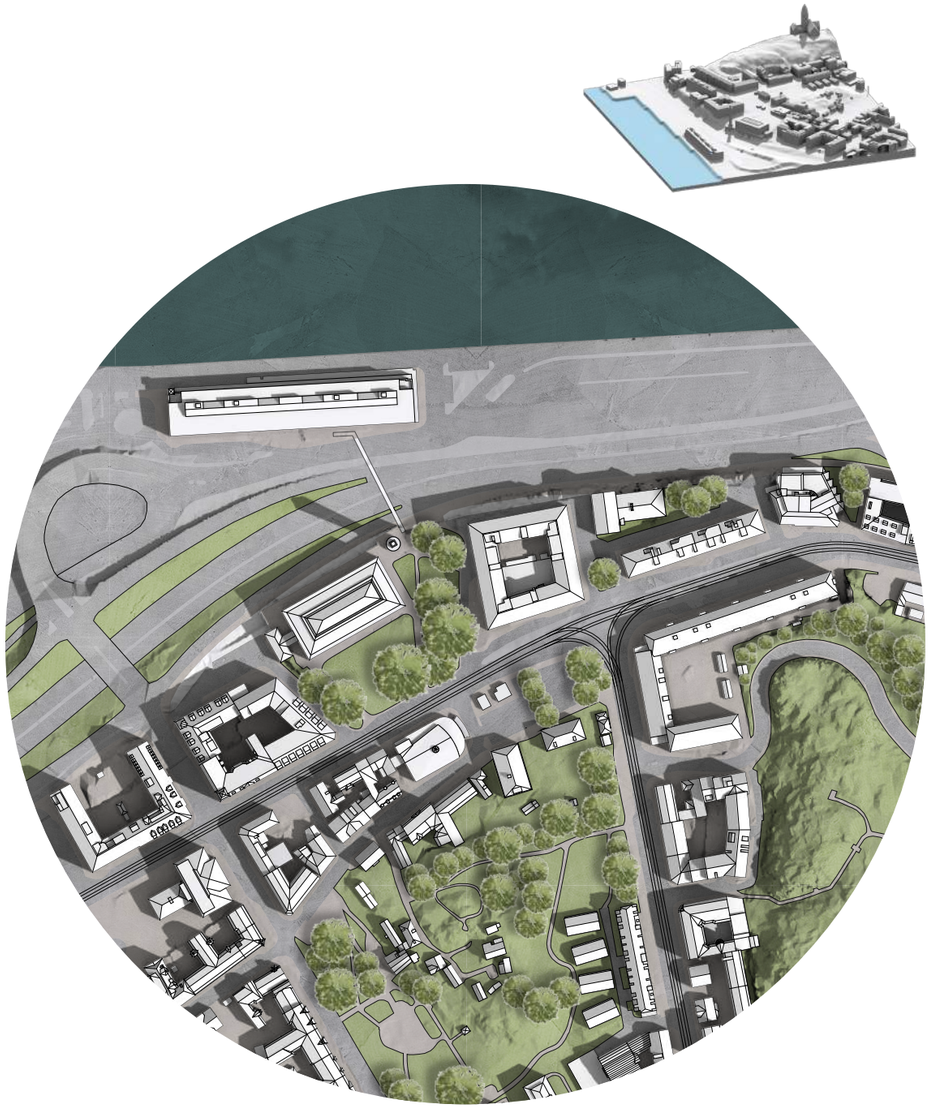


Figure 11. Göteborg Stirgberget (Kraemer, 2020). All rights reserved.

SITE - STIGBERGET & KAPAREN BIOGRAF

The project site lies in the middle of Stigberget and connects directly to the historic marketplace Stigbergtorget (Figure 12). The vicinity to the Göta-älv river, Masthugget (the hill), and the green area were strong reasons for me to choose this particular site. An even stronger reason is the old cinema building, Kaparen Biograf, and the parking lot in front of it that promises many opportunities for a building design that fosters a connection to nature. The historic aspect of the Kaparen Biograf already established connections to many residents in that area and can increase the engagement that people show towards new developments.

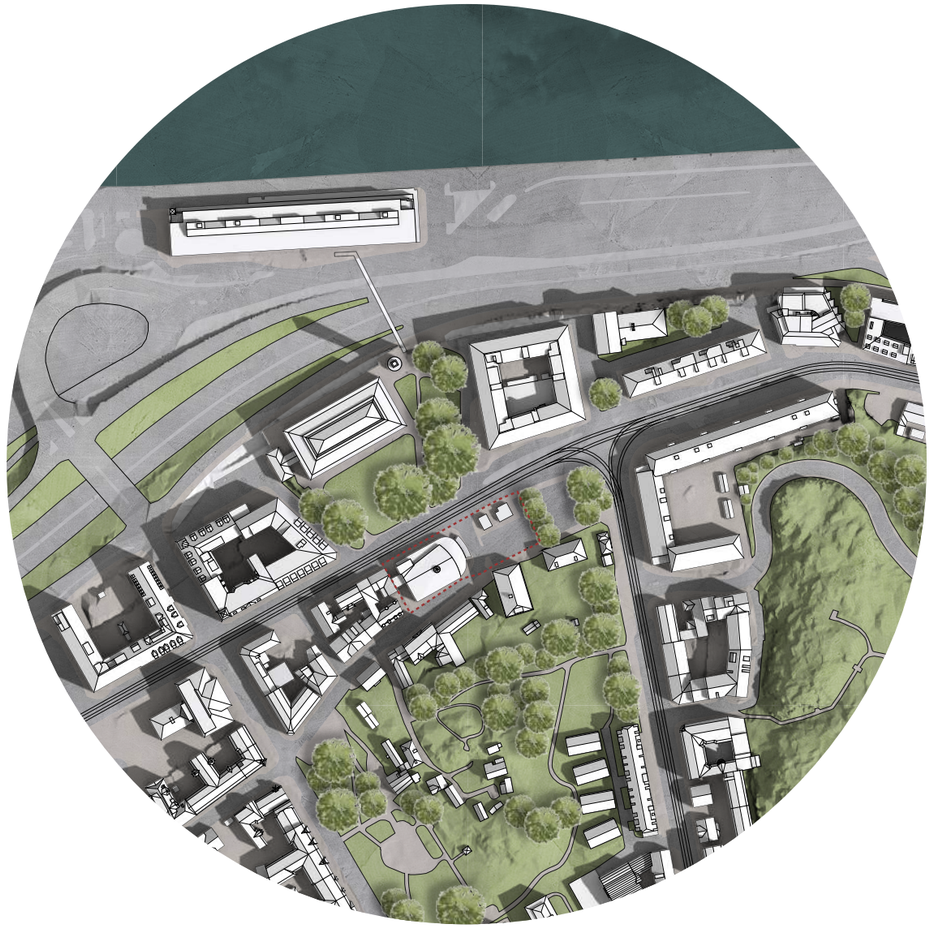


Figure 12. Stigberget project site (Kraemer, 2020). All rights reserved.

FUNCTIONS

The area around Kaparen Biograf accommodates various functions such as cafés, bars, clubs, restaurants, and supermarkets (Figure 13). There is also a maritime museum with an aquarium (sjöfartsmuseet akvariet) located across the street of the Kaparen Biograf. The spacious front yard of the museum, as well as the park that starts at the backside of the surrounding buildings next to the old cinema offer qualities to the site that can be connected to.

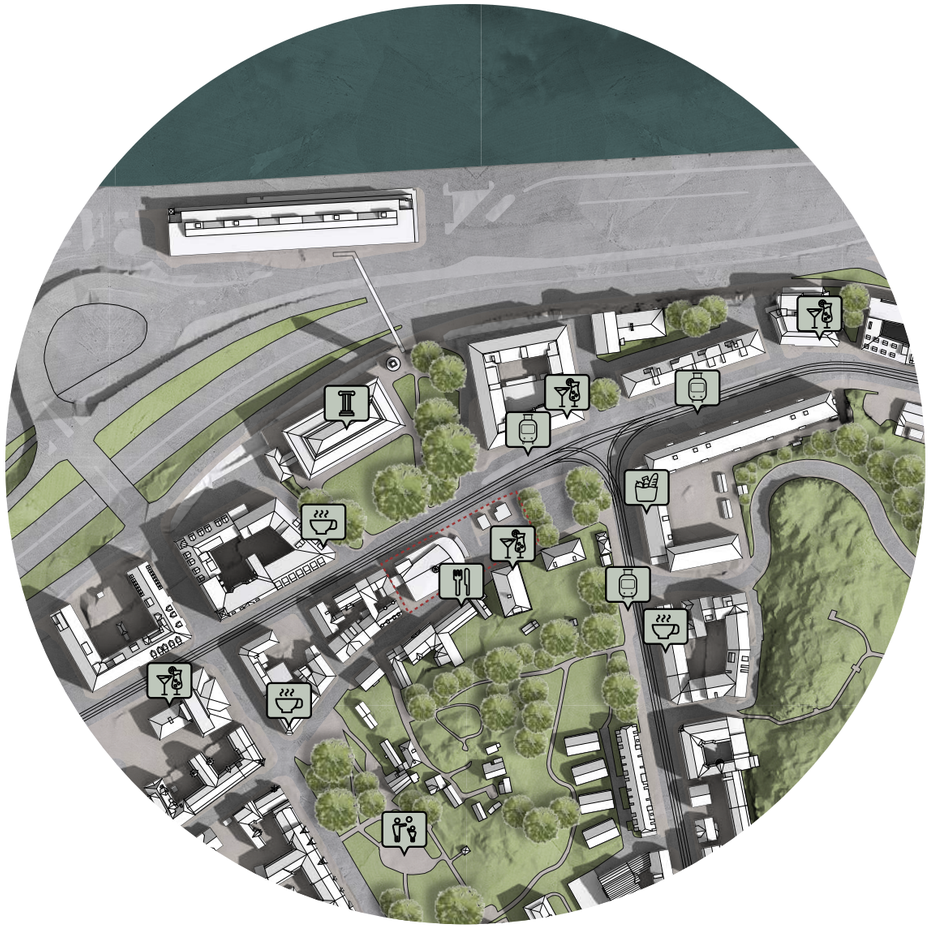


Figure 13. Stigberget functions (Kraemer, 2020). All rights reserved.

SURROUNDING NATURE & ACCESSABILITY

The amount of nature and greenery that the site plan suggests is smaller than anticipated after a closer look at the site. Many of the green areas are inaccessible because of private functions or steep and rocky terrains (Figure 14). Especially the park offers only a few opportunities for recreational activities and should be more integrated into this area.

Inaccessible areas

Figure 14. Stigberget green areas and accessability (Kraemer, 2020). All rights reserved.

SUN STUDY

With the sun rising in the east, most of the sunlight will get to the relatively closed south facade of Kaparen (Figure 15). Due to its function, the building does not have many windows and the large cinema hall would be quite dark. However, opening up the facade towards the south could create interesting opportunities for the design of the interior as well as the exterior.

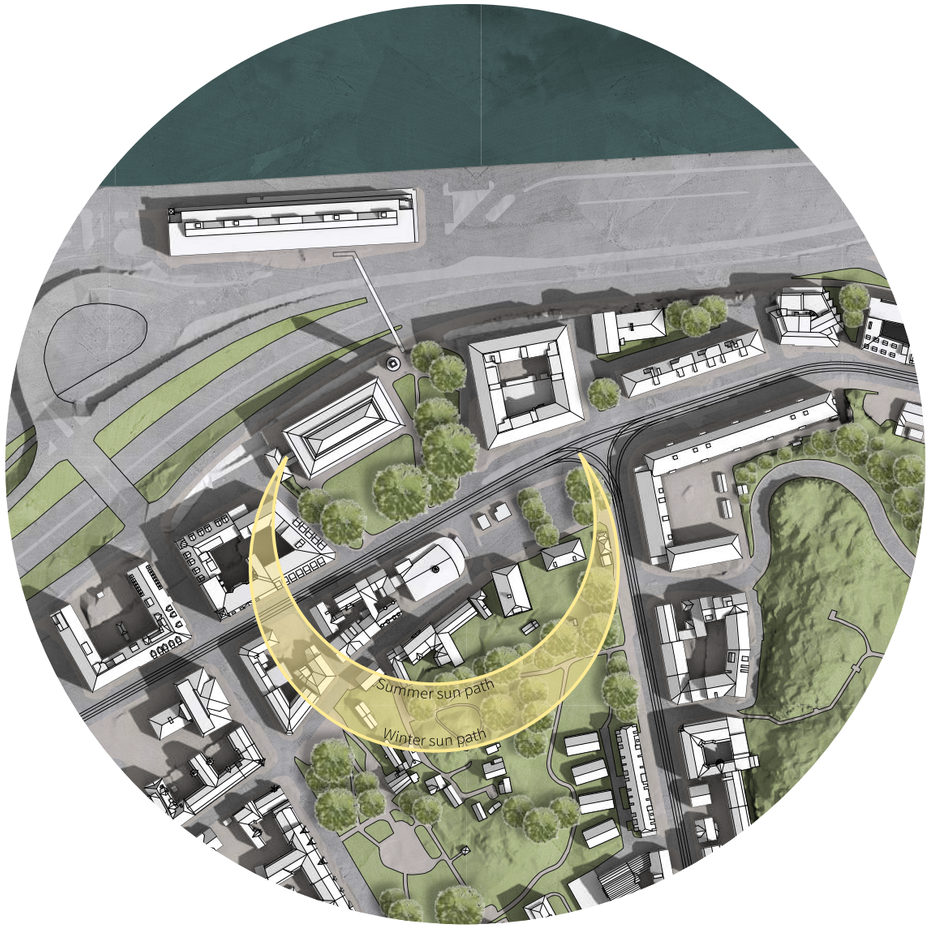
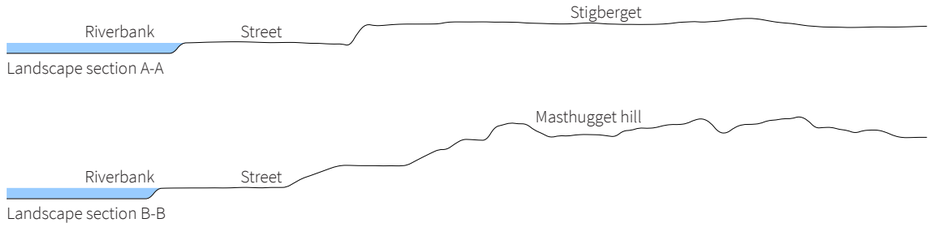


Figure 15. Stirgberget sun path (Kraemer, 2020). All rights reserved.

