



AND THEN WHAT ?

*Exploring how a **sustainable future**
would transform the site of an
urban shopping mall*

by Elin Westin

Master's thesis at Chalmers Architecture
Master's programme Architecture and
Planning Beyond Sustainability

*Supervisor: Shea Hagy & Marco Adelfio
Examiner: Emilio Brandao*

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Master's Thesis
Chalmers School of Architecture
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Thesis Direction: Urban Challenges
Examiner: Emilio Brandao
Supervisor: Shea Hagy & Marco Adelfio

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CHALMERS
UNIVERSITY OF TECHNOLOGY

Abstract: And Then What?

The year is 2031. Global net human-caused emissions of carbon dioxide (CO₂) has fallen by about 45% from 2010 to this year of 2031. With great effort the climate crisis has been averted and the global warming has been limited to 1.5 °C. This has been accomplished by radical changes in society. The world is different, and has to stay that way.

This thesis will focus on how the changes that have to happen to reach the climate goals may change the architecture of the city. The chosen climate goals will be taken from the United Nations Sustainable Development Goals, in combination with the objectives set by the Swedish government (Sveriges miljömål).

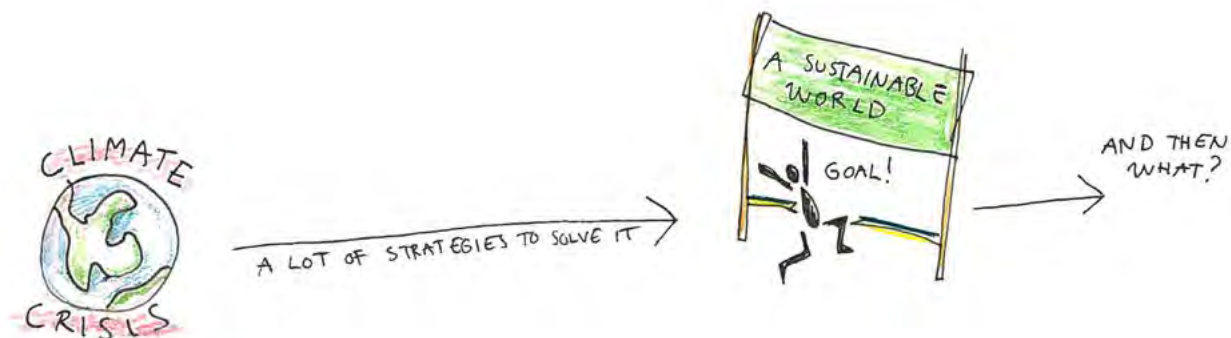
In this future, the societal structure has adapted to a circular economy, which replaces the take-make-waste system. Places created for the consumption of products will be diminished and function differently.

As a way to research through design, Nordstan in Gothenburg is chosen as a visionary example in a sustainable scenario. Today, these blocks are joined together as a shopping mall. The idea is to explore how urban architecture and the public spaces may be reshaped in a place that

used to rely on unsustainable qualities. This site is also chosen because of the densification of the urban areas in Sweden. Nordstan, with its location next to the central station, will probably stay as the most central point of Gothenburg, even if the city expands in the future.

The purpose of this thesis is to envision and explore what it would mean for the built environment if the goals for sustainability were to be reached at their deadline, the year of 2030. Instead of asking the question 'Is this possible?' this thesis explores the outcome at the finish line. A problem today is that the high demands for sustainability makes a lot of people feel like they have to sacrifice comfort and wellbeing. By showing a positive outcome, the future may not seem so bad or impossible. This need for radical changes also gives an opportunity to make better solutions. The aim is to raise a discussion on the subject: If we make it - what will a sustainable future look like?

Keywords: *Speculative design, Utopia, Circular Economy, Sustainable development goals*



*" When a man sets out to project something for the future, It may turn out to be a very amusing bit of history, because it will be only what can be made now. But, actually, there are men today who can make what is an image. It is **what is possible today, not what will be the forerunner of what things will be tomorrow.** Tomorrow You cannot predict, because tomorrow is based on circumstance, and circumstance is both unpredictable and continuous. "*

- Louise I. Kahn 1969, p. 39 in 'Conversations with students'

A c k n o w l e d g e m e n t s

First off, I would like to thank my team of tutors: Emilio, Shea & Marco. You have been the perfect combination of calmness, crazy and legitimacy. Without your help this thesis would have been a boring book of nonsense.

The idea of this thesis are based on long evening discussions with my friend Matilda Andersson, having whiskey by the fire and fantasizing about what the world could be like. Thank you for always asking "What if..." at the times I started to doubt myself.

I would also like to thank my friend Dario Samardzic for his calm input and handwritten notes of feedback. I can barely read them, but I felt the support anyways.

And last, thanks to my family. No matter what I do you are always so proud of me.

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About the author

During my years as a student, my design approach has developed from two directions. The first one is to rebuild and transform rather than start from scratch. The current built environment has a lot to offer, and it is my opinion that architectural value can be found in most places if you start looking for it. The other direction that has shaped my role as an architect, is sustainable design. It is to always aim for ecological and social sustainable solutions. With this master thesis, I hope to further explore how these two directions can be combined. This is my final project as a student. Hopefully this will be the starting point of many transformational projects to come, that are aiming for a sustainable future.

