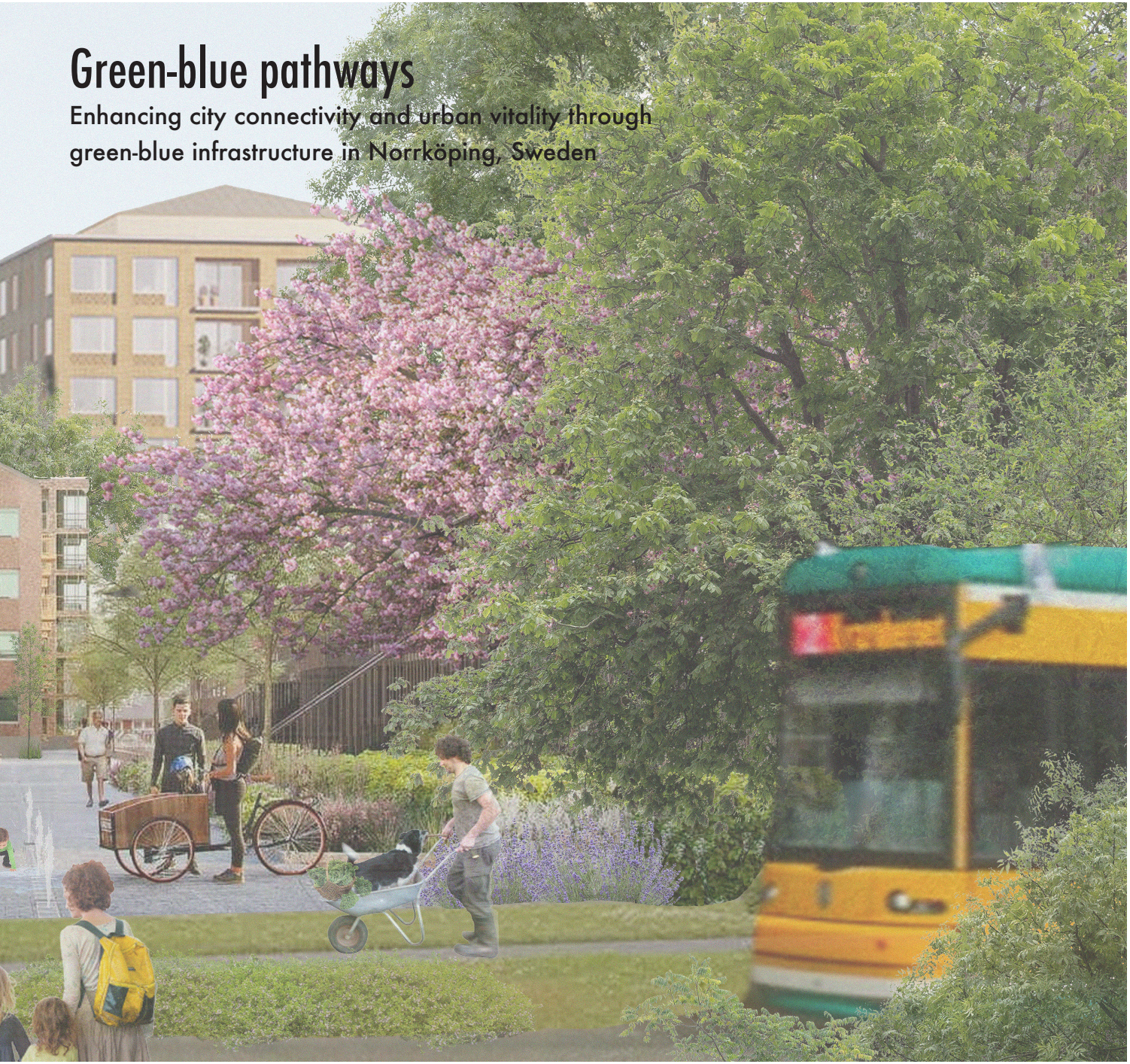
Green-blue pathways

Enhancing city connectivity and urban vitality through green-blue infrastructure in Norrköping, Sweden



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Enhancing city connectivity and urban vitality through green-blue infrastructure in Norrköping, Sweden

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Abstract

Our world is facing major challenges and the built environment plays a major role in both adapting to, and, challenging the current situation. As urbanization advances and densification takes place, more people reside in cities with an estimated 68% of the world's population expected to live in urban areas by 2050. Urban areas confront mounting challenges due to population growth, resource constraints and the escalating effects of climate change. Tackling these issues is crucial to ensure cities offer healthy and sustainable living conditions.

What research clearly indicates is that urban green and blue spaces have the potential to play a vital role in achieving the Sustainable Development goals of the United Nations. With connection to both urbanization and densification, as well as people's health – not to mention climate change – the importance of nature and greenery can not be emphasized enough as its function and presence is important both on an individual level and for entire societies. Urban green and blue spaces not only provide benefits for the environment but also improve public health and well-being.

The aim of this thesis is to investigate how the spatial organization of a densification development in Norrköping, Sweden, can be arranged with focus on green-blue values as a driver for transformation, activation and integration and create a lively, mixed used and pedestrian friendly district that also improves the overall connectivity in a city scale. The design proposal attempts to meet the needs of a growing city where the holistic benefits of green-blue values plays the key role.

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Introduction

Motive

Our world is facing major challenges and spatial planning and the built environment plays a major role in both adapting to and challenging the current situation. As urbanization advances and densification takes place, more people reside in cities with an estimated 68% of the world's population expected to live in urban areas by 2050 (Madureira and Monteiro 2021). However, urban living restricts access to nature and raises exposure to environmental risks like air and noise pollution, but also warmer temperatures, flooding and threatened biodiversity. Urban areas confront mounting challenges due to population growth, resource constraints and the escalating effects of climate change (World Health Organization 2017). At the same time, it is also clear that nowadays 81% of adolescents and 27.5% of adults do not meet WHO's recommended levels of physical activity and mental illness is put forward as a growing global threat when it comes to public health (World Health Organization 2022a; World Health Organization 2022b).

Tackling these issues is crucial to ensure cities offer healthy and sustainable living conditions and research speaks its clear language. What research clearly indicates is that urban green and blue spaces have the potential to play a crucial role in achieving the Sustainable Development goals of the United Nations (Tate et al 2023). The 17 Sustainable Development Goals, also known as 'The Global Goals,' are an urgent call for action by all countries – developed and developing – in a global partnership and comprise a set of interconnected objectives crafted to provide a sustainable future for everyone on this planet (UN n.d). With connection to both urbanization and densification, as well as public health – not to mention climate change – the importance of nature and greenery can not be emphasized enough as its function and presence is important both on an individual level and for entire societies. Urban green and blue spaces not only provide benefits for the environment but also improve public health and well-being (World Health Organization 2023).

Figure 1: The Sustainable Development Goals.

Source: United Nations (n.d).

Aim

The aim of this thesis is to investigate how the spatial organization of a densification development in a central location of the city Norrköping, Sweden, can be arranged with focus on green-blue values as a driver for transformation, activation and integration.

Method

The method consists of a combination of literature overview and site visit.

The literature overview provides a base knowledge and related background, as well as research.

The site visit gives an understanding of the site and offers the possibility to take photos and understand the site in more detail.

Research questions

Why is presence of green and blue elements within the built environment important for us as humans and cities?

How has the concept of nature in city within urban planning theory changed through time?

How can the concept of green-blue infrastructure be used as a base for transforming, integrating and activating an area through densification, as well as increasing the overall connectivity within the city?

Research

The relationship between human and nature

Humans have always relied on nature for survival and good quality of life. The relationship between human and nature relates to everything from the consumption of natural resources and the recreational value to cultural aspects in relation to nature as well as the mental bond we humans can experience with nature (SEI & CEEW 2022).

But it can be stated that our view of the importance of nature has changed and generally, we can see that we have distanced ourselves from nature in the meaning that we no longer have the same bond to nature as we used to. Through industrialization and urbanization, the interaction with nature has changed and the ability to understand the natural resources like flows of water, food and waste have more or less been hidden from us and just become a part of the automatic everyday system. With water in pipes underground, food being brought to food stores and waste in bags put in garbage cans, a lot of the interactions with nature that we used to have when we had to grow our own food, collect water, take care of our own waste etc is no longer present for many of us, especially living in cities (Kesibir and Kesibir 2017).

Today, research can clearly declare the importance of prioritizing access to green and blue areas in the cities (SEI & CEEW 2022). Multiple studies show how access to nature and green-blue areas can prevent both physical and mental illness in people of all ages and point on the multiple benefits of human connection with green-blue spaces. Everything from just viewing green-blue elements through the window to having access to green-blue areas affect us (de Vries and Dinand Ekkel 2016). Green-blue elements both attract movement, recovery and social activities and can contribute to reduce stress and increased ability to concentrate. Long term access to green can mean lower healthcare costs and this can contribute to equalizing health differences between different groups in the society. In this sense, access to nature and green areas can be seen as a question of social equality (Naturvårdsverket 2023).

> In average, people spend **90%** of their time indoors.
>
> (Sweco 2021)

The green and blue elements are also experienced through our senses like sound, smell and color and also age with time and changes with the seasons. In that sense, the green-blue elements are also important by adding a movement and temporality to our everyday lives (Wingren 2015).

In denser cities, it is even more important to try and increase our daily contact with nature and green-blue elements. Actually, on average people spend 90% of their time indoors (Sweco 2021). What that means is that we need to strive for adding the possibility for people to have contact with green-blue elements closer to where we live, work, go to school, spend our free time and stay inside (Naturvårdsverket 2023). Because also in concern with this, research clearly showcases the advantages of this.

Residence

Living close to nature provides quality of life – the more green space, the better. Multiple research studies, including one encompassing approximately one thousand European cities, demonstrate a significant link between access to nature and people's lifespan (Barboza et al 2021). Tiny green areas remain impactful for individuals' welfare, acting as hubs for socializing. Additionally, glimpses of greenery from homes offer rejuvenating effects, potentially prompting outdoor pursuits (Stoltz and Grahn 2021).

Workspace

Interacting with green-blue elements during work hours can offer rejuvenation essential for daily life. Studies suggest this boosts job contentment while decreasing absenteeism due to mental health concerns (Naturvårdsverket 2023). Research from Sweden demonstrates that even a brief walk during work breaks alleviates stress and exhaustion. Access to calm, outdoor areas for relaxation during breaks also enhance well-being and alleviate stress (Skärbäck et al 2019). Additionally, glimpses of greenery or water through windows provide beneficial microbreaks (Shin 2007).

Leisure

Spending time in nature and green-blue areas during our free time is important for our recovery. Leisure activities such as walking in parks, hiking, visits to the forest, swimming and gardening are examples of common activities that people do during their leisure time. The reason why this is important for our recovery is, among many things, access to daylight and fresh air, the physical movement as well as the stimulation of our senses that together contribute to a pleasant experience (Naturvårdsverket 2023).

Schools and preschools

There is a clear connection between stays in nature and movement in children (Faskunger et al 2018). Studies comparing children with access to natural settings in school and preschool playgrounds to those with nature-deficient play areas indicate enhanced motor skills and concentration in the former. Moreover, the presence of greenery on playgrounds notably promotes physical activity among girls and younger children, resulting in reduced conflicts and more open-ended play in natural outdoor environments. Access to green can also increase the possibility of outdoor education which means many advantages, among other things, higher study motivation and increased creativity (Naturvårdsverket 2023).

Indoors

Even indoors it is possible to create a feeling of contact with the green and blue, something that, among other things, can promote calmness, recovery and ability to concentrate (Naturvårdsverket 2023). Based on a pivotal study from the mid-1980s (Ulrich 1984), patients recovering from surgery who have a view of nature require less pain medication and experience faster recovery compared to those with views of brick walls. It is therefore important to not underestimate the visual part of nature and greenery. Even if we can not visit a green area, just seeing it from our window can also have a positive effect on us.

The relationship between city and nature

In ancient times, cities often emerged in locations with access to natural resources and favorable climate conditions. Early settlements relied heavily on nature for sustenance, with agriculture and hunting playing essential roles in urban economies. As cities grew and expanded, the natural landscape was often altered to accommodate increasing population densities and infrastructure development. Eventually, through industrialization, the question of the relationship between cities and nature rose and ever since the birth of modern planning, the fight between 'dense' and 'green' has been going on (National Geographic n.d).

The urban theorist Henri Lefebvre observed that there was a conflict between 'the right to the city' and 'the right to nature'. Within planning processes, this has often been put forward as a strong dichotomy, where on one side there are arguments for the urban qualities of a city in connection to innovation, social integration, shorter distances etc and on the other side the arguments for the conservation of green belts, parks and more open spaces in the city (Ståhle 2010).

How to merge 'dense and green' has been on several people's task throughout time, among many Ebenezer Howard with his famous diagrams for the 'Town-country' (1945) and Le Corbusier with 'The Green city' – La ville verte (1942) (Ståhle 2010).

The two of them exemplifies that the goal of integrating nature into the city is the same, but how it should be done differs. Both Ebenezer Howard and Le Corbusier shared a vision for integrating nature into urban environments, their approaches differed in terms of scale, density, and philosophical standing point. Howard emphasized human-scale communities and social reform, while Le Corbusier's vision of the 'The green city' favored large-scale, high-density developments guided by modernist principles of efficiency and functionality (Ståhle 2010).

What we agree on today is that the interaction between urban areas and the natural environment is crucial for the well-being of both ecosystems and city dwellers. Urbanization often leads to the transformation of natural landscapes into built environments, but maintaining a balance between cities and nature is essential for sustainability and quality of life. Strengthening the relationship between cities and nature is essential for creating healthy, resilient and sustainable urban environments (Lee et al 2015).

"Instead of acting like colonizers and believing that we can control nature as we see fit and eliminate everything that stands in the way, we must realize that when all life thrives, so will humanity."

- Matteo Giusti
Environmental scientist and co-writer of the FN report 'Unlocking a better future'

The conceptual evolution of nature in city

It is clear that the ideas about nature in relation to the city have changed over time and this is something that can be clarified when looking into how nature is being expressed in urban planning theory and practice. The development and conceptual evolution of nature in the city is something that Duvall, Lennon and Scott (2018) examines in more detail. Before, nature was viewed as a separate part from the city, almost something deterrent and dangerous. Today, we instead acknowledge nature as a natural component of urban systems (Duvall, Lennon and Scott 2018). But how did we go from that to this?

Nature as relief

For a long time, nature was seen as the unknown and dangerous and the cities the secure and safe place. A clear border between the two was established. But during the industrial revolution, when cities grew polluted and crowded, the concept of nature instead developed into something desirable rather than something deterrent. The incorporation of nature into cities was in many ways a planning-based reaction to the poor conditions in urban industrial areas and quickly became a key question, but also a start of the 'nature-city dichotomy' (Duvall, Lennon and Scott 2018).

The rising of the park grew strong during the mid-nineteenth century, largely by Fredrick Law, the designer of New York Central park. The idea was how the park could be the meeting between nature and the urban, as well as a space for social interaction. In this sense, the idea of the park both relates to the environmental conditions of that time as well as the mental and physical well-being (Duvall, Lennon and Scoot 2018).

Another example of a response to the problems related to the industrial cities is Ebenezer Howard and his urban model for the Garden City where the core idea lies in the combination of the rural and urban qualities: the economical and social opportunities in the town and the beauty, fresh air and sunlight in the countryside. Generally for this time, the idea of nature was very much related to the countryside and how nature was beneficial for humans, foremost connected to aesthetic and health aspects while the cities were associated with the dirty, crowded and artificial. Nature was therefore mostly framed through its benefits for us as humans (Duvall, Lennon and Scott 2018).

Nature as boundry

The introduction of green belts was influenced by the garden cities movement. Green belt as a concept aimed to ensure spaces for both recreational use, agriculture and forestry. This time, the focus was more on spatial separation and nature conservation. While the benefits of nature were still very much connected to the benefits for human health, scientific knowledge received an up swing during the 1960s and 1970s and the awareness of environmental problems, like for example air pollution, increased (Duvall, Lennon and Scott 2018).

The emergence of a new urbanism movement began, more specifically the 'compact city model', as a reaction to urban decentralization, suburban growth, urbanization, sprawl and car dependence. The overall concept of the compact city model is an organization of medium density and mixed land use that preserve valuable land outside of cities while reducing distances and increasing access to everyday destination points. Yet, the compact city model does not emphasize the incorporation of nature within the city, although the idea in many ways relates to preserving natural areas on a bigger scale. Still, the tendency is to spatially place nature outside of the city rather than within it (Duvall, Lennon and Scott 2018).

Nature as greening

When the rise of global environmental concern was enlarged, the focus shifted more towards questions related to climate change mitigation, adaptation, energy and resource consumption. From this, the 'eco-urbanism movement' eventually emerged with a more environmentally centered approach where technology and engineering received an important role. The development of the so-called 'eco-cities' shares many similarities with the compact city approach, but focuses more on nature within the city through 'green' technology where questions of for example water treatment, waste management and renewable energy arose. Because of this, the eco-city movement represents a shift when it comes to placing nature in the city.

Overall, the 'climate change theme' grew stronger and has since become a dominant part of contemporary conceptualization of nature in cities (Duvall, Lennon and Scott 2018).

Nature as system

At the end of the 20th century and the beginning of 21th, the research related to impacts of cities on the local as well as global ecosystems was examined more profoundly. This started the view of cities themselves as complex systems, where humans play an important role within the system, leading to the view of cities not only as ecological systems, but also social. This social-ecological system perspective can be understood as an expansion of earlier principles and perspectives, where the idea of reconnecting the urban with nature thrives from the value seen in the parks, green belts, national parks and garden city movements, all together (Duvall, Lennon and Scott 2018).

The view of nature as more of a system with focus on the impacts of nature on humans leads to an approach that more harmonizes with spatial planning, as many of the goals can be achieved through spatial planning and a nature-based design. The complexity of the urban ecosystem and how to incorporate nature into the urban fabric demonstrates a change of approach compared to rural-urban perspective where nature primarily exists separated from the city (Duvall, Lennon and Scott 2018).

The biophilic urban model, advanced by Timothy Beatley, is probably the most clear example of a social-ecological system perspective. 'Biophilic cities' aim to not only incorporate natural spaces into urban areas, but in all aspects of urban planning and at all scales. The 'ecosystem services' concept is also a perception of how the connection between nature and cities can be made, based on the view

that urban areas are directly dependent on ecosystem services and also acknowledging the benefits that these services can provide us as humans. In response to the challenge of operationalizing this, the 'green infrastructure' approach has emerged as an attempt to make the ecosystem services land spatially (Duvall, Lennon and Scott 2018).

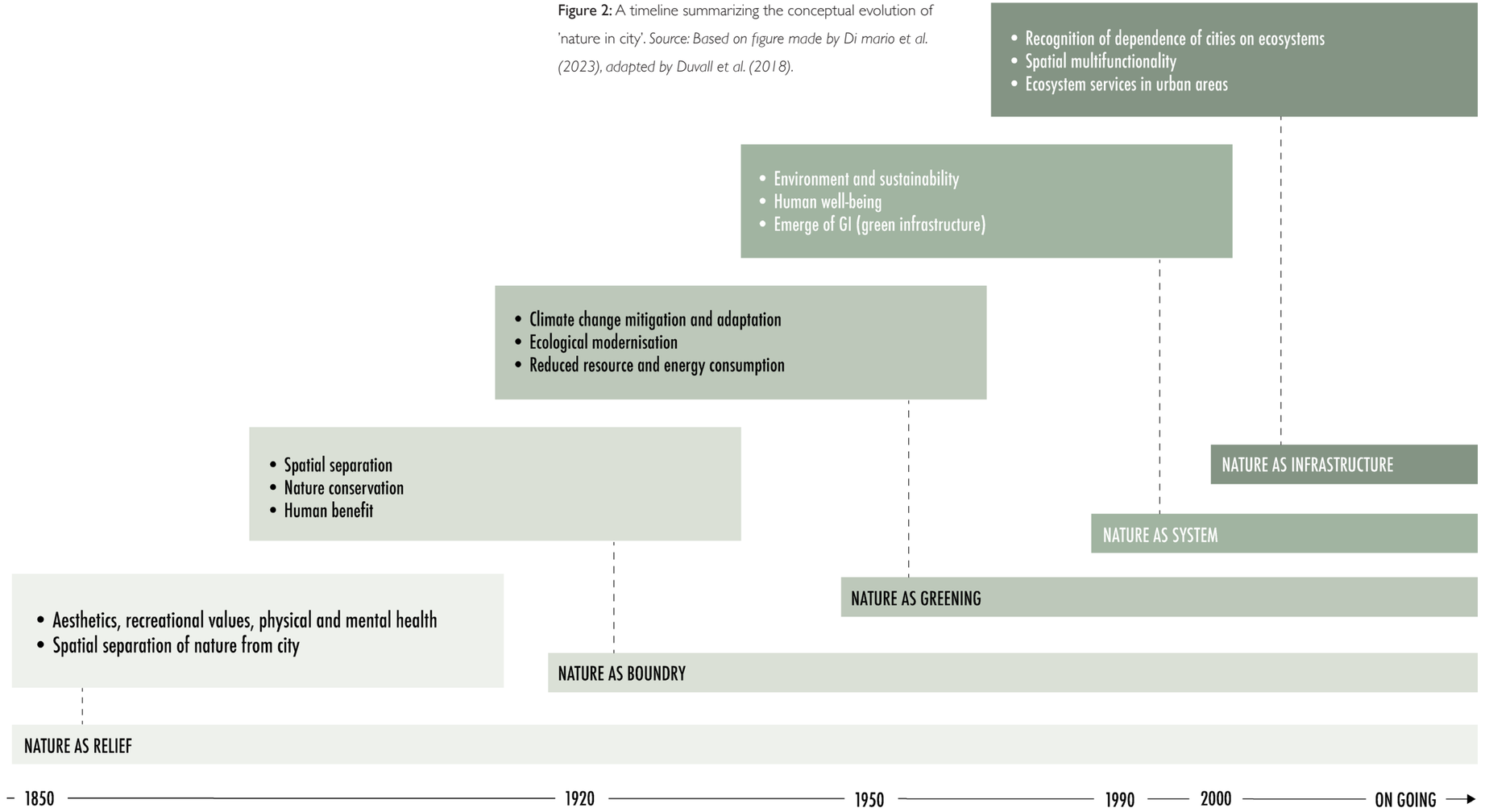
Nature as infrastructure

With connection to earlier movements, the view of nature as infrastructure is a more recent concept. Crucial to the idea about putting nature in relation to infrastructure is the principle of connectivity and multifunctionality by creating a network of different urban green and blue components. The approach expands on the green belts concept, but takes it even further, focusing on how the green-blue space network can be woven throughout the city fabric and take part as different components that together benefit both humans, ecosystems, communities and whole societies.