AXES AND VIEWS

The site presents multiple options to make connections to the surrounding areas. A visual connection to the waterfront could be created between the nearby residential building and the museum. The close vicinity to the museum front yard could result in a symbiosis between Kaparen Biograf and the museum. The characteristic landscape allows visual connections to the lower riverbank as well as the higher Masthugget hill (Figure 16).



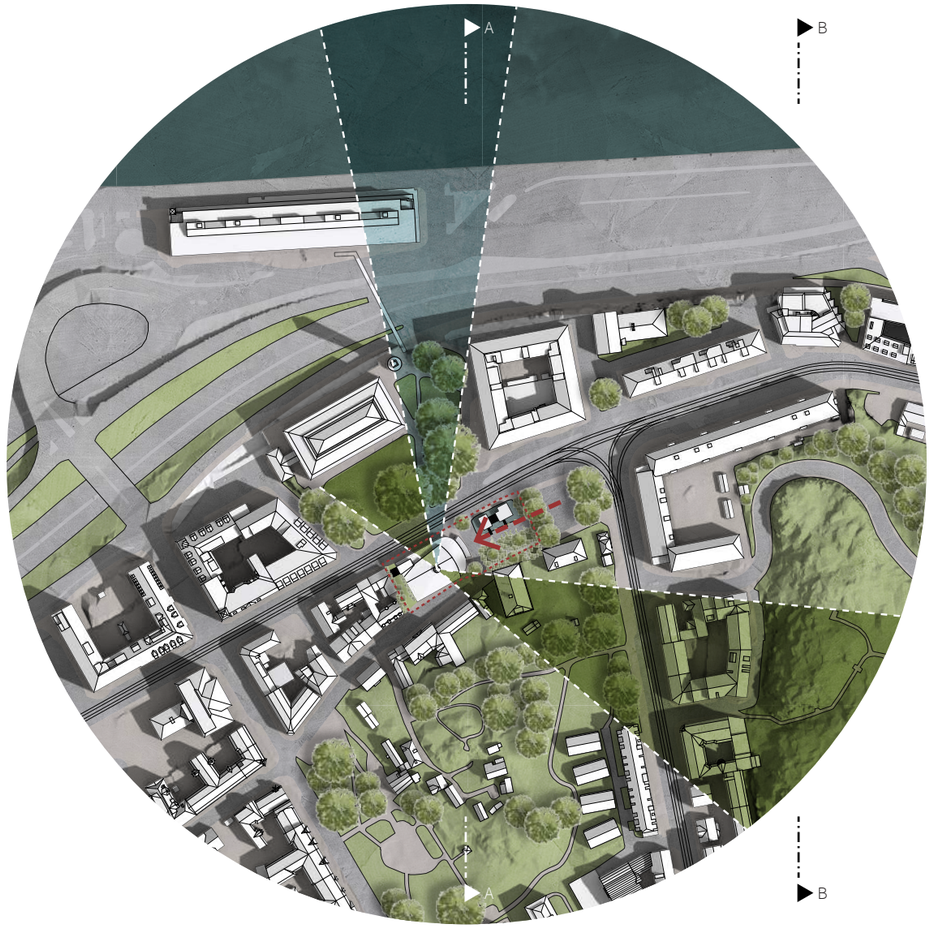


Figure 16. Stigberget visual connections and landscape sections (Kraemer, 2020). All rights reserved.

SITE PICTURES

The condition of Kaparen Biograf does not live up to the former prestige and importance that the building had. The facade has been vandalized with graffitis and all entrances and windows of the old cinema have been sealed. It has the appearance of an abondoned building. A treeline divides Kaparen and the parkling lot in front of it from the historic marketplace and the Gathenhielmska building. The maritime museum and the memorial next to it is across the street and leads the way to the Göta-älv river (Figure 17).

Figure 17. Collage Stigbergstorget (Kraemer, 2020). All rights reserved.

BUILDING ANALYSIS

KAPAREN BIOGRAF

This old, almost historic, cinema was planned and constructed in the 1940s and got its' name from Captain (Kaparen) Lars Gathenhielmska and the close vicinity to the Gathenhielmska building. The main entrance on the east facade guided visitors to the entrance hall of the cinema (Figure 18) while three separate commercial areas found their place on the north facade (Figure 19) and contribute other functions to the urban environment. The building has changed its' functions several times during its' lifetime.

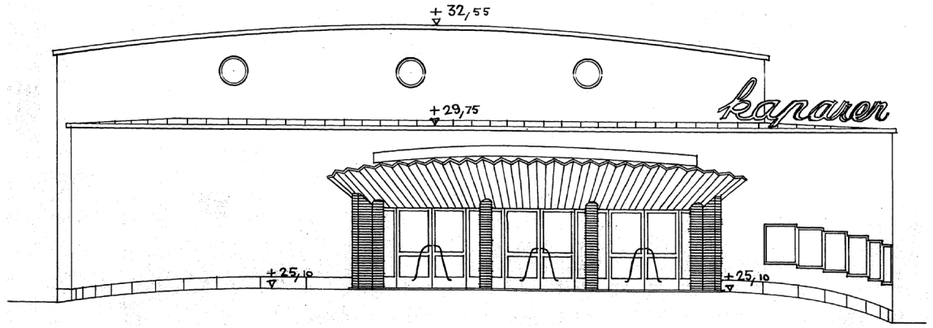


Figure 18. East facade (Göteborg stadsarkiv)

The north facade is characterized by a rather conventional facade that blends in with the neighboring buildings (Figure 16). Architect Nils Olsson described the project as difficult since tight building regulations limited the building height. It was also problematic to find a balance between an outstanding building that reveals its purpose at first glance and a building that connects to the neighboring buildings.

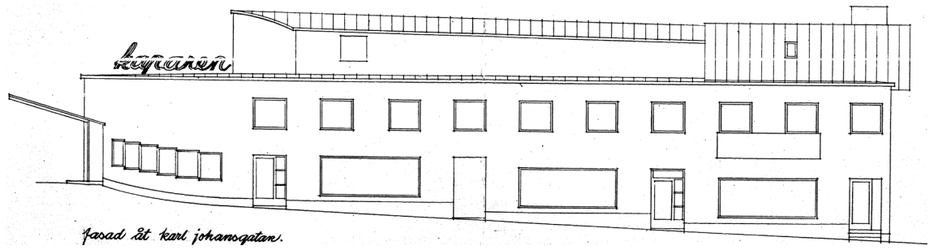


Figure 19. North facade (Göteborg stadsarkiv)

The interior of the cinema is very clear. A functional core separates the entrance hall from the cinema hall. The building makes use of the sloping terrain to arrange the seats in the cinema hall with a height difference. This also creates room below the seats for bathrooms and other rooms. The three shops on the north facade, as well as the office floor above the stores, are completely separated from the cinema functions and only accessible from the outside.

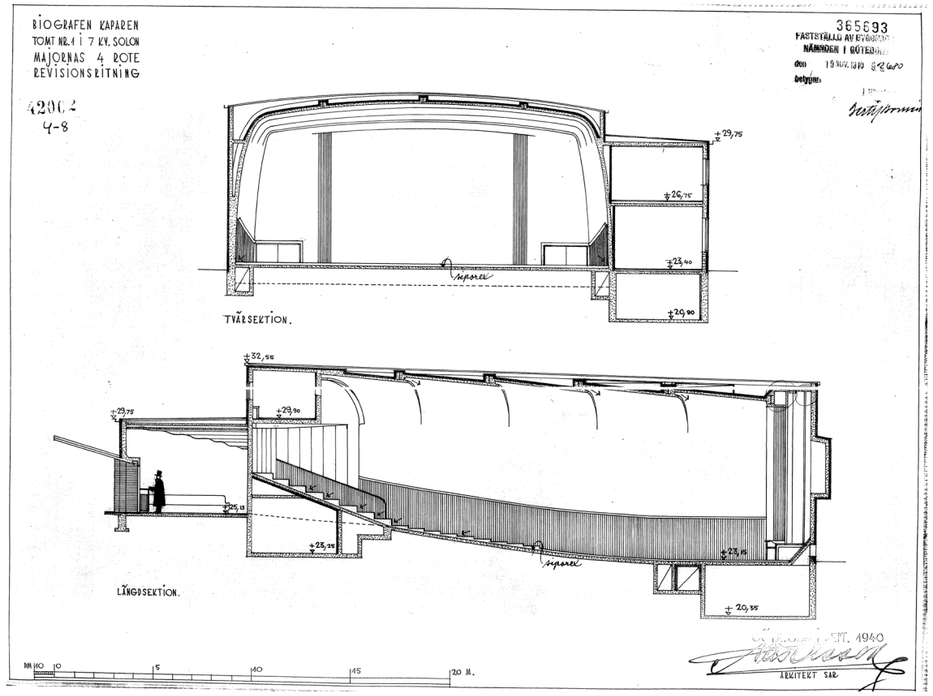


Figure 20. Sections (Göteborg stadsarkiv)

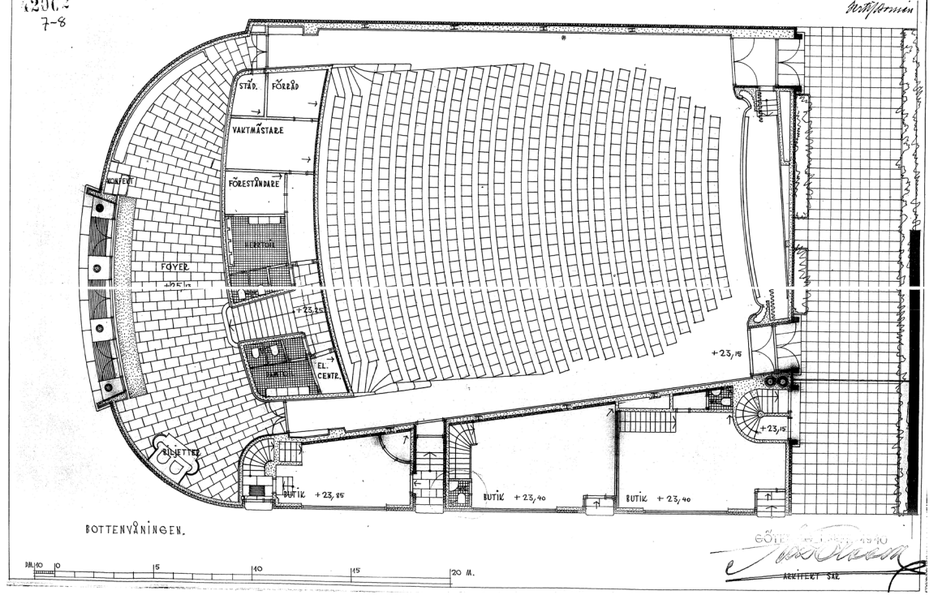


Figure 21. Ground floor (Göteborg stadsarkiv)

KAPAREN POST OFFICE

The biggest changes to Kaparen have been made during its transformation to a post office in 1984. The sloping floor of the cinema hall (Figure 20) has been evened out to create a big open space that can accommodate several service points for customers of the post office (Figure 22). In addition to the changes to the floor, the entrance area has been reduced in its size and office rooms have been set up along the entrance room (Figure 21 & 23). Finally, the high ceiling of the cinema hall allowed for a gallery, thus adding another level to the building (Figure 22).

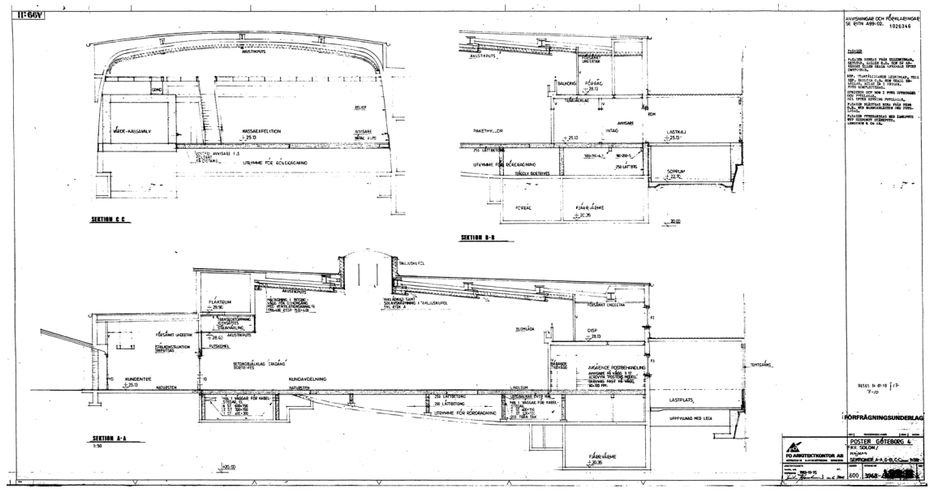


Figure 22. Sections (Göteborg stadsarkiv)

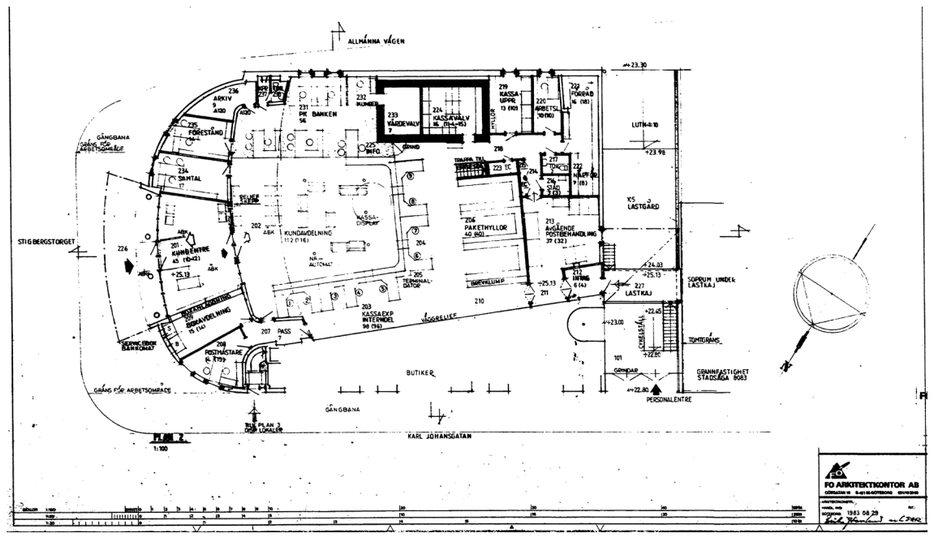


Figure 23. Sections (Göteborg stadsarkiv)

KAPAREN SUPERMARKET

The changes made during the use of Kaparen as a supermarket from 2008 to 2009 are relatively small compared to the previous changes, however, it shows the flexibility that the building offers. The large open space that the cinema hall provides can host functions that require small rooms as well as large and open floorplans. The entrance area has become the cashiers' point, the cinema hall has become the market hall (Figure 24), and the area below and on the gallery has become the warehouse and staff area of the supermarket (Figure 25).

