

A NEW PLANNING APPROACH

- preparing for an increased flood risk
Astrid Steen



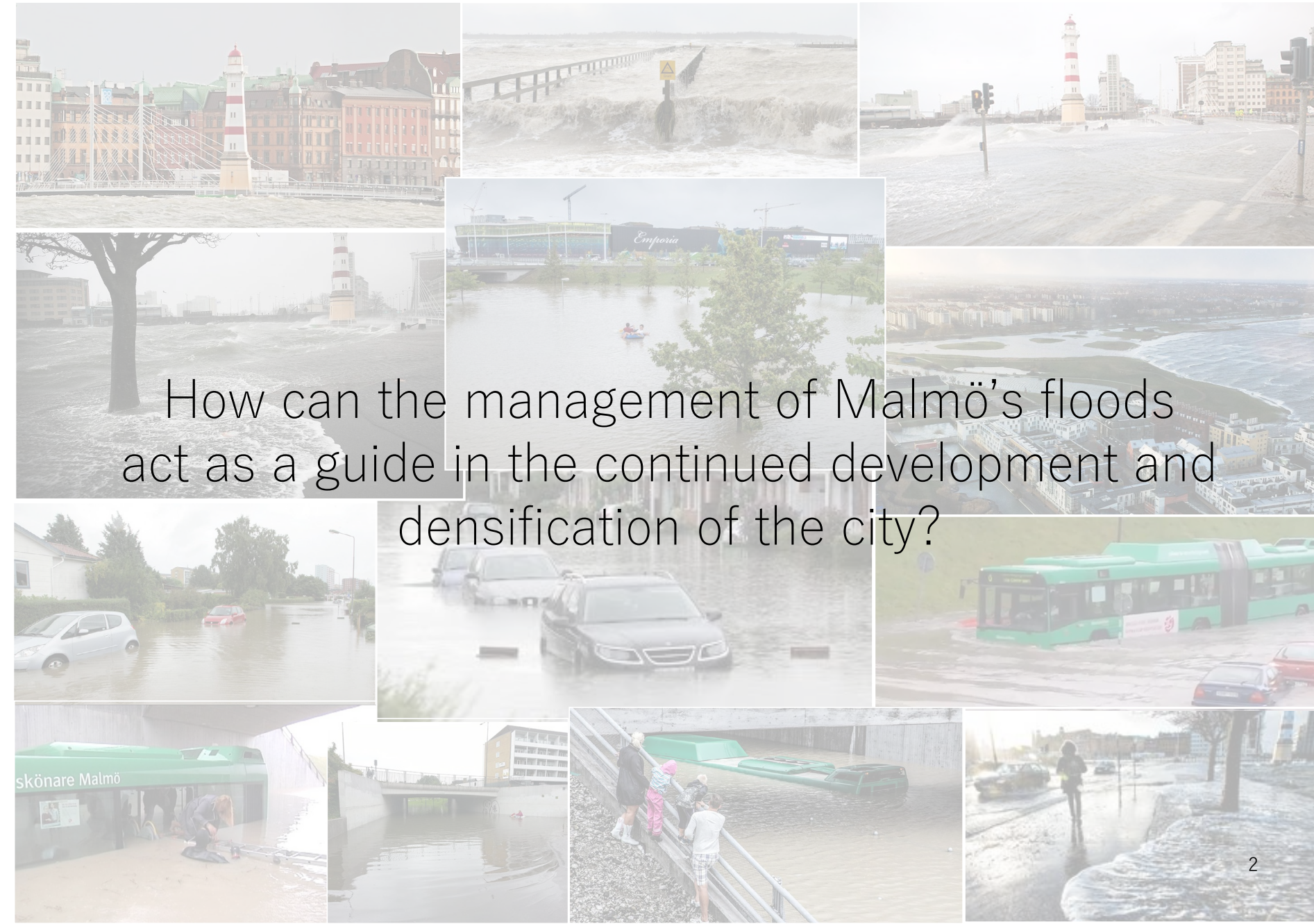
A NEW PLANNING APPROACH

Master Thesis in Sustainable Urban Design
Master of Science in Architecture in the field of Sustainable Urban Design
School of Architecture, Faculty of Engineering, Lund University

Lund, May 2019

Author:	Astrid Steen	Architect MSA
Supervisors:	Pär Gustafsson	Professor Emeritus, Landscape Architect LAR/MSA, Swedish University of Agricultural Sciences
	Louise Lövenstjerne	Course Leader, Board member of SUDes Urban Lab, Architect MSA
Examinator:	Peter Sjöström	Programme Director Sustainable Urban Design, Lund University
Jury:	Jenny B. Osuldsen	Partner at Snøhetta, MLArch Professor in Landscape Architecture, Ax:son Johnson guest Professor at Lund University
	Daniel Wasden	Course Leader, Planner of Lund municipality, Architect FPR/MSA

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ACKNOWLEDGEMENT

I would like to express my deep gratitude toward Professor Pär Gustafsson, my main supervisor, for his understanding of my work, his guidance and his enthusiasm for the research work throughout the semester.

I would like to thank Pär Svensson and Mozafar Veysipanah of Malmö municipality for their assistance in providing me with the flood data. I would also like to thank Linus Zhang for his help in getting a deeper understanding of this data.

I would also like to offer my special thanks to the entire SUDes team for the past two years, in which I've learnt and grown so much. It has been the most rewarding

time of my academic career. A special thanks to Louise Lövenstjerne and Andreas Olsson for guiding all of us through this wonderful wringer.

A special thanks to my SUDes family, without whom this would have been so much harder in so many ways and not half as much fun. I will keep you with me always!

Finally, I wish to thank my family for their support and encouragement throughout all of my studies. To my husband, Christoffer Steen; this would not have been possible without your love and support, as you are always there for me.

Thank you!

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ABSTRACT

WHAT?
How should we deal with city planning in a world that is rapidly turning urban, without destroying valuable nature assets along the way? The last decades are proof that the system we are using today is not up to the challenge.

Therefore this thesis is showing a new approach to how comprehensive city planning can grow from nature based values and a deeper understanding of a city's foundation.

WHY?
Today cities grow in empty plots of land or out into the country side. Increasingly greenery within cities are also at risk due to the urban development, while at the same time, everyone is in agreement that we not only need to protect the green we have in cities but also increase it. At the same time we also need to continue building. The question is; how to do this?

HOW?
Taking Malmö as an example the thesis shows where the city should continue to grow with new development as well as where to densify. Based on an analysis of the

soil, the topography of the landscape and the prognosis of future floods (both due to sea level rise and cloudbursts) a new map of Malmö is created, one that shows places suitable for green, suitable for extended water management, for new development and for densification.

The design work reinvents one of these areas and shows what a transformation of the city might look like when prioritizing differently than today when it comes to planning and exploitation.

Meaning; instead of letting short-term monetary gains and "the easy choice" control our views on which places are suitable for city development, we look at the long-term effects (economical, ecological and social) of city development and what natural components the city's made up off to determine how and where we should continue our efforts towards building a strong society.

INTRODUCTION

When looking at municipal planning in Sweden today it is no surprise to see that it is mainly guided by two things; empty plots of land to reasonable prices, at prime locations suitable for the builder's clientele's particular interests (supply and demand). These have, quite often, a quite close relation to the economy and will fluctuate accordingly.

The demand on Swedish municipalities for producing detailed development plans are therefore high, as they control the building limitations of a specific site. As the pace of the building industry also becomes more rapid the necessary time that needs to be put into the detailed development plans is infringed upon, leaving few

opportunities for the planners to get a deeper understanding of the places they work with or put them in a wider context. This makes it hard to accurately assess whether or not the places we plan in today should be used for further development at all.

“Your scientists were so preoccupied with whether or not they could that they didn't stop to think if they should.”

- Ian Malcolm (Jeff Goldblum), Jurassic Park

When planning is only looked at from a short-term, economic point of view, instead of from a sustainable and analytical point of view, the result is that a lot of problems (that could be solved at an early planning stage) are cemented into the city structure and ultimately the

cost for dealing with these will be much higher in the end but with the addition of having created poor social and environmental living conditions. Malmö, being one of the largest and densest cities of Sweden, is also expected to continue growing with approximately 50.000 people within the next 10 years. The question is where to fit these people. Already dense, Malmö is looking at how to expand, not wanting the city to sprawl due to the benefits of a more close-knit city network as well as a need to protect the valuable arable land surrounding the city.

What this thesis is looking at is how one can re-think a city's approach to city development and city densification. Not limiting it to empty, available plots of land and a short-term, money-making built environment. Using Malmö as an example and adding another critical factor for the city - the issue of flooding - I raise the question: How can the management of Malmö's floods act as a guide in the continued development and densification of the city?

With this I would like to create a comprehensive strategy that: - looks at how the floods (both due to sea level rise and cloudbursts) affect Malmö,

- presents a proposal for how Malmö could deal with the floods for long-term sustainability as well as
- an analysis of how this knowledge should have a strong impact on how the city looks at its future growth.

The strategy will clearly point out areas that are suitable for continued development and for continued densification. For the thesis' design work one of these areas have been chosen and a proposal made for how this area could deal with the issues of densification and flood management.

BACKGROUND

MALMÖ

ÖRESUND

Malmö is located by the sea in the southwest parts of Skåne. The city was founded in the 12th century and during the Middle Ages it expanded due to its rich fish industry. The further development of the city continued through water-related businesses such as Kockum's shipyard and the work in the docks. To this day the docks are of national interest and under protection, having a major importance for the shipping industry as well as being Sweden's face outwards to the traffic in Öresund; which is one of the most heavily trafficated waters in the world.¹

Today, the physicalities of the straight (Öresund) has made it possible for Sweden and Denmark to build a bridge between the two countries, physically linking Malmö to Copenhagen and creating a new well-connected region; Öresundsregionen.

The region includes Skåne and east Denmark and, population wise, is the largest trans-national cooperation region in all of the Nordics. The region produces 26 % of the united GDP of Sweden and Denmark.²

In particular, the public opinion of the labour and housing markets has changed drastically since the bridge's construction in 1995-2000, and today it is seen as one commuter market.

¹ MALMÖS VATTEN - kunskaps- & planeringsunderlag

² Öresundsregionen



Connected to Copenhagen

³ Att göra i Köpenhamn med familjen



Next to the sea

⁴ Resa till Malmö

⁵ <https://tyda.se/search/rapsolja>



Surrounded by valuable farmland

POPULATION

Malmö is the 3rd largest and 4th densest city of Sweden.⁶

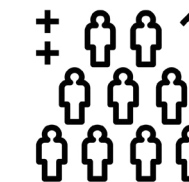
There's a yearly increase in its population, both due to high birth rate and immigration (domestic as well as foreign) and the population is expected to grow with 50.000 people within the next decade. This puts the housing market under high pressure.

The population also increases over the course of a day as more people commute to the city than from it.⁷

Estimated population 2028:
380.000

3rd largest city in Sweden.

Population 2018:
333.000



Estimated density 2028:
2.436 inhab./km²

4th densest city in Sweden.

Density 2018:
2.130,4 inhab./km²

⁶ Malmö

⁷ <https://malmo.se/kommun--politik/Fakta-och-statistik.html> (2019-01-29)

⁸ Kommuner i siffror

NATURAL CONDITIONS

Malmö is surrounded by high quality farmland on all sides, apart from the west-north-west sea-facing side. Because of this, further development of built areas should be focused on densification in the city and further development of recreational spots in the city and along the coast.

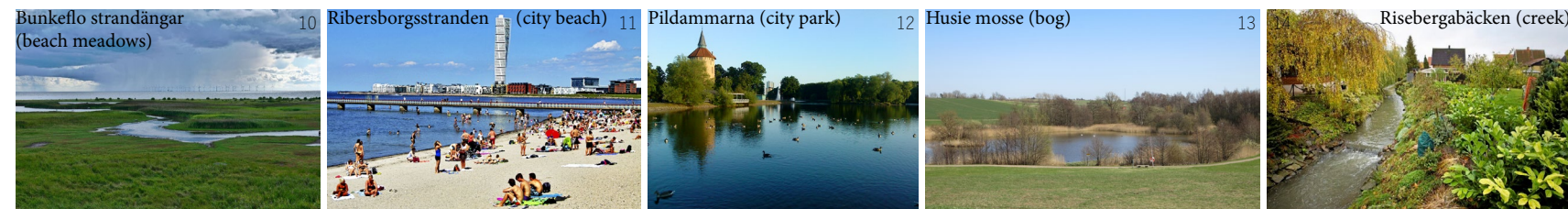
Sege å and Risebergabäcken are Malmö's most important creeks, dewatering a large portion of the municipality (more than a fourth). The area around Risebergabäcken is one of the most high-risk areas for flooding due to cloudbursts.

Since the late 19th century roughly 90 % of the wetland areas of Skåne have disappeared. Malmö municipality wishes to increase the wetlands in the municipality as it will help to create a more sustainable environment. The ones that are still left are; the beach meadows, Toftanäs våtmark (wet-

land), Husie mosse (bog), the ponds around Glostorp and Käglinge, in Limhamns kalkbrott (limestone quarry) and out on Klagshamnsudden.