Chalmers University of Technology

2017 - 2020 Master of Architecture, MPDSD

- 2019 Architectural Heritage and Transformation
- 2018 Sustainable building
- 2017 Local Context

Lund school of Architecture

2014 - 2017 Bachelor of Fine Arts and Architecture

- 2017 Architecture in Time and Space
- 2016 Sustainable Architectural Design
- 2014 -2016 Studio Q

Reading instructions

When reading this thesis, I want you to imagine a vision for the future on your own. The vision I have created is not made to be the ultimate vision. It is just a taste on what it could be like, one version out of many. Stay open to your own ideas, and don't be stressed out. Achieving a sustainable future gives great opportunities to imagine a better world, and feeling that opportunity is the purpose of this project.

This thesis is divided into an introduction, three chapters of content and a last part with discussion. The first chapter is about the site. The second chapter covers the research, and the third chapter is about the design. The second and third chapters are the biggest ones, and both begins with an overview of each process.

Glossary

Circular Economy is... *"A systemic approach to economic development designed to benefit businesses, society, and the environment. In contrast to the 'take-make-waste' linear model, a circular economy is regenerative by design and aims to gradually decouple growth from the consumption of finite resources" - the Ellen MacArthur Foundation*

'Commercial' means... making or are intended to make a profit

'Sustainable' means... supporting long-term ecological balance/ beneficial for both the planet and for human health.



I will not let people feel guilty for existing
I believe humans can live in balance with nature
I believe we already know what needs to be done
No more compromises
Let's go

M A N I F E S T O

The most reliable
way to predict
the future
is
to create it.

- Peter Drucker

Relevance

When designing for sustainability, you often get overwhelmed in the complexity of it all, thinking it won't be enough or that the world is already doomed to fail. So instead of going with the usual "How do we achieve this?" which leaves you feeling it will be impossible, A more optimistic approach is to ask yourself "If we achieved this, how did we do it?"

The aim for this project is not to just be relevant for architects, even if they are the main target group. By visualizing a sustainable future, the process of this thesis hopefully opens up a discussion on the subject, where opportunities are more in focus than the limitations. Nordstan is a place most people in Gothenburg are familiar with, and can therefore encourage more people than just architects to be involved in thinking out loud. By assuming that the climate crisis can be solved, we can take a pause from the negative energy and think freely for a time on how we want to shape our city.

B a c k g r o u n d

Urbanization and the need for a sustainable city

Today in Sweden, the building sector stands for 18% of the total co2 emissions, and 33% of the country's energy usage. (Boverket, s.23, 2019). Production and renovation is the major part of this and stands for 70% of the emissions from the building sector. (Boverket 2019, p.24).

The Swedish population is growing, and more people are moving to cities. This leads to a lack of housing in urban areas, which in turn is solved by a rapid production of new buildings. This densification and shortage of empty plots makes the value of land skyrocket in cities. (Boverket 2019, p.5)

As cities grow denser, the use of public transport might increase and traffic by car reduce. This would lower emissions from the city. But densification may also lead to less accessibility to green areas, less indoor daylight, and other problems that occurs when the building sector is forced to develop fast and dense. The value of land also plays a vital part. The closer to the core of the city, the more expensive the land. This creates a situation where the most central plots get very expensive, which might make the built development

dominated by functions that generates a high profit.

These circumstances creates a challenge when it comes to the development of the built environment in the urban areas of Gothenburg, especially when the sustainable aspects need to be prioritized.

T h e s i s Q u e s t i o n

If the sustainability goals were reached in a future scenario

- How would the site of an urban shopping mall be transformed to match this future?

Purpose

- To explore ways urban architecture can be transformed to fit into a sustainable future
- To investigate and explore alternative functions of today's commercial public spaces
- To raise discussion on the subject: If we make it - what will a sustainable future look and be like?

Delimitations

Rule of thumb

This thesis will only focus on the changes for sustainability that affects architecture and the built environment, or architecture and the built environment can affect.

Context



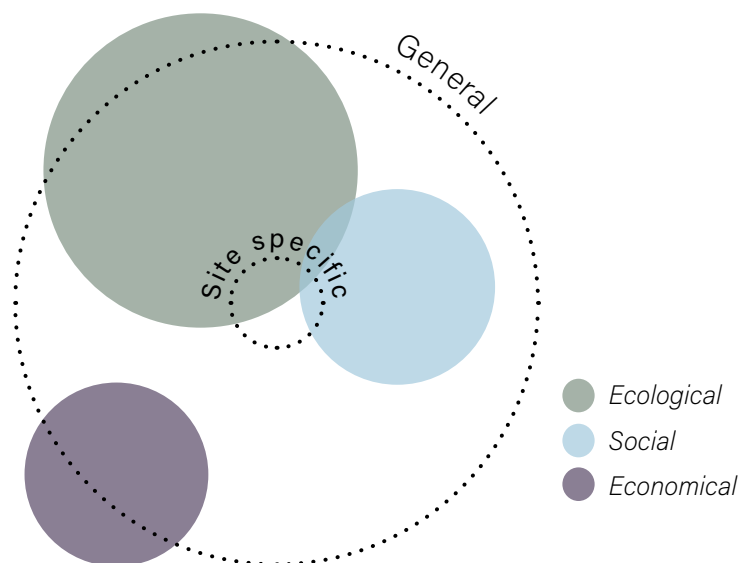
Fig 1. Scale of Rural to Urban. *The aim is to explore the challenges of transitioning into a sustainable built environment in a scenario of urbanization and densification. Therefore, the chosen context of this thesis is closer to urban than rural. The rural context has a lot to offer in terms of creating a sustainable society, but are not a part of the focus for this thesis.*

Design

Conceptual > Detailed

Sustainable aspects in focus

Fig 2. Delimitation Diagram. *Showing the grade of focus for the different kinds of sustainability. For example, the ecological sustainability takes up most focus, both in a general and site specific way. The economical have a more general focus and the social is mostly related to the site.*



Methods

DPSIR Model

The DPSIR is a framework model used to describe the interactions between human impacts and the state of the environment. DPSIR stands for Drivers, Pressures, States, Impacts & Responses. In this thesis, it has been renamed "Diagram of Connections", and is an analytical diagram connecting the unsustainable aspects of the site to environmental impacts and the driving forces behind them. (Kristensen, 2004)

Critical Design

Means design that is based on a critical theory approach, in this case a speculative future that challenges and questions the unsustainable qualities of today's society and built environment.