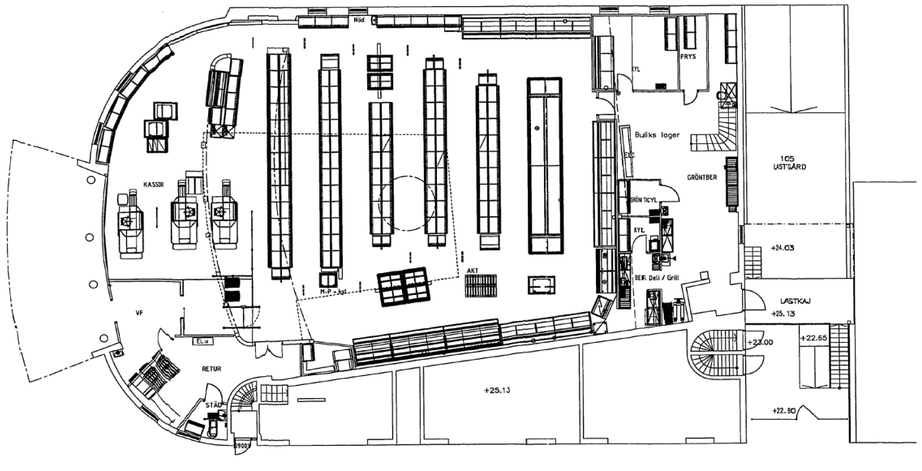


Figure 24. Kaparen floorplan 1 (Göteborg stadsarkiv)

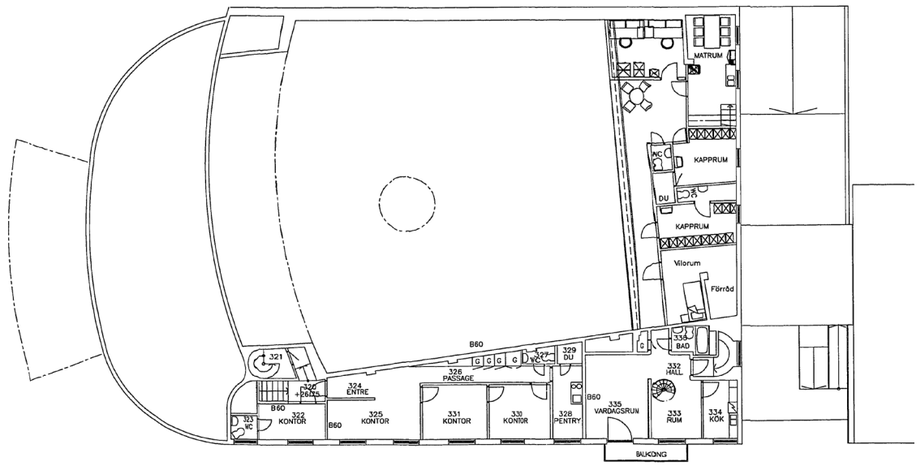


Figure 25. Kaparen floorplan 2 (Göteborg stadsarkiv)

DESIGN CONCEPT - FUTURE USE

KAPAREN "URBAN FOREST" KINDERGARTEN

Since the usage as a supermarket, the old Kaparen building has been empty and waiting for a new function. Using the iconic building as a testing ground for an urban interpretation of the forest kindergarten for children between one and five years and a public green space where people can experience and connect with nature adds value to the surrounding area and makes use of the potential that the old cinema holds. By utilizing the large open space and the different height levels within the building it is possible to create an interesting and diverse environment for children to explore. As the description of forest kindergartens already suggested, children should explore the area and structure their days by themselves, thus, the program of the kindergarten should be flexible and include only necessary functional areas like toilets, staff rooms, and a kitchen. To create the connection between children and nature it is important to work on the different scales that have been presented in the theoretical part of this thesis.

REVEALING URBAN NATURE

A first step to create nature experience and make nature present in the design is to reveal the already existing nature in urban environments. This includes weather phenomena just as much as the flora and fauna that exist in cities. Including environmental features in architectural designs is one of the six biophilic design elements mentioned in Kellerts, Heerwagens, and Madors (2008) book about biophilic design. However, revealing the existing environmental features rather than just including new natural elements is important for creating an understanding of what modern urban environments do to nature and how normally suppressed natural elements find there way back into the city or building. This could include roots growing through the pavement, moss growing on the walls or roofs, animals nesting on the facade, or rain coming to the interior spaces.

EXPERIENCE OF NATURE

In addition to revealing and introducing nature to the design, it is important to create spaces and areas that enable the children to experience and explore nature by themselves. This means that there has to be a variety of spaces and a playful, intuitive way of connecting the different areas. Areas that have different qualities and feature different natural elements that distinguish them from each other and convey different atmospheres for the kids to experience. However, experiencing nature alone is not enough to build up a strong connection to it during childhood. However, interacting with nature is even more important for a strong human-nature connection.

INTERACTION WITH NATURE

Interacting with nature is one of the best ways to create a strong human-nature connection. Fostering an active engagement between children and the natural environment through various activities builds a strong bond which in return leads feelings of affection and responsibility for nature. Interacting with nature can mean many different things and can range from playing with sand to growing plants or taking care of animals. Implementing different opportunities for interacting with nature will be a key to create the urban version of a forest kindergarten (Figure 26). The variety of zones, the playful and free pathways to explore the building, and the many spaces that enable nature to take a place in the building should create the feeling of an environment without boundaries.

CONNECTING TO NATURE

The connection to nature is something that needs time to grow. Exposing children to natural features and engaging them in activities that include nature helps doing that from an early age on. In addition to the experiences inside Kaparen, it is important to also connect to the natural elements that surround the site. Creating a visual connection to the Göta-älv waterfront as well as to the Masthugget hill helps to make the topography more noticeable in the city.

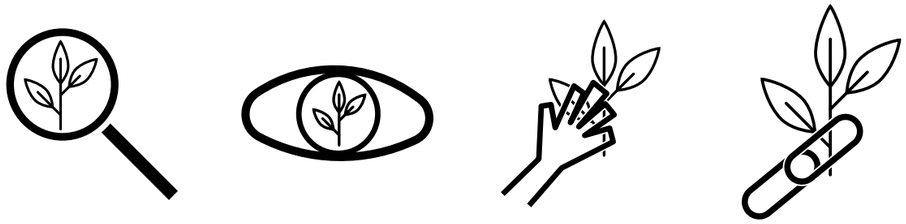


Figure 26. Reveal, experience, interact, and connect (Kraemer, 2020). All rights reserved.

BIOPHILIC DESIGN AS DESIGN PRINCIPLES

Biophilic design describes the transfer of the concept of biophilia to the design profession and the attempt to incorporate its values into buildings - an attempt that is rather difficult since our understanding of the human-nature connection still needs to be further explored (Kellert, Heerwagen and Mador, 2008). In Kellerts book *Biophilic Design*, a number of six design elements are presented that include around seventy attributes that can lead to a biophilic building. Several of these attributes are chosen based on the potential in them to create nature experiences and connections which take place on the building scale and the vicinity around it (Figure 27). References for these attributes offered a good starting point and inspiration for the urban forest kindergarten in Kaparen.

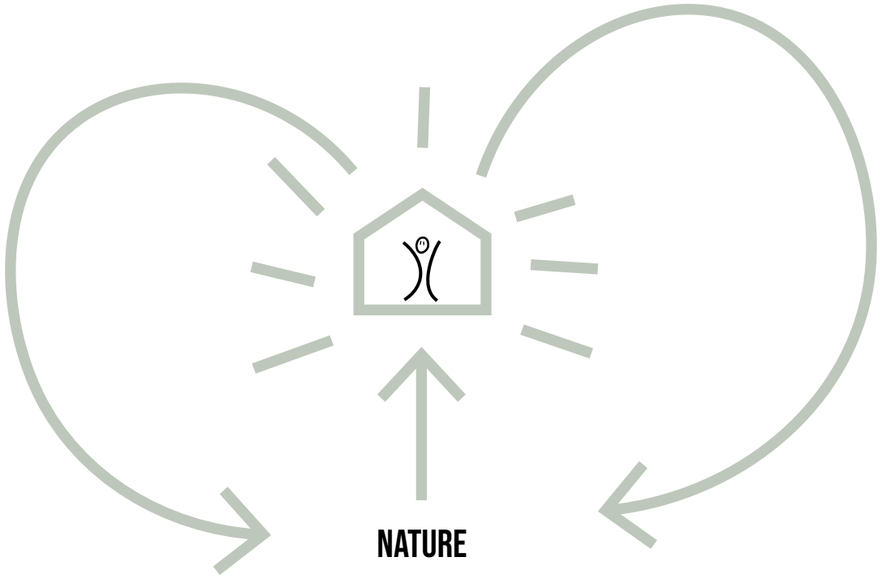


Figure 27. Biophilic design (Kraemer, 2020). All rights reserved.

Environmental features

Color
Water
Air
Sunlight
Plants
Animals
Natural Materials
Views and vistas
Facade greening
Geology and landscape
Habitats and ecosystems
Fire

Natural shapes and forms

Botanical motifs
Tree and columnar supports
Animal motifs
Shells and spirals
Egg, oval, and tubular forms
Arches, vaults, domes
Shapes resisting straight lines & right angles
Simulation of natural features
Biomorphy
Geomorphy
Biomimicry

Natural patterns and processes

Sensory variability
Information richness
Age, change, and the patina of time
Growth and efflorescence
Central focal point
Patterned wholes
Bounded spaces
Transitional spaces
Linked series and chains
Integration of parts to wholes
Complementary contrasts
Dynamic balance and tension
Fractals
Hierarchically organized ratios and scales

Light and space

Natural light
Filtered and diffused light
Light and shadow
Reflected light
Warm light
Light as shape and form
Spaciousness
Spatial variability
Space as shape and form
Spatial harmony
Inside-outside spaces

Place-based relationships

Geographic connection to place
Historic connection to place
Ecological connection to place
Cultural connection to place
Indigenious materials
Landscape orientation
Landscape defines building form
Landscape ecology
Integration of culture and ecology
Spirit of place
Avoiding placenessless

Evolved human-nature relationships

Prospect and refuge
Order and complexity
Curiosity and enticement
Change and metamorphosis
Security and protection
Mastery and control
Affection and attachment
Attraction and beauty
Exploration and discovery
Information and cognition
Fear and awe
Reverence and spirituality

Bold-written attributes are further investigated.

ENVIRONMENTAL FEATURES

From the various attributes that fall under the category of environmental features, I found the existential elements of our environment most important. Water, Air, Sunlight, and Earth (Geology and Landscape) together with flora and fauna (animals and plants) are the elementary parts of our planet. Implementing those attributes in design relates to nature or reveals urban nature. Finally, the attribute “views and vistas” is important for people to connect to the environment, scale and proportion is crucial for a pleasant experience.

WATER AS A DESIGN FACT

Water is an essential part of our evolution, it is necessary for any human to survive, thus, civilizations often evolved in the vicinity to oceans, seas, and rivers. Research has shown that, because of this fundamental connection to water, both, children and adults prefer scenes with water (Kellert and Wilson, 1993). Quality, quantity, movement, and clarity should be well defined when water is being used as a design element. The Jewel Changi Airport in Singapore (Figure 28) includes water with a huge artificial waterfall in the center of the building. A more subtle implementation can be seen at the BMW Group Pavillon (Figure 29 & 30), where water swells over the roof and creates a curtain of water in front of the facade.

Figure 28 (top left). Jewel Changi Airport, Singapore (Ang, 2019). CC BY-NC 2.0.
Figure 29 & 30 (top right & bottom). BMW Group Pavillon, London (eVolo, 2012). CC BY-NC-ND.

AIR AS A DESIGN FACTOR

Despite the invisibility of air, the effective and natural use of airflows instead of mechanic ventilation systems is preferred by people (Kellert, Heerwagen, and Mador, 2008) and leads to better user experience in buildings. Ancient buildings already made use of this natural ventilation concept by using wind towers (Figure 33) to provide the building with cool and fresh air. Making wind visible could be another use of air as a design factor. Observing trees and plants bending in wind (Figure 31), leafs falling and gliding through the air, or looking at curtains being blown into movement (Figure 32 & 34) showcases nature in a calming way.

Figure 31 (top). Plants in wind (Nash, 2013). CC BY-NC 2.0.
Figure 32 (mid left). Curtain Wall House, Japan (Herada, 2007). CC BY-NC 2.0.
Figure 33 (mid right). Wind tower, Bahrain (Donque, 2010). CC BY-NC 2.0.
Figure 34 (bottom). Curtain in Wind (Peiper, 2010). CC BY-NC-ND 2.0.

SUNLIGHT AS A DESIGN FACTOR

Light in general and sunlight, in particular, is one of the most important design factors. Daylight factors are even a fixed part of building regulations and have to fulfill certain criteria. Humans are generally day active and heavily rely on light to see. This reliance could explain why people prefer sunlight over artificial lighting whenever possible (Kellert, 2008). Sunlight changes during the day and over the seasons. Taking the sun path into account for design strategies is essential not only for good lighting conditions but also for the perception of time. Working with sunlight through openings in rooftops or walls (Figure 35), showcasing shadows that are casted by the sun (Figure 36) or using it for determining the daytime (Figure 37) can increase the meaning of sunlight in the built environment.