Overall, the concept of nature as infrastructure can be seen as an attempt to tie together several previous threads in the evolution of nature's place in the city. To summarize the evolution of nature in urban planning, it can be stated that the perspective has evolved from a more anthropocentric focus to a more holistic socio-ecological perspective (Duvall, Lennon and Scott 2018).

But what more specific does 'Green-blue Infrastructure' mean? What is the definition and how can it be implemented? Before going deeper into the concept of Green-blue infrastructure (GBI), *urban green* and *blue spaces* first need to be defined and explained.

Figure 2: A timeline summarizing the conceptual evolution of 'nature in city'. *Source: Based on figure made by Di mario et al. (2023), adapted by Duvall et al. (2018).*



The definition of 'urban green and blue spaces'

Urban green and blue spaces can be defined as 'the natural and semi-natural areas we find in cities or urban areas' (Sunita et al 2023). *Blue spaces* are defined by a significant presence of water, like lakes, rivers and ponds. Meanwhile, *green spaces* may have water features but are mostly filled with vegetation like grass or trees. These areas can be everything from well-tended urban parks to more untouched natural spots, like native forests. Therefor, urban green-blue areas can be put in broad spectrum and consists as much of parks, gardens, lakes and rivers as street trees, green roofs, meadows, permeable pavements, rainbeds and other bodies of water that we find in an urban context (Wingren 2015; Sunita et al 2023).

A clear difference between the green-blue spaces we find in an urban context compared to rural areas, is how the urban green-blue spaces generally are more integrated and mixed with the built form. For example it can be with the building itself or connected with grey infrastructure like streets, parking lots or other paved areas we find in the urban context. The urban green-blue spaces overall tend to relate more to the combination of green-blue-grey and technical components, for example water management where often green roofs, permeable pavement and different types of infiltrationsystems can be used (EU 2021).

The need and demands for higher efficiency in the city's spaces become greater when both the number of buildings and people increases. Cities need to be supplemented with new places and new forms of greenery that can be integrated in a balanced way with the built environment. In parallel with the densification of cities, there is also a change in how we humans use the city's green-blue spaces. Residents use urban green-blue spaces in a variety of ways and it is important to understand how these spaces may be used and what the needs of residents are (Lee et al 2015). For example, cemeteries have become a place for exercise and parks a place for gardening and frisbee golf.

When the amount of people in cities increase, conflicts can arise in how the city's green-blue spaces should (or can) be used when there are more of us who must share the same area and the load on the city's existing green-blue spaces increases. This requires a balance, where the importance of the city's green-blue cultural heritage – such as avenues, parks and cemeteries – alongside new forms of green-blue elements needs to be made clear and interact (Wingren 2015).

Although questions about urban green-blue spaces in relation to for example climate, biodiversity and land resource is very important, it is also crucial to value the green-blue not only for its physical structure and ecological function, but also its value in relation to the experience of the people (Wingren 2015). The green-blue spaces we find in cities is also something that can contribute to the whole identity of a city and it provides meeting places and become places we carry in our minds.

GREEN-BLUE AS STRUCTURE

GREEN-BLUE AS CLIMATE EQUALIZER

GREEN-BLUE AS BIOLOGICAL PLATFROM

GREEN-BLUE AS LAND RESOURCE

GREEN-BLUE AS NATURAL BARRIER

GREEN-BLUE AS IDENTITY

GREEN-BLUE AS LIVING SPACE

GREEN-BLUE AS MEETING SPACE

The different types of 'urban green and blue spaces'

The green and blue we find in cities consists as much of the public parks and the private gardens as the street trees and green wastelands between roads and buildings (Wingren 2015). In connection to planning and ownership, roughly, the green and blue spaces in our cities could be divided into following categories.

The public green-blue spaces

The public green-blue spaces we find in cities can be natural areas that provide access to contact with nature, sport areas that include green-blue spaces but are designed for sports activities, formal green-blue spaces that are organized and designed focusing on aesthetic components of plants and trees or informal green-blue spaces that are characterized by natural development and less organized. Often, the mapped public green-blue land goes under the category park or nature area, but basically all green-blue spaces that we find in our cities that are not private should be considered public and valuable in one way or another (Vidal et al 2020; Wingren 2015).

The private green-blue spaces

A big amount of the green that we find in cities is actually green on private land, for example residential gardens and allotments. With the own responsibility for the land, it can mean an automatic diversity and variation in both the amount and the type of greenery, which can lead o a positive experience because it creates a variation. But the own responsibility can also, in total contrast, mean a lack of diversity. Today, a majority of private owners prefer lawns and avoid greenery that needs greater care. Overall, it can be seen that greenery tends to decrease in private gardens, especially the front yards that almost can be seen as a disappearing resource where more and more paved areas replaces the private green areas and this for example causes an increased runoff (Wingren 2015).

The public green-blue spaces are often protected, developed and managed through green-blue structure plans and conservation plans, while the private green tends to fall between the chairs where the view of the value of private green in a wider perspective often is lacking. In the denser city, the private gardens need to be addressed as not only important for the owner itself, but also the value and overall role these green-blue areas have in the city context. By letting more of the private green be visible for others, by for example using front yards, we automatically increase the exposure and presence of green for the common man. By also reducing plot sizes, we can both free up more space for public green and it also means less space for the private owner to take care of, while still having a garden (Wingren 2015).

The green roofs and green facades

Green roofs can be a way to activate the roof by providing outdoor space, add an aesthetic and visible element and also contribute to a cooling effect.

Green facades can have an effect on heat as well as noise, but foremost they add a visible value and compared to green roofs, the green facades are more limited in their function (Wingren 2015).

THE PARK

THE GARDEN

THE STREAM

THE CEMETERY

THE STREET

THE ALLOTMENT

THE ROOF

THE WALL

Green-blue infrastructure (GBI)

Green-blue infrastructure holds many defintions, one example is: *"A strategically planned network of natural and semi-natural areas with other environmental features, designed and managed to deliver a wide range of ecosystem services, while also enhancing biodiversity"* (European commission n.d). Common to all definitions, however, is the aspect of connectivity and coherence. The main idea of working with green-blue infrastructure is the view of how the network of green-blue spaces improves the connectivity of natural areas and improves the quality of the environment and at the same time improves the health and quality of life for citizens (European Commission n.d). The motive of the concept of green-blue infrastructure is how the natural vegetative systems and green technologies collectively can provide society with a multitude of environmental, health, social and economic benefits (Green Infrastructure Ontario 2021).

"An interconnected network of natural areas and open spaces, as well as technologies and practices, that use natural systems – or engineered systems that mimic natural processes – to enhance overall environmental quality, conserve ecosystem functions and natural capital, sustain clean air and water, and provide social and economic benefits to people and communities" (Allen 2012).

"A network of open space, airsheds, watersheds, woodlands, wildlife habitat, parks, and other natural areas that provides many vital services that sustain life and enrich the quality of life" (Allen 2012).

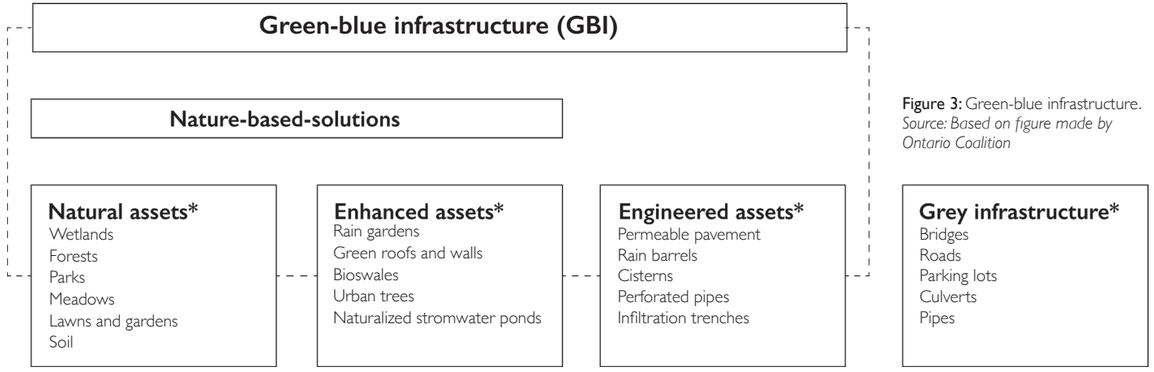


Figure 3: Green-blue infrastructure. *Source: Based on figure made by Ontario Coalition*

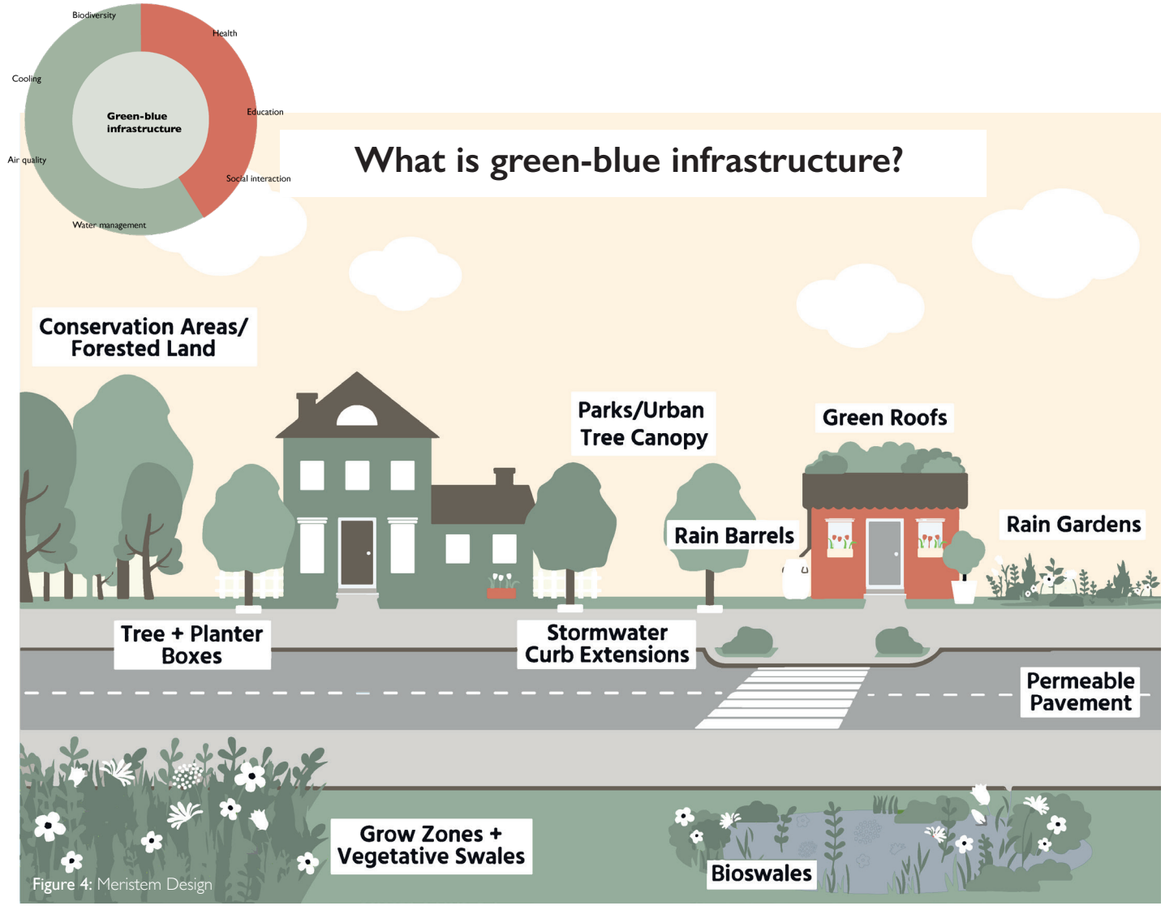


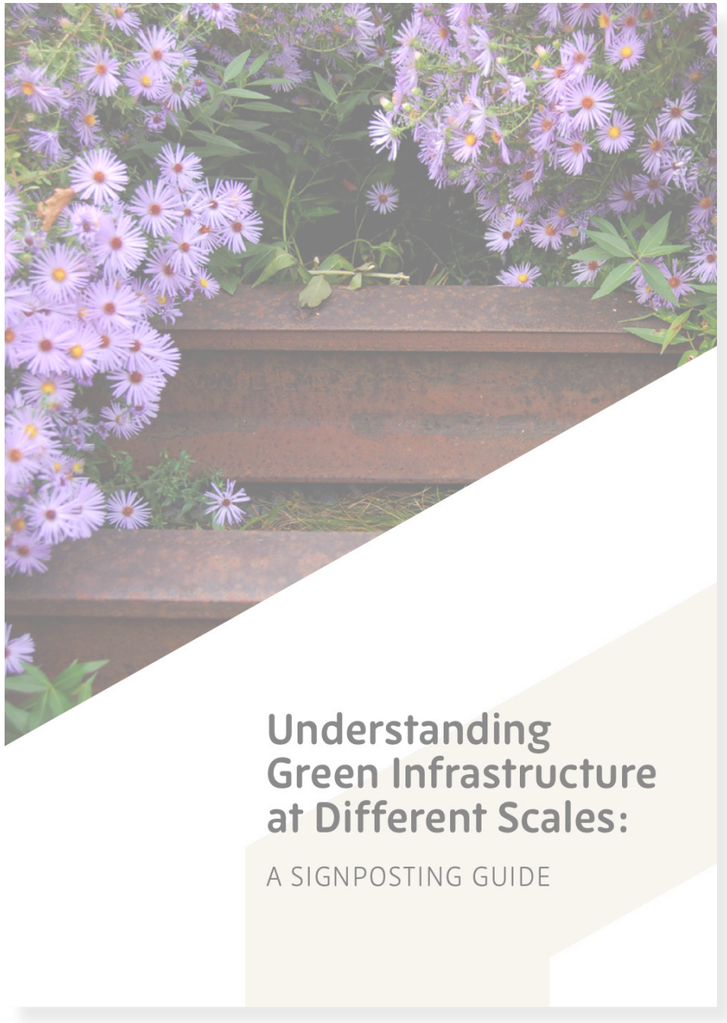
Figure 4: Meristem Design

Green-blue infrastructure as part of different scales

Densification policies often contribute to preservation of natural spaces at a regional level, but then instead tend to reduce the green and blue spaces within the urban areas. As demonstrated, urban green and blue space is vital both for the society and us as individuals and therefore, the green and blue spaces in the cities should not be underestimated. To enable the creation of a green-blue network that works as an infrastructure rather than separated and unrelated parts, the green-blue needs to be managed and handled through different spatial scales. The main idea of green-blue infrastructure planning is to address issues and contribute provisions at multiple scales, from national level to regional and city scale, all the way down to neighborhood level and block scale, including park, streets, gardens and even materials and pavements (Grădinaru and Hersperger 2019).

It is also crucial to understand how different provisions and possible benefits vary at different scales. Barker et al (2019) have created a guide with the aim of creating a better understanding of how green-blue infrastructure can be implemented at different levels. The guide uses matrices to showcase which provisions will deliver benefits at the **micro, meso and macro scale.** In the guide, each scale is quite loosely defined, but **micro scale** is referring to a more specific or average sized site or development proposal and its immediate surroundings. **Meso scale** in turn consists of multiple micro locations and spatially could mean a neighborhood or district. Finally, **macro scale** is considered as the largest scale and may include for example a whole city or region (Barker et al 2019).

The guide is also divided into the three themes of **Environmental benefits, Social benefits** and **Economic Benefits**. In this thesis, the focus has been on the environmental and social benfits and therefor, these are the ones that will be presented.



Environmental benefits

What is shown is for example that on a meso scale, street trees and hedgerows is the most important provision both when it comes to reduced heath island effect and improved water and air quality.

At the same time, it is also clear that street greenery, allotment areas and sport areas are not the most benefitial when it comes to for example increased population of protected species. But on the other hand, the allotment and sports areas might provide important social benefits for people and both parts are important.