Storytelling

A way of presenting research in a way that makes it more understandable is through storytelling. By creating a narrative as a way of presentation, the future setting is easier to imagine.

Relevant methods that are not included

Research on future technological solutions

The way of proposing solutions to the climate crisis by regulations set by the government in combination with change of lifestyles, is sometimes described as a european approach. This stands in contrast to the so called american approach: that the solution is in technical development, where our lives can go on as usual. (Azar 2012, p.110)

Most likely we will need a combination of the two. But this thesis will not be leaning on assumptions about the development of technology that can reduce emissions. Instead the focus will be to achieve sustainability with what we already know today.

Participatory methods of design

When creating public spaces, a great method is to let the users of the site participate in the design process. In this project the design is based on a speculative society of the future and will not be actually realized. Therefore people of today will not be included in creating the vision, because they represent other cultural values. This method would have been an interesting approach but so important to do correctly, that it has been ruled out.

1 THE SITE: NORDSTAN 2020

Nordstan in Gothenburg is chosen as a place to be transformed in a sustainable scenario. Today, these blocks are joined together as a shopping mall. The idea is to explore how urban architecture and the public spaces may be reshaped in a place that used to rely on unsustainable qualities. This site is also chosen because of the densification of the urban areas in Sweden. Nordstan, with its location next to the central station, will probably stay as the most central point of Gothenburg, even if the city expands in the future.

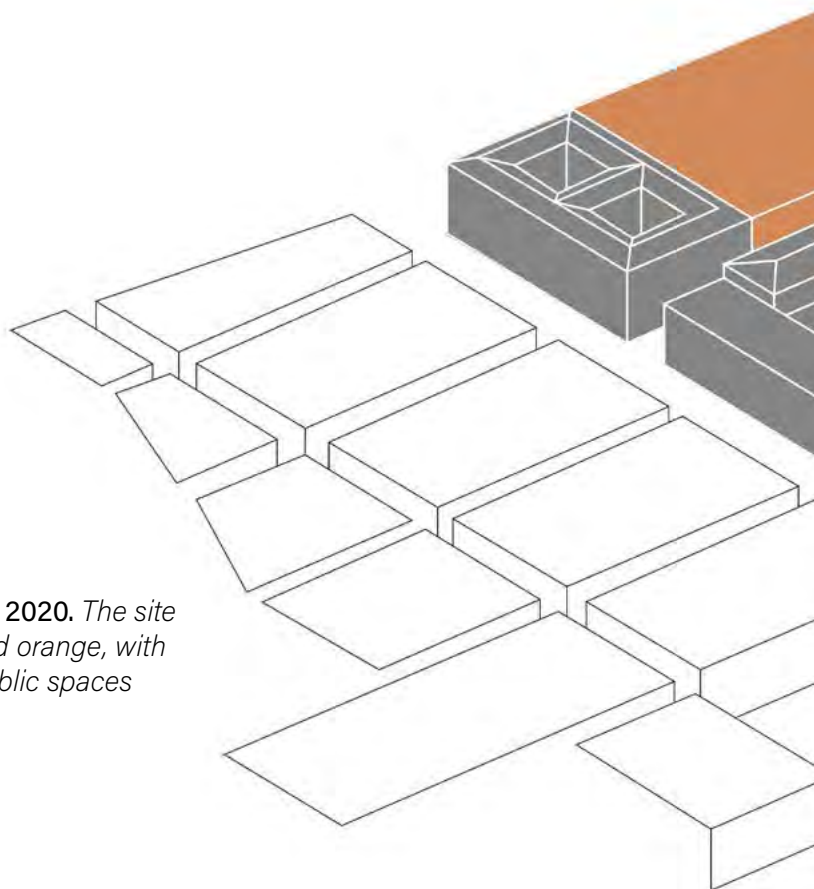
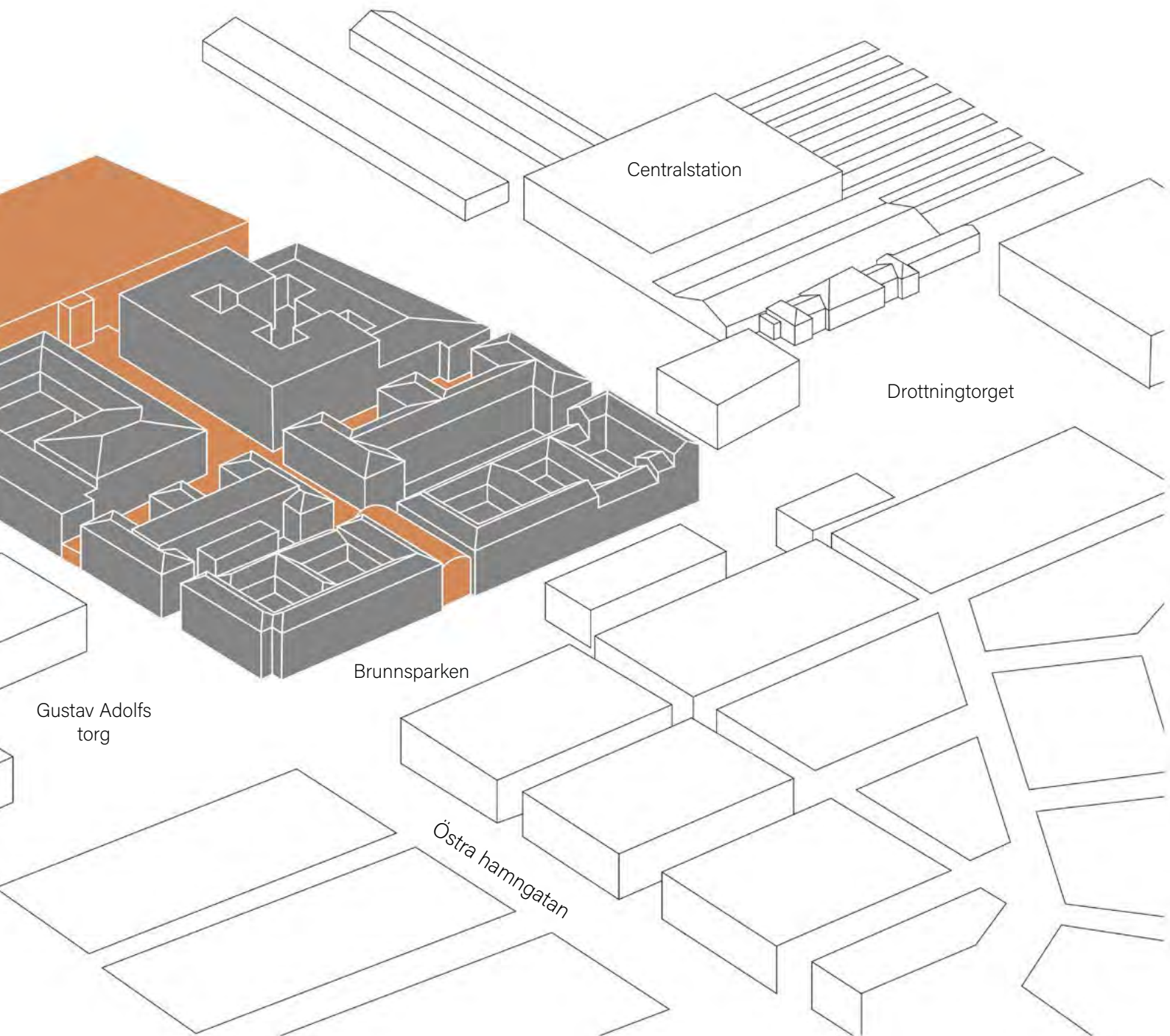