Figure 35 (top). Viewholes, Aarhus (Kraemer, 2019). All rights reserved.
Figure 36 (bottom left). Light and shadow, Aarhus (Kraemer, 2019). All rights reserved.
Figure 37 (bottom right). Aarhus University, Aarhus (Kraemer, 2019). All rights reserved.

PLANTS AS A DESIGN FACTOR

The Nordic pavilion at the Venice biennale (Figure 38 & 39) leaves trees untouched and builds its' structure around the branches, thus, letting nature in and out of the building. Plants reclaiming space by growing over floors and walls of buildings (Figure 40) can add a natural character to the otherwise planned built environment. Urban agriculture elements (Figure 41) and private roofterraces (Figure 42) can promote nature-based activities.

Figure 38 & 39 (top left & bottom right). Nordic Pavilion Venice Biennale (Patt, 2015). CC BY-NC-SA 2.0
Figure 40 (top right). Nature returns, Georgia (Kraemer, 2015). All rights reserved.
Figure 41 (mid). Urban agriculture, Göteborg (Kraemer, 2020). All rights reserved.
Figure 42 (bottom left). Green terraces, Copenhagen (Kraemer, 2019). All rights reserved.

ANIMALS AS A DESIGN FACTOR

Animals are usually not a design element but considering them as a design factor can lead to the implementation of habitats for insects, birds, fish, or even other animals. Bird houses (Figure 43) are probably one of the most common implementations of animals as a design factor. Insect homes (Figure 44) are easy to build and implement, however, inviting insects to a building is usually less attractive to people. Aquariums (Figure 45) offer an opportunity to get in touch with sea life and add a unique element to any space.

Figure 43 (top). Birdhouse sculpture, Neuss (Kraemer, 2018). All rights reserved.
Figure 44 (top right). Insect home (William, 2015). CC BY-NC-ND 2.0.
Figure 45 (bottom left). Aquarium, Enoshima (Takaku, 2005). CC BY-NC-ND 2.0.

VIEWS AND VISTAS AS A DESIGN FACTOR

I found this attribute important because views on nature have a significant influence on peoples wellbeing and health (Kellert, Heerwagen, and Mador, 2008). The feeling of connectedness to nature also varies with the scenery that is visible from windows. Interesting natural features (Figure 47) generally decrease stress levels while views on urban environments (Figure 46) increases them. Placing windows in a way that they focus on pleasant views (Figure 48) rather than bleak city skylines can make a huge difference.

Figure 46 (top). City skyline, Frankfurt (Kraemer, 2016). All rights reserved.
*Figure 47 (bottom left).*View tower window, Georgia (Kraemer, 2015). All rights reserved.
Figure 48 (bottom right). Window view, Georgia (Kraemer, 2015). All rights reserved.

PATTERNS AND PROCESSES

AGE, CHANGE, AND THE PATINA OF TIME

Showing or preserving the aging process of materials adds value to a building and represents the history and story behind it. To me, time is the most important part of nature since it is the very foundation of all changes and processes that take place. Making this invisible element more tangible by experiencing the effects of aging people, and especially children get a better understanding of it. Aged copper has an old and historic appearance (Figure 49), stains, moss, and damaged plaster reveal the effects that nature can have on a building when its not maintenanced anymore (Figure 51) and damaged elements (Figure 50 & 52) create an atmosphere that suggests the absence of people.

Figure 49 (top). Aged copper, Asheville, North Carolina (Tsuji, 2011). CC BY-NC-ND 2.0.
Figure 50 (top left). Old door, Laucha (Kraemer, 2017). All rights reserved.
Figure 51 (bottom left). Old dock, Helsingør (Kraemer, 2019). All rights reserved.
Figure 52 (bottom right). Old wall, Laucha (Kraemer, 2017). All rights reserved.

LIGHT AND SPACE

SPATIAL VARIABILITY

Creating a variety of spaces does not only benefit the flexibility of a building, it also provides the potential for exploration and discovery. Especially in a kindergarten, it is important to offer areas with different atmospheres, so that children can retreat from the active zones or be by themselves when they don't feel like interacting with other kids. The different spacial qualities in the reference pictures convey feelings and atmospheres that invite visitors to explore (Figure 54), stay (Figure 53), or move on (Figure 55). Combining these various atmospheres in a single building leads to a dynamic and flexible design.

Figure 53 (top). Maritime museum, Helsingør (Kraemer, 2019). All rights reserved.
*Figure 54 (bottom left).*Stairwell Kaiser Wilhelm Museum, Krefeld (Kraemer, 2016). All rights reserved.
Figure 55 (bottom right). Stairwell Kolumba, Cologne (Kraemer, 2015). All rights reserved.

INSIDE-OUTSIDE SPACES

Designing spaces that are pure indoor or outdoor spaces is important for the variety of rooms that should be available to the users of a building, however, I think that it is very important to create a visible connection between inside and outside. The Langen Foundation by Tadao Andō achieves this connection by a large glazed facade that creates a transition zone between the solid core of the building and the outdoor space. The library room of Aarhus University (Figure 58) introduces the outdoor space through large and almost floor to floor windows. However, the design of the residential building (Figure 57) does not find a good balance between indoor and outdoor areas. The two spaces are strictly seperated from each other which makes it difficult to create a connection to possible natural features, even though there are none in this example. I think it is important to create a strong link between inside and outside spaces to introduce natural features from the exterior to the interior (Figure 56).

Figure 56 (top). Langen foundation, Neuss (Kraemer, 2018). All rights reserved.
Figure 57 (bottom left). Residential building, Aarhus (Kraemer, 2019). All rights reserved.
Figure 58 (bottom right). Library Aarhus University, Aarhus (Kraemer, 2019). All rights reserved.

PLACE-BASED RELATIONSHIPS

HISTORIC CONNECTION TO PLACE

Historic elements in buildings or places are drivers for a strong connection between people and space. Choosing historic sites for new projects usually draws more attention since many people care for these areas, however, a succesful design that creates a dialogue between old and new has the potential to revitalize a building or to build a closer connection between people and place. By choosing a unique building like the Kaparen cinema, it is possible to use the already existing historic connection to enhance the bond between the natural features that have been implemented in the design. Iconic buildings like the cathedral in Cologne (Figure 59) are landmarks and part of the cities identity, old industrial areas like the Landschaftspark Duisburg-Nord (Figure 60) resemble large parts of the cities history and by transforming this area into a natural retreat, many of the residents find a new connection to nature. Artistic interpretations like the sculpture made from old windows in Bruges (Figure 61), refer to a past time and remember people of the history of this space. Implementing references to the history of places and buildings adds an important dimension to any design and helps people to connect to the site.

Figure 59 (top left). Kölner Dom, Cologne (Kraemer, 2015). All rights reserved.
Figure 60 (middle right). Landschaftspark Duisburg-Nord, Duisburg (Kraemer, 2019). All rights reserved.
Figure 61 (bottom left). Window sculpture, Bruges (Kraemer, 2015). All rights reserved.

EVOLVED HUMAN-NATURE RELATIONSHIPS

EXPLORATION AND DISCOVERY

To discover nature or explore an environment creates a strong connection between the person who is exploring and the environment that is interacted with. Features that encourage exploration do not necessarily have to be entirely natural. Artificial structures like the Tiger & Turtle sculpture in Duisburg (Figure 62) or climbing elements in an adventure park (Figure 63) invite people to explore the pathways or views that are provided by these structures. The kindergarten in Fuji (Figure 64) combines playful climbing and exploration by creating an accessbile rope mesh around a tree. In my opinion it is especially important to introduce these kind of elements in the urban forest kindergarten to foster childrens curiosity.

Figure 62 (top). Tiger & Turtle sculpture, Duisburg (FallD0wn75, 2012). CC BY-NC-SA 2.0
Figure 63 (bottom left). Forest climbing, Garmisch (Annoni, 2012). CC BY-ND 2.0
Figure 64 (bottom right). Fuji Kindergarten, Fuji (ForgemindArchimedia, 2011). CC BY 2.0.

DESIGN PROPOSAL

PLAZA CONCEPT

Starting with the parking lot in front of the entrance to Kaparen there is a first opportunity to create a plaza that introduces new natural features to the site (Figure 65). Picking up the nearby elements like the waterfront or the park and extending them on to the site will enhance the presence of these elements in the city and lead to a better connection between people and urban nature. By adding water to the plaza the public area becomes more attractive to a majority of people (Kellert and Wilson, 1993) and adds a unique character to the urban space. The red marked area represents the pathway that leads through the plaza and to the entrance of Kaparen. This area should become a transition zone between water elements and green elements, with plants growing through the pavement and growing over the borders of the green zone.

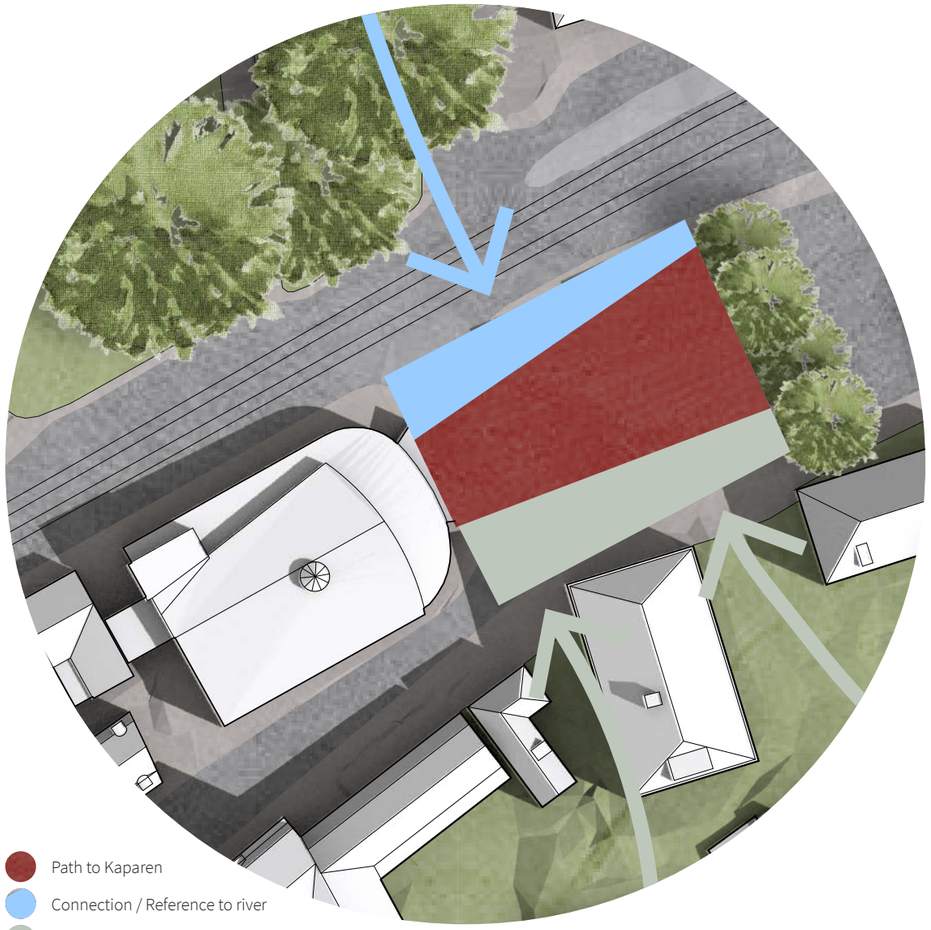


Figure 65. Stigberget plaza concept (Kraemer, 2020). All rights reserved.

PLAZA SITEPLAN

Pathways that lead through the green area enable visitors to experience the dense plantation from the inside and filter out the city atmosphere for a short duration. The plants should grow uncontrolled and wild, creating the character of nature claiming its space in the urban environment. The existing street food buildings can remain on the new water area and remain as pavilions on the pond. Accessible through wooden paths they become a new and unique feature in the city district. In addition to the plaza, the rear side of Kaparen opens up by demolishing the loading bay that was used during its time as a supermarket. This does not only create new access points to Kaparen but also new pathways to the park in the southwest of the area (Figure 66).

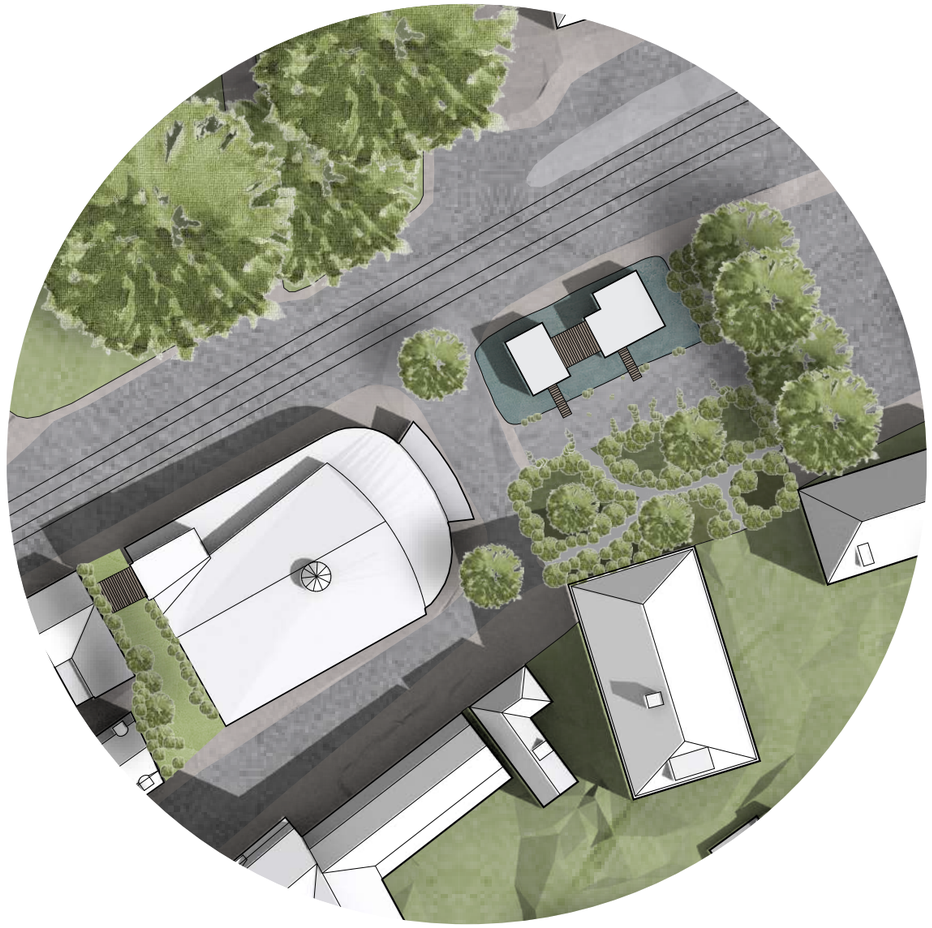


Figure 66. Stigberget plaza (Kraemer, 2020). All rights reserved.