Environmental benefits from GI provision at the **MACRO** scale

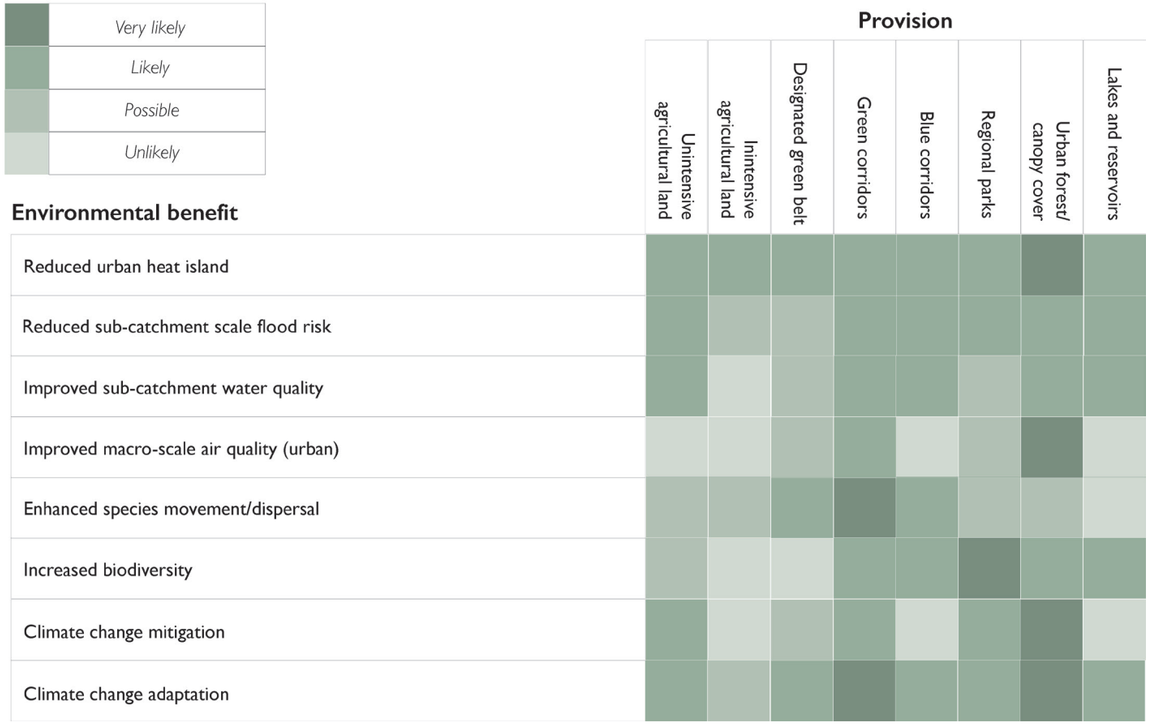


Figure 5: Environmental benefits from GI provision at the macro scale. *Source: Barker et al. (2019).*

Environmental benefits from GI provision at the **MESO** scale

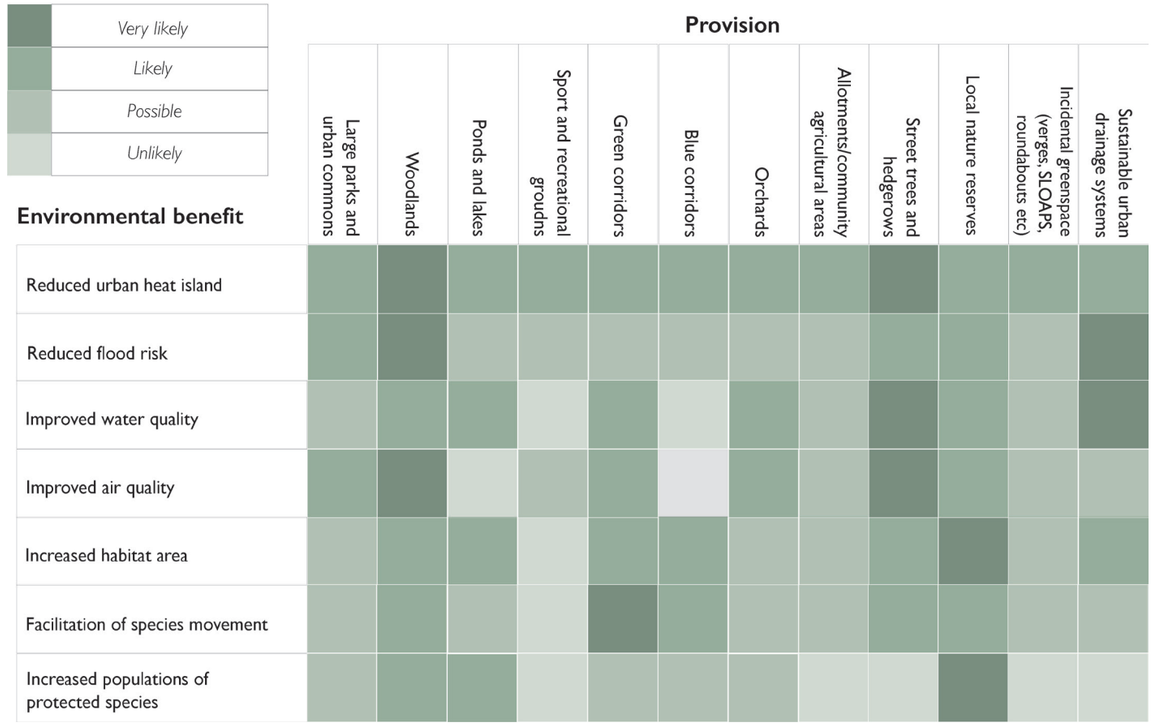


Figure 6: Environmental benefits from GI provision at the meso scale. *Source: Barker et al. (2019).*

Environmental benefits from GI provision at the **MICRO** scale

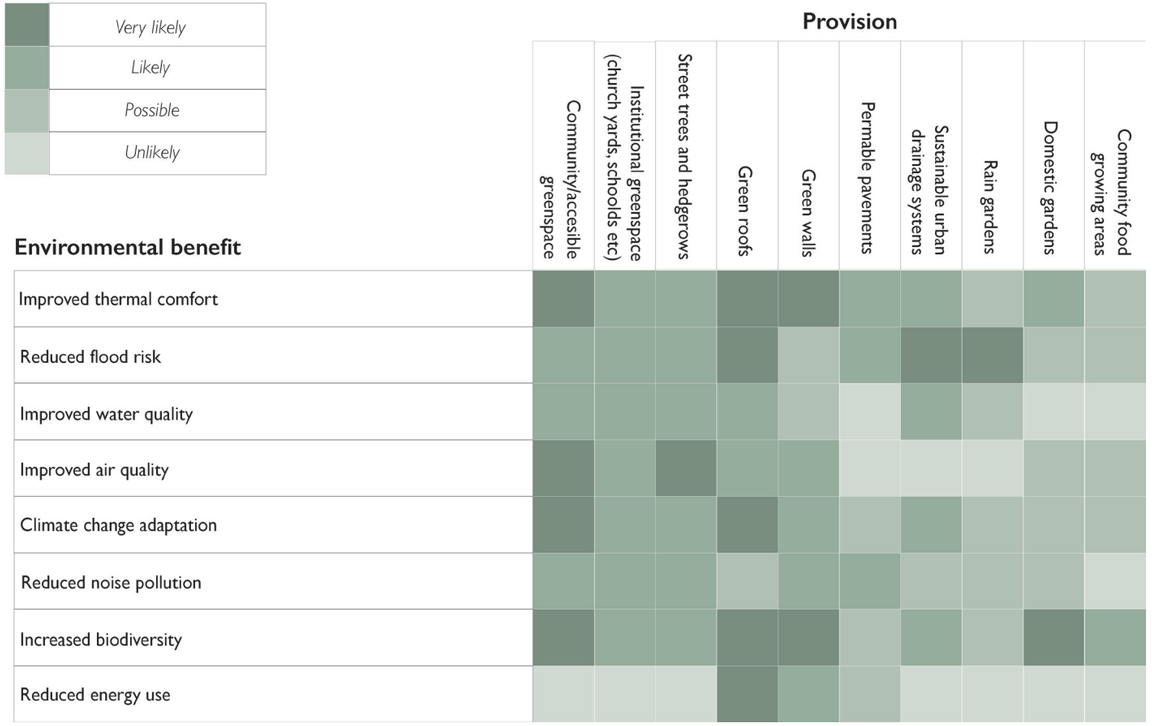


Figure 7: Environmental benefits from GI provision at the micro scale. *Source: Barker et al. (2019).*

Social benefits

Among the social benefits, when it comes to access and enjoyment, it is clear that different types of parks – at all three scales – together with nature reserves, community food areas and gardens are important.

It can also be seen that a lot of different provisions have a positive effect on mental health. Physical health, reasonably, is more dependent on space.

An interesting point is that compared to other provisions, green roofs and facades, as well as street trees seem to be important when it comes to environmental awareness. This showcase that the visual parts of green-blue infrastructure also matters.

Social benefits from GI provision at the **MACRO** scale

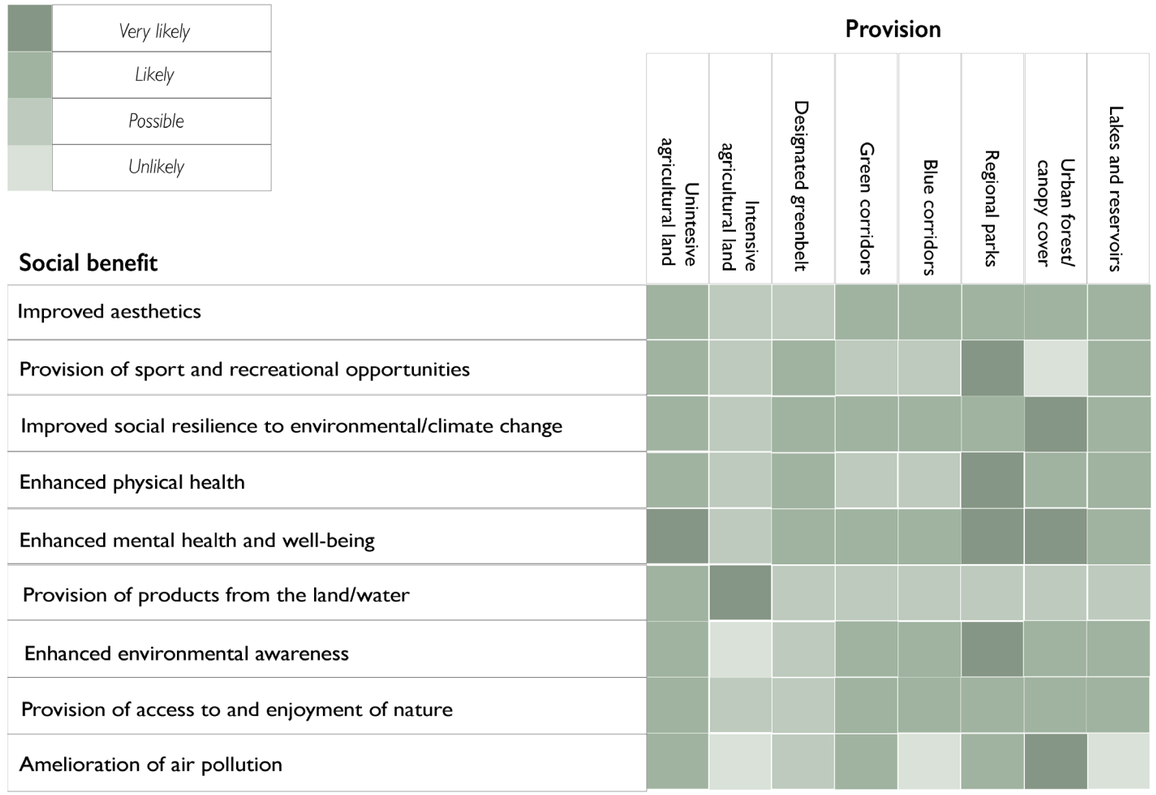


Figure 8: Social benefits from GI provision at the macro scale. *Source: Barker et al. (2019).*

Social benefits from GI provision at the **MESO** scale

Figure 9: Social benefits from GI provision at the meso scale. *Source: Barker et al. (2019).*

Social benefits from GI provision at the **MICRO** scale

Figure 10: Social benefits from GI provision at the micro scale. *Source: Barker et al. (2019).*

Concluding remarks on research

It can be clearly stated that both research and literature jointly confirm the holistic benefits of using nature as a source with a focus on both people and communities and that, in an urban context, there are clear arguments for urban green-blue spaces – with both environmental and social values. The research also indicates the importance of providing accessability to these green-blue values in the everyday life, both where we live, work, spend our free time and even while being indoors.

The green-blue infrastructure (GBI) concept clarifies how the combination of different green-blue elements can contribute to the holistic perspective of putting both the human and the environment in focus and that the understanding of working between different scales is crucial to enable the coherent, green-blue network.

What research also points towards is that in denser cities, we need to widen the perspective of the green-blue structures in terms of its value and use. More functions needs to share the same space and new forms of green-blue elements need to work hand in hand with existing structures.

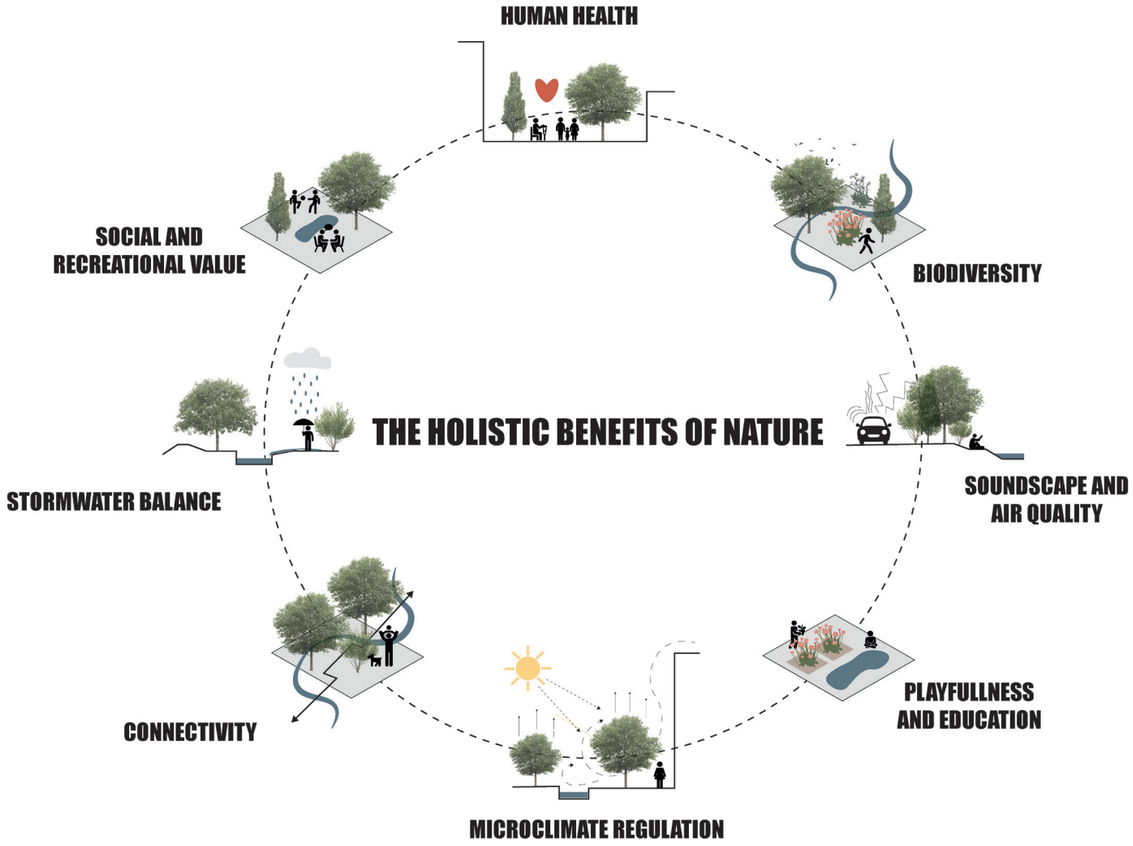
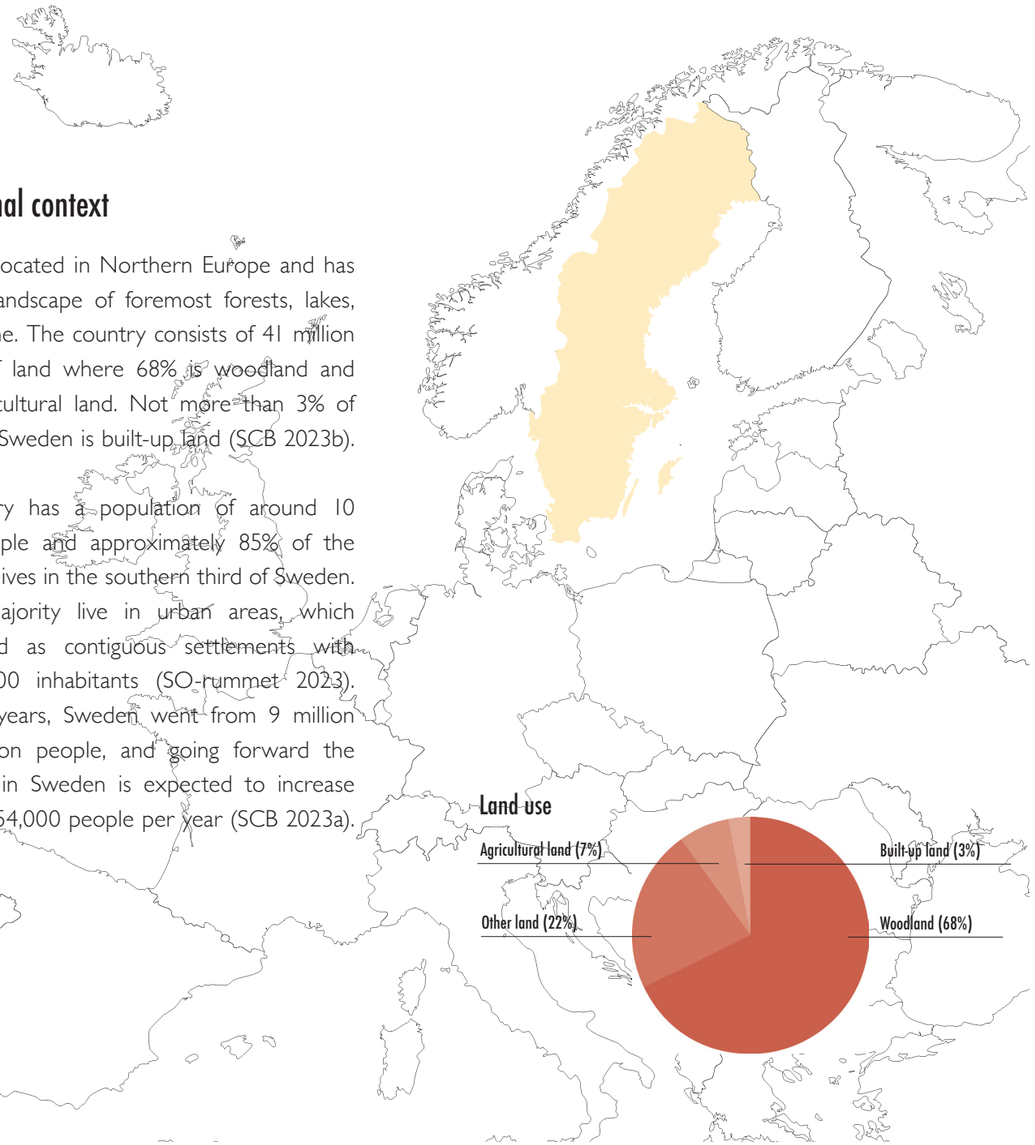


Figure 11: Summary of the holistic benefits of nature.
Source: Based on figure made by SLA

Analysis

Norrköping



The national context

Sweden is located in Northern Europe and has a diverse landscape of foremost forests, lakes, and coastline. The country consists of 41 million hectares of land where 68% is woodland and 7% of agricultural land. Not more than 3% of the land in Sweden is built-up land (SCB 2023b).

The country has a population of around 10 million people and approximately 85% of the population lives in the southern third of Sweden. A large majority live in urban areas, which are defined as contiguous settlements with at least 200 inhabitants (SO-rummet 2023). In just 13 years, Sweden went from 9 million to 10 million people, and going forward the population in Sweden is expected to increase by around 54,000 people per year (SCB 2023a).

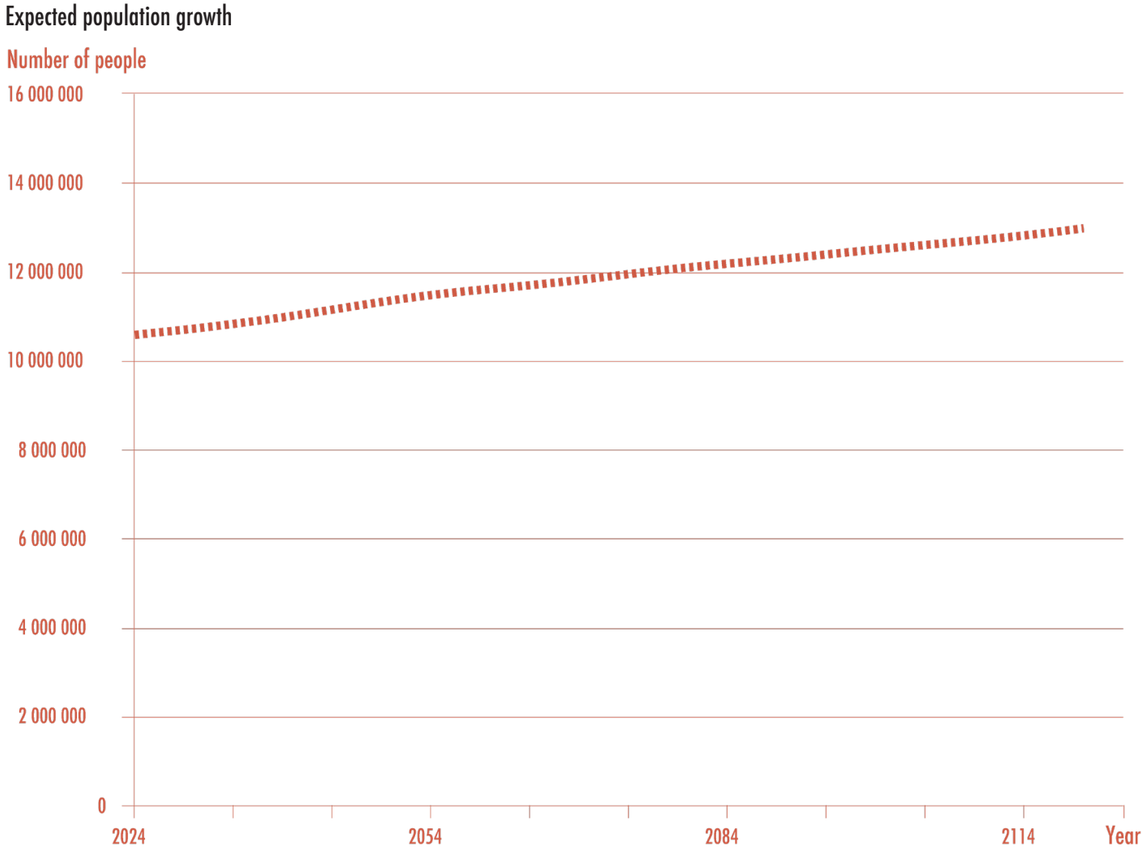


Figure 11: Expected population growth in Sweden.
Source: Statistiska centralbyrån (2023a).