Fig 3. Volumes of the Site 2020. *The site is marked out with gray and orange, with the orange showing the public spaces that will be in focus.*



Context

The chosen site is located in Gothenburg, on the west coast of Sweden. Gothenburg is the second largest city in the country, with a population of more than 580 000 people. (Sandin, 2020).



Fig 4. World Map. Showing where the site is located in different scales.

Description

Nordstan is a shopping mall at the core of Gothenburg, connected and situated next to the central station (to the east). It has entrances in all directions, with its main entrance in the south leading out to Brunnsparken. The district's real name is "Östra Nordstaden" and consists of 8 building objects that are put together by a net of indoor pedestrian streets. On the street level the function is mainly stores and shops, with levels above consisting of offices and some hotels (Lundgren, 2005).



Fig 5. Sitemap. Map of the central part of Gothenburg with the site marked in white.

Opened	1972
Architects	Backström & Reinius
Owners	Vasakronan, Hufvudstaden. FO Peterson & Söner, Gösta Andersson Byggnadsfirma AB, and Castellum AB.
Shops	200
Visitors per year	35 millions (2015)

Delimitations

The physical area

These are the areas of the built environment that this project will focus on when creating the vision. It consists of the first and the second levels of the buildings, and the parking garage to the north. The upper levels will be left untouched in this project, because they present no challenge in adapting to different private functions. The street level and the garage building are chosen because they are public, and have functions that won't make it in a sustainable future. Therefore, they will be transformed.