KAPAREN KINDERGARTEN - TRANSFORMATION

To create an environment with many natural features and plenty of ways to explore them the old building has to be transformed or at least extended with structures for plants to grow on and elements to make spaces more usable. The elements that have been added will be described step by step, however, the general concept is to enclose the building with a scaffolding that enables plants to grow on the outside and to create new openings in rooftop and facade to connect the interior spaces of the cinema with the outside (Figure 67). In addition to the transformations of the existing building fabric, there will be elements added that create new links between spaces, extend rooms of the cinema, or ensure the safety and user-friendliness.

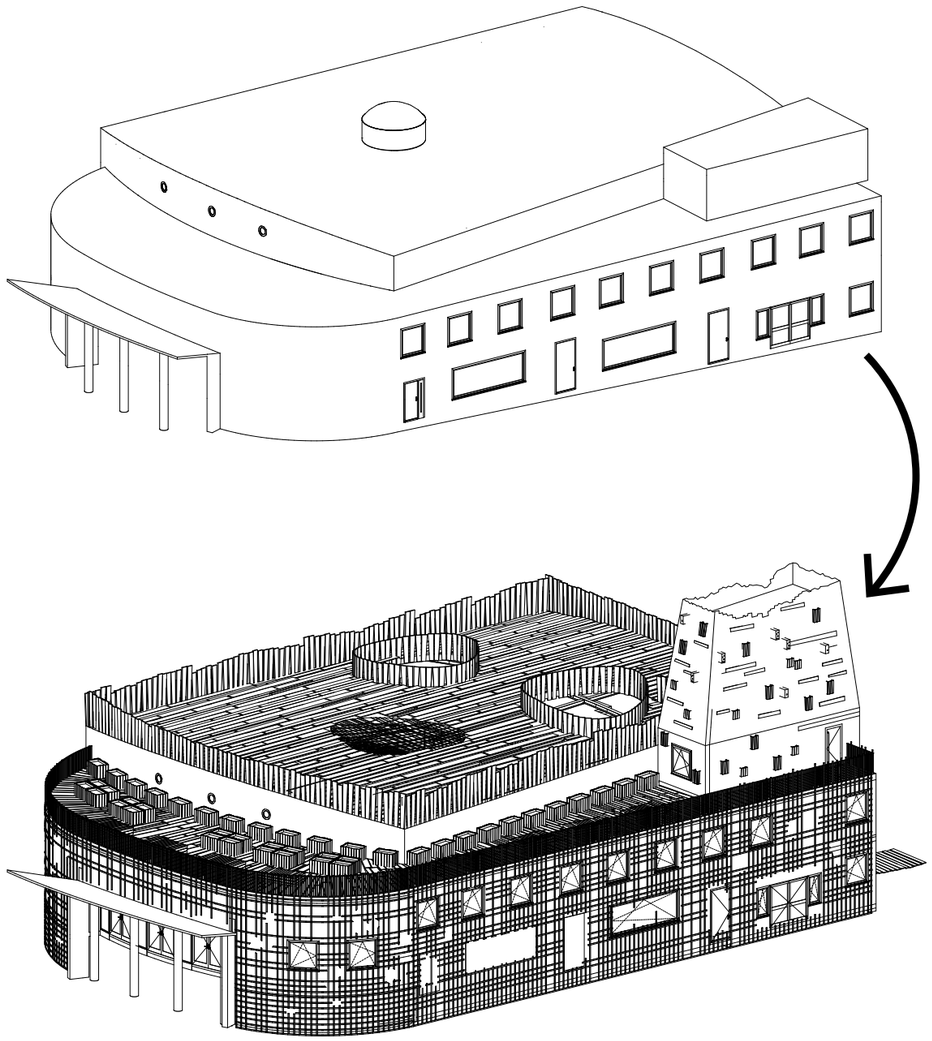


Figure 67. Kaparen transformation (Kraemer, 2020). All rights reserved.

DESIGN PROCESS - BUILDING TRANSFORMATIONS

The most drastic changes to the existing building fabric have been made at the rooftop, the interior floor slab of the north facade, and the apartment block on the rooftop. The openings on the rooftop are based on the distances between the load-bearing steel beams. Three large openings provide space for trees that will be planted in the old cinema hall while the smaller openings let through daylight, rain, and wind. The extension of the apartment block offers an opportunity for children to have a visual connection to the Göta-älv river, experience the wind at a higher altitude, and observe insects and birds at the insect boxes and birdhouses from the inside of the tower. The ramps that now connect the entrance level with the lower part of the floor and the first level create a child friendlier and risk-free connection than the narrow stairway and also contribute to the free flow between the different areas (Figure 68).

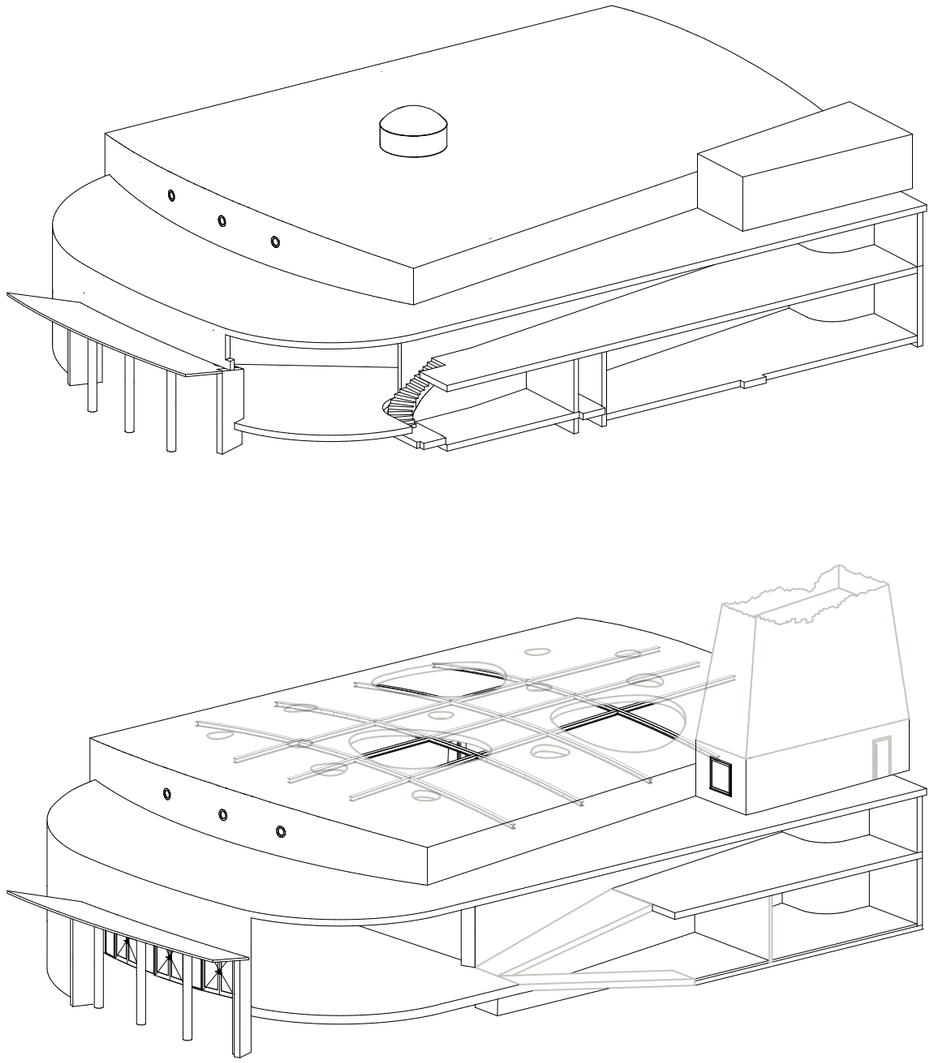


Figure 68. Kaparen building transformations (Kraemer, 2020). All rights reserved.

DESIGN PROCESS - EXTENSION: ENTRANCE AND STAFF AREA

To separate the entrance area from the open kindergarten space, children toilets and a small front office have been added to the old cinema lobby. By leaving a larger space between behind the main entrance open, a transition zone between exterior and interior is created. The main entrance to the indoor spaces of the kindergarten is in direct connection to the front office that has a good overview in all directions. The ceilings of the newly created rooms offer a new platform for the children to explore. Below the old post offices gallery, a new staff room finds its place (Figure 69). The staff room also accommodates toilets, a shower, and a silent/first aid room. Noticeable is also, that the topography of the old cinema floor has been reestablished. The sloping floor allows for higher ceiling height and creates the feeling of more natural ground. However, because of the increased height difference, the stairs that once used to lead from the ground floor to the gallery, now create a connection between the ceiling of the staff area and the gallery, thus, offering a shortcut to the kindergarten teachers.

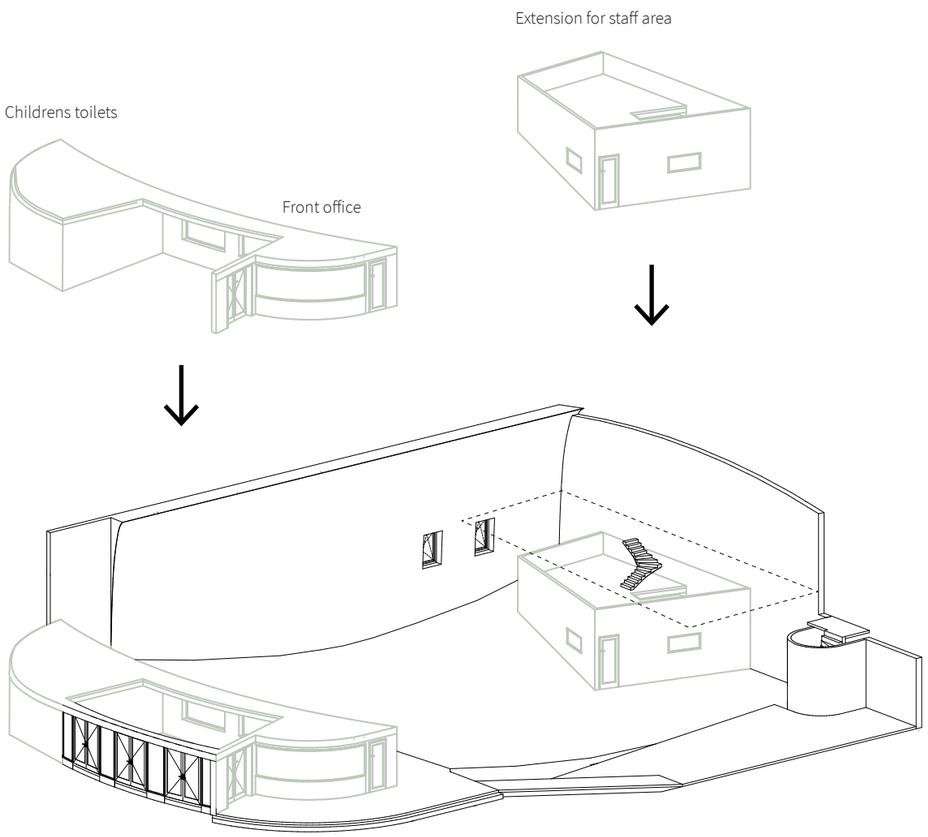


Figure 69. Kaparen room extension (Kraemer, 2020). All rights reserved.

DESIGN PROCESS - EXTENSION: WOODEN BRIDGE

The load-bearing steel construction of the cinema hall holds great potential for suspending elements from the ceiling. A wooden bridge that connects the spaces on different heights turns itself around the openings that have been made in the rooftop (Figure 70). As soon as the planted trees reach a certain height it will be possible for the children to not only run from level to level but also experience the trees on different heights. The wooden bridge creates a loop of pathways in the building that makes it easy for children to play, explore, and connect to their environment.