The public opinion in the country

White Arkitekter has compiled a report (2023) with the Swedish people's opinion on issues related to the built environment. What the report showcases is that the Swedish people, in general, are concerned about their built environment and many of the opinions and preferences that are expressed can be understood as a reflection of our current times where we can both see changes in our behavior, but also expressed needs.

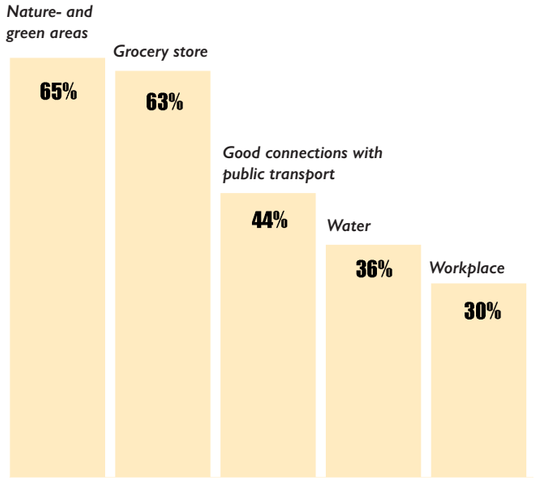
Among many questions, it is clear that questions regarding the presence of and proximity to nature and green-blue areas rank high on people's list. For example, 65% of the Swedes consider nature and green areas to be the most important factor to live near. Overall, a majority of the people also want to see more greenery in the urban environment and increase the number of parks and green areas in public spaces.

76% of the Swedes want to see more greenery in the urban environment to promote ecosystem services and preserve biological diversity.

65% of the Swedes consider nature and green areas to be the most important thing to live near.

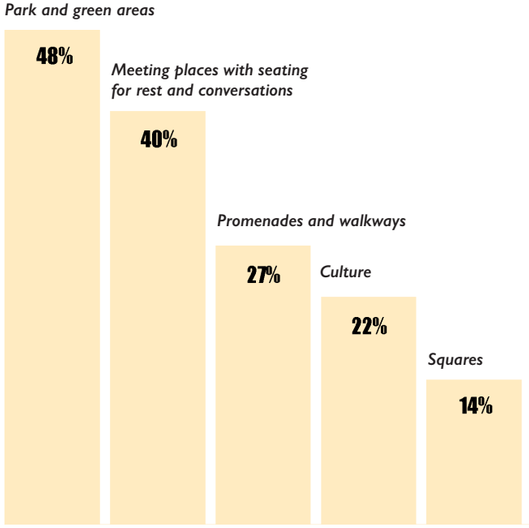
48% of the Swedes want to see more parks and green areas in the public space.

This is most important for Swedes to live nearby



When it comes to what Swedes value highly in terms of having close proximity to where you live, nature and green areas are on the top of the list. Close access to grocery stores and good connections with public transport is also important.

This is what Swedes want to see more of in the public space



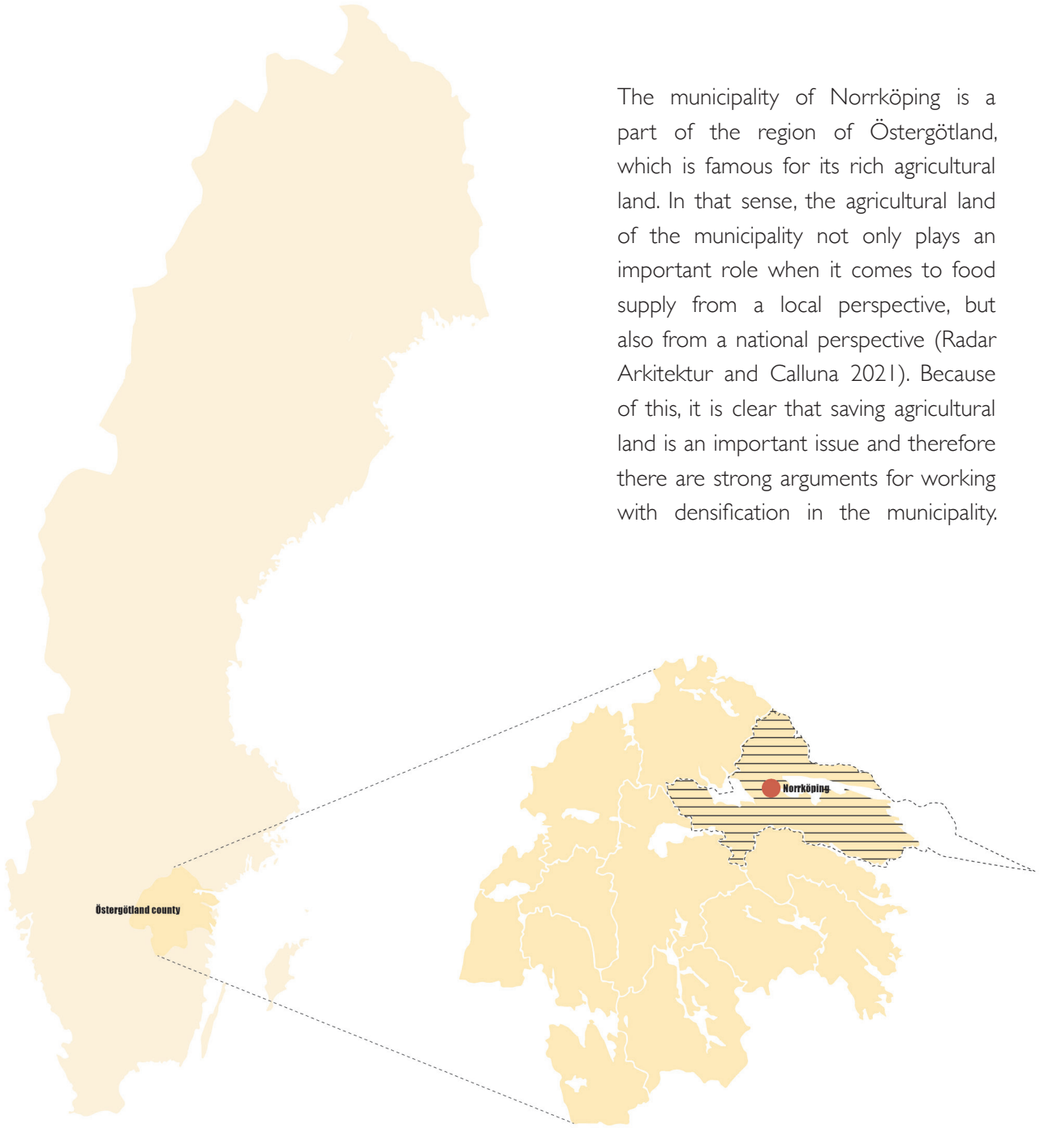
Roughly half of Swedes want to see more parks and green areas in the public space. There are also requests for more meeting places with seating for rest and conversation, as well as walking paths.

The regional context

The city Norrköping is located in the eastern part of Sweden and is currently the tenth largest city in Sweden with approximately 145 000 inhabitants (SCB 2024).

Norrköping is well connected to all three largest cities in the country. By train, both Göteborg and Malmö are reachable within approximately three hours and the capital Stockholm can be reached within little more than an hour's travel time by train.

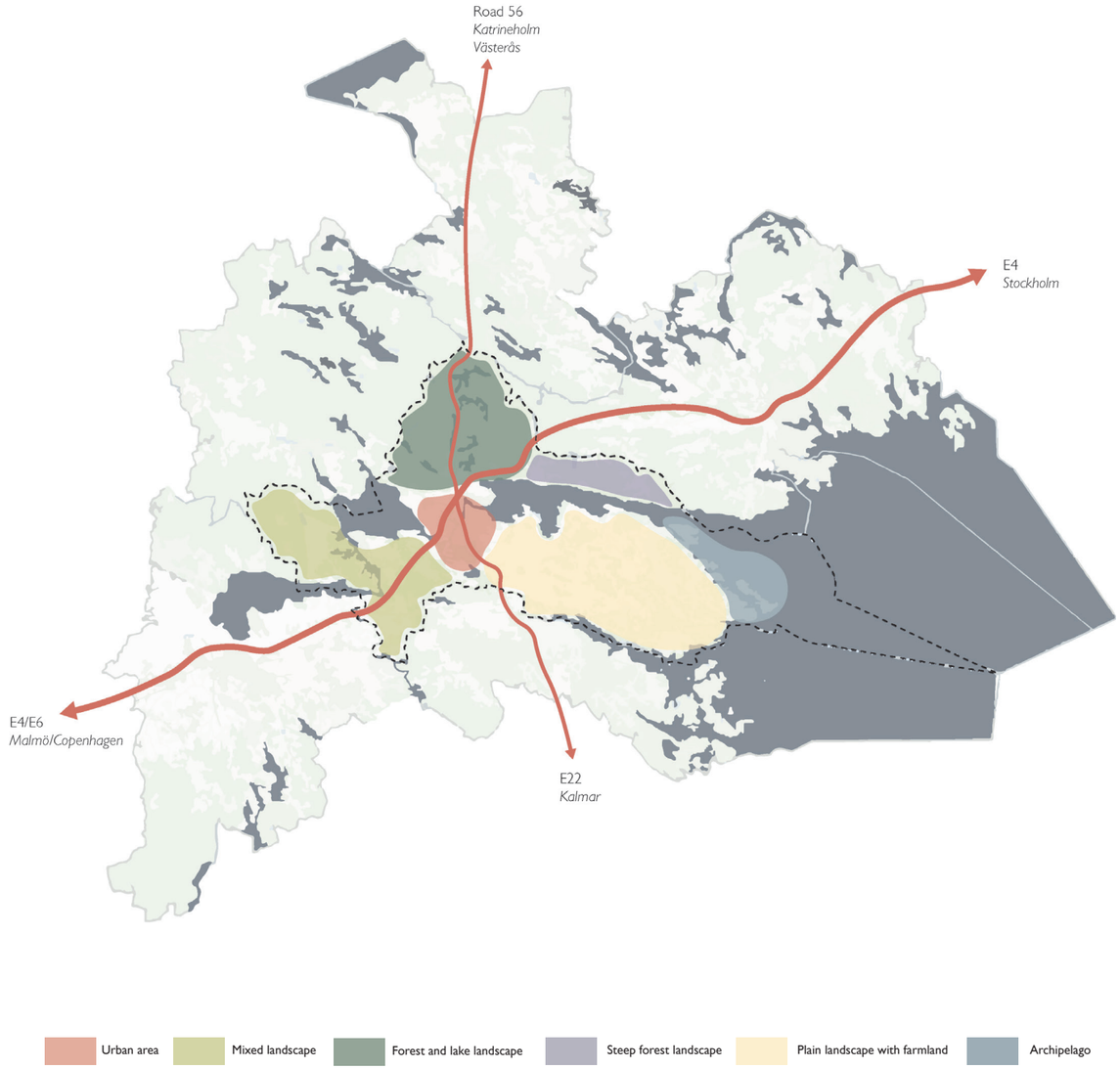
The municipality of Norrköping is a part of the region of Östergötland, which is famous for its rich agricultural land. In that sense, the agricultural land of the municipality not only plays an important role when it comes to food supply from a local perspective, but also from a national perspective (Radar Arkitektur and Calluna 2021). Because of this, it is clear that saving agricultural land is an important issue and therefore there are strong arguments for working with densification in the municipality.



The municipality

The municipality of Norrköping today has around 145 000 inhabitants and is expected to grow in the upcoming years. The proposal for the new comprehensive plan is based on the vision of 175 000 inhabitants, which means that the comprehensive plan needs to create the possibility for the municipality to be able to grow with around 30 000 new residents, whilst needed functions that such development entails can be secured (Norrköpings kommun 2023).

The city of Norrköping is located centrally in a diverse municipality that consists of both open agricultural landscape, woodland, dramatic mountain areas, lakes and archipelago. The northern part of the municipality is known for the woods of Kolmården, which is characterized by dramatic faults in the landscape. The terrain consists of rift valleys, coniferous forests and marchlands. Around 90% of the total number of lakes in the municipality can also be found in these areas. The utmost part of the municipality to the east by the Baltic sea consists of hundreds of islands that together form the archipelago of Norrköping (Länsstyrelsen 2016).



The comprehensive plan

During the summer of 2023, the proposal of a new comprehensive plan for the municipality of Norrköping (2023) was out for consultation. With an increasing population and the need to protect agricultural land, the municipality uses a so-called 'four-step principle' in the comprehensive plan as a guide. This makes it clear that reclaiming unexploited land in the municipality should always be the last option and only an alternative if the other three options cannot be achieved.

Overall, there is a focus on mobility, densification, protection of agricultural land and strengthening of green structures in the propsal. What is clear, however, is that the green-blue both takes up a lot of space in the overall plan and the municipality of Norrköping emphasizes the importance of the green-blue with a connection to both climate, health and well-being, attractive designed living environments and promotion of physical movement and sustainable mobility (Norrköpings kommun 2023).

The comprehensive plan also states that in urban areas in the municipality, green areas and parks should be reachable within walking distance and provide different activities depending on the distance. These different activities are summarized in the so-called 'socio top spin'.

From this, it can be concluded that what people should have the closest access to is greenery and the possibility to rest, walk and play at the playground. Examples of activities and qualities for which it is okay to travel further to experience are views, forest feeling, fishing, swimming and different winter sports.

Figure 12: 'Four-step principle'.
Source: Norrköpings kommun (2023)

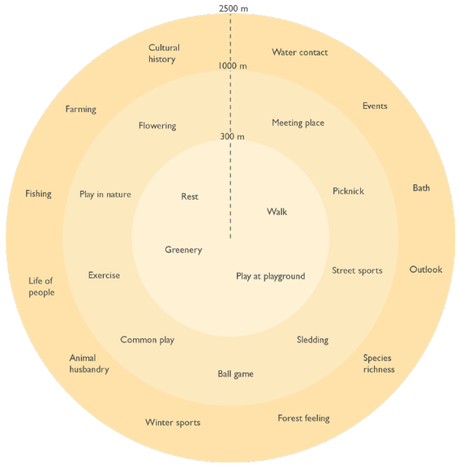


Figure 13: 'Socio top spin'.
Source: Norrköpings kommun (2023)

"A well-designed living environment with elements of greenery, parks and green areas must be promoted in the local environment both for existing and new residential areas to contribute to good health, well-being and security."

"Green areas, parks and green lanes in the built environment are important aspects of the designed living environment and must be obvious parts to take into account and include in the development of public space."

"In the urban environments, it is particularly important to make room for green environments that can deliver ecosystem services to deal with challenges linked to climate change."

"Green elements can increase the attractiveness of choosing to walk and cycle, which is positive for public health."

"Access to a stimulating and green outdoor environment as well as facilities for sports throughout the city and urban areas creates the conditions for physical activity and better health."

"There is also a need to develop new green lanes so that in the long term create a coherent network of green structures between the city's various green areas."

Some examples of how the municipality frames the importance of green-blue values in the comprehensive plan.
(Norrköpings kommun 2023)

"It is important to continue supplementing the existing city with service functions, new housing in various forms of tenure and workplaces. In parallel, parks, green areas and other meeting places also need to be developed to create a living, healthy and more cohesive city."

The city

Norrköping is foremost known for its rich industrial history, vibrant cultural scene and picturesque waterfront. Situated on the banks of the Motala ström river, Norrköping was once a major center for textile production during the 19th and early 20th centuries, earning it the nickname "Sweden's Manchester." (Norrköpings stadsmuseum n.d).

One of Norrköping's defining features is its striking industrial landscape, characterized by well-preserved brick buildings and historic factories that have been repurposed into modern spaces for living, working, and entertainment (Norrköpings stadsmuseum n.d). The Motala ström riverfront, lined with parks, promenades, and cafes offers closeness to water and opportunities for strolls and outdoor activities.

Culturally, Norrköping is home to numerous museums, galleries, and theaters, including the renowned Museum of Work, which showcases the city's industrial heritage, and the Louis de Geer Concert Hall, a popular venue for concerts and performances. The city also hosts several annual festivals and events, celebrating everything from music and film to food and literature. Today, Norrköping stands as a vibrant urban center, blending its industrial heritage with modern innovations and cultural attractions, offering visitors and residents alike a dynamic urban experience in the heart of Sweden's Östergötland region.

The main components of the city's identity

The industry

In the 1600's, the dutch businessman Louis de Geer started several industries in Norrköping, among those a clothing factory and a paper mill. This made the city grow and for a period of time, Norrköping was actually the second biggest city in Sweden and under the 19th century, half of the clothing manufacturing in Sweden took place in Norrköping. The good times for the industries lasted until the 1950s, after that the concurrence from abroad became too big and by the time of the 70s, only a few industries were still running (Norrköpings stadsmuseum n.d).

Luckily, instead of tearing down and building new, the municipality of Norrköping decided to work with preservation and find new uses for the old buildings. Today Norrköping is probably mostly famous for the so-called 'Industrial landscape' – a unique part in the center of the city where once the industry was located. The industrial landscape is even unique in Europe and because of the interplay between history, culture and innovation, this is one of the most loved parts of Norrköping and a big part of the identity (Norrköpings stadsmuseum n.d).

The stream

Motala stream runs through the city of Norrköping and connects the Baltic sea in the east with Vättern in the west, the second biggest lake in Sweden. The power of the running water once led to the growth of Norrköping as a leading industrial city and has ever since been played an important role in the city, both as a function and as a physical element (Norrköpings stadsmuseum n.d). Today, the stream still functions as an important element for the city, where people enjoy the stream in different ways.

Photo: Peter Holgerson

The promenades

Since the end of 19th century, the center of Norrköping has been framed by linden avenues, called 'the promenades'. The promenades consist of the North, East and South promenade and together they consist of around 1800 linden trees that are between the age of 120-160 years. The promenades are an important characteristic of the city and serve as a strong, green connection around the city center (Norrköpings kommun 2019).

The tram

Norrköping is known for its yellow trams. Already in 1904 the first trams started to run and now, 120 years later, it is a big part of the city's identity. Today, the tram network served by two tram lines still work as a base for the public transportation as they account for 66% of the share of travelers in the city's public transport (Norrköpings kommun n.d).

The culture

Year 2017 Norrköping was selected as the first Northen music city to be a part of UNESCO Creative Cities Network (Svenska Unescorådet 2017). With a lively and active music scene in many genres, Norrköping is known for the engagement of cultural events. Music, culture and creativity is a strong part of the city's identity and it is well known that people from Norrköping are very proud of the rich cultural heritage the city has to offer.

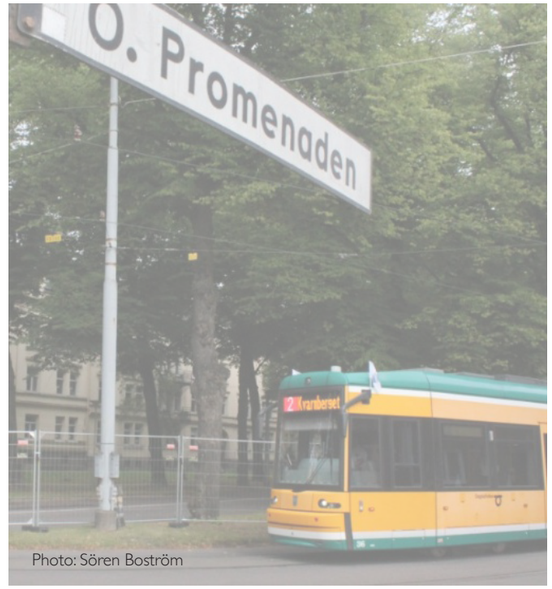


Photo: Sören Boström


Photo: Niclas Sandberg

A historical overview

Early days

Norrköping's history can be traced back to medieval times when it was a center for trade due to its strategic location along the Motala River (Norrköpings stadsmuseum n.d). It was granted its city charter in the 14th century, solidifying its status as an important urban center (Nationalencyklopedin 2023).

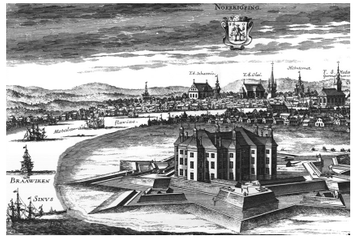


Photo: From 'Suecia antiqua et hodierna' by Erik Dahlberg

Industrial Revolution

During the 19th century Norrköping experienced significant growth, particularly with the advent of the Industrial Revolution. The city became a major hub for textile production, earning it the nickname "Sweden's Manchester." The presence of numerous factories along the riverbanks contributed to its economic prosperity (Norrköpings stadsmuseum n.d)

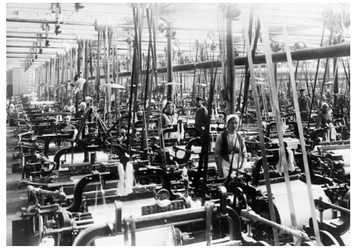


Photo: Norrköping Stadsmuseum

Expansion and Modernization

The 20th century brought further expansion and modernization to Norrköping. The city continued to thrive as an industrial center, diversifying its economy beyond textiles to include manufacturing, engineering and technology sectors (Norrköpings stadsmuseum n.d).