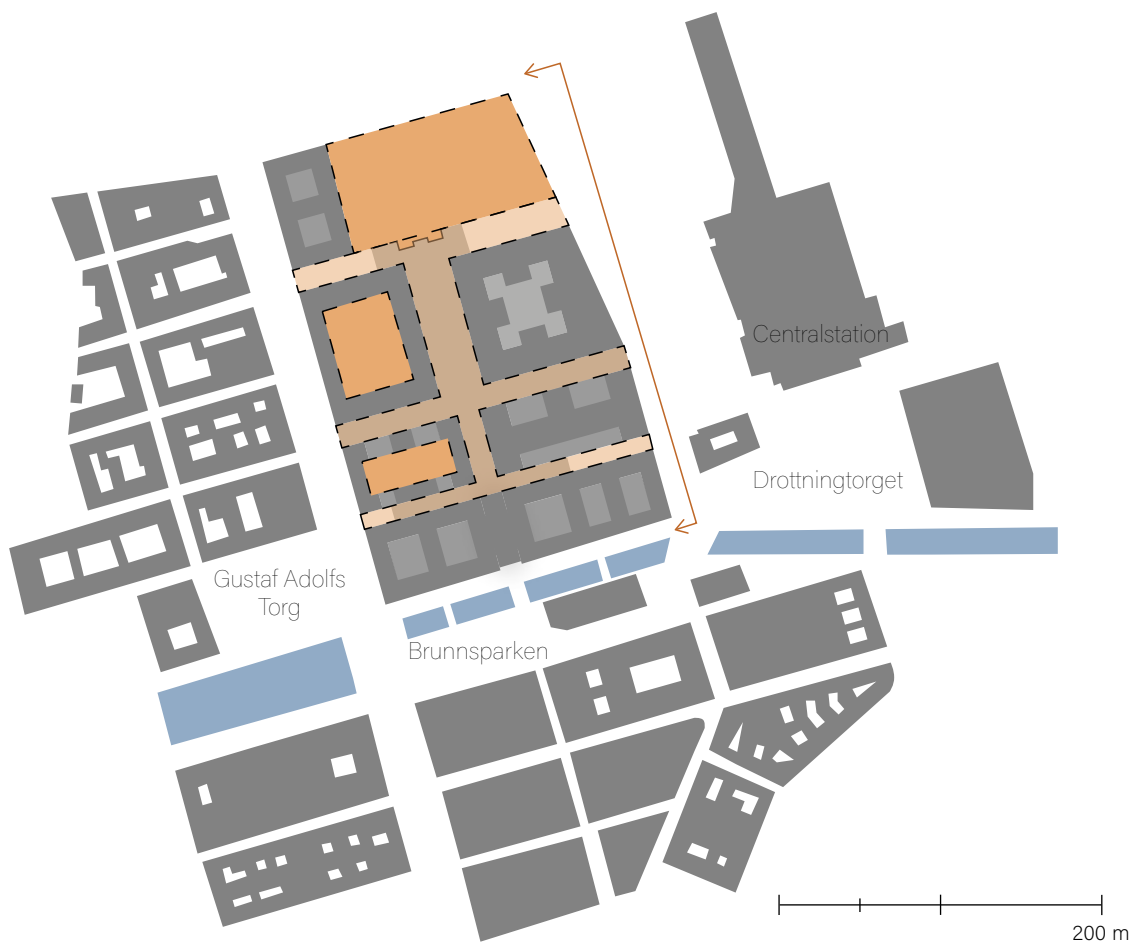


Fig 6. Siteplan. Showing the site of 2020, as it is today. Orange marks out the area of focus

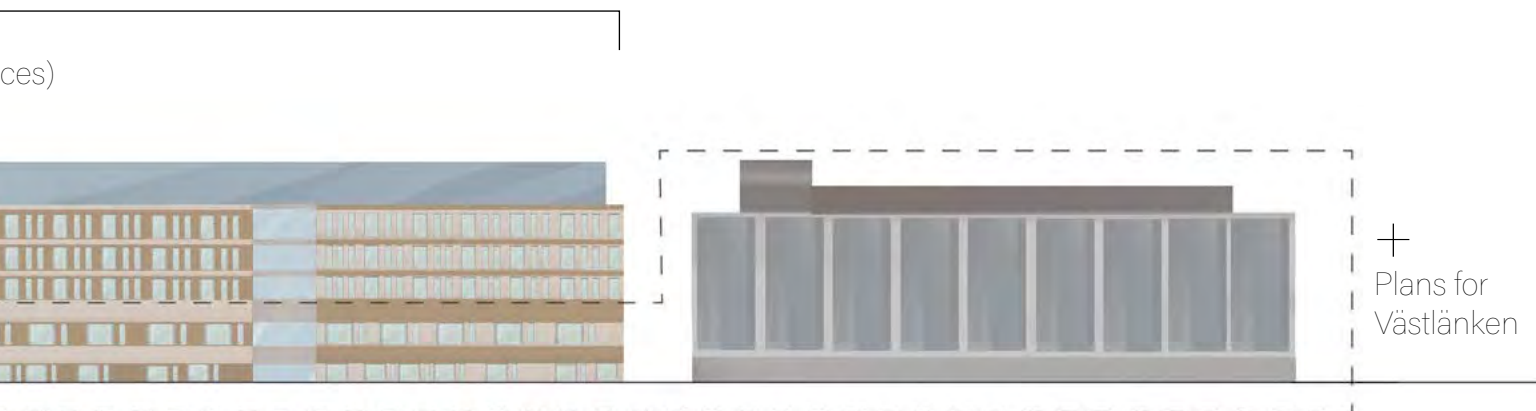


Fig 7. East Facades. The dashed line shows the area of focus.



The entrance of the shopping mall to the south, connected to Brunnsparken.

Walk through

The photographs shown to the right is presented in a walk through to get a clearer view of the site and it's public spaces. Nordstan consists of several buildings put together, but is experienced as one big shopping complex.



We are here



The same entrance, but viewed from the inside.



One of the indoor streets that are part of the shopping mall.



Nordstadstorget - the wider street that functions as a square



Viewed from the outside, with the carpark building visible to the right

Qualities to keep

Weather Protected public space

The entire shopping mall consists of 8 buildings connected through a network of indoor streets. This creates spaces sheltered from the weather, which is a great quality considering the swedish climate.

Nordstadstorget

In the middle of the shopping mall is a wider street with a stage. This space is used as a central point and public square and is an actively used platform for public events and happenings. Surrounding Nordstadstorget is a second leveled balcony structure, connecting restaurants and cafes on the second level to the square.

Great access to public transport and the city

The location of Nordstan is very central in the city and has its own passage connecting to the central station in the east. To the south is Brunnsparken, which a big access point for public transport. The axis of the middle street in the shopping mall has a natural flow into the rest of the city to the south.

Qualities to question

Semi public space

A problem with the indoor-street layout is that the space is only semi-public, in the sense that it has opening hours and are privately owned. These spaces have also shown to be seen as unsafe, and has a high presence of security guards and surveillance cameras to monitor the behaviour of people.