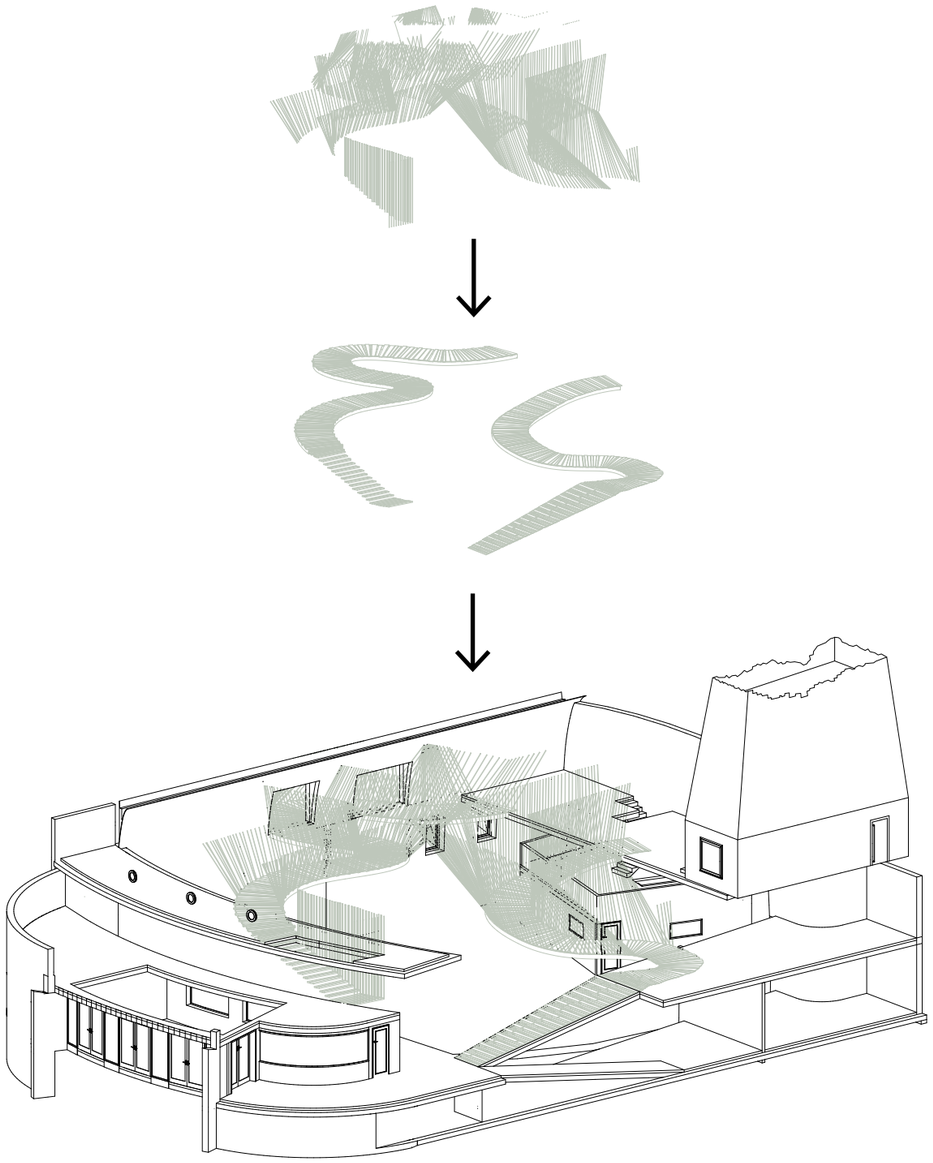


Figure 70. Kaparen wooden bridge (Kraemer, 2020). All rights reserved.

DESIGN PROCESS - EXTENSION INTERIOR ELEMENTS

The wooden panels that have been added to the interior space function as a visual connector between the added rooms and wooden bridge. Creating a similar style between the implemented architectural elements is important to convey the same atmosphere within the children's area and clearly indicate which parts have been added and which parts belong to the existing building fabric. The wooden boards do not only act as facade elements but also as railings, platforms, and pathways to, for example, a slide. Several boards have been added below the windows on the south facade to lead rainwater from the windows down the wall (Figure 71).

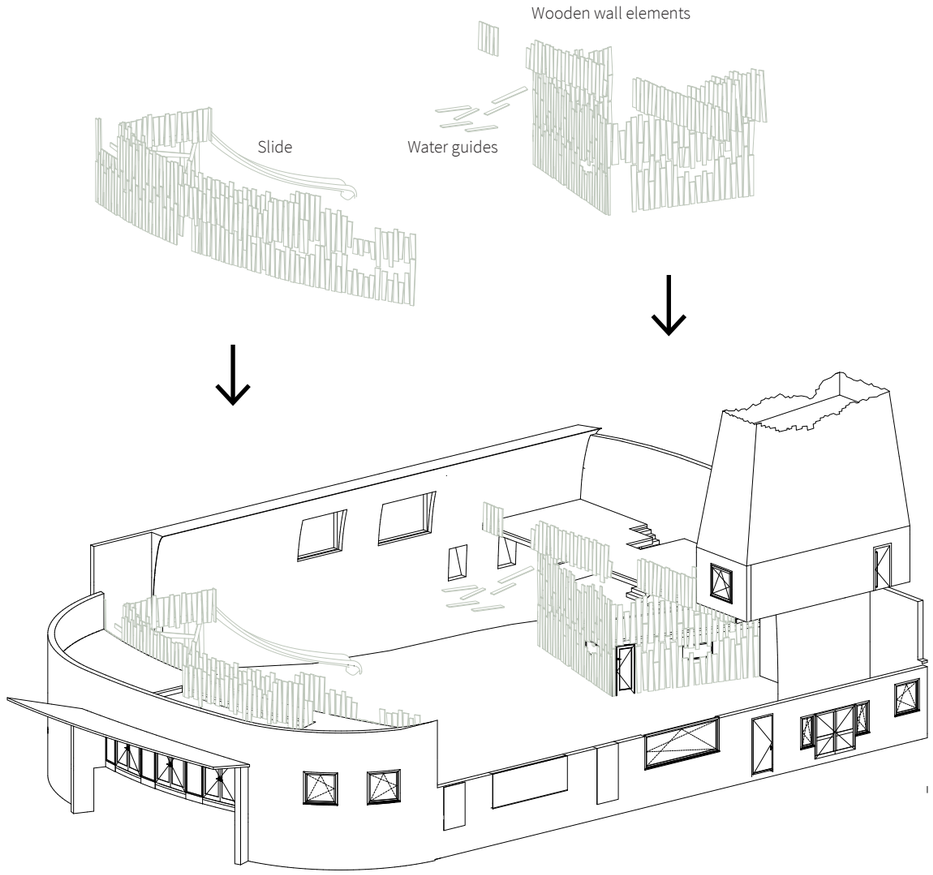


Figure 71. Kaparen interior extensions (Kraemer, 2020). All rights reserved.

DESIGN PROCESS - EXTENSION EXTERIOR ELEMENTS

The exterior elements that have been added to the building mainly serve as attractors for natural features. Scaffolding has been added to the facade to aid plants in climbing up the walls. The scaffolding in combination with plants will serve as a filter in front of the railing that now surrounds the lower rooftop. Wooden boards function as a new layer on top of the old copper rooftops to avoid high surface temperatures of the metal during the hot times of the year. The rooftops are divided into a publicly accessible lower area and a to the children's exclusive upper area. However, both areas are equipped with plant boxes for urban agriculture activities. To further differentiate the lower and upper rooftop, a different railing system has been used for the children's area. Wooden boards surround the rooftop and the openings in it are either surrounded by a wooden railing or covered with wooden boards. One of the three large roof openings is closed with a rope mesh, that lets children experience the height and the tree that is growing below it. Birdhouses, as well as insect and plant boxes, have been added to the wind tower (Figure 72). An interesting feature is small view holes that let children peek into the bird and insect boxes from the inside of the tower.

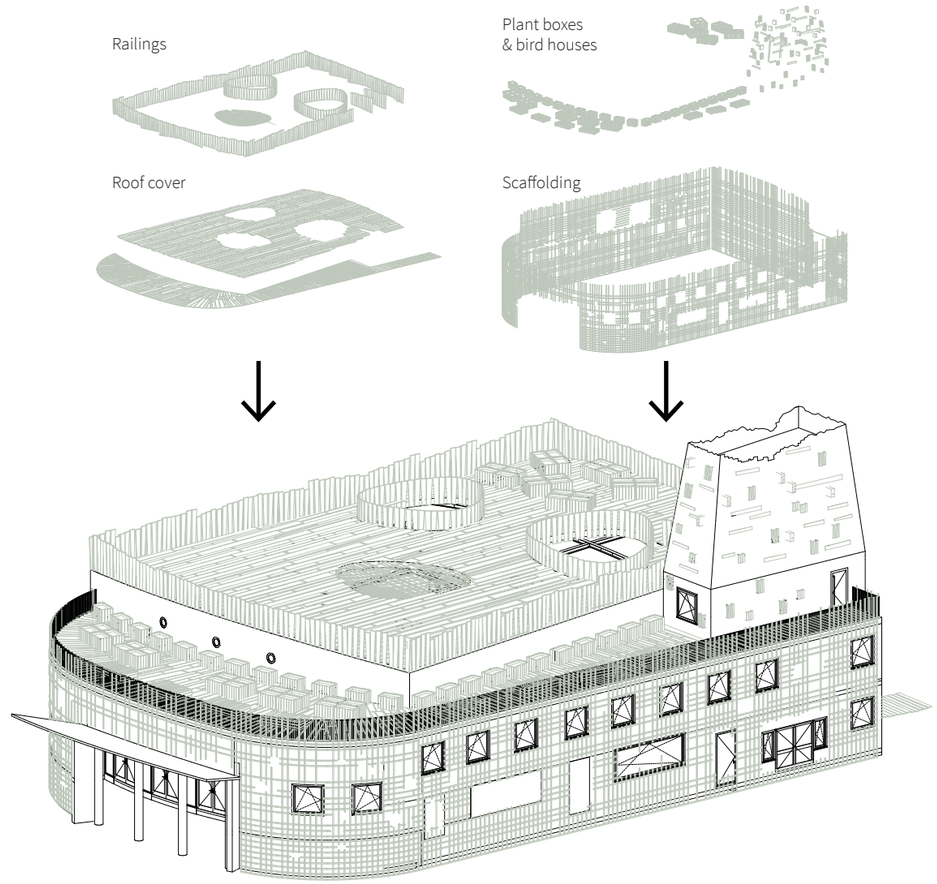


Figure 72. Kaparen exterior extensions (Kraemer, 2020). All rights reserved.

KAPAREN KINDERGARTEN - FLOORPLAN FIRST FLOOR / ENTRANCE FLOOR

The entrance area, front office, and toilets are situated at the main entrance to the building (Figure 73). A door that leads to a short hallway along the front office separates the entrance area from the children's space. The hallway ends in a junction that leads directly to the cinema hall and ramps to the lower part of the entrance level or first floor. A wooden scaffolding leads up to the midlevel that is on top of the front office and the toilets. At the end of the cinema hall, a kitchen and staff room are accommodated. The kitchen can be used as a sheltered common area during cold winter days, however, it should serve as a room for short breaks to warm up rather than an activity room since the children should spend most of their time in the open spaces of the kindergarten regardless of weather influences. A small pond in the corner of the building receives rainwater through the openings in the facade and adds another unique natural feature to the program. In addition to the break room, the staff area is equipped with toilets, a shower, a first aid room, as well as a stair that leads up to the area on top of the ceiling and the gallery on the first floor.

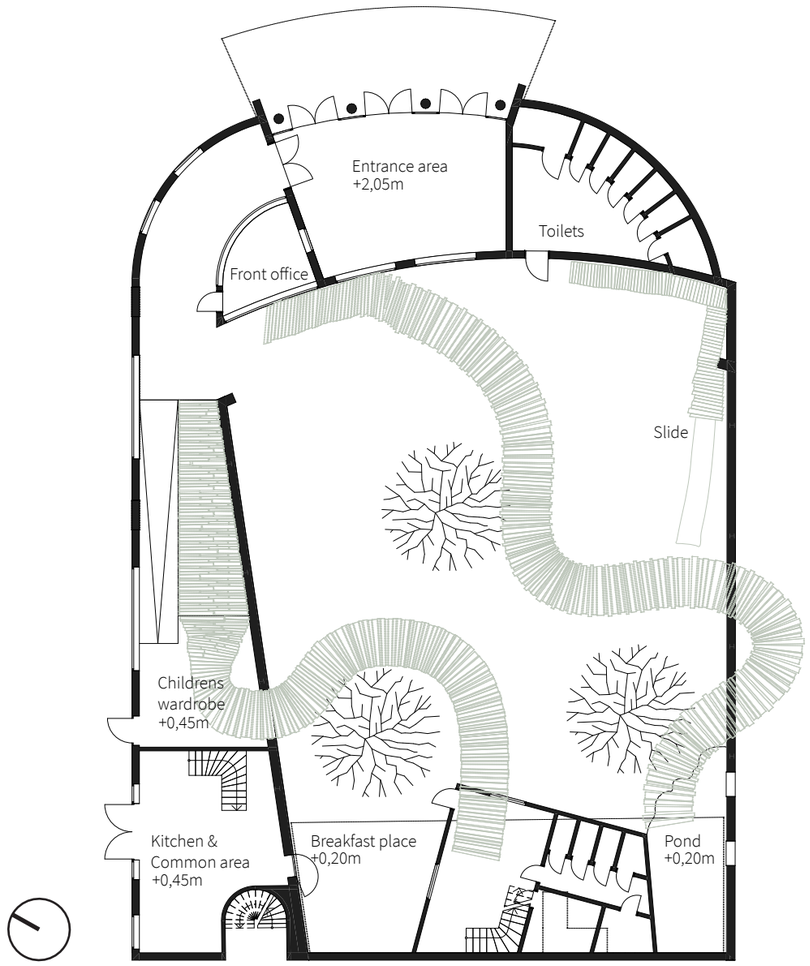


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Figure 73. Kaparen first floor (Kraemer, 2020). All rights reserved.

KAPAREN KINDERGARTEN - FLOORPLAN SECOND FLOOR

The second floor (Figure 74) has several areas on different height levels. Starting with the ramp that leads from the first floor up children enter a workshop area for creative activities like tinkering with leaves, wood, and other natural items. The ramp continues from the creative workshop up to the gallery and leads over the suspended wooden bridge around one of the trees that is growing in the cinema hall. The gallery is a flexible space where many paths join each other. It is an access point to the wind tower, the rooftop, the staff area, and the second wooden bridge that leads up to an old technical room, a "secret room" for the children to retreat to when they want to take a rest from the more active zones. The pathway continues via a stair that leads down to the midlevel. This area is a transition zone between the calm "secret room" and the active ground floor. The midlevel also connects to the wooden scaffolding and slide that leads down to the cinema hall.