Photo: Östergötlands museum

Industrial Decline and Transformation

The latter half of the 20th century brought challenges to Norrköping as changes in global trade and technology led to the decline of its traditional industries. Many textile mills closed, resulting in unemployment and economic hardship. However, Norrköping adapted to these challenges by diversifying its economy and investing in new industries such as engineering, technology and services (Norrköpings stadsmuseum n.d).

Photo: Östergötlands museum

Urban Redevelopment

In the latter half of the 20th century, Norrköping underwent urban redevelopment initiatives to revitalize its city center and improve living conditions. Old, abandoned industrial areas were transformed into residential and commercial spaces, breathing new life into the city (Norrköpings stadsmuseum n.d).

Photo: Unknown

Today

Today, Norrköping continues to thrive as a vibrant city with a mix of historical and modern charm. Its waterfront areas, such as the popular Industrilandskapet, blend industrial heritage with recreational spaces, attracting locals and tourists alike.

From an industrial city to an innovative city

Since the industrial crisis in the end of the 1900's, Norrköping has gone through a major recovery. New residentials and businesses have been established in the central parts of the city and the population has grown. Today's popular and beautiful industrial landscape in the center of the city that holds a mix of knowledge, businesses and culture showcase this. With a sensitive preservation and transformation of the at that time closed and abandoned industrial area, the industrial landscape once again turned into the core of the city but where manufacturing has been replaced by more knowledge-oriented activities (Norrköpings stadsmuseum n.d)

Almost half of the job opportunities in the municipality can be found within the central parts of the city. Through strengthened infrastructure and public transport where the possibility of work commuting is created, the city of Norrköping has the potential to continue investing in knowledge-intensive and innovative companies. The industrial landscape, along with other attractive inner city environments, play an important role in showing how Norrköping can continue the transformation into a city of knowledge (Norrköpings kommun 2023).

Photo: Unkown

"Norrköping is a city that has made the transition from industrial city to today's knowledge city. The city has carefully able to renew its citycenter where the factories now houses a university and technology companies. A truly successful example where a beautiful and historic urban environment has developed and given new life and content – faith in the future has returned to Norrköping."

– Jacob Wesström
Samhällsbarometern (2020)

Green-blue strategies

Since the industrial crisis in the end of the 1900's, it is clear that the municipality put forward the importance of green-blue elements in the proposal of the comprehensive plan (Norrköping 2023). As already stated, the municipality points towards the earlier mentioned holistic benefits of focusing on the green and the blue as part of their future vision for the municipality.

When it comes to the city of Norrköping, the municipality also has a document (2020) where they go deeper into both mapping the green-blue structure in the city, as well as further explaining their thoughts and main points relating to the green-blue structure and needs within future city development.

The main categories that the municipality focus on in the document is:

- **Experience for humans**
- **Living conditions for plants and animals**
- **Climate adaptation**
- **Multifunctional surfaces**
- **The economic community benefits of greenery**

A concern that is being brought up is the absence of a cohesive green network in numerous urban areas, with many parks and natural zones lacking identity and being difficult to find. With urban expansion underway, there's a pressing need to both improve existing green spaces and establish new ones to address these challenges.

A goal that is presented is that Norrköping's parks and natural areas should be connected in a structure, where you can easily and safely move along green recreation lanes, through the city (Norrköpings kommun 2020). It can be interpreted as the municipality itself demonstrating the need for what the concept of green-blue infrastructure makes clear.

Photo: Mia Agvald Jägborn

Architectural strategies

Norrköping boasts a proud legacy in architecture. The city harbors a wealth of architectural treasures, embodied in structures and neighborhoods spanning various epochs, each possessing unique qualities and characteristics. With the exception of a few decades marked by widespread demolition in the 1960s, Norrköping has consistently championed exemplary architecture and maintained a lofty level of ambition among all stakeholders.

In the document Arkitekturstaden Norrköping (2018), the municipality specifies the strategies for architecture within the city. This works as a guide and points out the main aspects that should be considered throughout the whole building process, from initial idea to final building or area.

The strategies that are presented is:

1. The architecture should enrich
2. The architecture must respect its surroundings
3. The architecture must strengthen the cultural heritage
4. The architecture must have a design language of high quality
5. The architecture must promote social integration and interaction
6. The architecture must promote urban life
7. The architecture must age beautifully and with dignity

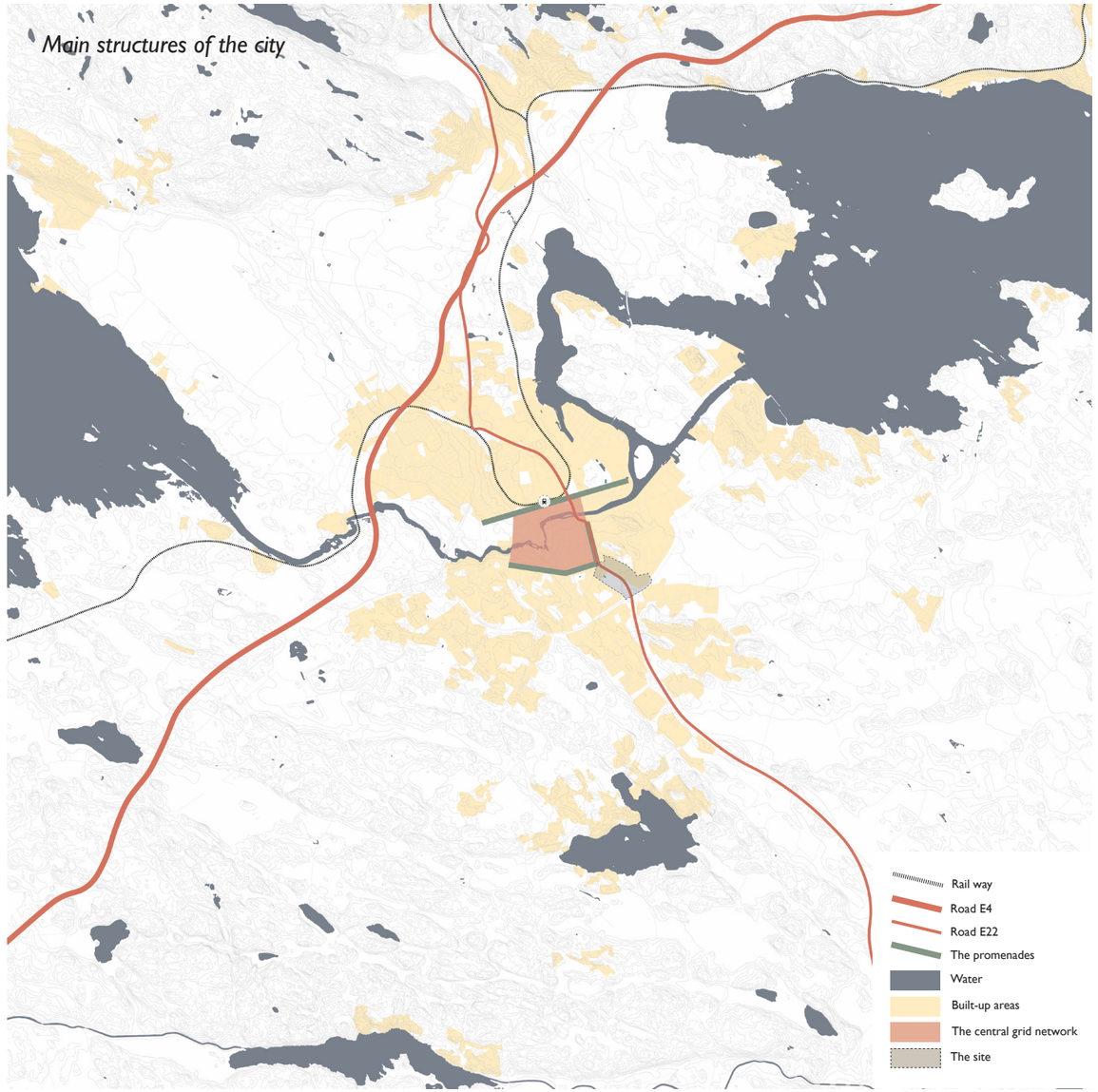
Photo: Crelle Ekstand

Mapping the city

To put the site in a city scale context, some aspects in city scale will be explored in order to understand the site also in the wider context.

The city of Norrköping has developed on both the north and south side of the Motala stream and the core of the city is located with the stream in the center. The central parts is well charachterized by a grid network, that in turn is framed by the famous promenades of the city.

Road E22 connects the city down south along the east coast of Sweden and today, this road goes through the site and along the central parts of the city. The motorway E4 connects Norrköping up north along the east coast and south west down the country.



Important nodes

The map showcase how the site relates to some of the bigger nodes and public functions, like the city center and hospital as well as the bigger external shoping and sport area.

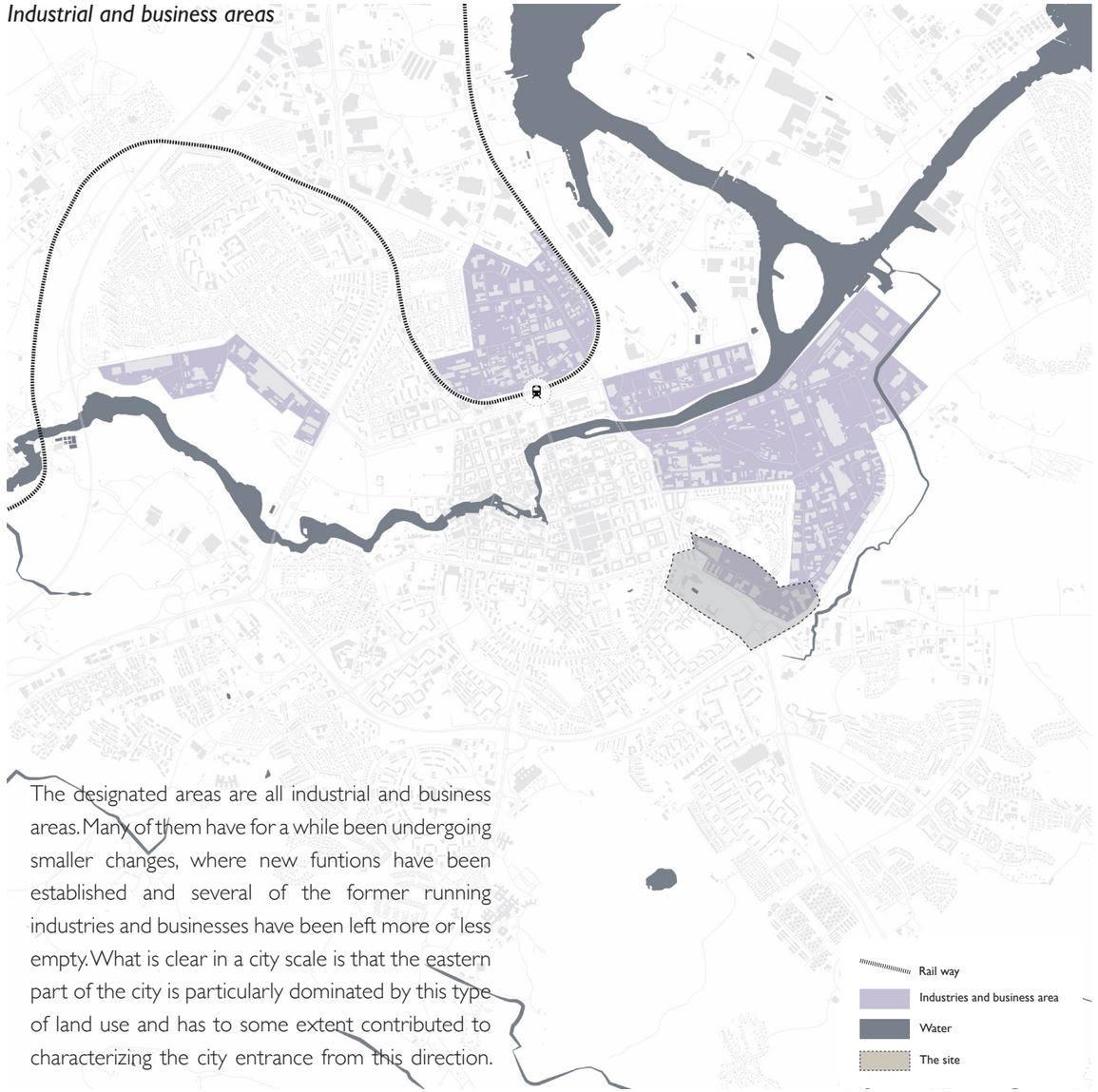
It can be seen that the site is located in close proximity to the city center, as well as the smaller airport that is located in the eastern part of the city.

Ringroad

Today, the existing ringroad goes through the site and along the central parts of the city in east. The plan is that the ringroad instead would be led more around the city center and by that, create the possibilty for transforming a part of the ringroad into more of city character, as part of the promenades.

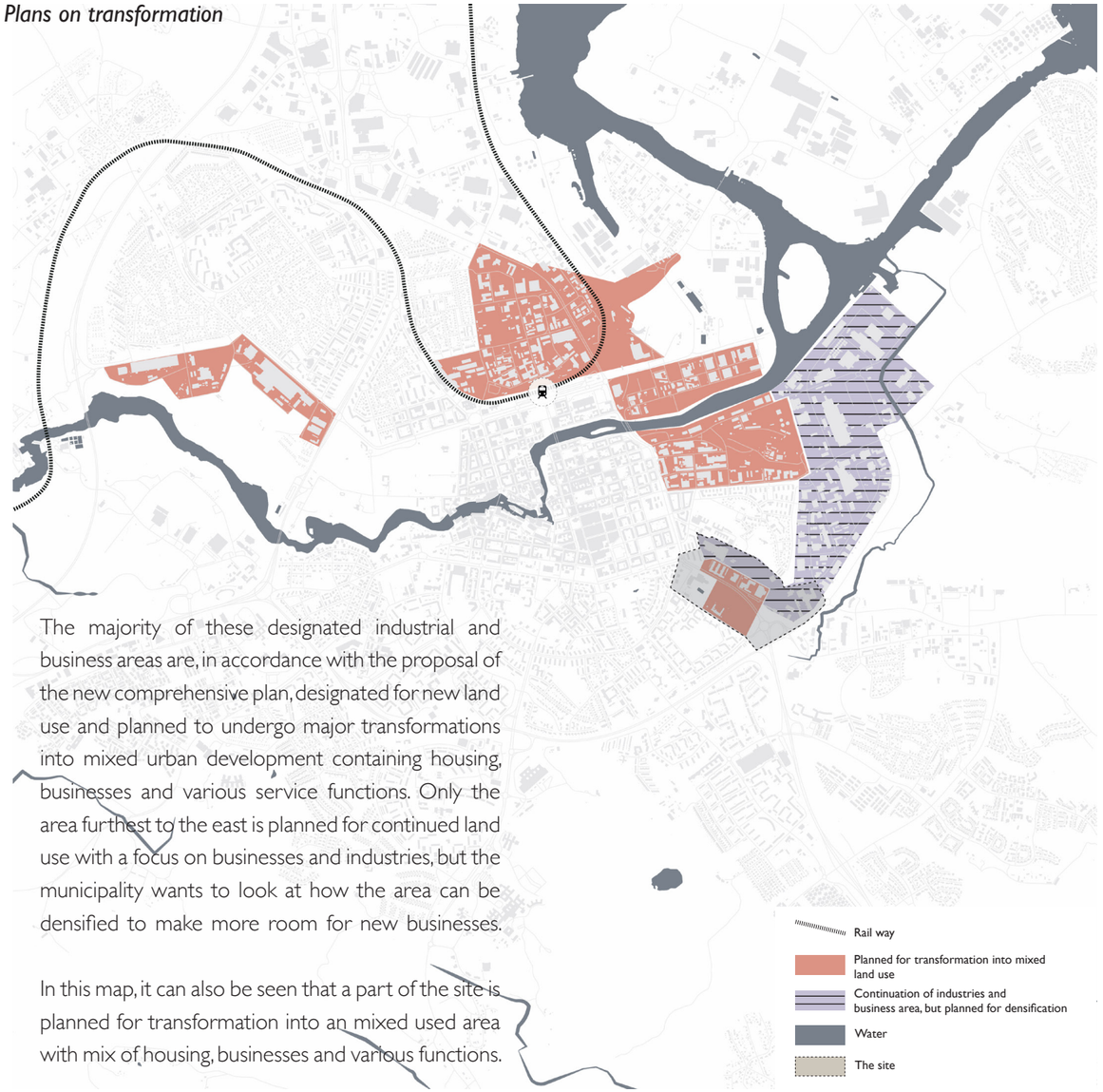
The part of the ringroad that goes through the site would then be transformed from a road with high speed into more of a city boulevard.

Industrial and business areas



The designated areas are all industrial and business areas. Many of them have for a while been undergoing smaller changes, where new funtions have been established and several of the former running industries and businesses have been left more or less empty. What is clear in a city scale is that the eastern part of the city is particularly dominated by this type of land use and has to some extent contributed to characterizing the city entrance from this direction.

Plans on transformation



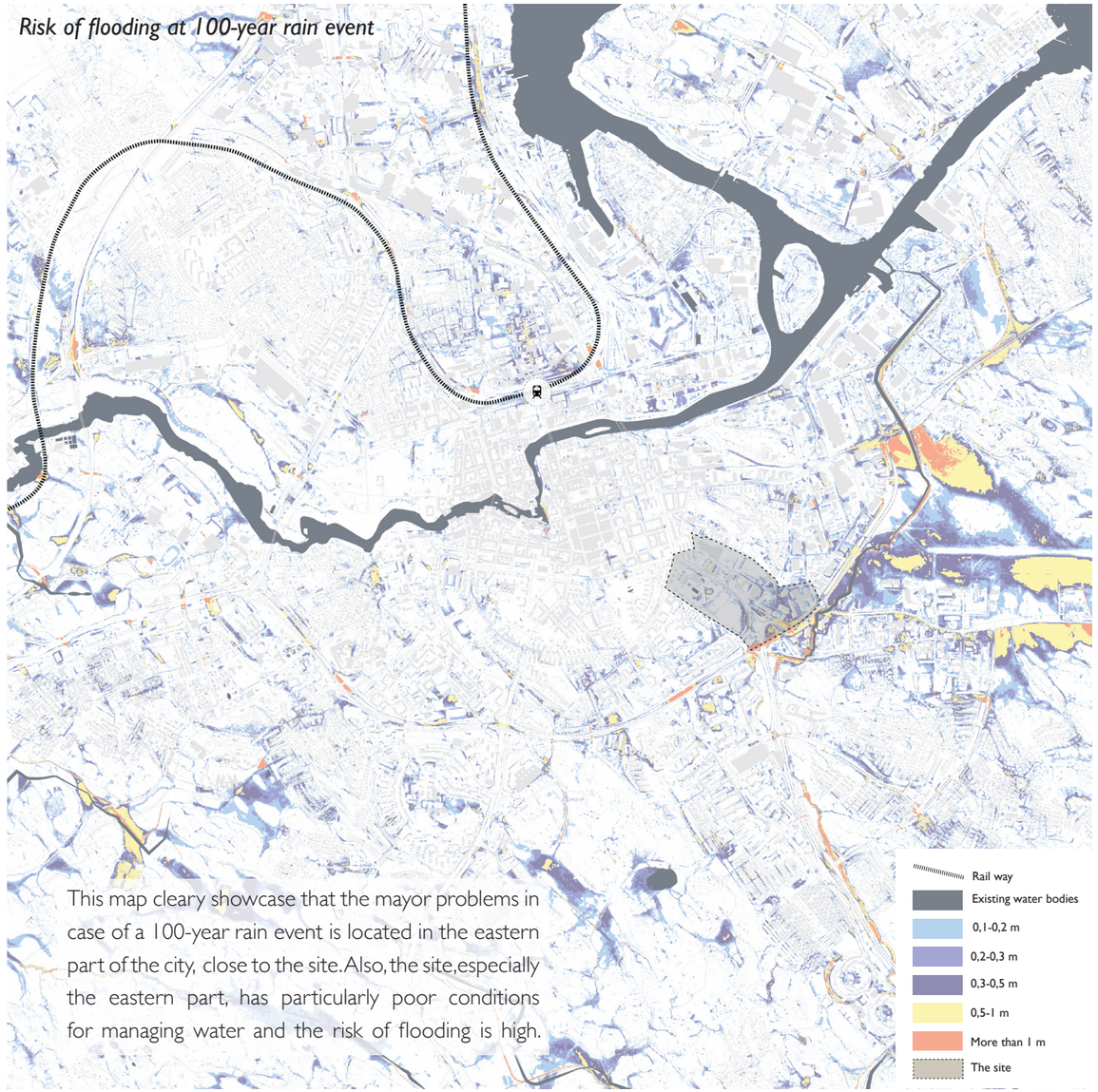
The majority of these designated industrial and business areas are, in accordance with the proposal of the new comprehensive plan, designated for new land use and planned to undergo major transformations into mixed urban development containing housing, businesses and various service functions. Only the area furthest to the east is planned for continued land use with a focus on businesses and industries, but the municipality wants to look at how the area can be densified to make more room for new businesses.