Generally beach meadows have a flat terrain and plants are adapted to regular floods of salt water as well as the erosion made by the sea. The soil in these areas is of utmost importance since the so called fine soil has good absorption properties. To maintain these meadows they need to stay open by either foraging or pasturage.

In a wetland the groundwater lays very close to / above the ground surface most of the year, giving these places very specific characteristics. They help with taking up and storing nutrition which decreases overfertilization. In the city they can help with water storage as well as purifying runoff water from toxins. They are also important for biodiversity.⁹



⁹ MALMÖS VATTEN - kunskaps- & planeringsunderlag

¹⁰ https://sv.wikipedia.org/wiki/Bunkeflo_strand%C3%A4ngar

¹¹ <https://www.sydsvenskan.se/2017-07-10/smygfoto-graf-pa-ribban-gripen>

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¹² <https://hcarlberg.wordpress.com/tag/pildammarna-malmo/>

¹³ https://sv.wikipedia.org/wiki/Fil:Husie_mosse,_Malm%C3%B6.jpg

¹⁴ <https://www.skd.se/2014/10/28/koloniagarna-kraver-oversvamningsstopp/>



INFRASTRUCTURE

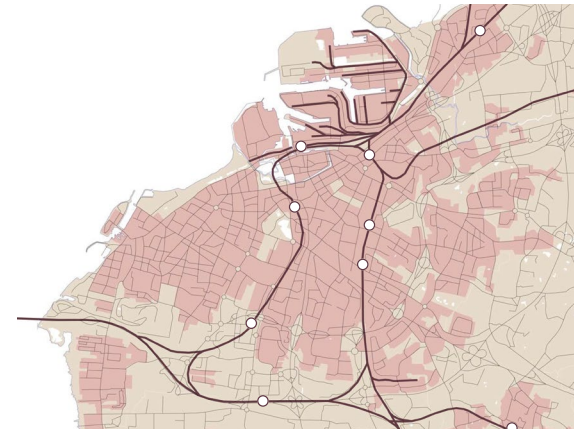
Malmö has a well developed public transportation system. The railway has several train stations in the city, with a high connectivity to Skåne, to the larger train network of Sweden as well as the continent via the Öresund bridge. This makes it possible for people to commute within and beyond the large cooperative region of Öresund.

The buses also have an intricate network within the city, reach far in the region and run very often.

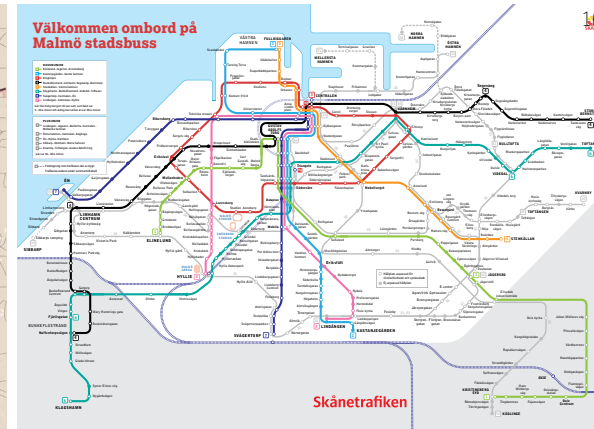
With such a rich public transportation network it is no sur-

prise that the car traffic is declining (and has been since 1975). Although Malmö still has a lot of car traffic, the city's efforts in investing in the train and bus networks as well as biking lanes has had an impact on how inhabitants look at car traffic. Few choose to take the car to move within the city since the other available options often are more convenient.¹⁵

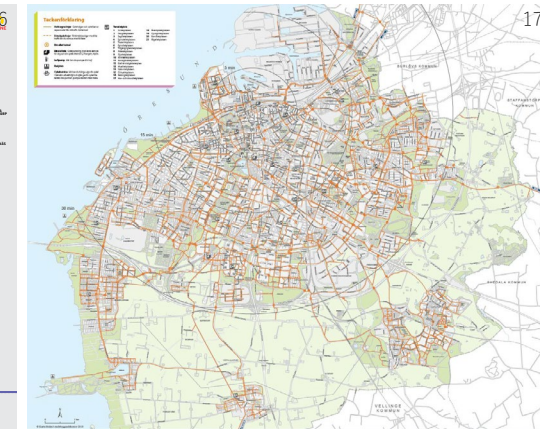
Looking over the car roads of Malmö many are large scaled, having been conceived during a time when the car was the focus of good planning. This space has the potential to be of better use when Malmö further moves towards sustainable transportation.



Malmö's road and rail network



Malmö's bus routes



Malmö's bike paths

¹⁵ Trafikutvecklingen i Malmö stad år 2015
15

¹⁶ Malmö linjenät

¹⁷ 2018 - Cykelkarta - Malmö

THE FLOODS

SEA LEVEL RISE

That the world is facing climate change and extreme weather conditions is neither fake news nor an exaggeration. According to the UN's climate panel IPCC (2007) the effects of global warming lead to heat waves, heavier cloudbursts, more intense storms and sea level rise. The report from 2013 shows that the sea level rise is at risk for reaching up to +3,5 m by 2100.

Malmö is one of 16 areas by the sea that have been pointed out as a considerable flood risk by Myndigheten för Skydd och Beredskap (Swedish Civil Contingencies Agency). In case of high sea level rise low lying coastal areas in the city centre with direct connection to the sea (dock areas and canal-adjacent spaces) are especially vulnerable. Västra hamnen, Universitetsholmen, Nyhamnen, Gamla Staden, Rörsjöstaden, Ribersborg and a low lying area by Sege å have been pointed out by the municipality as high-risk areas.¹⁸

Sea level rise can have very detrimental effects on a society; for instance lower property value, decreasing the possibilities of coastal city development, influencing trade and industry negatively, harming ecosystems, polluting the groundwater (saltwater intrusion), limit recreation etc.¹⁹

¹⁸ MALMÖS VATTEN - kunskaps- & planeringsunderlag

¹⁹ Hållbar dagvattenhantering i Malmö

OUTER PROTECTION

Because of the negative effects flooding due to sea level rise can have on the mainland, Malmö municipality, like many others, thinks that outer protection (like reefs, dikes, breakwaters etc.) must be created to safeguard the coastline for the long run. However, right now there is no plan or system that determines who should pay for it all. The one thing we do know is that the cost of standing without protection is higher than paying for the protection.

CLOUDBURSTS

A cloudburst is defined as 50 mm rain/hour. On average it falls 600 mm precipitation/year in Malmö with July and August being the wettest months. Sunday the 31st of August 2014 Malmö was struck by extreme rain. In the morning the rain hit a record with 31,6 mm rain in an hour and 17,6 mm during 15 minutes. Even though these numbers don't add up to the cloudburst definition for an hour the rain continued to fall for the next 24 hours, reaching over 100 mm rain during a day.²⁰ This is 1/6 of how much it normally rains in a year. It is double the average of a month, even approximately 60 % more than it usually rains in August (being one of the wettest months). And this was in ONE DAY.

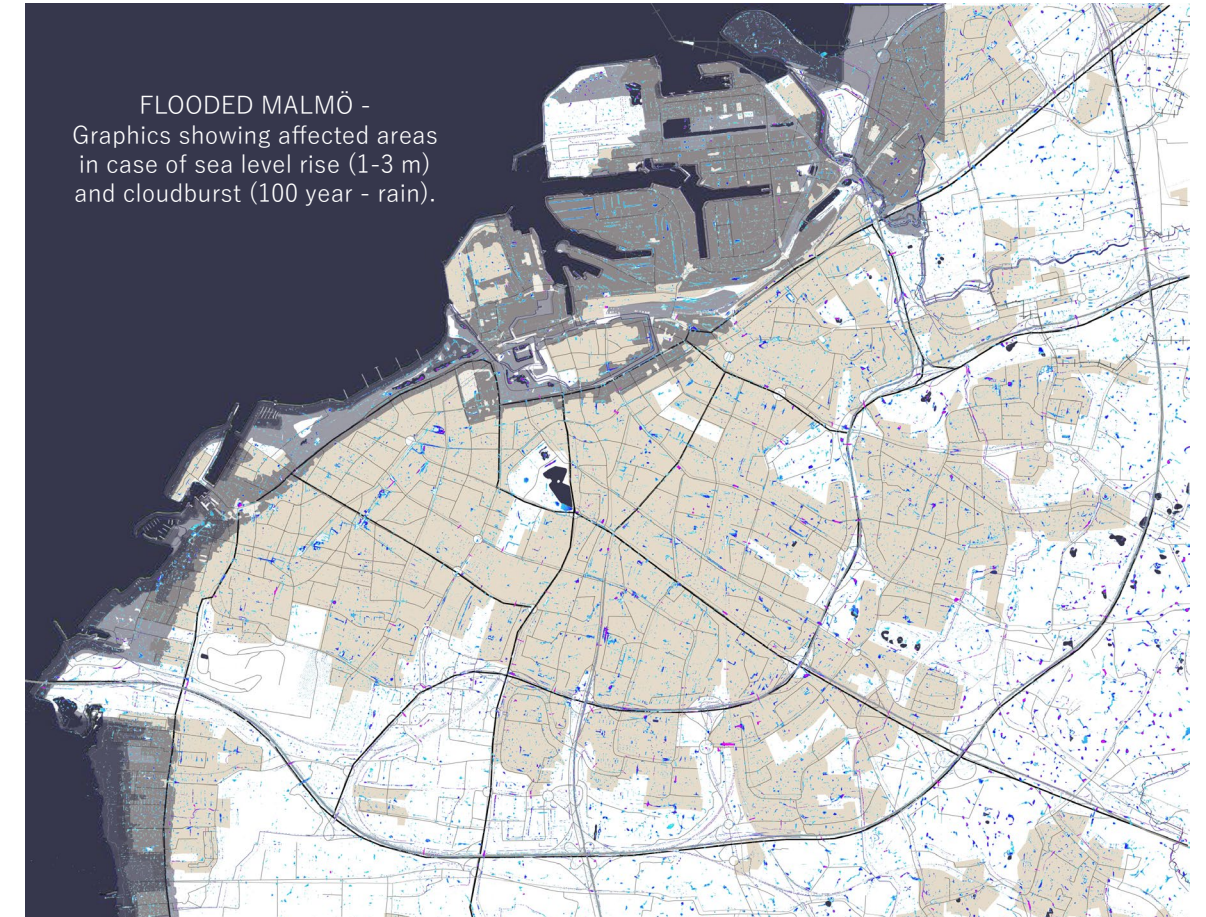
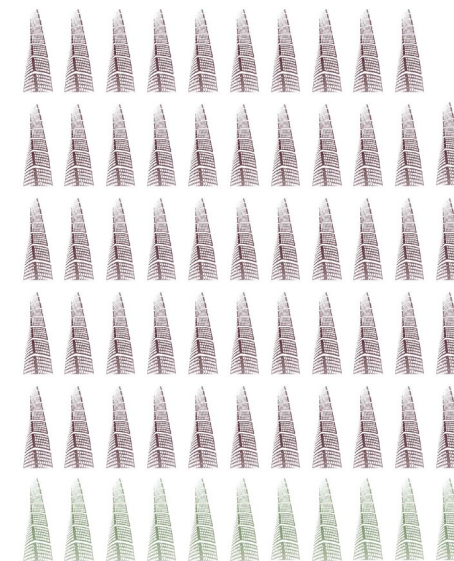
²⁰ Extremt kraftigt regn över Malmö

During the heavy rainfall in 2014, 11 Turning Torsos filled with water had fallen when the underground piping systems were full...

then 54 more fell.



Cost: 600 million.²¹
Rain duration: 1 day



²¹ www.youtube.com/user/VASYD1/videos

Flood data provided by Pär Svensson, water strategist, and Mozafar Veysipanah, GIS expert, Malmö municipality

Calculations show that cloudbursts in general will have increased with 15-35 % by the 22nd century. It is needed that we do our utmost to slow down climate change but also that we prepare and plan for a society where these phenomena are a part of everyday life.²²

According to the County Administrative Board (Länsstyrelsen Skåne, 2014) the most costly problem for the water and sewer-collective (VA-kollektivet) is the increase in cloudbursts and heavy rainfall. To put it in perspective; the total costs for the one day-flooding in 2014 surmounted 600 million SEK. A sum that equals the entire yearly net result for Malmö municipality or the yearly operating budget for the municipality board.

THE PLUMBING SYSTEM

The underground piping of Malmö was largely laid down in the 60's. Since then several factors affecting the system's efficiency has increased tremendously; the population, the construction rate, the number of taps and flush buttons as well as the effects of climate change.