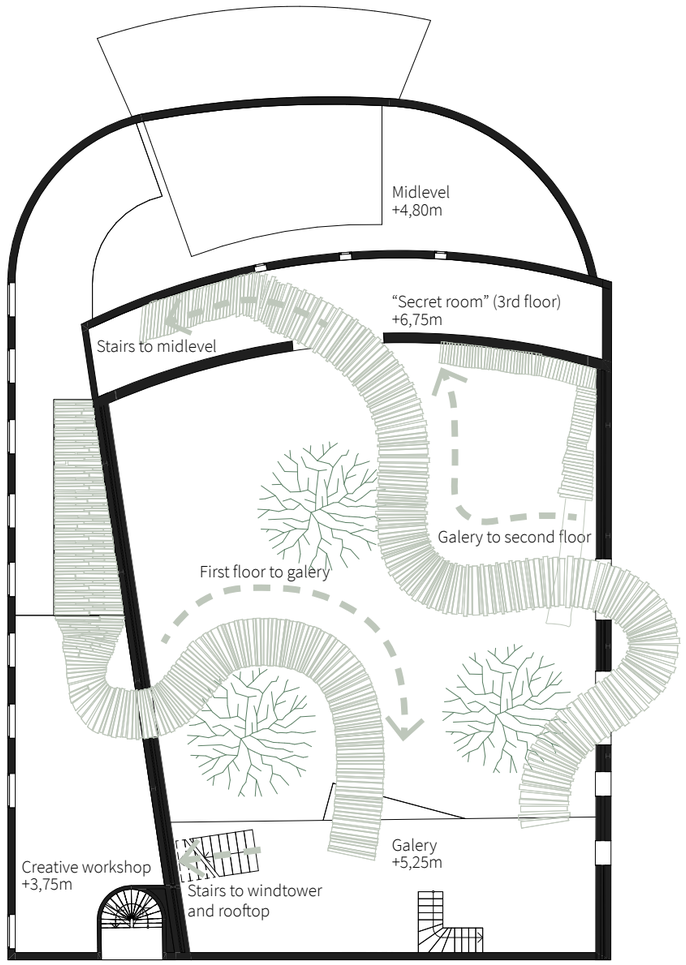

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Figure 74. Kaparen second floor (Kraemer, 2020). All rights reserved.

KAPAREN KINDERGARTEN - ESSENTIAL FUNCTIONS AND SPACES - FIRST FLOOR

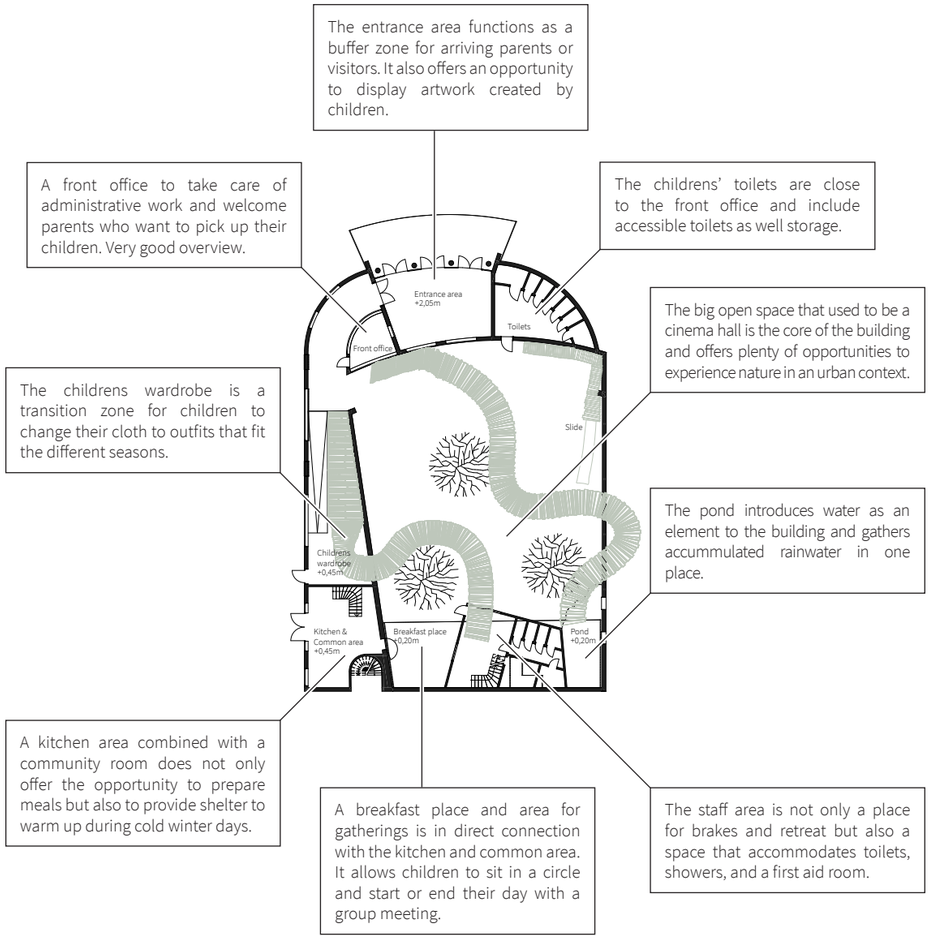


Figure 73. Kaparen first floor (Kraemer, 2020). All rights reserved.

KAPAREN KINDERGARTEN - ESSENTIAL FUNCTIONS AND SPACES - SECOND FLOOR

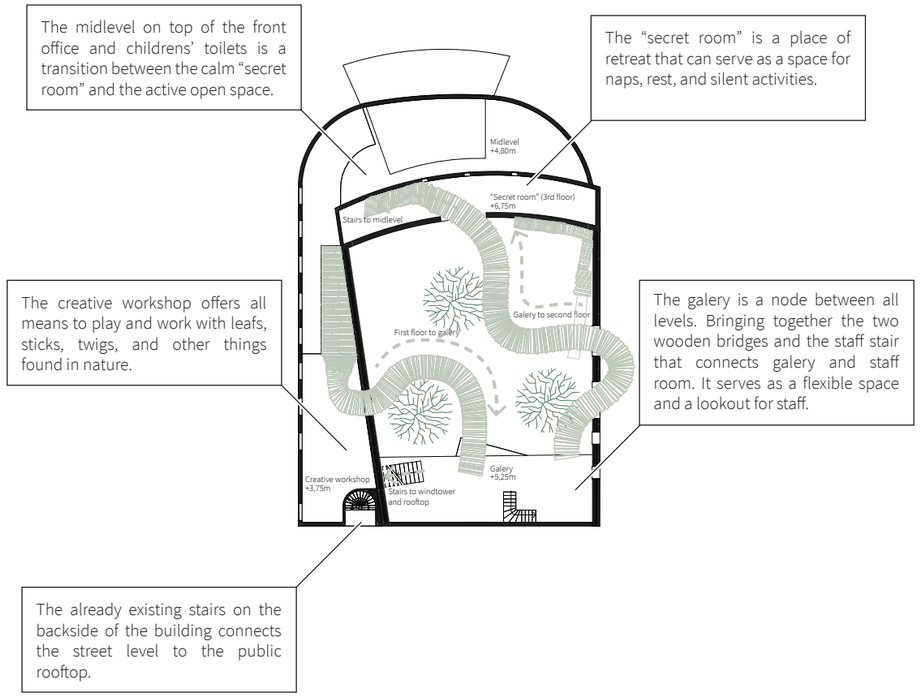
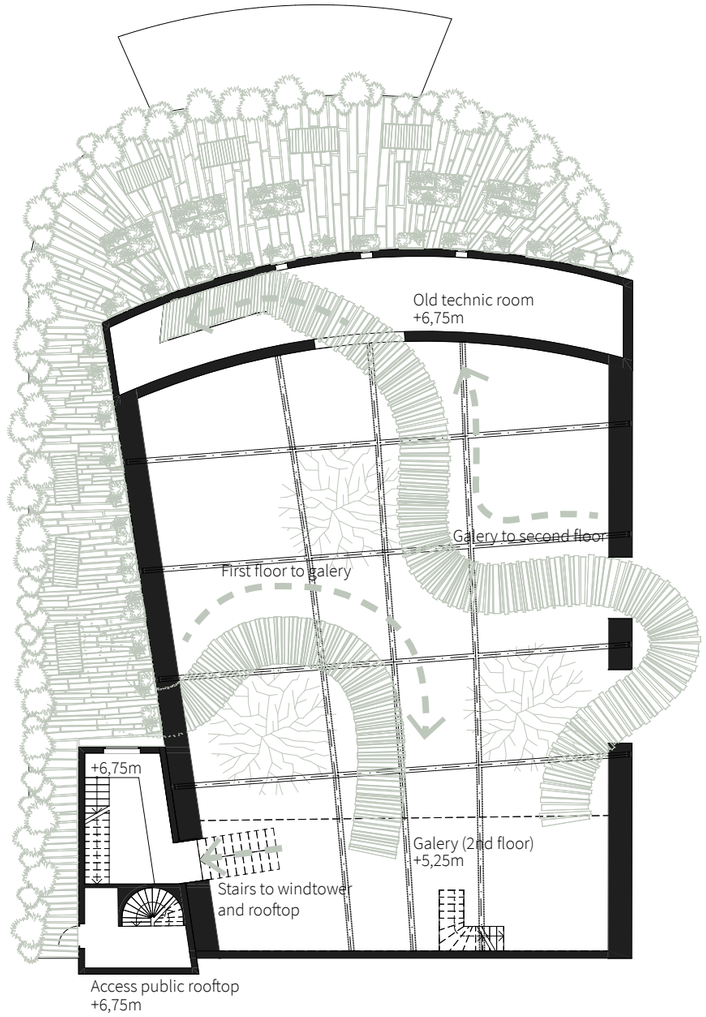


Figure 74. Kaparen second floor (Kraemer, 2020). All rights reserved.

KAPAREN KINDERGARTEN - FLOORPLAN THIRD FLOOR / PUBLIC ROOFTOP

The public rooftop is accessible through the staircase on the west side of the building. It offers space for urban agriculture and meeting points for social activities. The plantation that overgrows the railing creates a filter between rooftop space and the surrounding urban environment, thus, blending out the city atmosphere. The public rooftop invites to retreat from the fast-paced city lifestyle and adds many natural features to the surrounding area (Figure 75).



Scale 1:250

Figure 75. Kaparen public rooftop (Kraemer, 2020). All rights reserved.

KAPAREN KINDERGARTEN - FLOORPLAN KINDERGARTEN ROOFTOP

The upper rooftop (Figure 76) is exclusively for the children and kindergarten staff. It can be accessed through the stairwell of the wind tower and accommodates urban agriculture elements as well as the opportunity to create a close connection to the trees growing inside the cinema hall. Together with the ground floor and the wooden bridges, and the rooftop there are three different levels of experiencing trees. The trunk at the bottom, the dense leafy area at the middle, and the tree crown at the top. To get even closer to the treetop a mesh of ropes is spanned over one of the openings in the roof that enables children to climb withing the highest points of a tree. The plant boxes for urban agriculture can be individually by the children to foster a feeling of responsibility for their own plants. Following the process of a growing plant and experiencing the feeling of satisfaction when it flourishes does not only create a strong relationship between people and nature, it also teaches the origin of many fruits and vegetables that we use to buy in supermarkets.

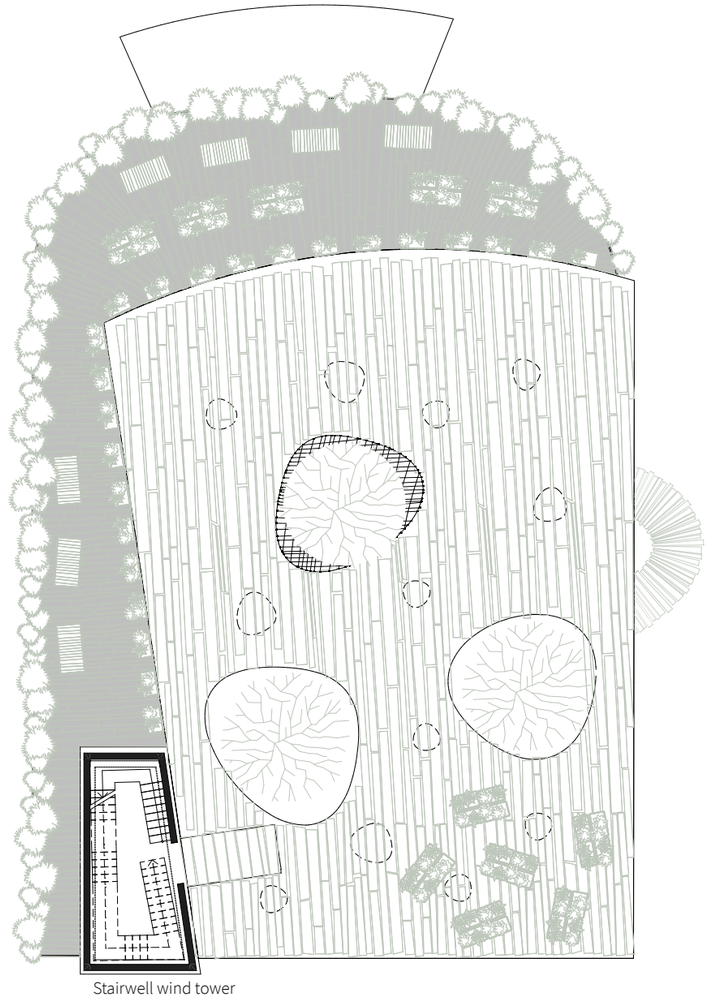


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Figure 76. Kaparen kindergarten rooftop (Kraemer, 2020). All rights reserved.

KAPAREN KINDERGARTEN - SECTION CINEMA HALL

The section through the cinema hall (Figure 77)reveals the generous size of the interior spaces and explains the many connections that now exist between the different areas. By taking out the floor extension that has been built for the past usage as a post office, the space becomes even larger and reaches a height that allows to suspend the wooden bridges without overwhelming the interior space. The lowest room height can be found with 1.70 m on the midlevel in the front of the building. However, this room height is more than enough for kindergarten children to use it, and even for the staff, it is suitable considering that this is one of the calm areas of the building.