In this map, it can also be seen that a part of the site is planned for transformation into an mixed used area with mix of housing, businesses and various functions.

Main green and blue structure

When it comes to the green-blue structure in the city context, it is clear that there is a strong presence of water centrally because of the stream that is running through the city. The existing promenades frames the central parts of the city and provides a green connection that also support the mobility of cyclists and pedestrians. There are plans of extending the promenades with new connections, one of these would go right through the site by transforming the existing road into a part of the promenades. There are a number of larger, more connected green areas within the city, but the majority of these areas takes the form of "built-in islands" and lacks a connection to each other.

Risk of flooding at 100-year rain event



This map cleary showcase that the mayor problems in case of a 100-year rain event is located in the eastern part of the city, close to the site. Also, the site, especially the eastern part, has particularly poor conditions for managing water and the risk of flooding is high.

Tram network and district centers

The tram network forms a strong public transport system for the city and has always been important in terms of localization of new development.

Many of the district centers are located along the existing tram network and with future plans of extending the tram network to for example strentghen the connection between the central station and the hospital, but also in closer proximity to the site, some of the existing district centers will have the possibility to develop even more and the tranformation of the site can also strengthen these district centers even more, especially the ones that are nearest.

Bike network

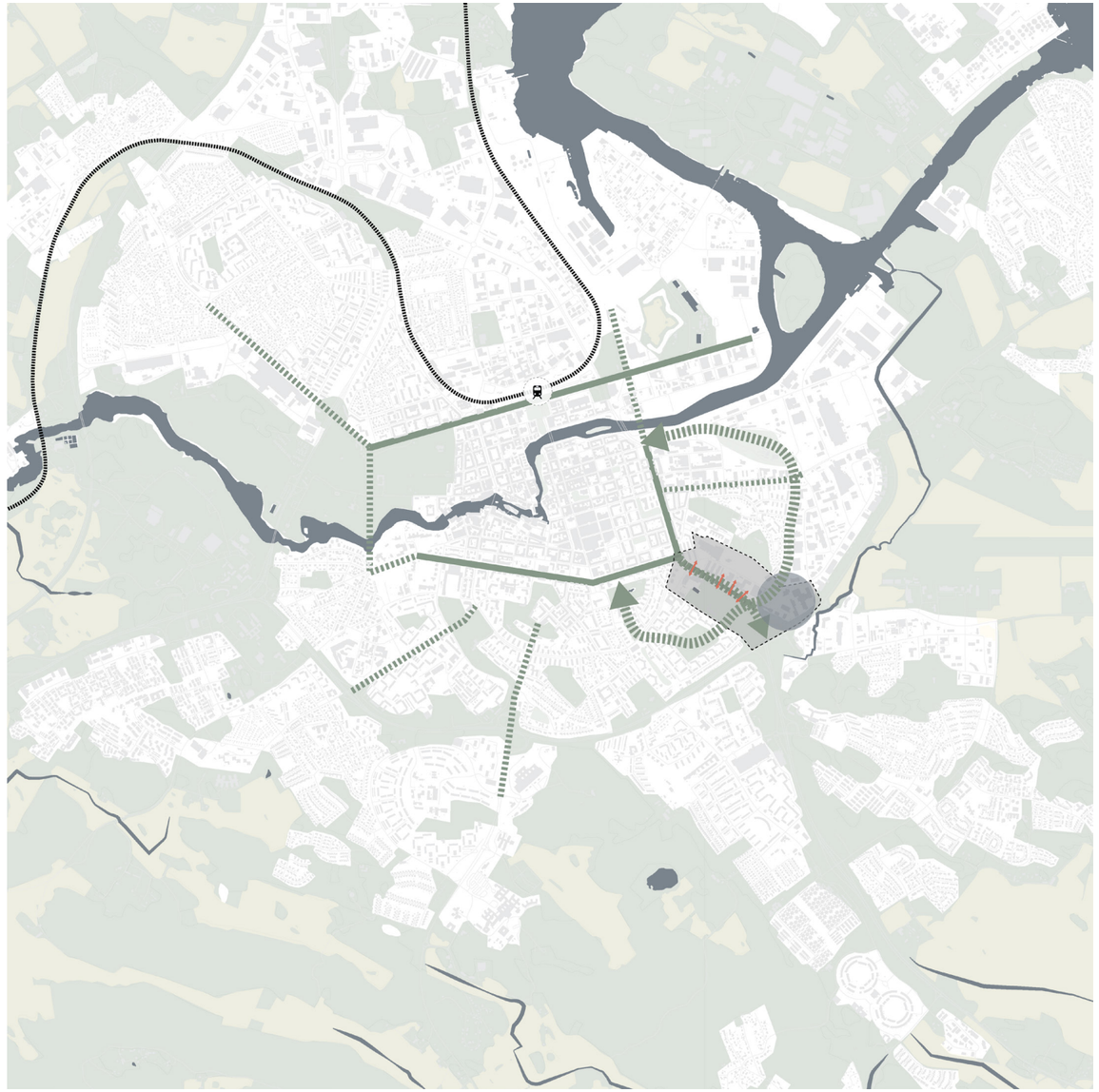
The main conclusion that can be drawn, with focus on the site, is that today there is no possibility to cross the main road that cuts the site into two (the road that goes straight through the site). In general, connections for cyclists and pedestrians are worse when it comes to movement in the city in an east-west direction.

Concluding remarks of the analysis in city scale

The main aspects to conclude when analyzing the site within the city context is that there are several existing green-blue areas, especially in close proximity to the site, but many of them today perform as 'isolated islands' in a city scale perspective. Improving the connection between existing green-blue areas can lead the way in not only connecting the site itself to the surrounding context, but also increasing the overall connectivity within the city.

The situation with bike connections showcase that there today is no possibility for pedestrians to cross the main road that cuts the site into to parts. Therfor, it is crucial to enable the movement between the two parts to unite the site as a whole, this both by fulfilling the municipality's plan on the transformation of the road as an extention of the existing promenades, but also by creating new transitions between the two parts of the site today.

It is also clear that the main issuses in case of a 100 year rain event is located within the proximity of the site, especially the most eastern part of the site showcase high risk of flooding. This is something that needs to be taken into consideration and also an argument for focusing on green-blue elements in a propsal for the site.



The site

Close to the city center, between the framed central grid network and the surrounding ring road, the site is located. Söderköpingsvägen splits up the site into two parts and there is today no possibility of crossing the road at any part between the big traffic interchange in the east and the meeting with the east and south promenade in west. Because of this, Söderköpingsvägen works as a barrier between the north and the south side of the site. As Söderköpingsvägen is dominated and prioritized by cars, it is not only impossible to cross – it is also difficult for pedestrians and cyclists to travel along the road. Along the southern part of Söderköpingsvägen there is no possibility to either walk or cycle.

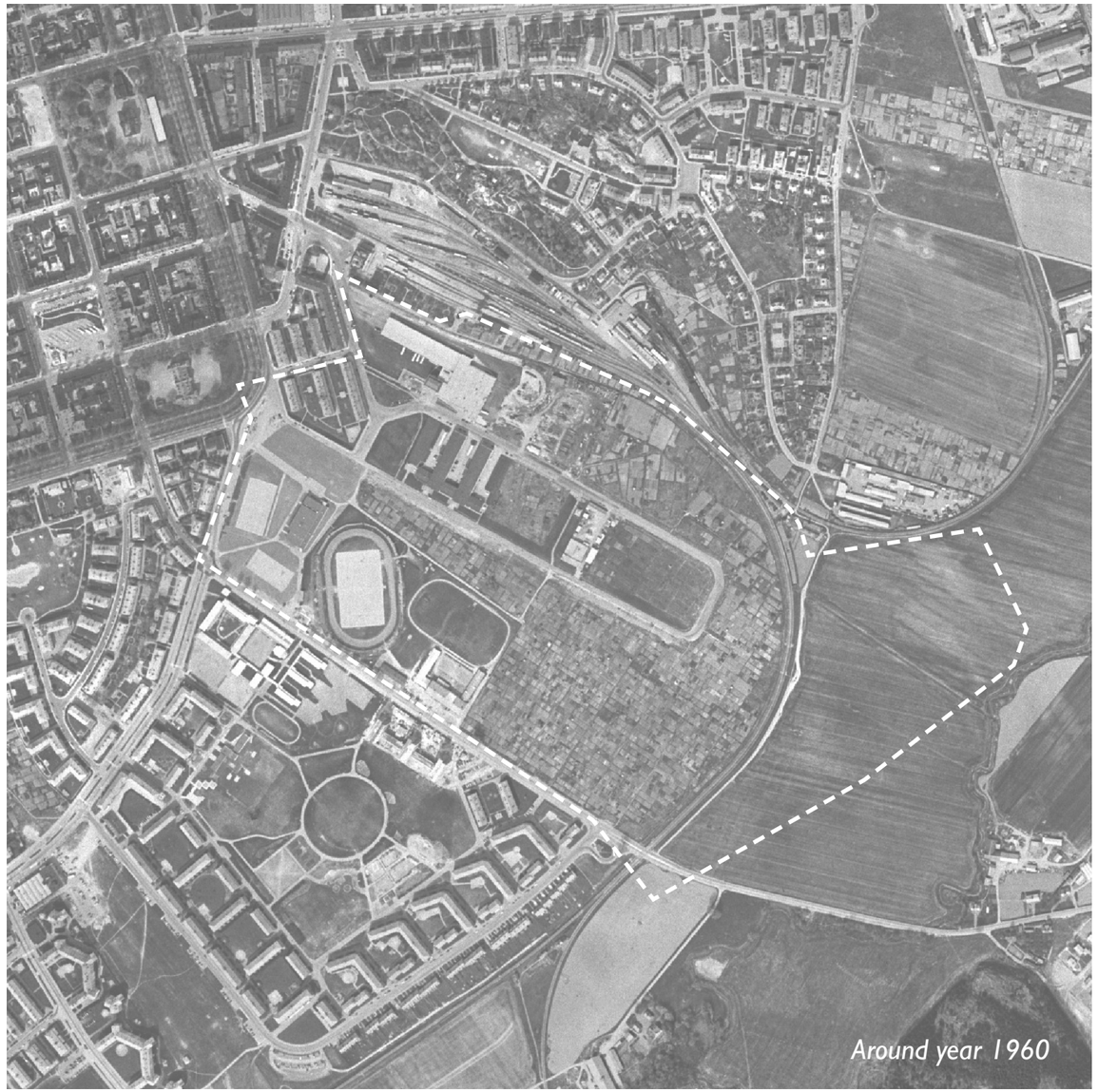
The area north of Söderköpingsvägen consists of a mix of light industry, offices and other businesses. In this area, you for example find the tram depot, as well as the office of Norrköpings newspaper that was founded in 1758, which actually makes it Sweden's oldest still published daily newspaper (NTM n.d). In this sense, two quite city-related features can be found in the area and are therefore of importance to preserve.

The character of the north part is very much related to the scale and the atmosphere of cars, where most of the public space is dedicated to vehicles. Overall, the northern part of the site has a high percentage of hard surfaces and there is a problem with water runoff, where especially the eastern part is at risk of flooding during heavy rains.

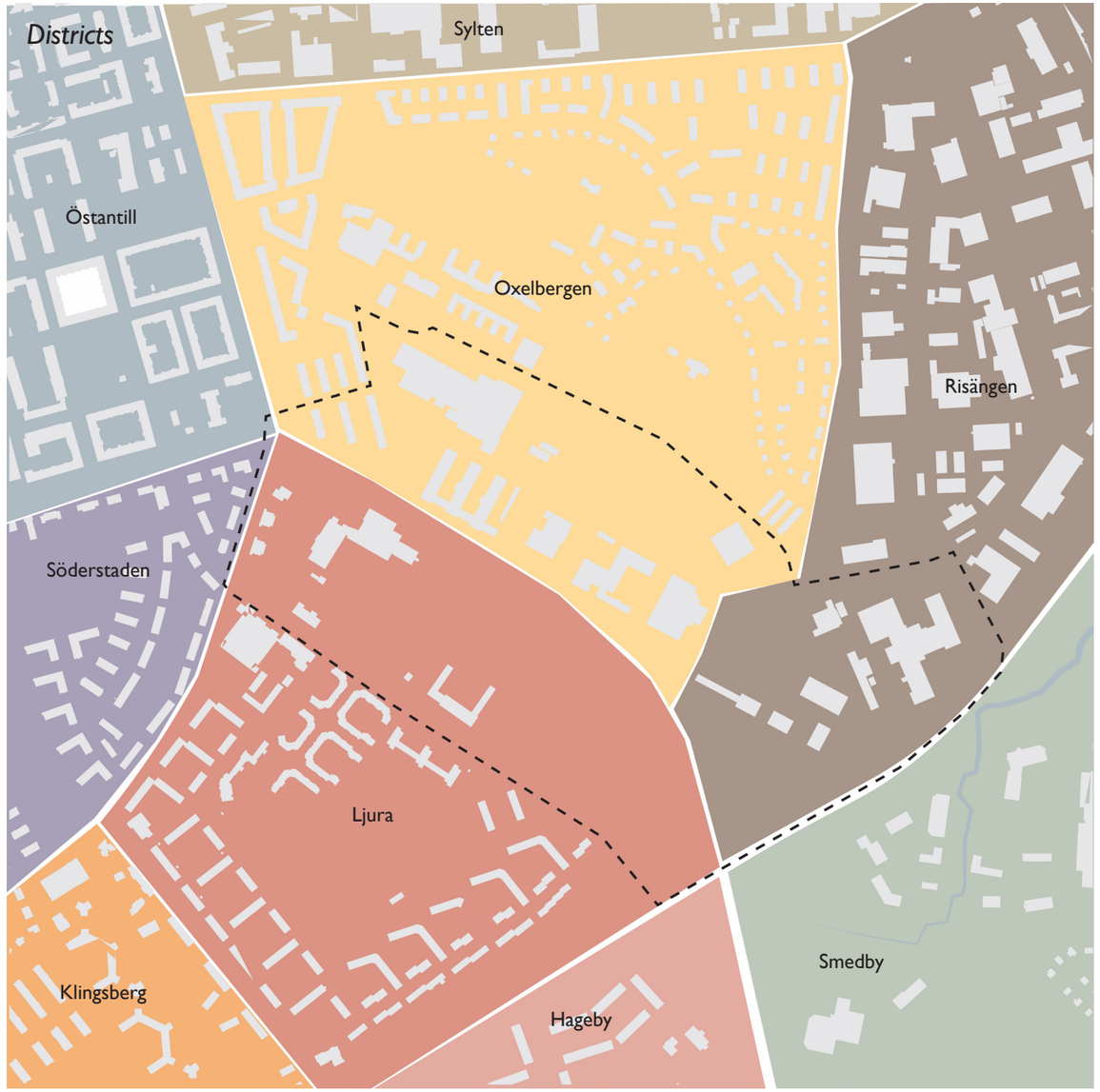
The area south of Söderköpingsvägen also consists of a mix of functions but, compared to the north part, with more focus on leisure and schools. In the western part of the south area there is a swimming hall with an associated outdoor area, a school and a pre school. In the eastern part there is an open area with a horse stable and associated horse activities. On a part of this land, there is a planning permission for a rescue station.

Historically, the site used to be more of farmland character and a major part of the site was for a long time the used for allotments, sports and overall, this has been an area of peri-urban character – the border between the city and the countryside with functions relating more to the countryside but with a location relating to the city center.

Today, the municipality has plans on transforming the site into a mixed used area through densification (Norrköpings kommun 2023). To enable this, the horse club that currenlty is located in the southern part of the site will have to move to new location.

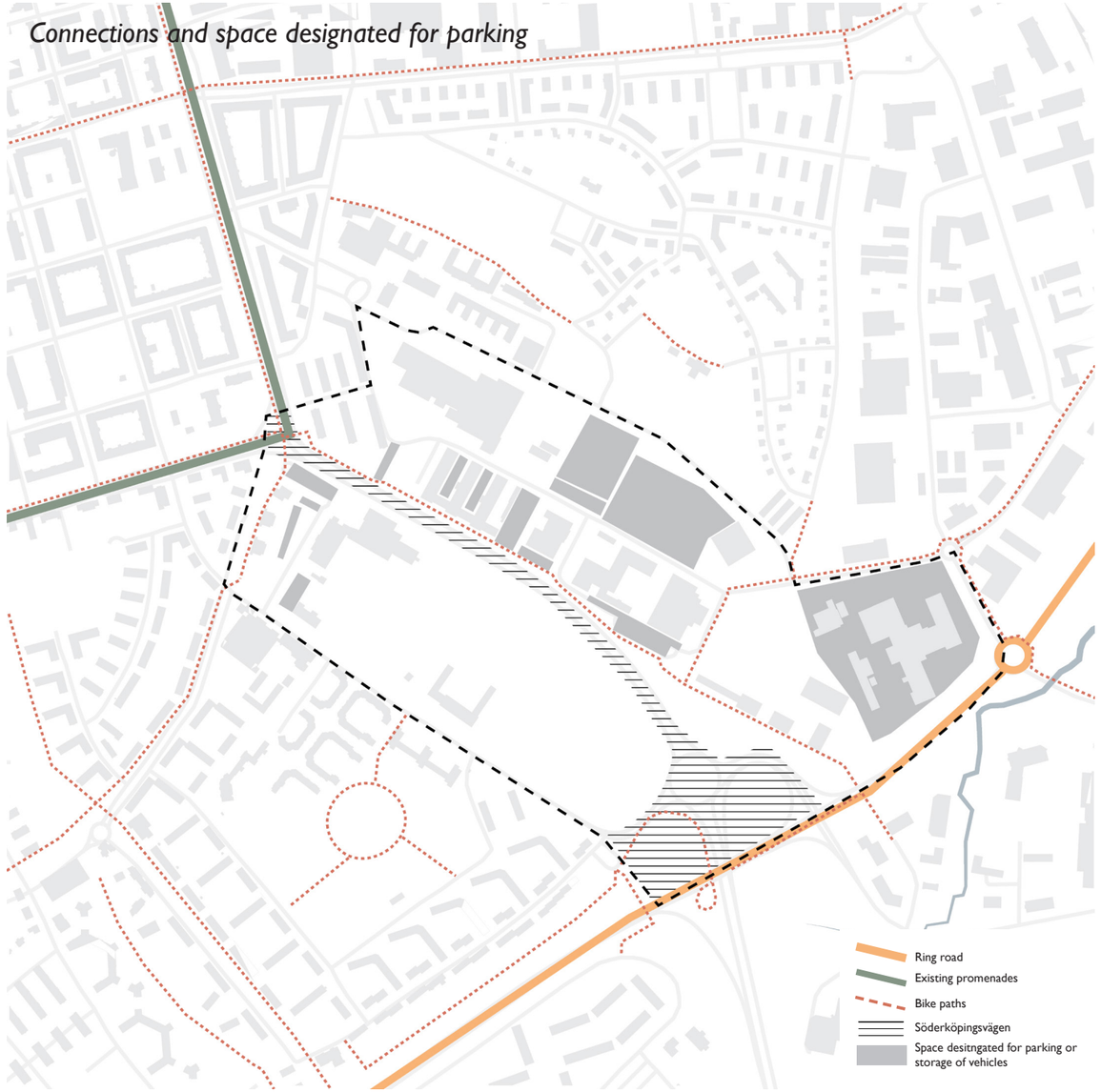

Around year 1960


Around year 1975


Districts
Sylten
Östantill
Oxelbergen
Risängen
Söderstaden
Ljura
Klingsberg
Hageby
Smedby