Looking simply at the 2014 cloudburst-case, almost 5 times as much rain fell as could be taken up by the ground and fit in the pipes. Without pumping in a ludicrous amount of

²² *Extremregn i nuvarande och framtida klimat - Analyser av observationer och framtidsscenarier*

²³ *Malmö stads budget år 2019*

money and preparing for a total excavation of all of Malmö over the next decades there's no chance of solving Malmö's cloudburst floods through bigger or more pipes. We need to look at other types of solutions, look at how nature normally deals with these events and how we can take advantage of that in our cities.²⁴

THE ECOSYSTEM SERVICES OF WATER

Water in itself has many good qualities that we also should look at when planning. It can maintain the structure and functions of an ecosystem as a support. It can also regulate as in; microclimate control, water management and quality as well as prevention of spreading of diseases or degrading environmental pollutants. As a provider on a larger scale it serves with; food, water, bio fuel etc. Lastly it also provides with places for recreation and beautiful scenery.

FLOODS & HUMANS

Floods can cause severe damage on both private and public property as well as the infrastructure. In underpasses and on roads the floods can be a direct risk to lifes. Floods, especially of longer duration, can also be the cause of spreading infections.

²⁴ www.youtube.com/user/VASYD1/videos

FLOODS & THE ENVIRONMENT

Floods harm the water environment. The run off brings with it bacteria, nutrients and chemicals to treatment facilities and recipients. Stormwater tends to contain metals and organic substances that can be found on the European Union's list of prioritized contaminants that are particularly dangerous to our health as well as the environment and should be discontinued.

The contaminants harm aquatic plants and animals while nutrients contributes to overfertilization and the bacteria levels can be so high as to create water bodies that are hazardous for people to be in contact with.²⁵

²⁵ *Klimatsäkra samhället*

STRATEGY

This strategy looks at the different layers of Malmö's city structure. How they make up the Malmö of today, and how they might affect the city in the future.

By analysing how these work together the thesis makes suggestions on how the city should protect against the coming floods but also comes to a conclusion on where the city should continue to develop or densify. These suggestions aren't following the traditional directions of city development as they aren't primarily focusing on empty plots, non-built land areas or commercial profit. Rather they are looking at where the land and the existing city could manage a further development without creating more problems in terms of floods and also where a construction could actually improve the situation for its surroundings.

If the strategy would be realised it would cause a slight shift in economy as the land value of some areas would change. The areas that are recommended for further development/densification stand a better chance to provide a long-term economically, ecologically and socially sustainable environment and should therefore become more highly valued on the property market than the plots that are identified as areas that should be left alone or simply reinforced with flood protective measures, because of the difficulties the people building on these would face.

The next logical consequence of the strategy would also, in a long term perspective, decrease the economic losses that municipalities, insurance companies and private property owners deal with today, due to the negative effects of floods. Not to mention the decrease of the effects of major flood events on society as a whole.

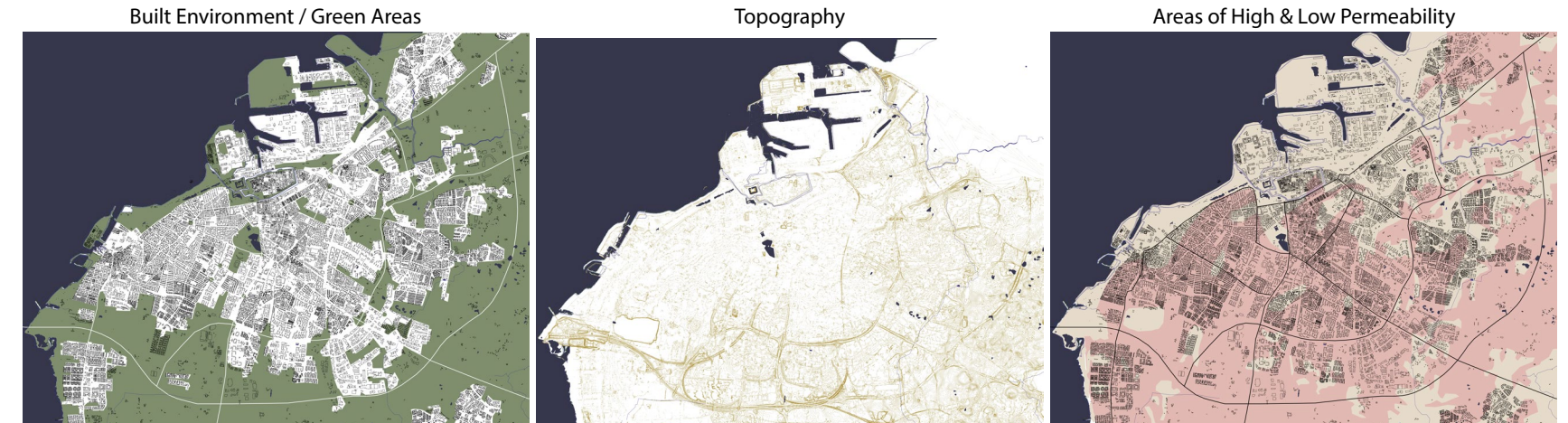
The most important realisation made during the thesis work is how this method of looking at city development could change how we go about city planning in Sweden. The work process that has been used can be applied to any location. Simply put; it looks at what natural prerequisites a city has to deal with future climate change (floods) and then combines this knowledge with a more traditional analysis of the city, looking at; built structure, infrastructure, green/blue structures, functions etc, ending up with a holistic, climate change resilient, city wide suggestion on which direction the city development should take.

This work method could be applied to existing city structures as well as new development sites as the analysis' foundation evolves around basic natural conditions such as soil composition, permeability rates and topography.

MALMÖ'S LAYERS

The layers that have been chosen for the further strategic analysis have been chosen to be able to answer the following questions;

- What land areas are built up areas and which ones are green, i.e: which areas/where does people have an easier/harder time to deal with water?
- What does the topography look like, i.e: which areas would be more/less affected by floods?
- Where does the ground have high vs. low permeability, i.e: where does the ground have the lowest vs. highest possibility to accommodate for large amounts of water?



- How is the infrastructure (road and railway) planned, i.e: what passages, that are important to society, are in most need of protection from floods?

Infrastructure - Roads & Railway



- What areas of the city would be affected if the sea would rise with 1, 2 or 3 meters, i.e: are there key locations that could be worked with to protect larger areas from future floods?

Sea Level Rise (1-3 m)



- What areas would be most heavily affected by a cloudburst, i.e: which land masses, affected and surrounding, need to and could deal with water to avoid dangerous floods?

Cloudburst - High Risk Flood Zones



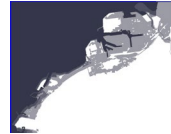
Blue Structure



Built Environment



Sea Level Rise 1-3m



High Permeability



Strategy Border



Green Structure



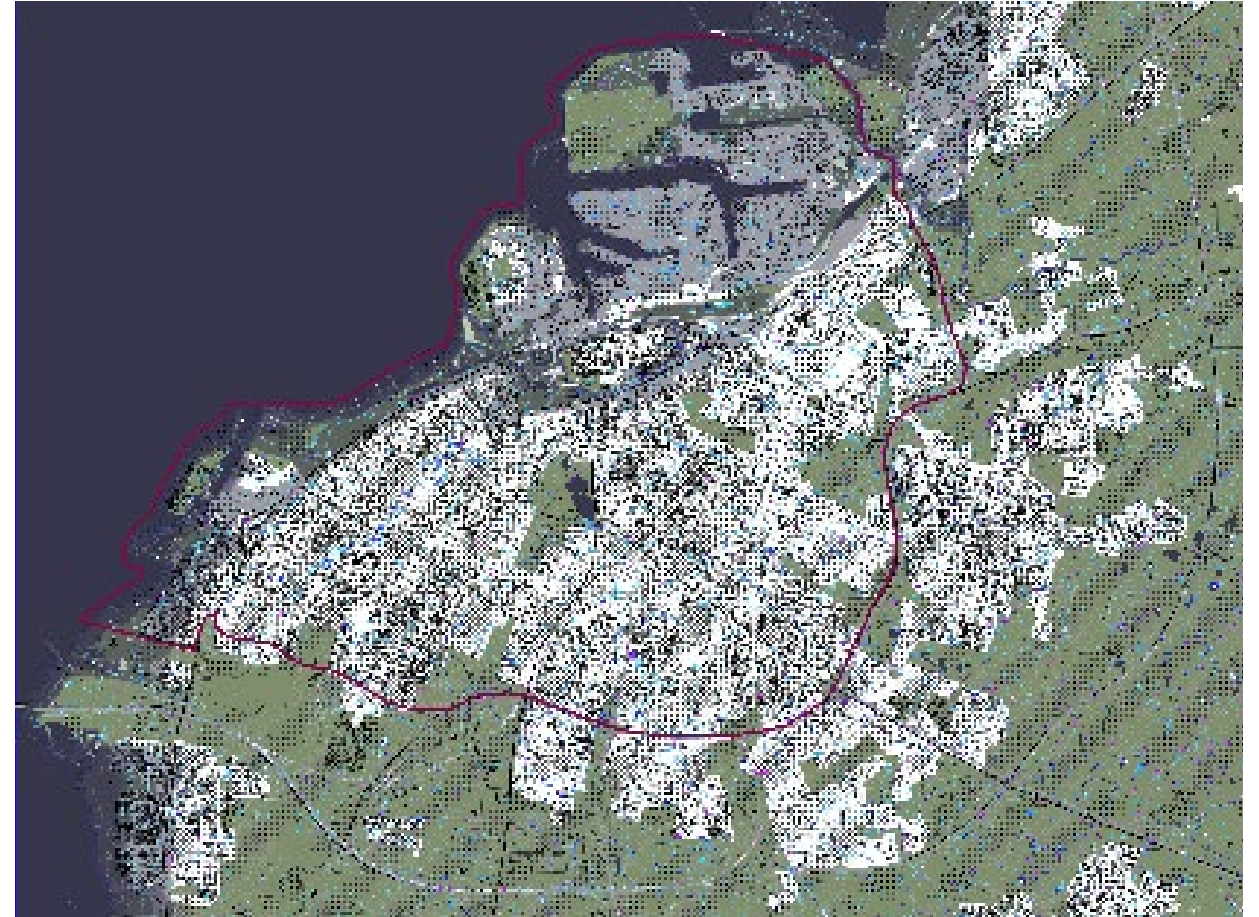
Road Network



Cloudburst Runoff



Low Permeability



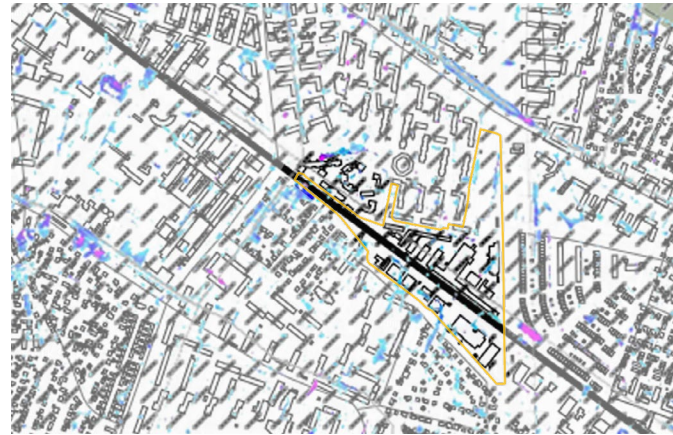
READING THE LAYERS

ZOOMING IN

When combined these layers make up the complex map you can see on page 26. To the right, there is a Zoom-in of the map as well as two smaller map showing what the area looks like when different layers are highlighted, making different aspects clearer.

In this particular example we can see an area that is affected by cloudburst floods in a few concentrated areas. Mostly it has a low ability to take up water (low permeability) and on top of that it is dominated by a sparsely built hardscape. Within the site boundaries there is primarily one area at flood-risk (which is highlighted in pink, in the right hand corner of the “Cloudburst effect” map) and would have to be addressed should the area be rebuilt/redesigned. Otherwise the general recommendation for this area is to lessen the amount of hardscape, making it possible to deal with storm-water on the site itself, minimizing runoff. Because of the topography this would reduce the pressure made by floods on the surrounding area (which seems to be more heavily affected and which also has a more tight-knit city structure which is harder to make changes to).