Commercially dependent

The main function of the site is to be for shopping and consumption. This creates an environment that actively encourages people to consume a large quantity of items and goods. Without this function the site would stand empty of people.

Seven floors of parking

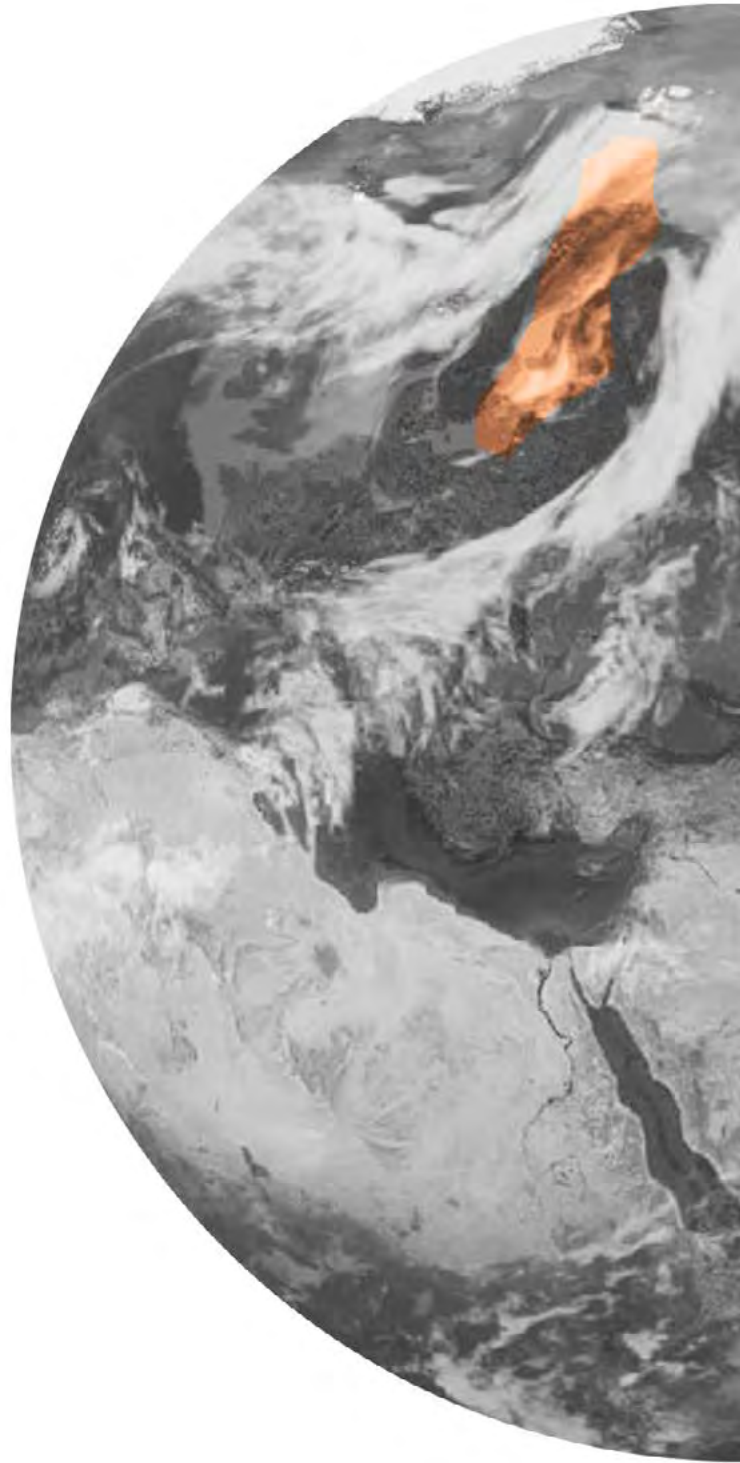
The biggest building at the site is the one for car-parking.

Lack of greenery

The entire site is indoor, except for some courtyards on the third level. This means that the entire street level lacks of greenery.

2 REACHING A SUSTAINABLE FUTURE

Creating this scenario has not been about trying to predict the future. This scenario is about presenting a future which contains a positive outcome from what we today are trying to achieve in the realm of sustainable development. It is based on research and the objectives and targets made from national and international goals to achieve a sustainable world. The purpose is to map out what needs to change through sorting out the goals that are relevant for the built environment, and analyzing what needs to change on the site. This research will stand as a framework for creating the vision of Nordstan 2031.





STEPS OF RESEARCH

1. Overviewing the goals for sustainability

Researching what needs to change to achieve a sustainable future. Looking at the the sustainability goals set by the United Nations, in the 'Agenda 2030' program. Complementing the international goals with Sweden's national ones, called 'The environmental objectives'

2. Narrowing it down

Sorting out the goals and prioritizing after relevance to the built environment. Choosing them after the delimitation-principle to only focus on the changes for sustainability that either affects architecture and the built environment, or architecture and the built environment can affect.

3. Mapping out the unsustainable aspects

With conclusions from analyzing the site, trying to specify the unsustainable aspects that relates to Nordstan. Mapping out potential reasons behind these aspects - the driving forces, and what kind of environmental impacts they lead to. This is presented through a diagram of connections.

4. Responding to the driving forces

Creating 4 responses that alters the driving forces behind the unsustainable aspects of Nordstan. These in turn alters the aspects and changes the outcome of the environmental impacts - creating a sustainable scenario for the site.