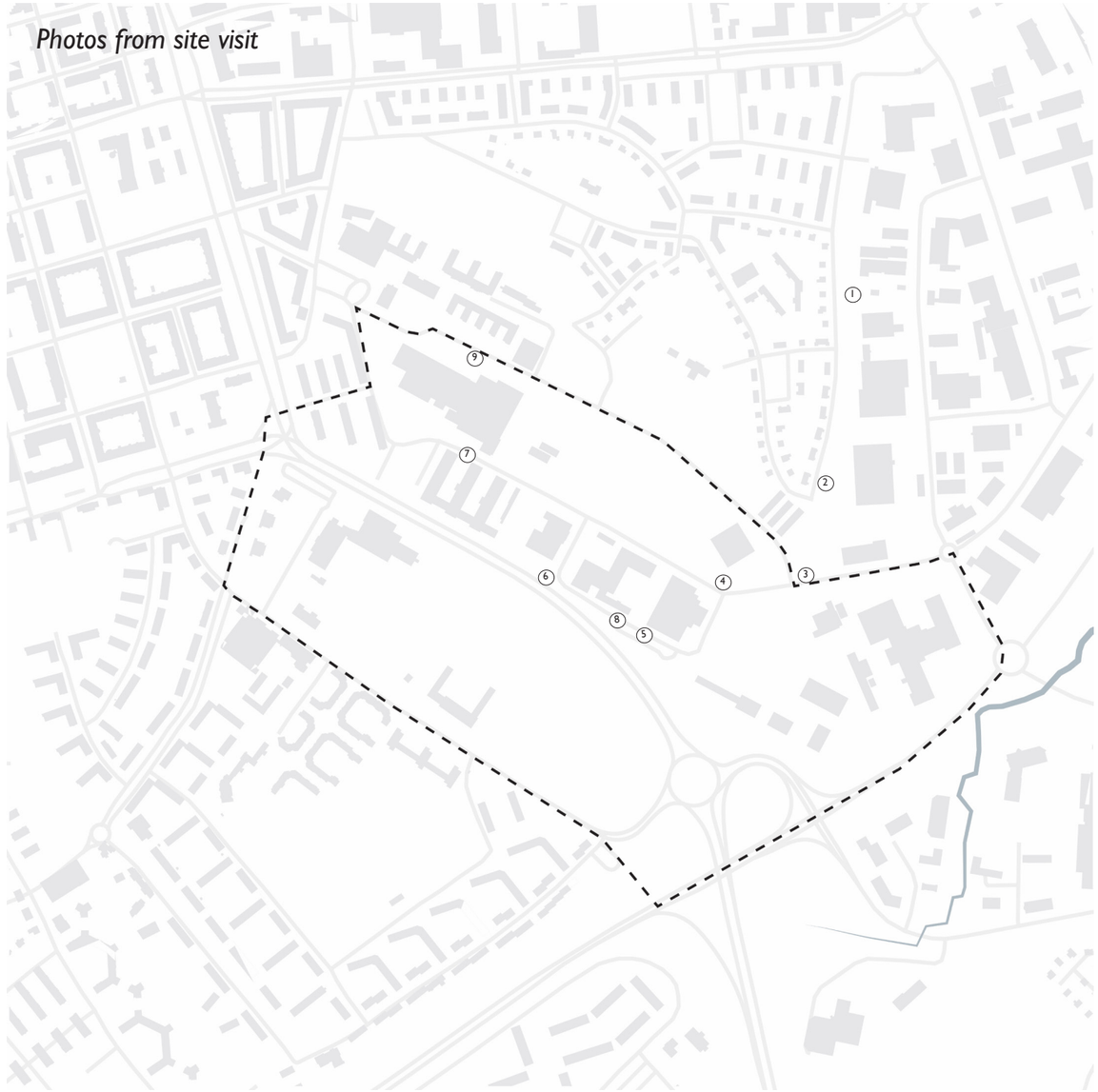

Green-blue structure
Existing promenades
Mixed green areas with trees and vegetation
Wild grown green areas with high precentage of trees
Green areas that mostly consist of grass or/and few trees

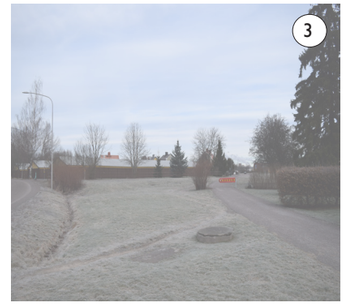
Connections and space designated for parking

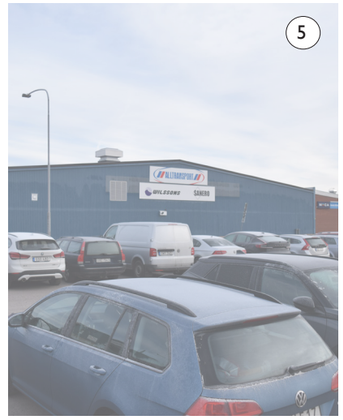


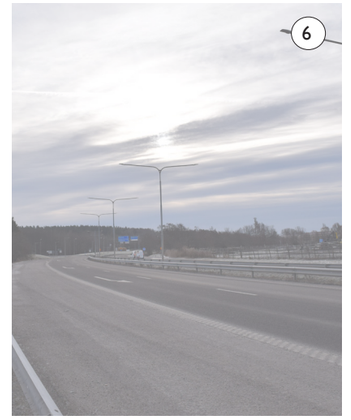
Functions

Photos from site visit

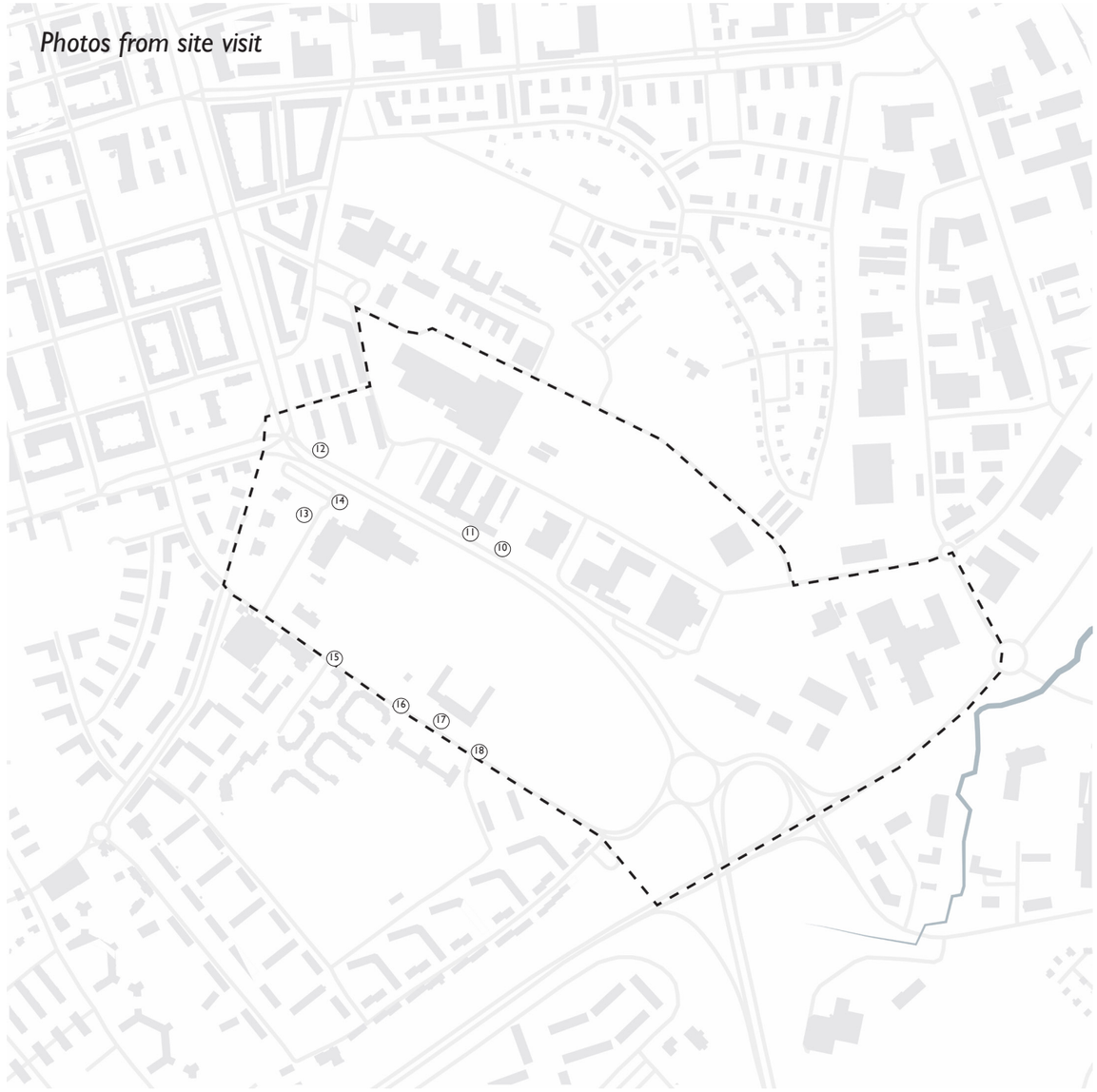


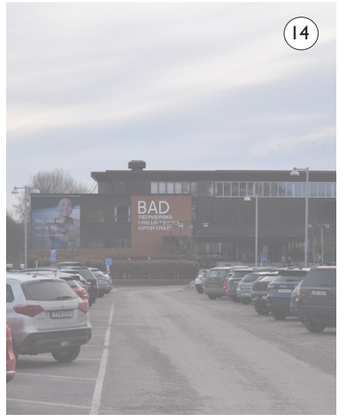


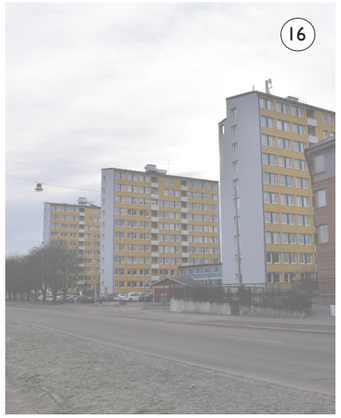




Photos from site visit





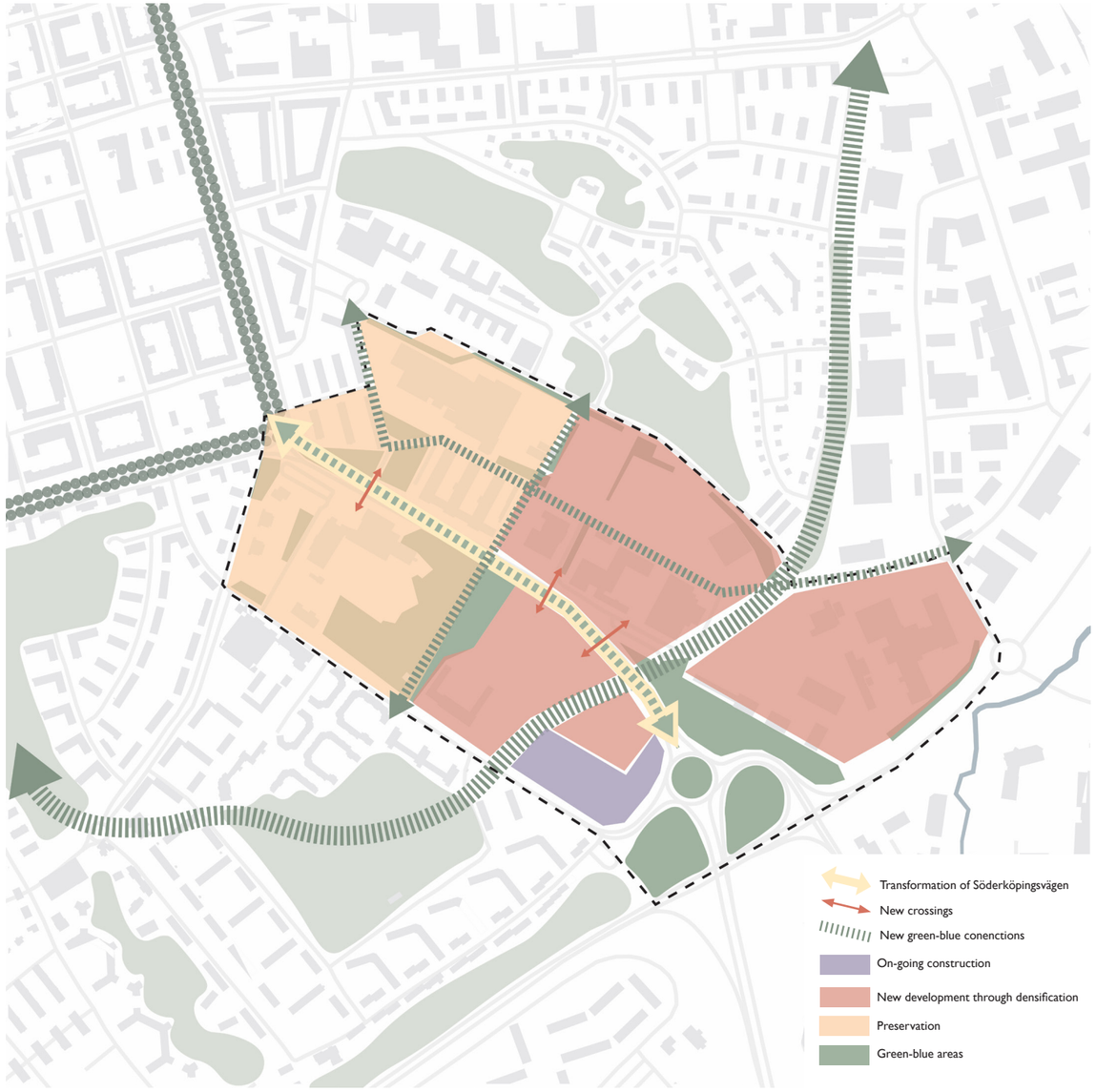


Concluding remarks of the analysis in site scale

The site generally lacks a pedestrian- and bicycle-friendly structure, and a mayor part of the public spaces in the area are designated for cars and parking spaces. Söderköpingsvägen is currently a barrier for the area and by transforming this into a green boulevard, together with the potential for new green-blue connections, a holistic overall approach can be taken regarding both mobility and the green-blue structure.

Some of the existing functions and buildings within the area are important bearers of identity, not only for the area itself, but also for the city as a whole. The tram depot, the tram museum and the office building where, among others, Norrköping's newspapers are housed are therefore especially important to preserve. Also the swimming hall, pre school and residences in the western part will be kept.

The eastern part of the area consists mostly of a mixture of businesses and light industries where the architectural value is not as high and most of the businesses, due to the high proportion of hard surfaces, contribute to the risk of flooding in this part of the area. These functions can advantageously be moved east, to the adjacent area which is planned to be densified for continued industry and business land. By freeing up this land for new development, the area can be planned in a way that takes greater account of flood risk and also contributes to create a stronger entrance to the city from south-east.

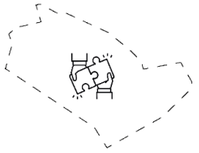


Design

Vision

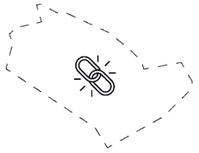
The vision is to create a vibrant and connected district where the holistic benefits of green-blue values set the base for both livability and sustainability. Here, residents, workers and visitors alike find joy and recovery among the spatiality of the green and blue. Here, the promise of a brighter tomorrow meets the beauty of today, where the existing meets the new and the green-blue leads the way.

Goals



Integrated part of the city

Activated public realm



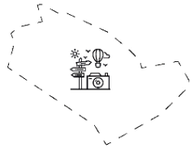
Linked green-blue network

Mixed green-blue neighborhoods

Strategies

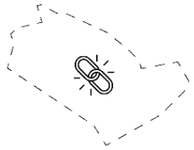
Integrated part of the city

- A continoues bike and pedestrian network
- Mixed scale
- Interaction with existing functions
- New functions



Activated public realm

- A continoues public space network
- Less space designated for cars
- Active ground floors
- Increased shared space



Linked green-blue network

- A continuoues green-blue network
- Variation of green-blue elements
- Integrated green-blue activites
- Stormwater mangagement

Mixed green-blue neighborhoods

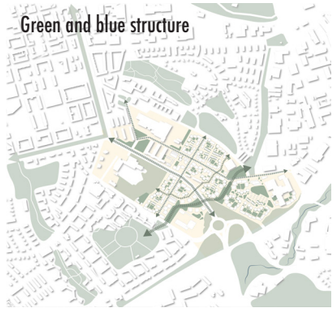
- Mixed typologies
- Semi open courtyards
- Soft interfaces
- Front yards and green roofs

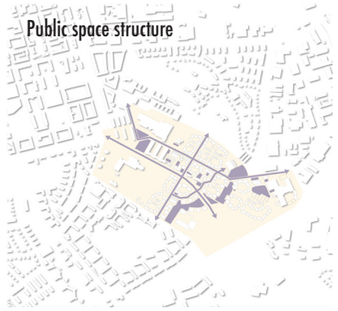
The proposal focuses on enhancing connectivity within the city and through the site by prioritizing green-blue infrastructure as a fundamental component of the design. Pedestrian-friendly pathways, bike lanes and greenways links both neighborhoods, parks and people as well as encourages active transportation and recreation.

Parks and courtyards as well as green streetscapes and roofs transforms the site into lush and inviting urban spaces that both contributes with environmental and social benefits for both residents, workers and visitors, ensuring that both the existing and new can cooperate.

Existing structures can contribute with identity, which is something that can be extended in the proposal through material selection, activation of already established functions and improvement of the overall accessibility and comfort.

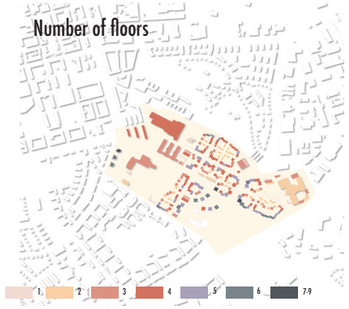
Masterplan

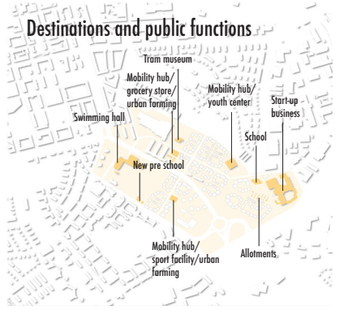

Green and blue structure


Public space structure


Functions
Residential
Urban farming
Mix-use
Bike parking
Public functions/ mobility-hub
Office/workspace
Existing or added functions


Connections
Boulevard
Main street
Local street


Number of floors
1
2
3
4
5
6
7-9

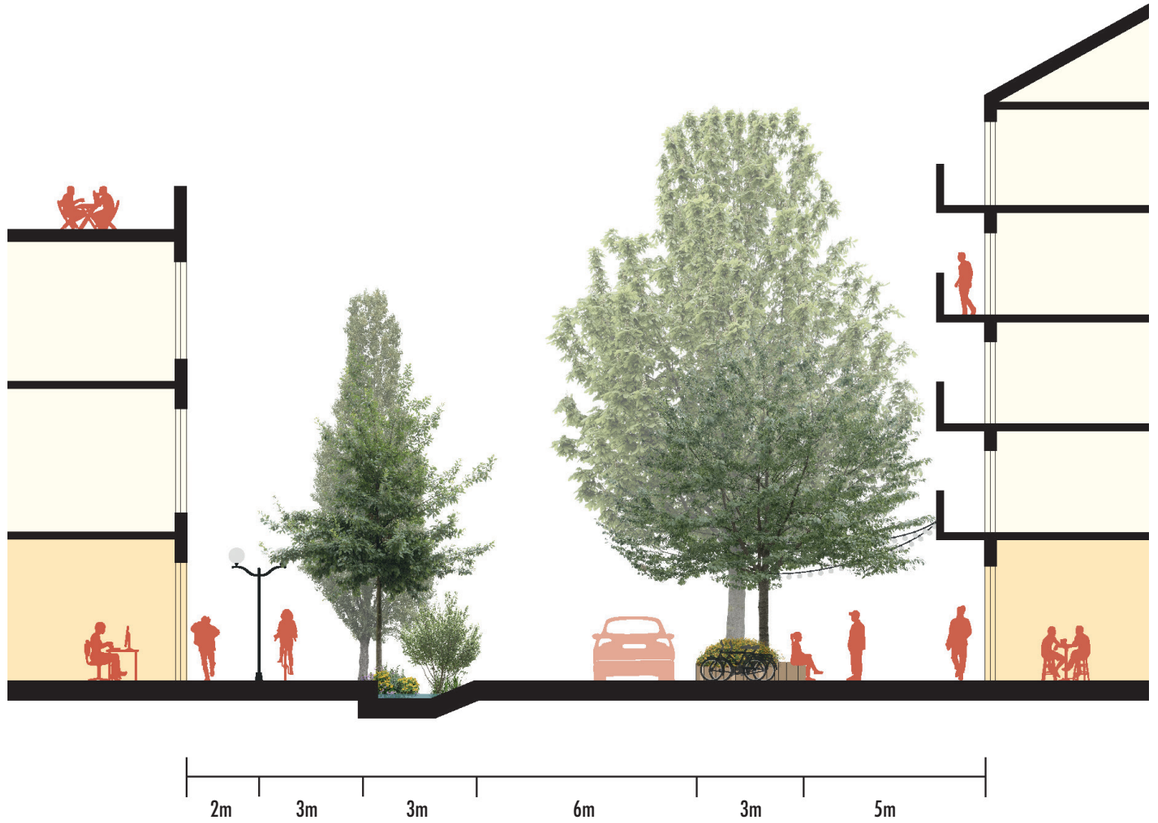

Destinations and public functions
Tram museum
Mobility hub/ grocery store/ urban farming
Mobility hub/ youth center
Start-up business
Swimming hall
School
New pre school
Mobility hub/ sport facility/urban farming
Allotments