Zoom-in of the strategy-analysis map (depicting the design site)

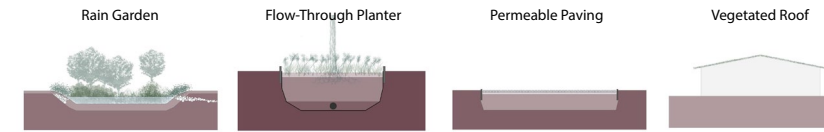


Cloudburst effect

High/Low permeability



The strategic proposal includes specific flood management measures. These are some examples that could be suitable in the zoom-in example;



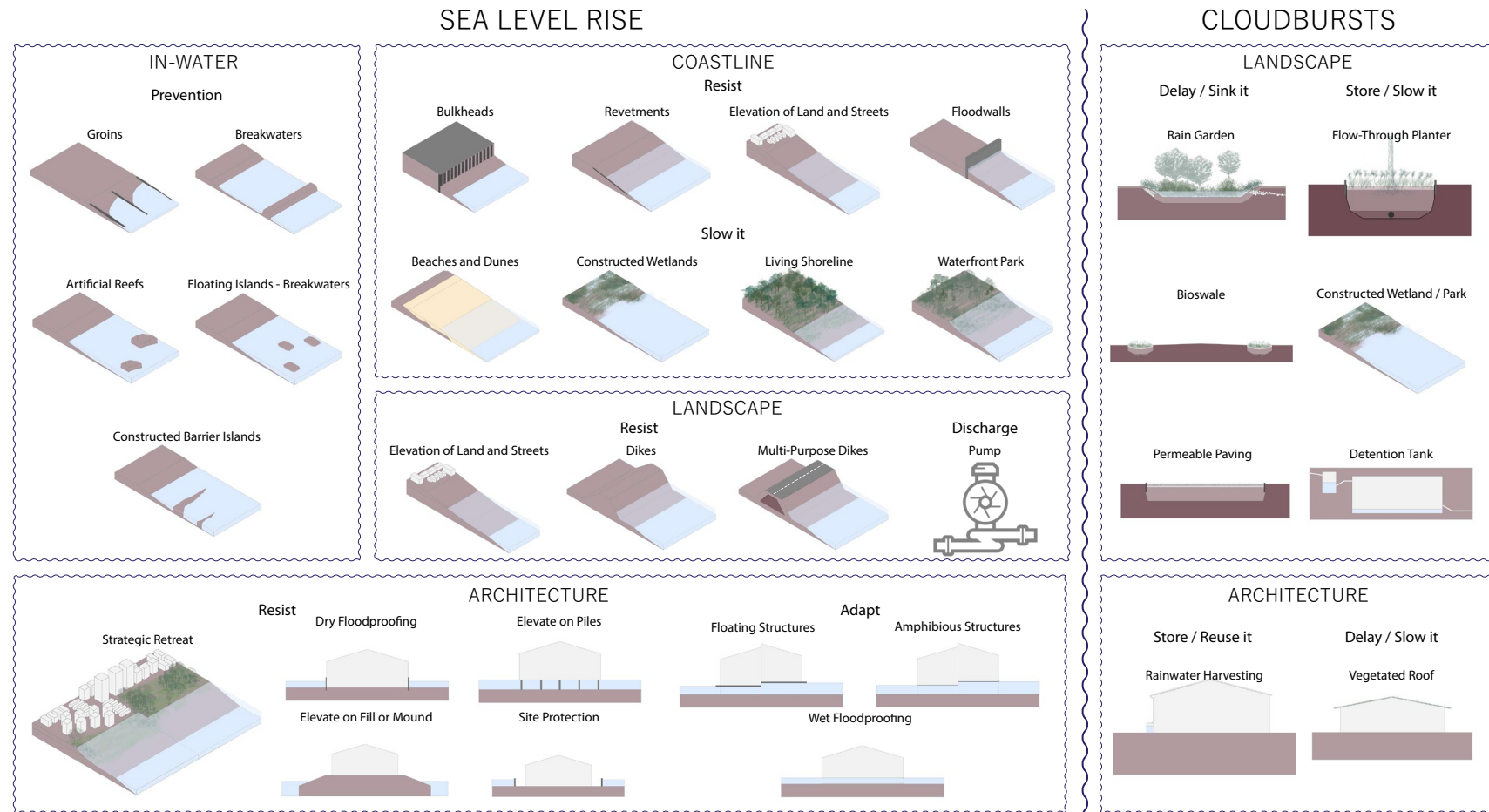
On page 23 you can find a library of the flood management measures, split into different categories depending on how they deal with floods. They will work as a compilation of strategic possibilities that will be used further on in the strategy and the design work, where they will be looked at more in detail.

Just like this, the city districts of Malmö have been analysed and suggestions have been made as to how they should be worked with in the future. Together they try to look holistically at potential development areas of Malmö through the questions stated with the layers.

For further information about the different flood management measures; see Appendix 1 - Strategy Library.

For further information about the analysis of the different city districts of Malmö; see Appendix 2 - Strategy-Analysis.

STRATEGY LIBRARY



GENERAL CONCLUSIONS

From the detailed strategy-analysis some general conclusions could be made.

In particular, to deal with the effects of sea level rise on the built environment, a dike of sorts should be made along the roads; Limhamnsvägen, Mariedalsvägen, Regementsgatan and Drottninggatan. These streets are all a sort of barrier to the city districts: Gamla Limhamn, Bellevue, Västervång, Ribersborg, Rönneholm, Kronprinsen, Davidshall and Midhem, which all would be heavily affected by a flood. However, if the roads (or an adjacent strip) are raised by only 0,5-1m the sea level rise floods wouldn't reach the city districts beyond. A large construction, but that would have a hugely positive effect on society and that can be implemented little by little, whenever road construction is carried out.

Outside this road stretch a recommendation is made to either use the land for recreational wetland areas (in high permeability areas), that can be resilient towards sea level rise, or new developments (in low-permeability areas), that need to incorporate "sea level rise"- flood management measures that can be seen on the previous page.

In the large dock areas densification is recommended, and to work towards more mixed functions in the area.

Five larger areas are recommended for new development. They all have a sparsely built environment with great possibilities for water absorption (high permeability). With further studies both new wetland areas / blue-green structures could be built alongside new development creating favourable living conditions. They are all also situated in attractive locations - alongside the water, close to train stations and/or already existing green areas.

Six larger areas are recommended for densification. They are all located in areas that have built environment but where densification projects are possible to mix in with the existing. Many of them are dominated by large-scale structures, some with industrial character. A mix of high and low permeability zones can be found in the areas, which should guide the continued detailed development work.

Sea Level Rise Flood Zones

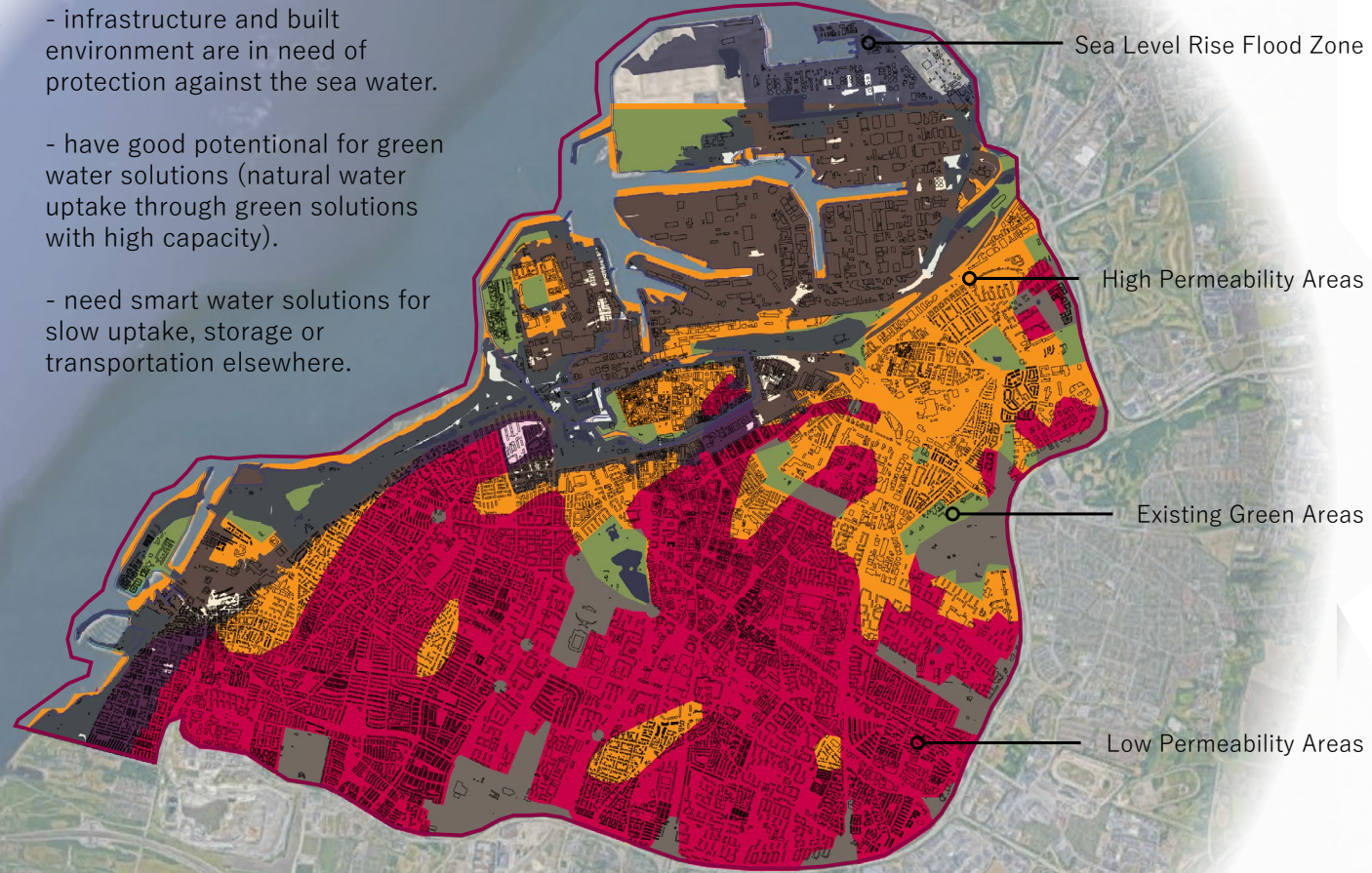
- infrastructure and built environment are in need of protection against the sea water.

High Permeability Areas

- have good potential for green water solutions (natural water uptake through green solutions with high capacity).

Low Permeability Areas

- need smart water solutions for slow uptake, storage or transportation elsewhere.



Densification

- should be made where large-scale green-blue solutions aren't recommended, with detailed landscape features (that help deal with floods) as well as architectural solutions.

New Development

- can happen in any open area not recommended for green-blue solutions but should be concentrated to the vicinity of large-scale green-blue solutions.



MALMÖ'S PLANS

To the right you can see a map depicting the current detailed development plans that Malmö municipality are working on; places they wish to reshape in some way.

Most of their work areas correlate with the thesis proposal, especially the larger areas. What the thesis shows is how many more areas could be interesting to look at. What areas could be a first step towards a denser, greener Malmö, that isn't overwhelmed by floods (in the short-term or long-term perspective), which doesn't decrease the surrounding, valuable farmland but instead increases the greenery within the city as well as the built environment.



Det här visar markeringarna i kartan

Gul markering = Planuppdrag	Yellow = To be looked at
Blå markering = Samråd	Blue = In consultation process
Orange markering = Granskning	Orange = In examination process
Grön markering = Antagen/Godkänd	Green = Approved
Lila markering = Gällande detaljplan	Purple = Valid

DESIGN

THE SITE

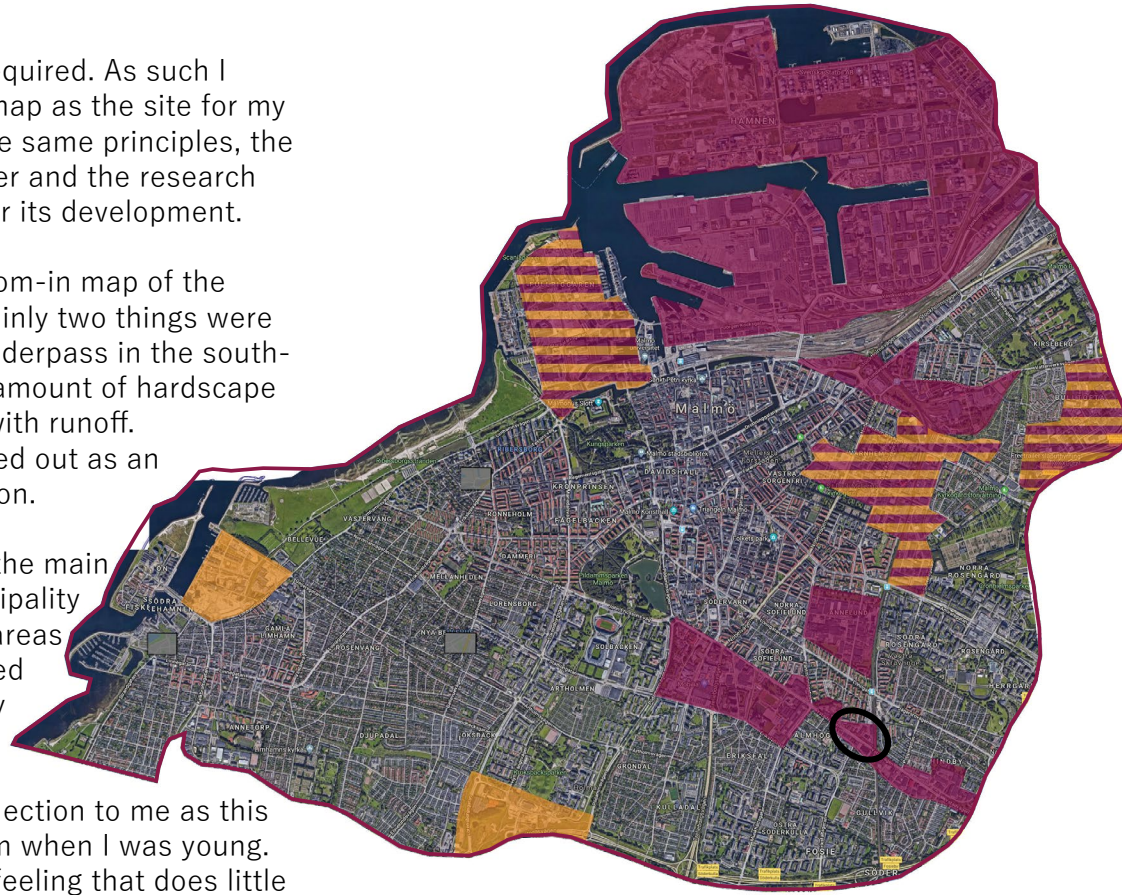
CHOSEN SITE

For the thesis, a design component is required. As such I have chosen the encircled area on the map as the site for my design. Since the design works along the same principles, the information from the Background chapter and the research from the Strategy chapter are utilized for its development.