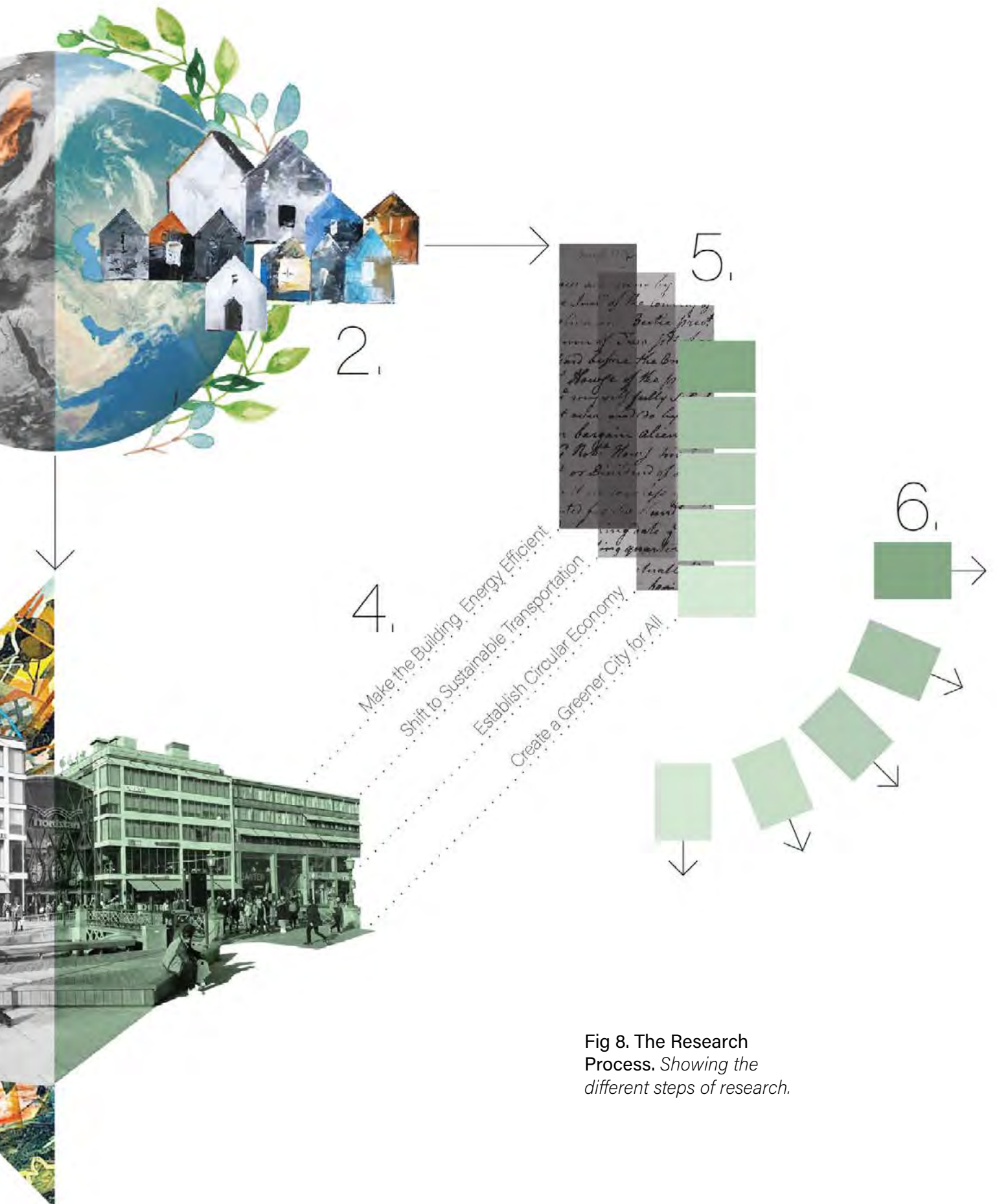
5. Summarizing the goals

The goals that are relevant for the built environment are summarized, turning 42 goals into 11. These are then grouped into the 4 different responses that connects to the site.

6. Creating strategies

Specifying different strategies in each response-group, to reach the sustainability goals.





The goals for sustainability

Overviewing the goals for sustainability

The first step in the research is to see on a larger scale what needs to change to reach a sustainable world. The chosen method for this is to look at the 17 sustainability goals created by the United Nations. The figure to the right shows all international goals from the United Nations, combined with the sustainability objectives from Sweden. The goals from the United Nations is taken from their program called 'Agenda 2030', and covers a wide range of subjects in the field of sustainability.

Each SDG is divided up in different amount of targets, which is visible in the diagram as well. (United Nations, 2015). The Generational goal from Sweden, shown in the middle circle, has in this thesis been divided up into it's seven points of focus and titled after their content. In the inner circle are different environmental objectives that are formulated by Naturvårdsverket. (Naturvårdsverket, 2012)

The focus in the swedish objectives are almost only on ecological sustainability, while the international goals from the UN covers social and economical subjects as well.

Outer Circle of SDGs

- Sustainable Development Goals

The international goals from the United Nations, to be fulfilled before the year of 2030. Consists of 17 main goals divided into different amount of targets, 169 targets in total.

Middle Circle of SWGGs

- Sweden's Generational Goal

The overall goal for Sweden, to be fulfilled before the year of 2050. The goal is divided into seven points of focus.

Inner Circle of SWEOs

- Sweden's Environmental Objectives

16 different environmental objectives.



Fig 9. Wheel of Combined Goals.
Goals and objectives from the United Nations and the Swedish government

The goals for sustainability

Narrowing it down

The figure shows the same diagram as the previous page, but only the targets and objectives relevant for the built environment are visible. They are chosen using the delimitation principle to only focus on the changes for sustainability that either affects architecture and the built environment, or those that architecture and the built environment can affect.