Masterplan
Detail plan A
Detail plan B

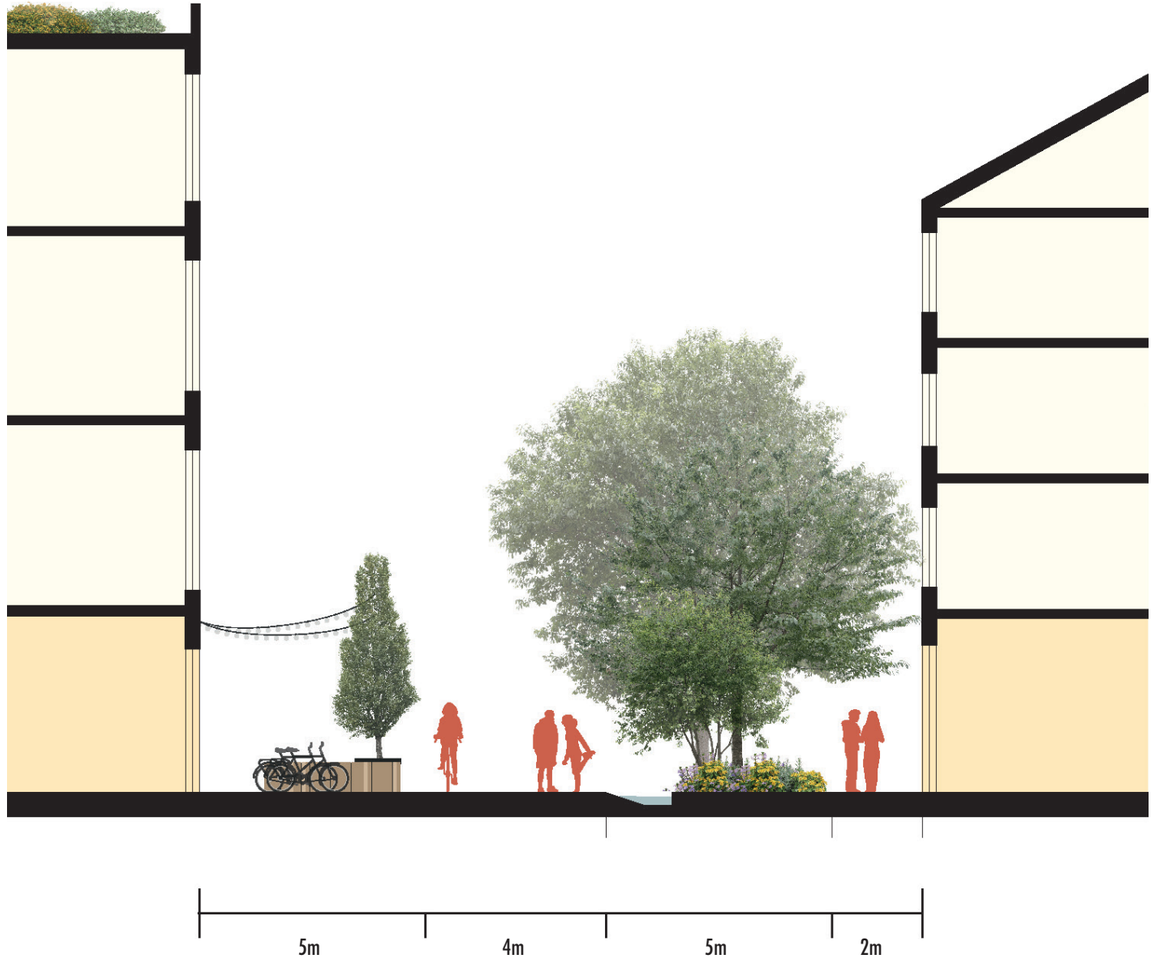
Section A:A
Green corridor, 57 m

Section B:B
New promenade, 32 m

Section C:C
Main street, 22 m



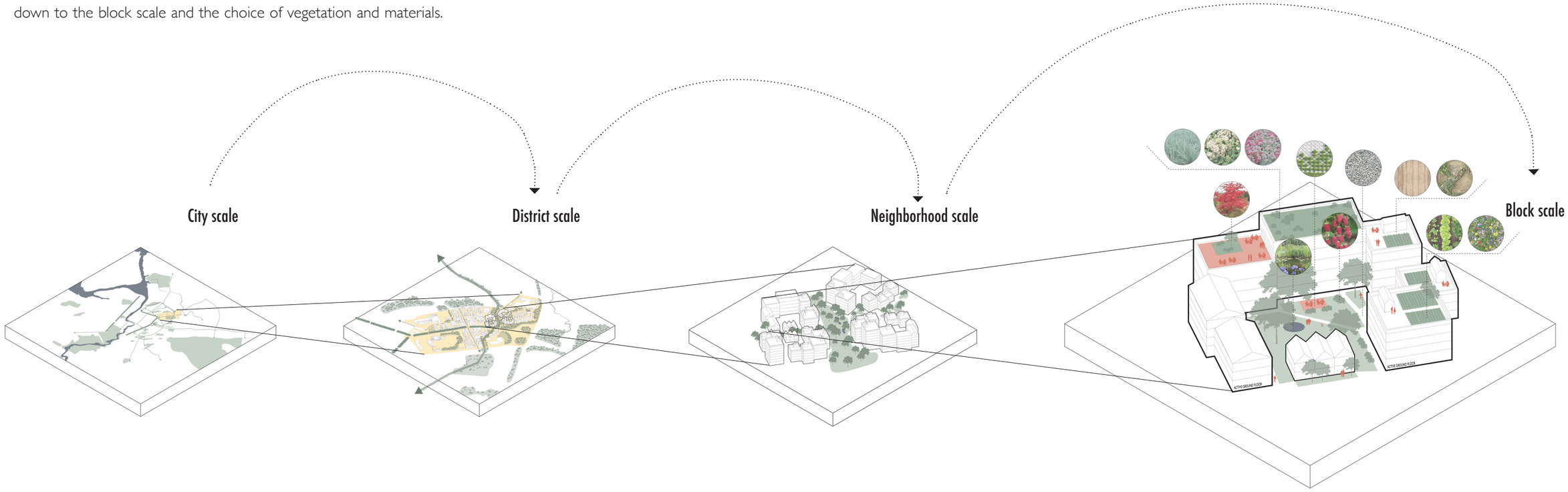
Section D:D
Shared street, 16 m



Section E:E
Local street, 12 m

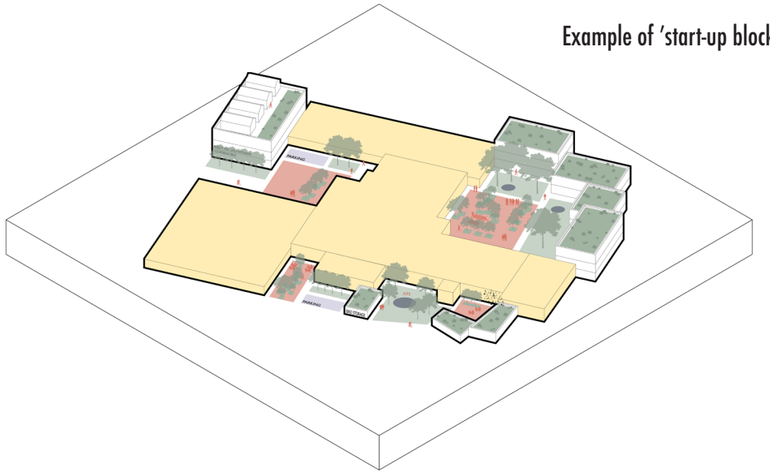
Working in differenct scales

The design proposal build upon the idea of mapping out and finding possible green-blue connections already in the city scale and further ensure that these can be implemented throughout the different scales, from city scale all the way down to the block scale and the choice of vegetation and materials.



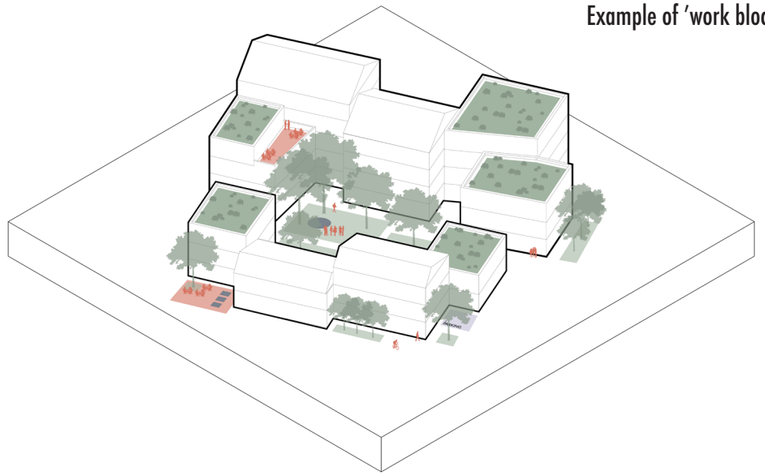
An example of how green-blue values can be used as the glue between existing structures and new additions. In this case, an existing structure (in yellow) together with new buildings form clearer common outdoor spaces and at the same time add more green-blue features for both workes and visitors. This also showcase how densification of surrounding industrial and business area and can work, for example this could be a location for start-up businesses.

Example of 'start-up block'



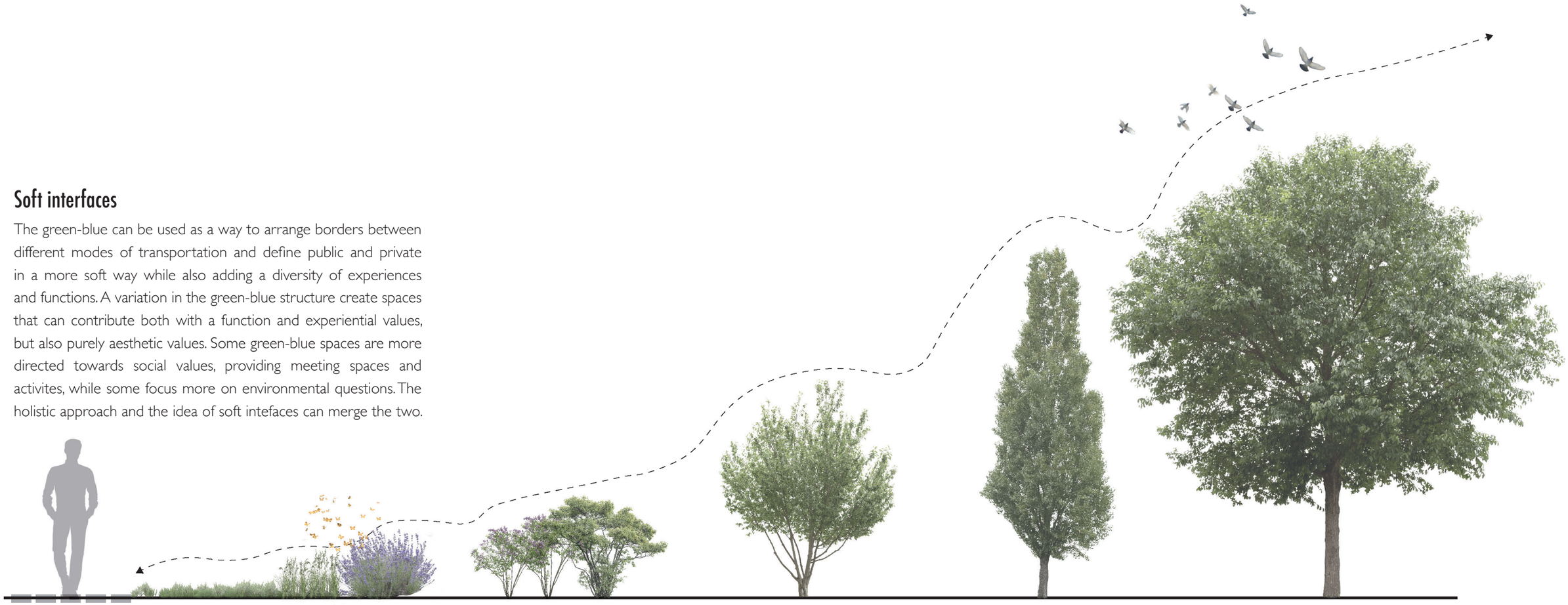
An example of a work-focused block. The main idea has been to integrate the connection with green-blue elements by forming a common green space, adding green to the roofs and create accessible terraces. By this, green-blue elements will be more present for the workes, both outside and from the inside. Adding the possibility for eating lunch outside, taking a break out in the common green space or just viewing green-blue elements from the inside increase the daily contact with green-blue elements.

Example of 'work block'



Soft interfaces

The green-blue can be used as a way to arrange borders between different modes of transportation and define public and private in a more soft way while also adding a diversity of experiences and functions. A variation in the green-blue structure create spaces that can contribute both with a function and experiential values, but also purely aesthetic values. Some green-blue spaces are more directed towards social values, providing meeting spaces and activites, while some focus more on environmental questions. The holistic approach and the idea of soft intefaces can merge the two.



Permable pavement / Grass / Flowers

Bushes / Perennials

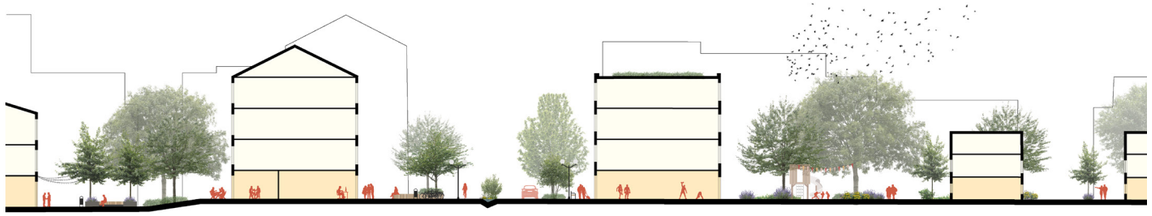
Smaller multi-stemmed trees

Trees with low canopy

Trees with high canopy

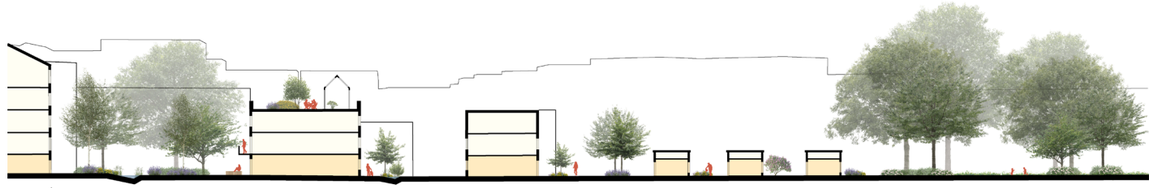
Detail plan A

Section F:F

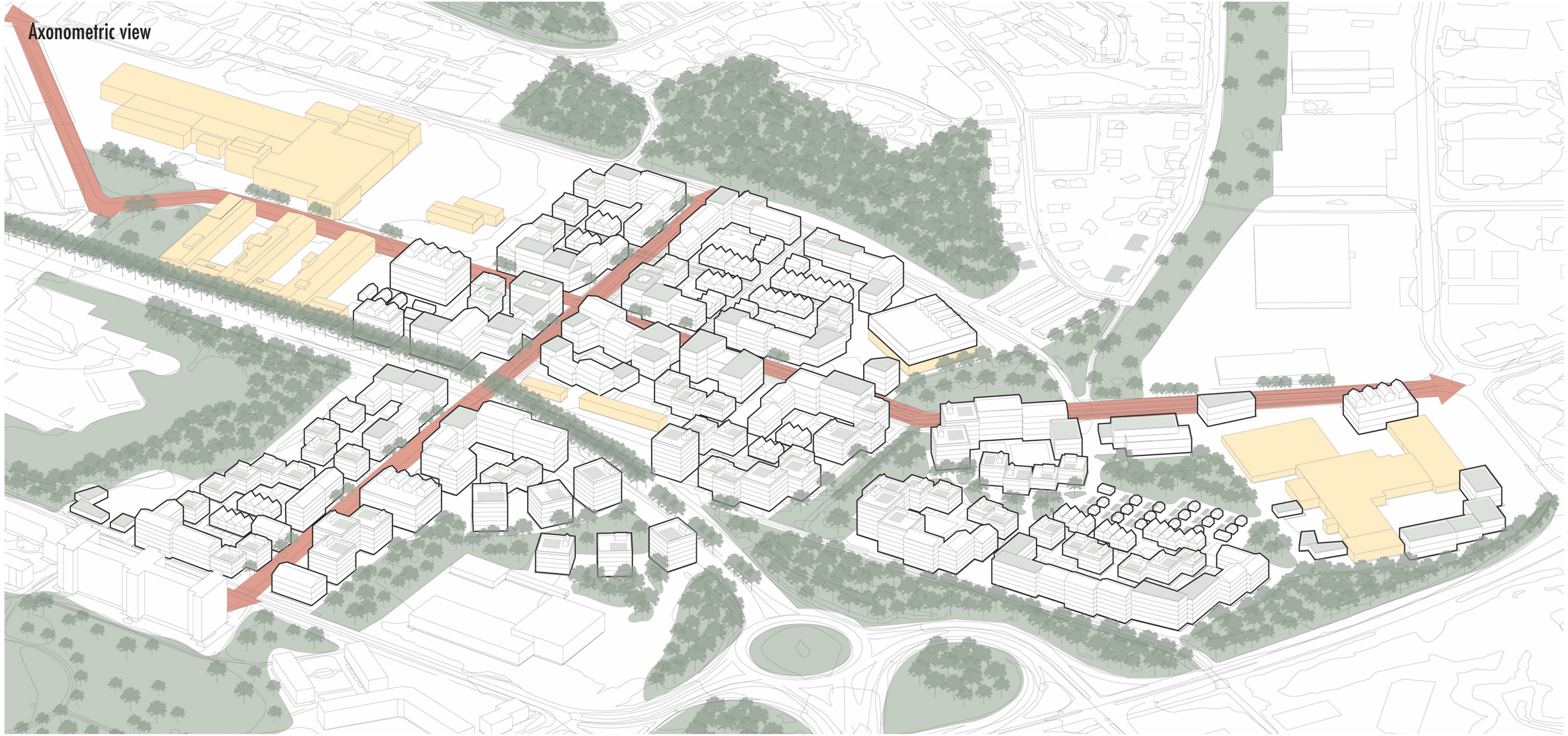


Detail plan B

Section G:G



Axonometric view



Visualization A
Green corridor

Visualization B
Allotment area

Concluding remarks

Conclusion and final thoughts

The presence, availability and need for green-blue spaces are evident to many of us, both through our own experiences and through clear scientific evidence. Throughout the education, this topic has been a recurring theme in lectures, seminars and discussions. However, delving deeper into *why* it is so important, both for us as humans and for our cities, has helped to truly strengthen the arguments for and understanding the holistic benefits of focusing on green-blue spaces within the built environment.

Working on this master's thesis has overall increased the understanding of the responsibility that lies with us who plan the built environment and thereby people's living environments. Much of what is planned today will not become reality for many years to come, and this gap means that the need to think ahead is of utmost importance. We must dare to be brave and bold to contribute to change and a sustainable future for coming generations.

Reflecting on the past months and the final result of this project, it can be concluded the holistic benefits of nature became the most important argument for the design approach, as the design foremost seeks to showcase how finding and securing the green-blue connections in the bigger scale can set a base for a more successful densification project where both social and environmental questions can be addressed.

Finally, I believe that the design of future built environments where more of us will share the same surface needs to mean that many boundaries are blurred – both physically speaking but also professionally – and that the courage to try new ways of integrating and combining functions is tested, including the green-blue. I will also carry with me the importance of working on different scales and remember that even that one tree on that one street makes a difference in the quality of life for people.

Acknowledgement

Thank you Andreas, for your guidance and support throughout this project.

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Thank you all friends and colleagues among SuDes.

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