It is the area that could be seen as a zoom-in map of the strategy-analysis on page 27. There, mainly two things were noted; it has a low-lying, flood-prone underpass in the south-east and generally needs to lessen the amount of hardscape and instead increase its ability to deal with runoff. From the general conclusions is it pointed out as an area that would benefit from densification.

The area lies along Ystadvägen, one of the main entrance roads to Malmö. Malmö municipality has pointed out these types of road as areas they want to transform; from large-scaled and car dominated to human-scaled city streets.

The road also has a more personal connection to me as this was the main road I entered Malmö from when I was young. It gives a grey, industrial, unwelcoming feeling that does little



for Malmö's reputation and represents it ill.

With its attractive location; mere kilometres from the city centre (2,5 km), proximity to a train station (on site), hospital (1,5 km) and sport fields (0,4 km) it has great potential to become a vibrant part of the city.

The goals of the design is to:

- increase the water management,
- increase the density and
- introduce a more mixed-use community.



The design site

SURROUNDINGS

North of the site is the neighbourhood Augustenborg, also called *Ekostaden* [The Ecological City]. It is famous for its sustainable work, mostly its stormwater management, including vegetated roofs, bioswales, runoff delay system of several ponds etc.²⁶

It is mainly dominated by apartment buildings, where smaller businesses also fit in, and a larger school area in the south west, adjacent to Augustenborgsparken (the park).

²⁶*Innovativt dagvattensystem i Malmö*



South of the site is the neighbourhood Almhög.

It is also dominated by housing units, both apartment buildings and villas. Smaller businesses can also be found, mainly along Ystadvägen and surrounding the central square. The area also has a centrally located park with school facilities next to it.



THE SITE TODAY

The north part of the site is dominated by the municipality's Service Department. Most of the area is gated and the buildings low-scale with few access points out towards the public. A majority of the buildings are covered with a 9500 m² botanical roof garden. It consists of various types of plants and habitats, helping with stormwater management, reducing urban heat island effects, improving urban biodiversity, wildlife and air quality.

It is a vast area with necessary functions but with bad space distribution as the area is so unefficiently used.

The south part of the site has much the same characteristics as the north; vast hardscape, with large-scale, industrial buildings of not to many floors (mostly 1-2 floors) and usually not used by a large amount of people. Some plots are gated, others house more people friendly activities such as; neighbourhood restaurant, bowling alley, gas station, fleemarket, small community college etc.

This space could also be used more efficiently while still providing structures that can house the current activities.



North of Ystadvägen



South of Ystadvägen

Ystadvägen cuts right through the site. It is one of the main entrance roads for cars coming to Malmö from the south and has four lanes (two in each direction), which turn into five-six lanes at the intersections. It was built in an earlier era when it was seen as positive to give a lot of space to cars in the city. In the last decades this view has changed and one of the effects of this has been that Trafikverket (The Swedish Transport Administration) recommends that priority should be given to pedestrians and cyclists. To ensure their (and motorist's) safety a general recommendation was made in 2008 to change the speed limits on roads in Sweden.^{26, 27} For Ystadvägen this meant that the speed limits were changed from 70/90 to 40/60 km/h.



Ystadvägen

This has been implemented, however, no physical change has been made that supports the lower speed. Many therefore drive too fast here with an unsafe environment.

To make this area into a more people-friendly zone it is recommended that the size of the road is narrowed down to better match the current speed limits and the desired and heightened street life activity.

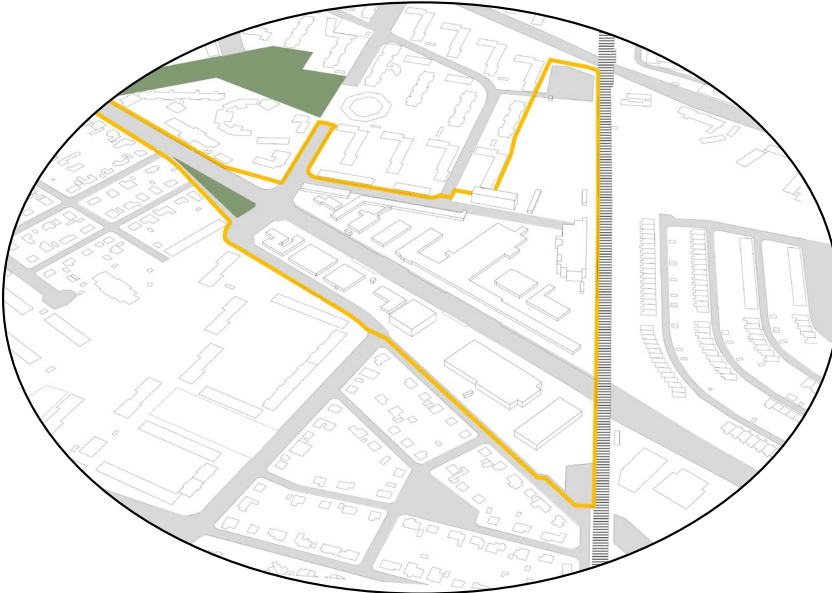
²⁶ *Hastigheter på väg*

²⁷ *Ändrade hastighetsgränser*

MASTER PLAN DEVELOPMENT

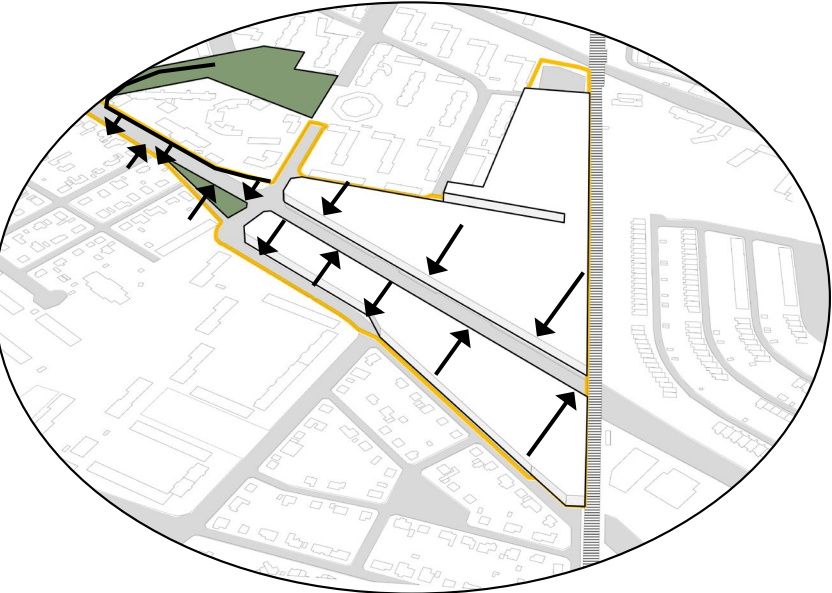
SITE TODAY

Adjacent to the train tracks leading to and from Persborg train station.
Cut through by Ystadvägen.
Low built industrial structures, north and south of the road.



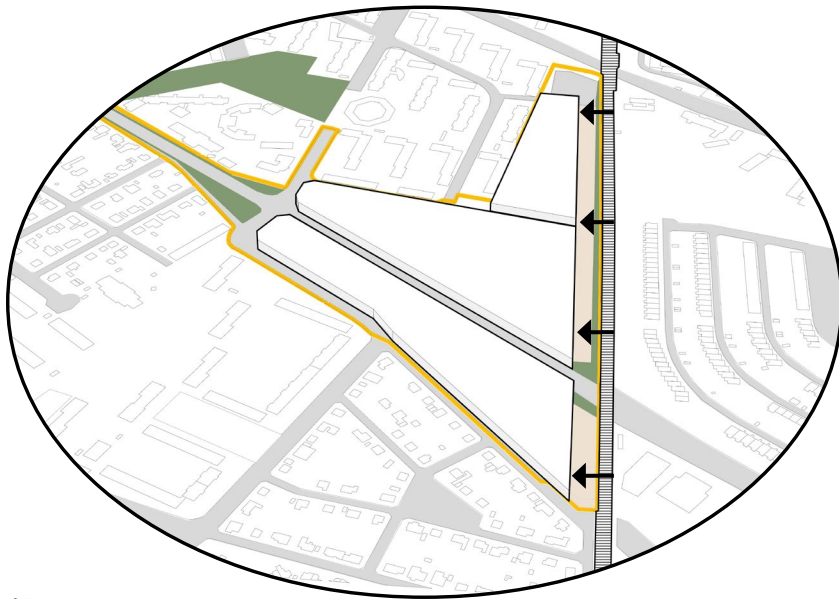
DOWNSCALING OF THE ROAD (through built structure and greenery)

Extend the built structure into the road in the south-east portion of the site and the greenery in the north-west.



THE EFFECTS OF THE ADJACENT RAILWAY (buffer zone & noise protection)

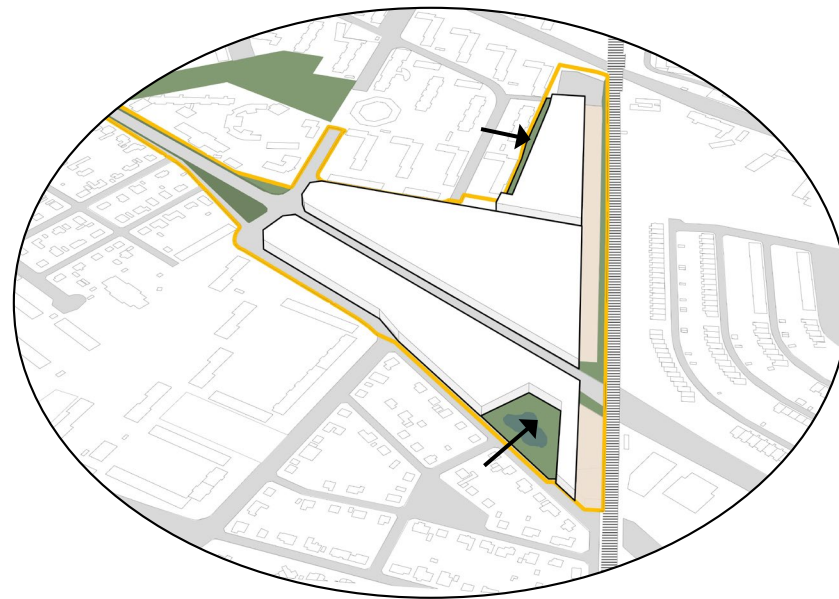
According to the Swedish building regulations buildings that are supposed to house people aren't allowed closer to railways than 25 m. This space will instead be used for the Service Department's outdoor storage and parking. Their offices will also work as a noise protection barrier for the rest of the site.



HIGH PERMEABILITY ZONE (water management)

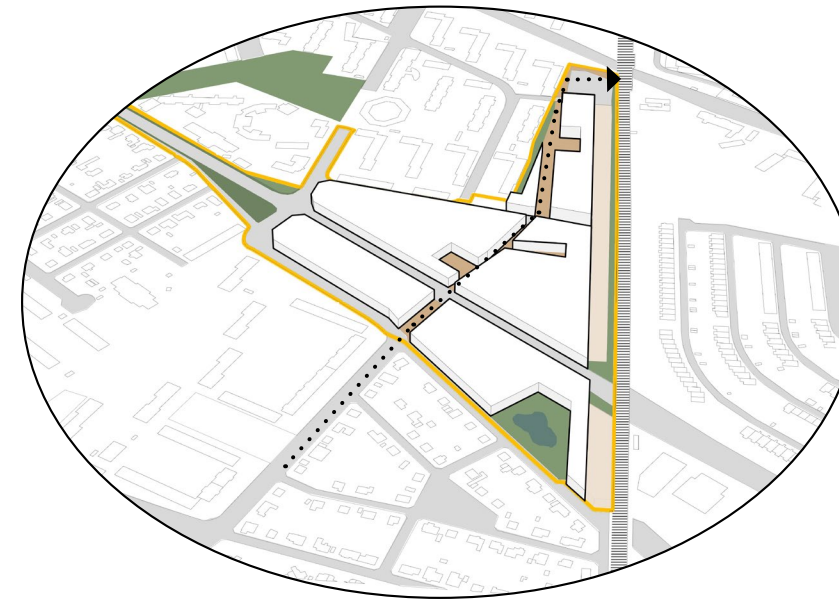
The only high permeability area on the site will be used for a small wetland park/rain garden. Since this also is on of the highest point on site, it is a good place to trap water from pouring down the site.