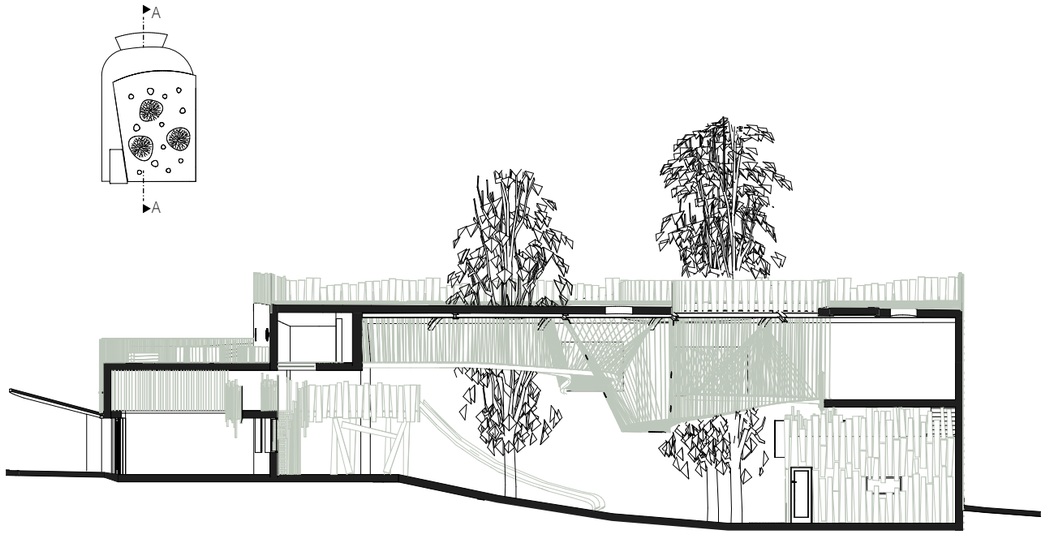

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Figure 77. Kaparen section A-A (Kraemer, 2020). All rights reserved.

KAPAREN KINDERGARTEN - SECTION WIND TOWER

Cutting through the wind tower and the ramp connections between entrance level and second floor show the interesting verticality that the tower creates (Figure 78). The stairwell is secured by ropes that span from the beginning of the stairs to the top of the tower. By opening up the roof between the beginning of the tower and the second floor it is possible to introduce the wind to the interior spaces. Especially while using the creative workshop, this can be a relaxing feature. The top of the wind tower functions as a viewing platform, however, by creating different heights in the brickwork of the wind tower, the views can be steered towards the Masthugget hill and Göta-älv river.

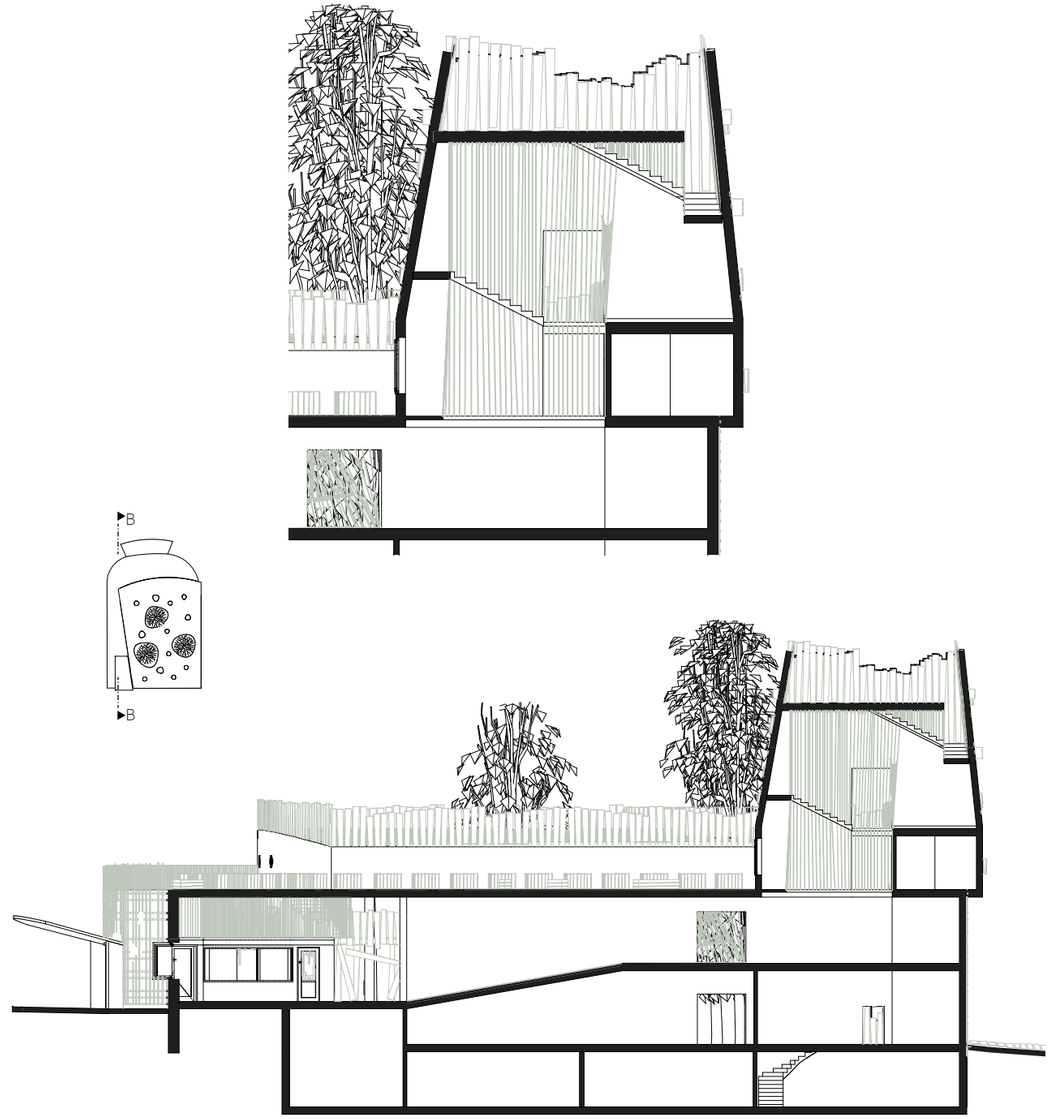

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Figure 78. Kaparen section B-B (Kraemer, 2020). All rights reserved.

KAPAREN KINDERGARTEN - FRONT ELEVATION

When comparing the front elevations of the historic Kaparen Biograf with the new Kaparen kindergarten it is possible to see the huge difference between the atmosphere that the building has now and that it used to have (Figure 18 & 79). This difference will become even bigger once the scaffolding is overgrown with plants and the old facade will vanish behind its natural filter.

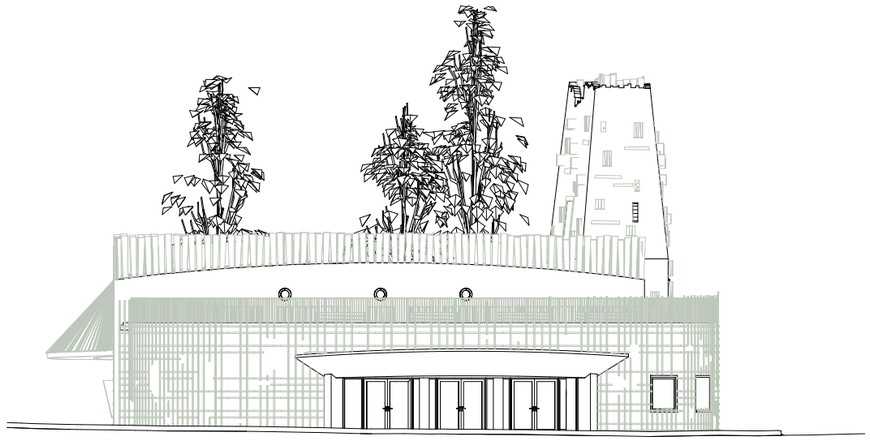

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Figure 79. Front elevation Kaparen (Kraemer, 2020). All rights reserved.

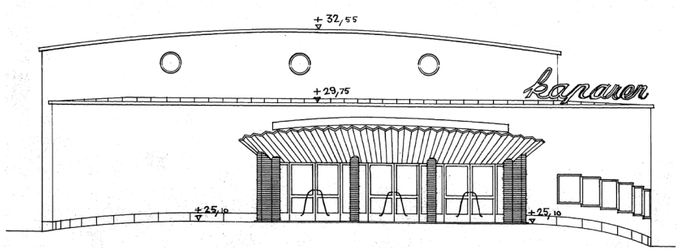

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Figure 18. East facade (Göteborg stadsarkiv)

PERSPECTIVES - PLAZA

The plaza in front of the old cinema (Figure 80) underwent a huge transformation compared to the previous state. The empty parking lot has become a densely planted green are on the side towards the park and an interesting water area that is surrounding the two existing buildings (Figure 81). The pavement is now permeable for plants and grass which diffuses the border between artificial and natural ground.

Figure 80. Front perspective Kaparen (Kraemer, 2020). All rights reserved.
Figure 81. Plaza perspective Kaparen (Kraemer, 2020). All rights reserved.

PERSPECTIVES - CINEMA HALL

The largest and most important interior space of the urban forest kindergarten is the cinema hall. Playful suspended wooden bridges create an interesting dynamic in the room which invites children to explore the environment. Trees, plants, and rocks that have been added to the space offer plenty of opportunities to climb, play, and learn about nature.

Figure 82. Cinema hall perspective 1 Kaparen (Kraemer, 2020). All rights reserved.
Figure 83. Cinema hall perspective 2 Kaparen (Kraemer, 2020). All rights reserved.

PERSPECTIVES - ROOFTOPS

The public rooftop combines urban agriculture with beautiful scenery. The plants growing on Kaparens facade create the impression of being in a dense natural environment while the plant boxes give the opportunity to directly interact and work with nature. Together with seating areas, the rooftop becomes a unique area for socializing and connecting to nature in the city.

Figure 84. Rooftop gardens Kaparen (Kraemer, 2020). All rights reserved.
Figure 85. Public rooftop Kaparen (Kraemer, 2020). All rights reserved.

PERSPECTIVES - WIND TOWER

At first sight, the wind tower is the biggest and most noticeable change to the old cinema building. The tower does not only create a connection to the rooftop and provides the interior spaces with natural ventilation, but it also creates a viewpoint that enables children to look at the Göta-älv river and Masthugget hill. Especially the view on the river would not be able without the extra height that the tower adds to the rooftop. The top of the tower's walls is designed in a way that the view is steered towards either the river or the hill but blends out the surrounding buildings from the view.

Figure 86. Cinema hall perspective 1 Kaparen (Kraemer, 2020). All rights reserved.
Figure 87. Cinema hall perspective 2 Kaparen (Kraemer, 2020). All rights reserved.

REFLECTION

This thesis has investigated the relationship between architecture and nature to get a new perspective on sustainable design. A perspective that reveals the importance of the human-nature connection and the urgency of implenting this connection in architecture. To get a better understanding of how this implementation could look like, a closer look at the meaning of nature, our connection to it, and the importance of this connection has been taken. This created a good introduction to the topic and to the mindset behind this thesis. Design strategies have been inspired by this enquiry and transferred into the architectural context. An existing building in a dense urban environment has been chosen to implement these strategies to create a kindergarten that fosters a strong relationship between children and nature. Several elements that introduce nature to the building but also encourage children to explore and interact with nature. The design combines biophilic design attributes, functionality, and an opportunity for children to explore nature in an urban setting.

FINDINGS

The initial questions on nature and humanity's connection to it have been described with a philosophical perspective on the topic. Doing this was a good introduction to the general idea and intention behind this master thesis: Emphasizing the importance of nature in human life and criticizing the prevailing unsustainable lifestyles that shape our society, as well as questioning the current and past architectural practice that led to the urban environment as we know it.
The research concludes that nature can be defined in various ways but ultimately describes the basic and unaltered material and lifeforms that our world is made off as first nature and the products that humans created from it as second nature. Modern cities and urban environments have been identified as a main driver for the extinction of nature experiences and the city lifestyles as a disruptive force between people and nature. Nature has been proven to be an important part of humanities development that is still connected to well-being, health, cognitive development. Relevant research papers have been evaluated to find strategies for strengthening the human-nature connection as well as reconnecting people to nature in general. Weak and strong leverage points have been identified and suggest that nature experiences alone do not have the potential to achieve a transformation in people's behavior and in society. Last but not least, these findings have been used to answer the question if architecture can reconnect people to nature. In respect of the strong impact of urban developments on people's connection to nature, there is an obvious connection between the design profession and the human-nature connection, however, the potential to affect this connection negatively is greater than the potential to affect it in a positive way.
Architecture remains a crucial part of the development towards a sustainable society but it needs help from other professions and disciplines as it merely provides space for the functions demanded by clients. Being aware of this, it is the architect's responsibility to argue for the inclusion of natural features in designs regardless of its profitability or functionality.

FINDINGS REPRESENTED IN THE DESIGN

One of the first research results revealed that architecture contributes to the disconnection between people and nature by claiming nature spaces as a site for new urban developments. This led to the decision to work with an existing building and transforming it for new uses instead of designing something new in an otherwise untouched environment. Furthermore, a special focus has been put on elements that focus on strong leverage points for sustainability transformations. Based on these leverage points the design proposes an urban interpretation of a forest kindergarten. A concept that is proven to build a strong connection between children and nature. It focusses on creating this connection rather than rebuilding it during adulthood. However, the public program of the design proposal offers opportunities for everyone to interact with nature and experience its features in the middle of an urban environment. Especially the historic aspect creates a feeling of connection to the building, thus, creating a connection to the new usage as a natural retreat. The knowledge about leverage points for sustainability transformations led to a special focus on design elements that foster feelings of attachment and strong environmental values. Features like the wooden bridge that lets children explore trees on different heights, the wind tower that allows views on the river and insights to birdhouses and insect boxes, and urban agriculture that lets children take care of plants and grow a feeling of responsibility for nature that leads to pro-environmental behavior in adulthood. The combination of design and program is an essential factor to create a proposal that lives up the expectation of building a strong human-nature connection and backs up the theory that architecture alone cannot reconnect people to nature. Important characteristics of traditional forest kindergartens like the ability to freely explore an environment have been adapted to the urban context and the building scale by creating pathways and loops inside the building that avoid the feeling of restriction.

CONTRIBUTION TO THE DISCOURSE

The discussion in this thesis aims to create questions about the current development of architecture, its' sustainability approach, and society's connection to nature in general. I think this thesis offers a new or at least an unusual perspective on architecture that has the potential to inspire architects, designers, and stakeholders to include more natural features and activities in design proposals and programs. The urban forest kindergarten shows that it is possible to combine functionality and the extensive use of natural features in an urban context, thus, offering a good example for future projects.

ENDNOTES

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