An existing bioswale area is preserved in the north.



ACCESS TO THE TRAIN STATION

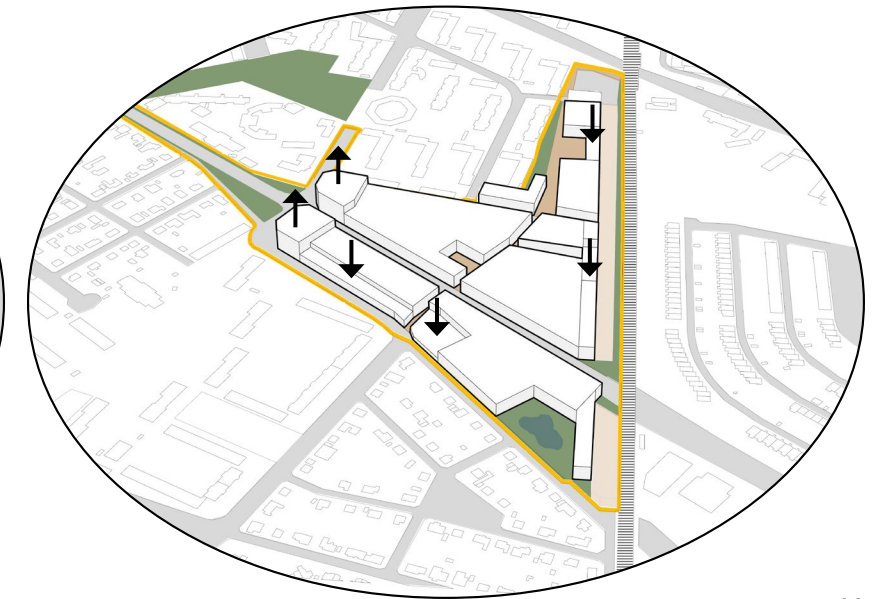
There is no convenient passage way from the south to the train station today. The thesis therefore propose a pedestrian passage from Nydalavägen in the south, cutting through the middle of the site and includes social gathering points along the way.



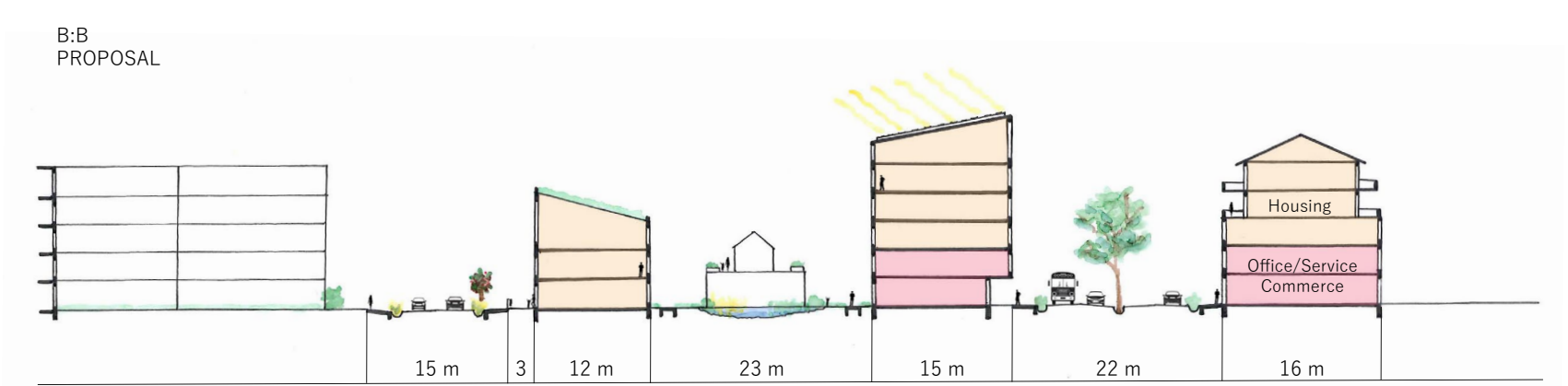
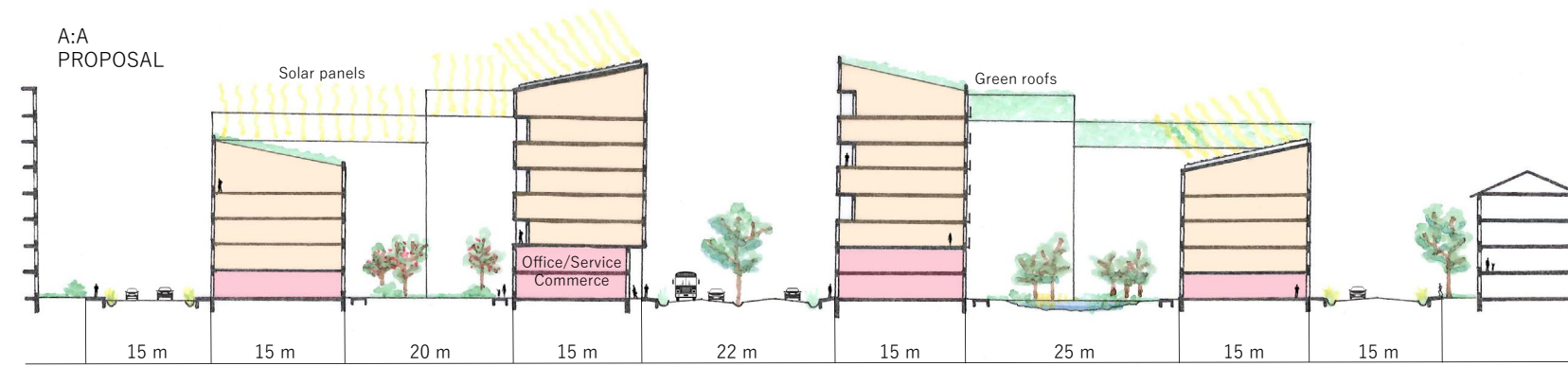
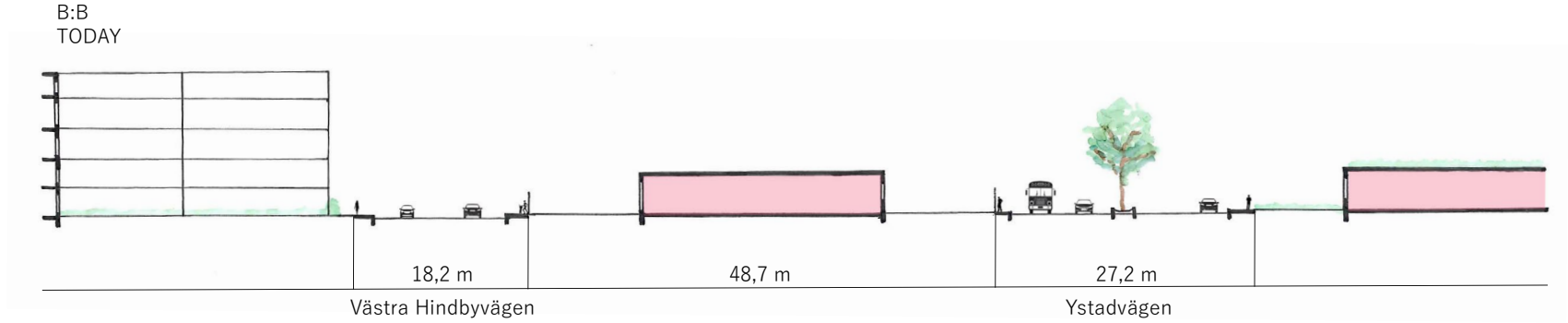
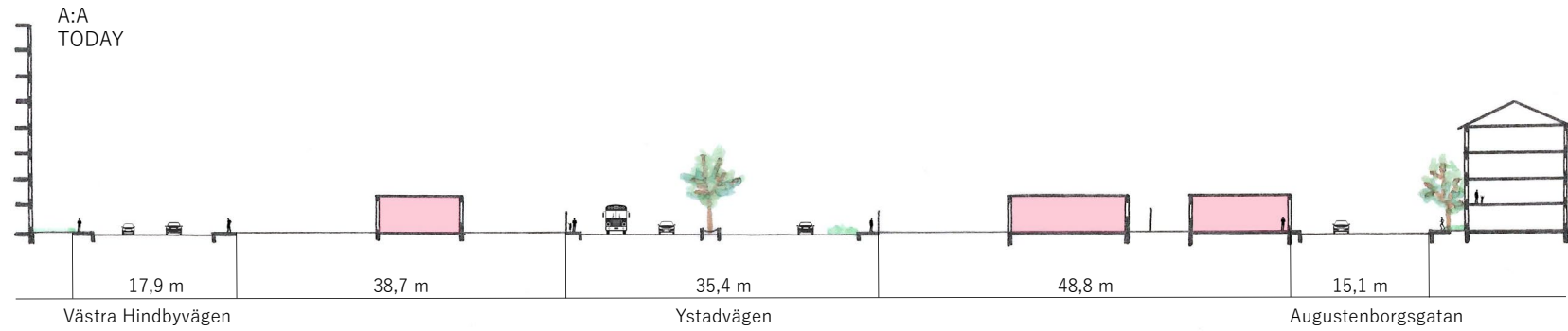
VARIATIONS IN THE BUILT STRUCTURE

To better frame and match the sprawling intersection the buildings to the west is allowed to rise above the rest. To create a dynamic street that matches the surrounding mixed building typologies the buildings lining Västra Hindbyvägen (and facing Almhög) are allowed to be lower, also allowing better sunlight conditions in the narrow courtyards beyond.

The entrance points to the (moved) botanical roof garden are lowered to be more accessible and inviting.



DENSITY IN SECTIONS

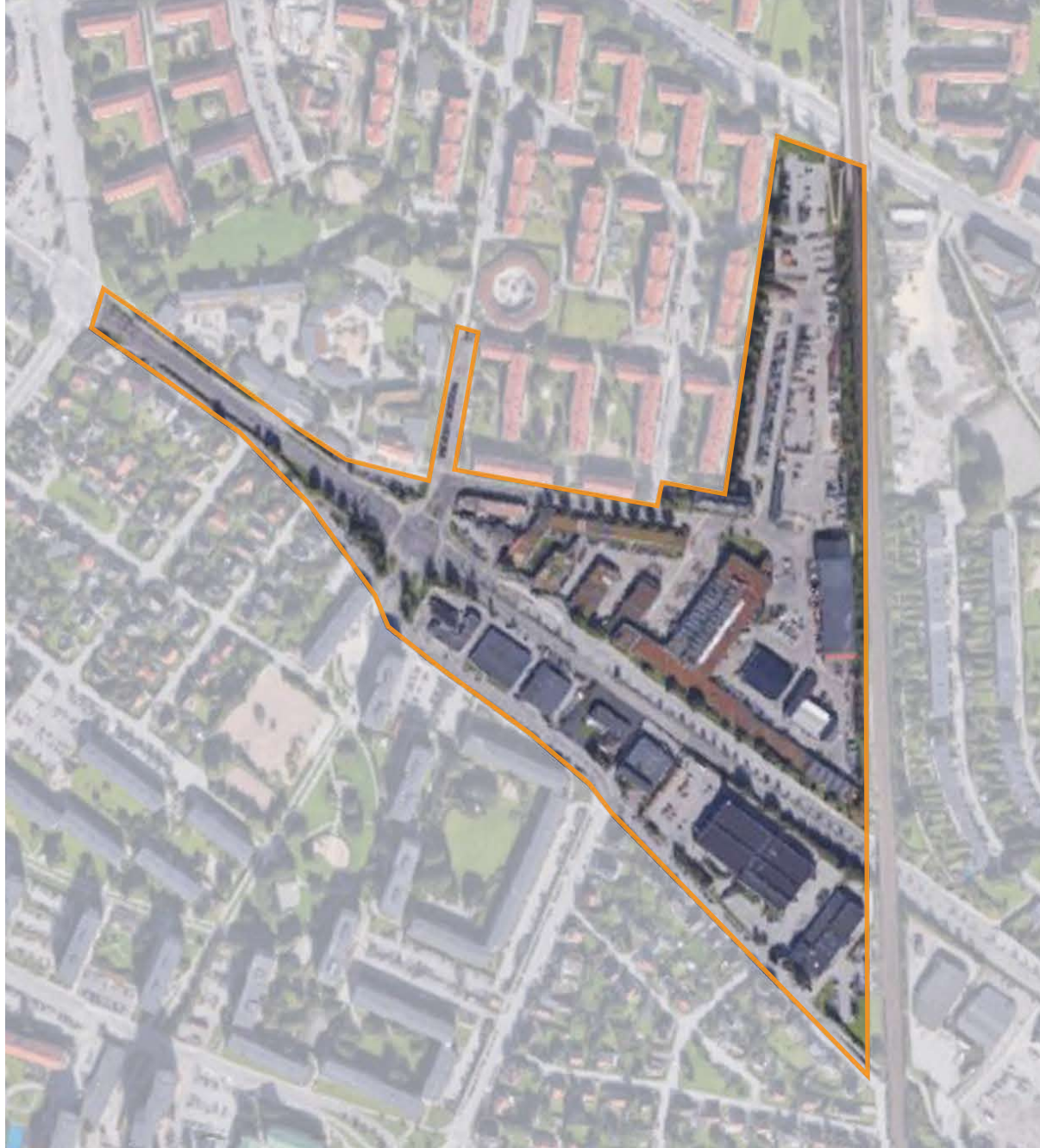


Today the density of the area is low. The structures are 1-3 floors, with a very homogeneous functionality. I propose a quite radical increase in density, permeable ground and more mixed functions.

	FSI	GSI	OSR	L
Today	0,27	0,19	0,81	1,33
Proposal	1,17	0,30	0,70	4,20

	Municipal service (m ²)	Commerce/ Office (m ²)	Housing (m ²)	No. of inhabitants	No. of apartments
Today	19.665	16.454	0	0	0
Proposal	26.786	37.514	88.508	2.200 (~40m ² /pers)	1450 (à 60m ²)

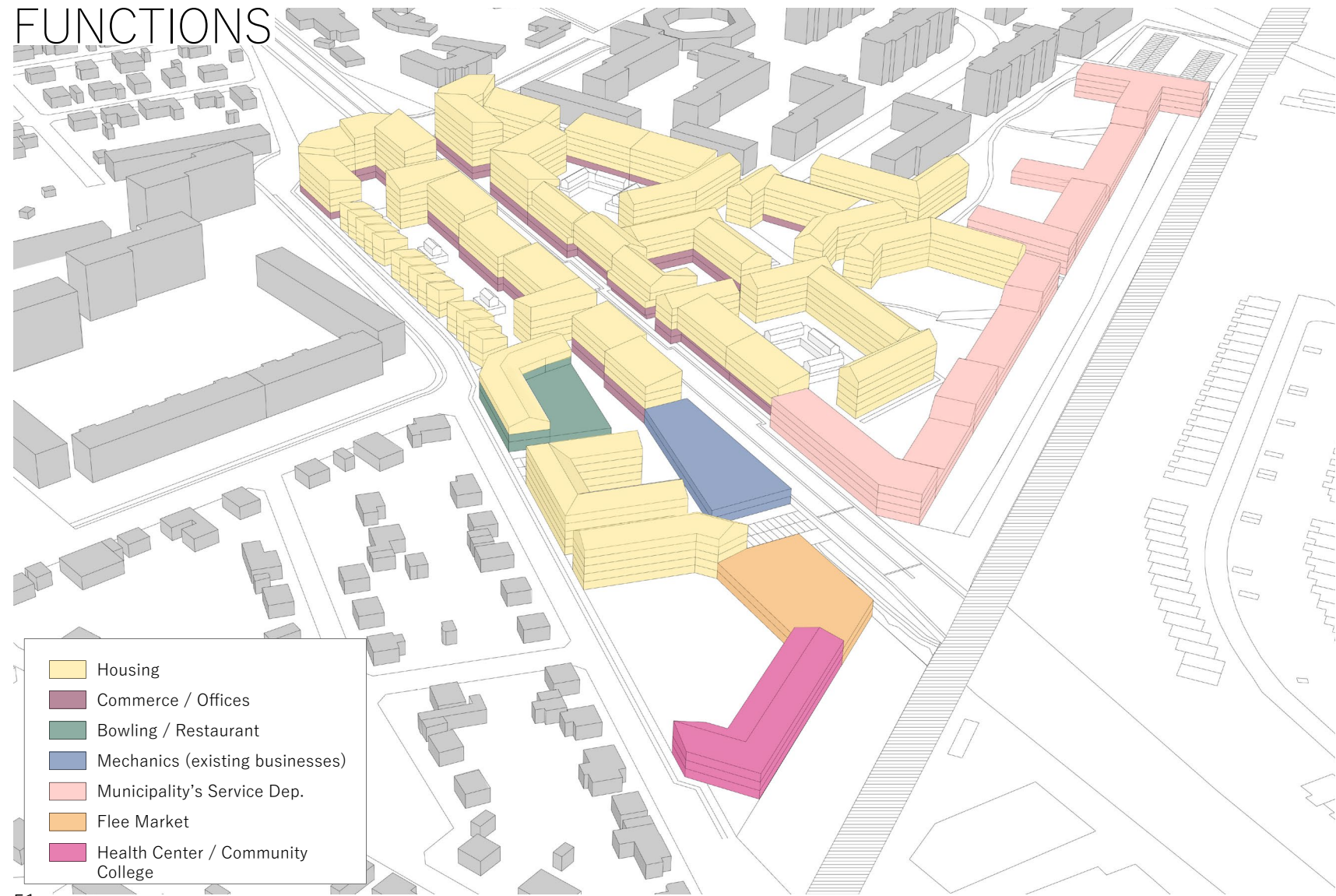
CURRENT LAYOUT



MASTER PLAN

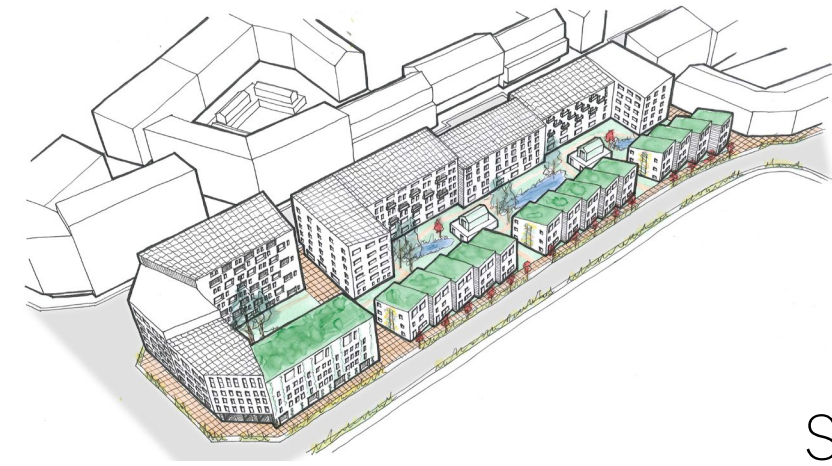
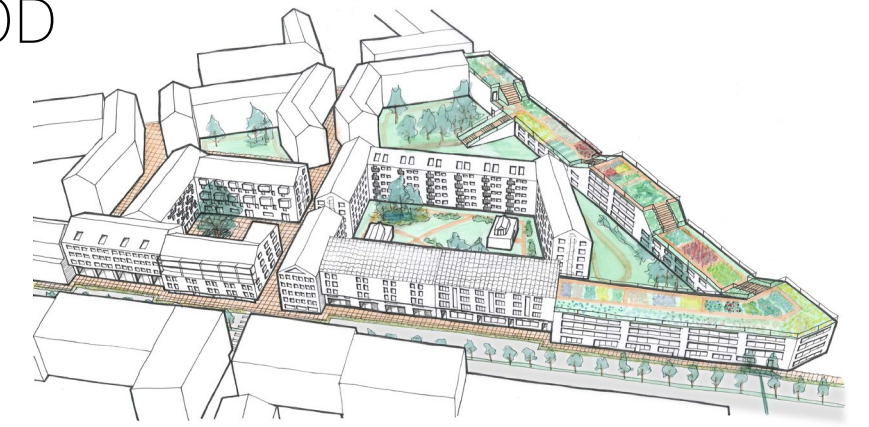


FUNCTIONS



- Housing
- Commerce / Offices
- Bowling / Restaurant
- Mechanics (existing businesses)
- Municipality's Service Dep.
- Flee Market
- Health Center / Community College

NORTH-EAST NEIGHBOURHOOD



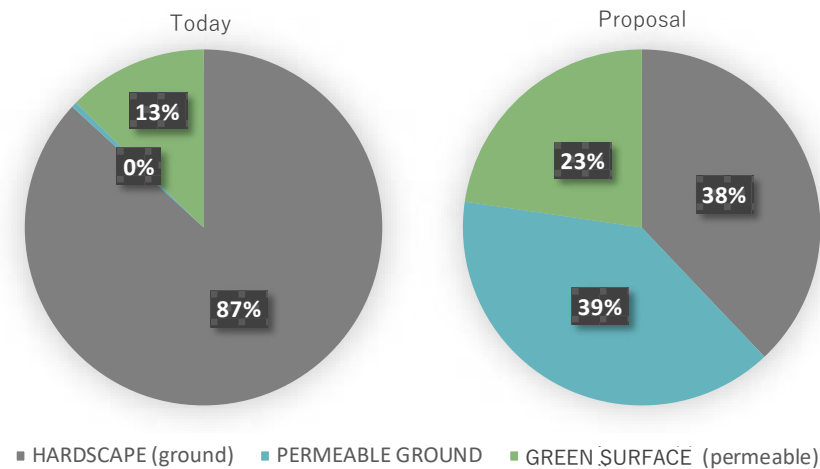
SOUTH-WEST NEIGHBOURHOOD

WATER MANAGEMENT

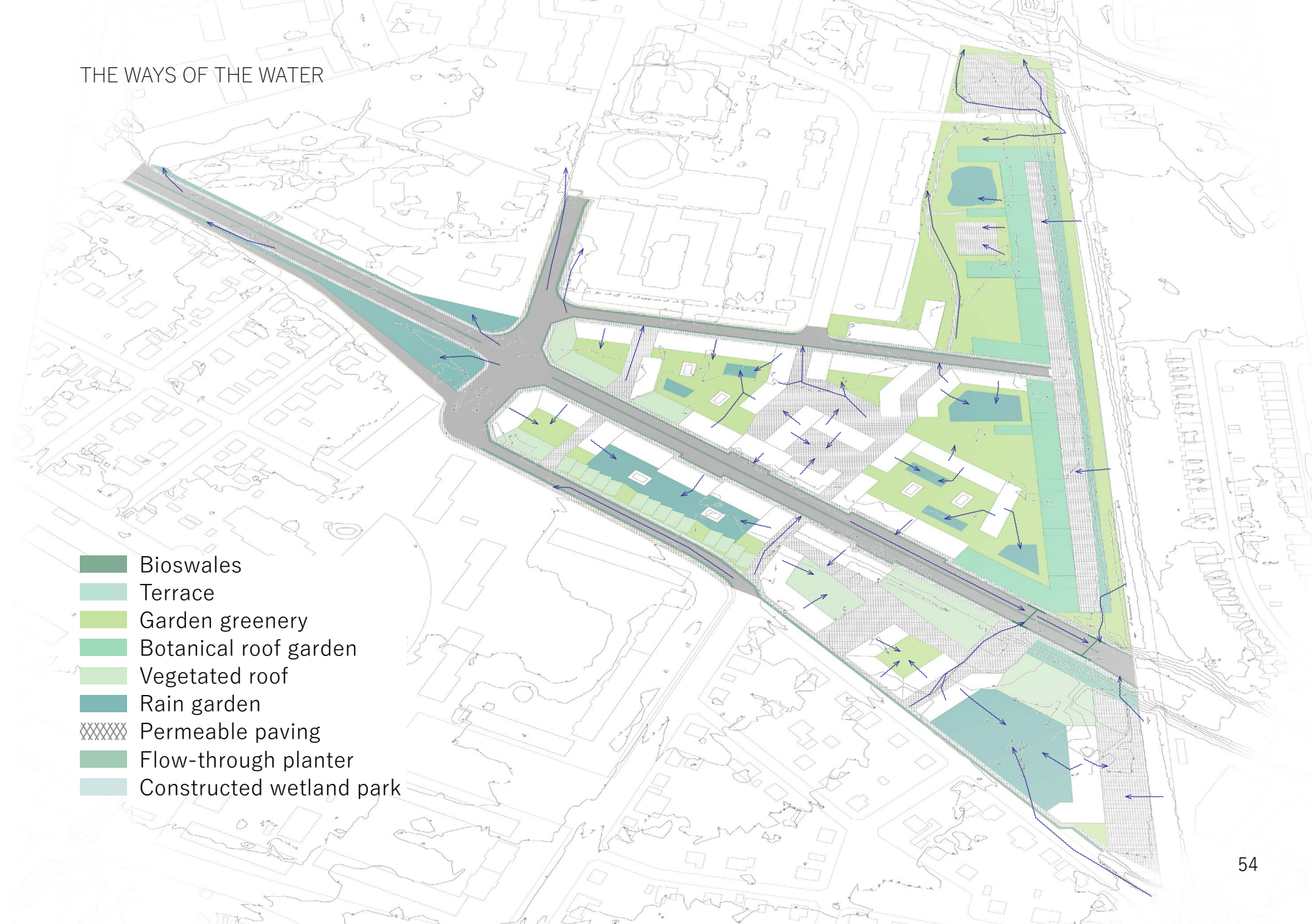
(m ²)	Today	Proposal
Open space	106.901,7	92.645,1
Hardscape (ground)	92.850,8	35.152,5
Permeable ground	14.050,9	57.492,6
Green surface (permeable)	13.512,4	21.014,6
Greenroof	9.987,4	14.055,7

To increase the areas ability to deal with water a great deal of the ground is proposed to turn from hardscape, non-permeable ground, to mixed permeable ground, as can be seen by the numbers on the left. The proposal increases the permeable ground by 49 %.

The water management measures that covers the ground are placed so that they can deal with the water in the best way according to the specific locations' prerequisites. Aiming to deal with water on the site, where it falls. Should it flood more, the measures are decreasing the flooded areas on and off the site, not creating new flood zones.

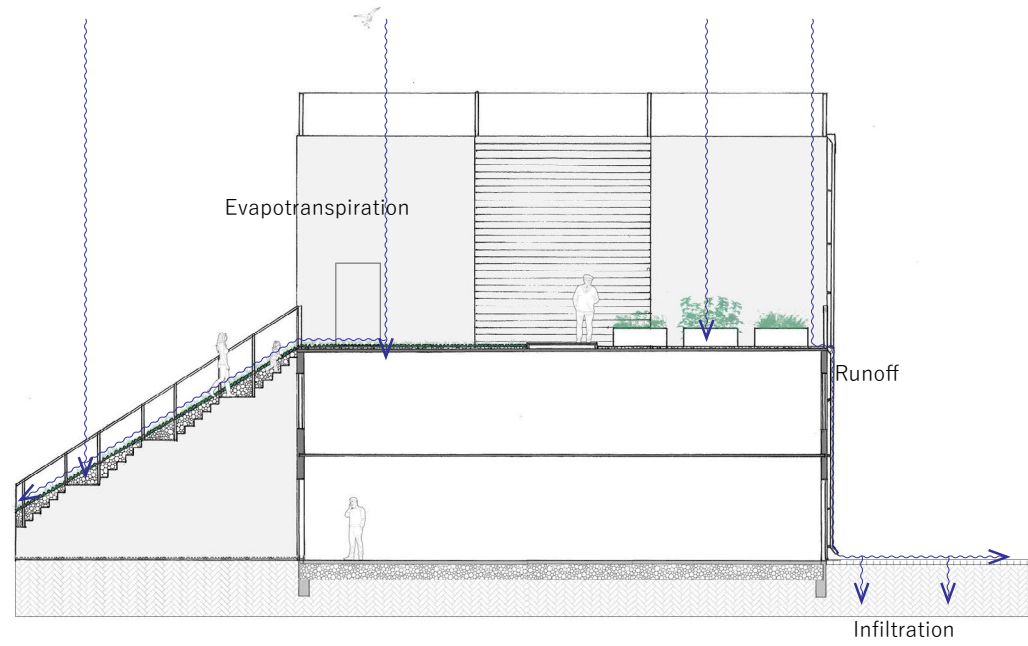


THE WAYS OF THE WATER

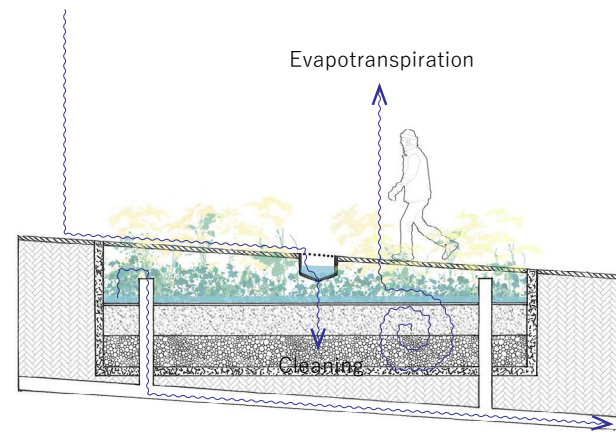


- Bioswales
- Terrace
- Garden greenery
- Botanical roof garden
- Vegetated roof
- Rain garden
- Permeable paving
- Flow-through planter
- Constructed wetland park

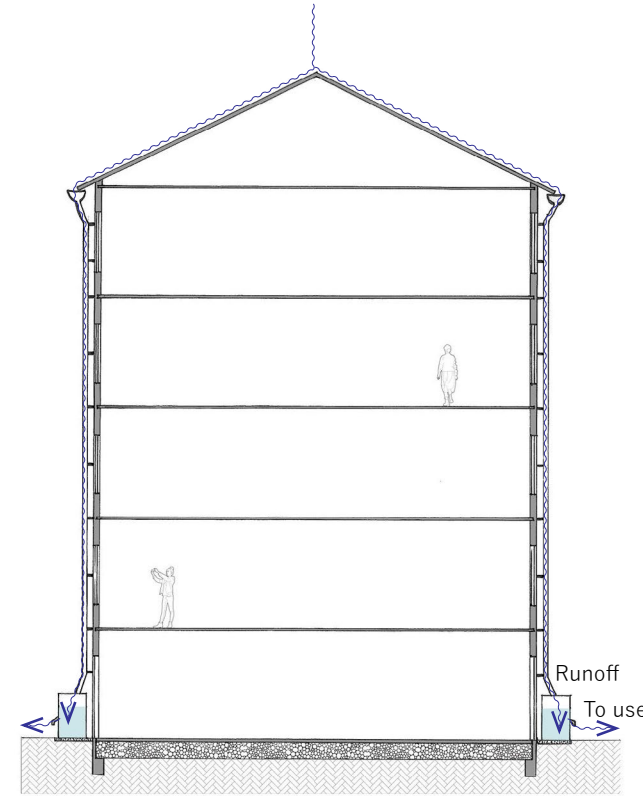
WATER MANAGEMENT MEASURES



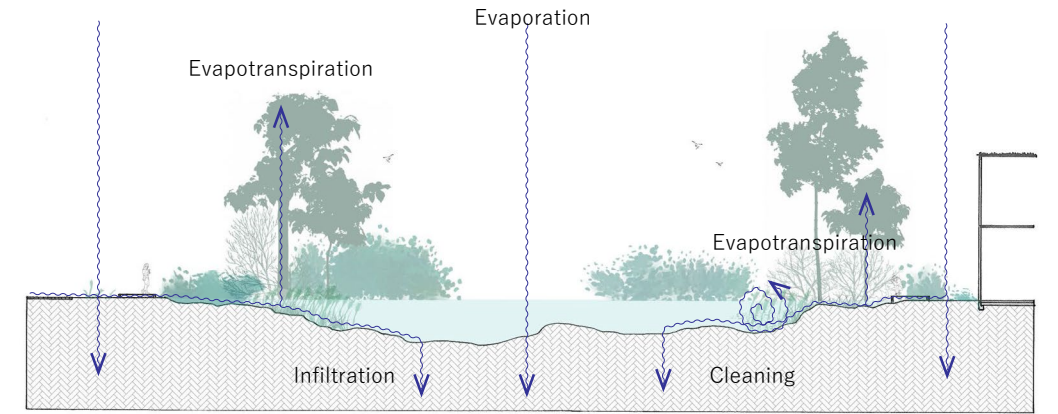
Botanical Roof Garden



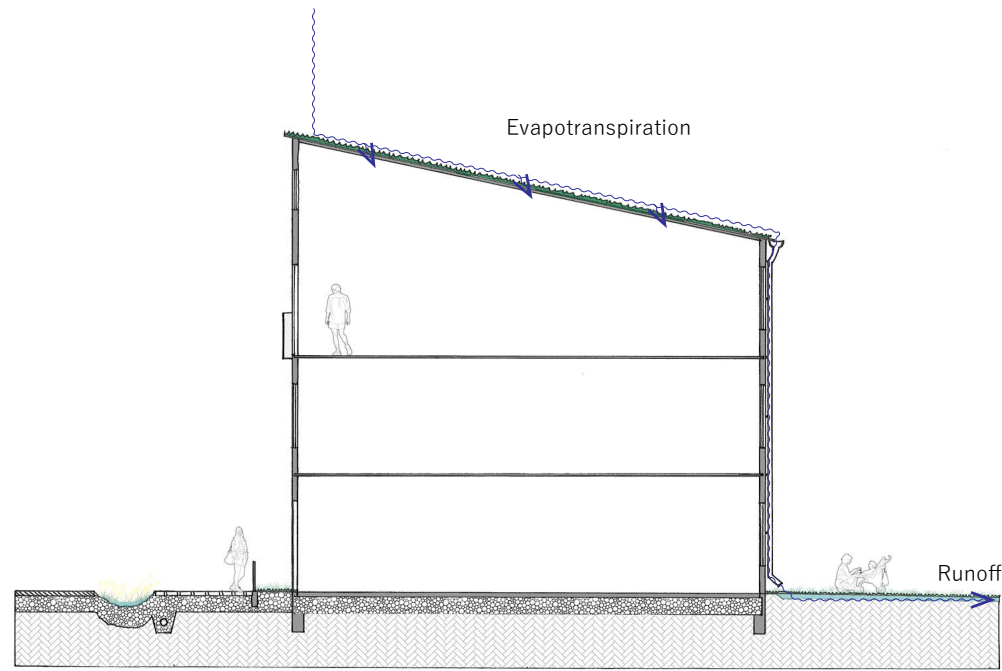
Flow-Through Planter



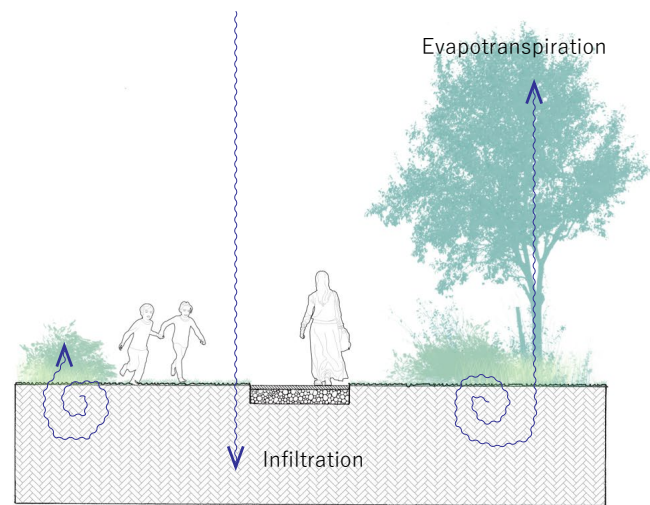
Rainwater Harvesting



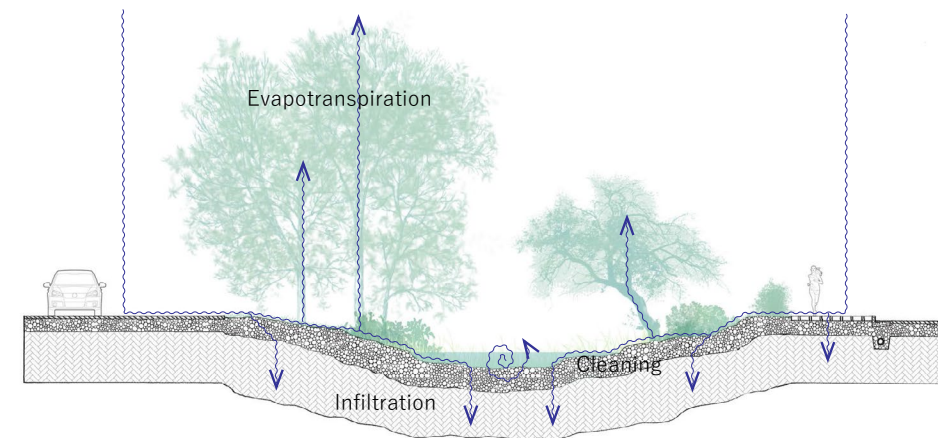
Constructed Wetland Park



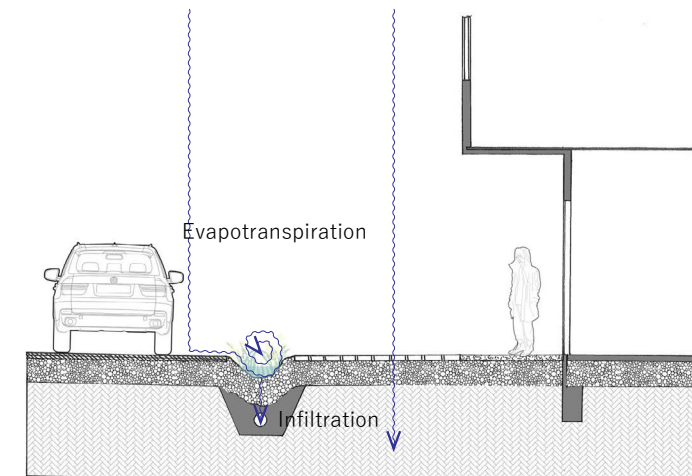
Vegetated Roof



Garden Greenery



Rain Garden



Bioswales & Permeable Paving

YSTADVÄGEN TODAY



YSTADVÄGEN TOMORROW



DIRECTORY

- Detailed development plans - The legal document describing what the land at a specific site may be used for.
- FSI - Floor Space Index (floor space intensity)
- GSI - Ground Space Index (built ground compactness)
- OSR - Open Space Ratio (non-built ground pressure)
- L - Layers (average number of floors)

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