For the SDGs, the specific targets have been highlighted, with the general goal and title still visible. For example the SDG 6 "Clean water" has 6.3 and 6.4 visible, but the other targets for the goal have been ruled out.

The Swedish objectives have different sizes based on relevance. For example is the objective "A good built environment" highly relevant for the focus of this project, while "Good Quality Groundwater" is still kept, but of less importance in this project.

Further on in this thesis the 'targets', 'focus points', and 'objectives' will all be summarized and mentioned plainly as goals.

Outer Circle of SDGs
- Sustainable Development Goals
The international goals from the United Nations, to be fulfilled before the year of 2030. Consists of 17 main goals divided into different amount of targets, 169 targets in total.

Middle Circle of SWGGs
- Sweden's Generational Goal
The overall goal for Sweden, to be fulfilled before the year of 2050. The goal is divided into seven points of focus.

Inner Circle of SWEOs
- Sweden's Environmental Objectives
16 different environmental objectives.

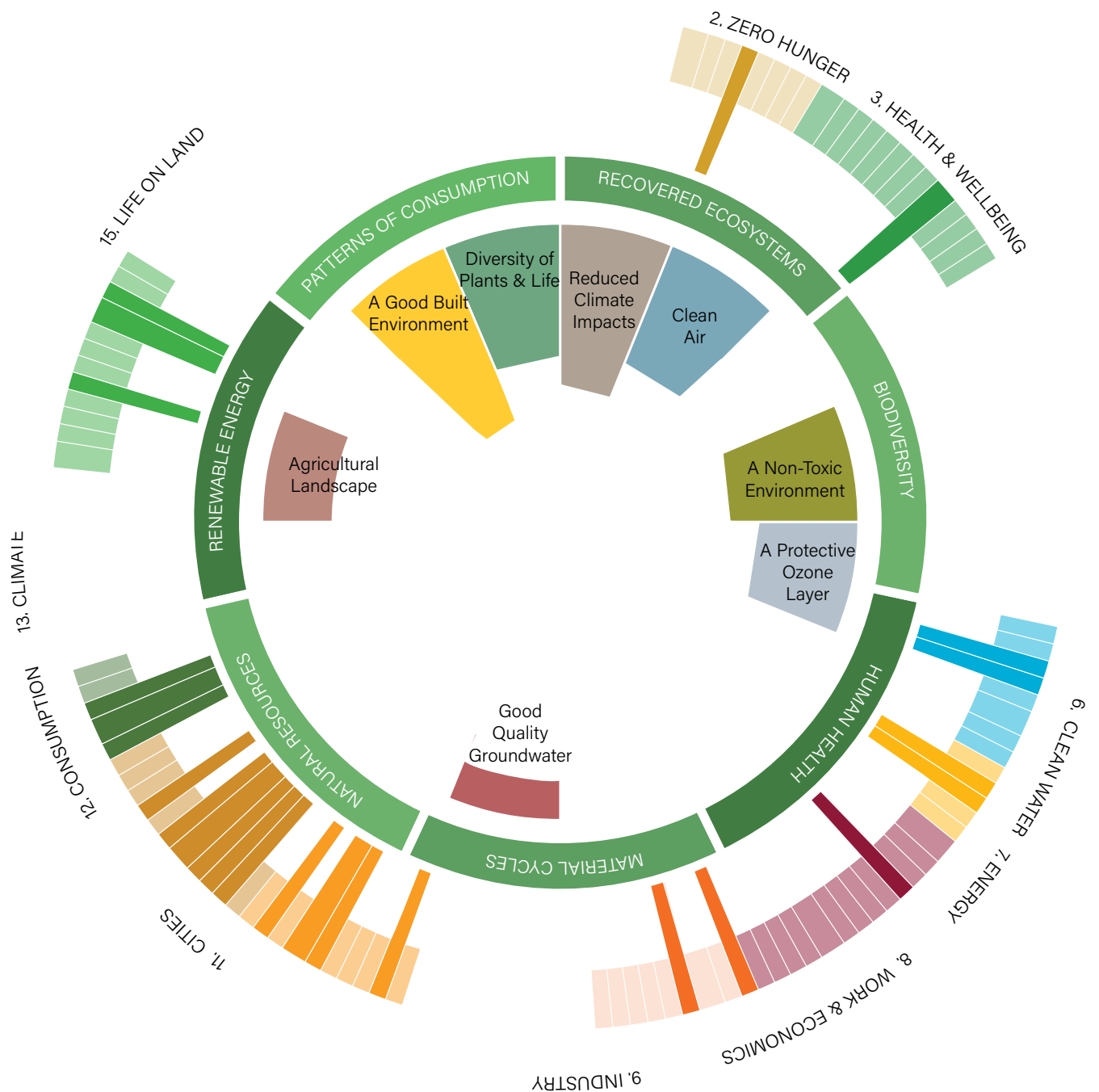


Fig 10. Wheel of Combined Goals, Sorted.
Goals and objectives sorted out, only keeping the ones that relates to the built environment.

Altered unsustainable aspects

Mapping out the unsustainable aspects

The list to the right is made inductively with focus on general unsustainable aspects. These are related to the site of Nordstan but can be found in many urban environments. The notations next to the list are made to group some of these aspects together. 'Consumerism' and 'Spatial Layout' are noted as reasons behind some of the aspects, while 'Pollution' is noted as an environmental impact that some aspects lead to. The connection between these notations are explored further in a diagram shown on the next two pages.



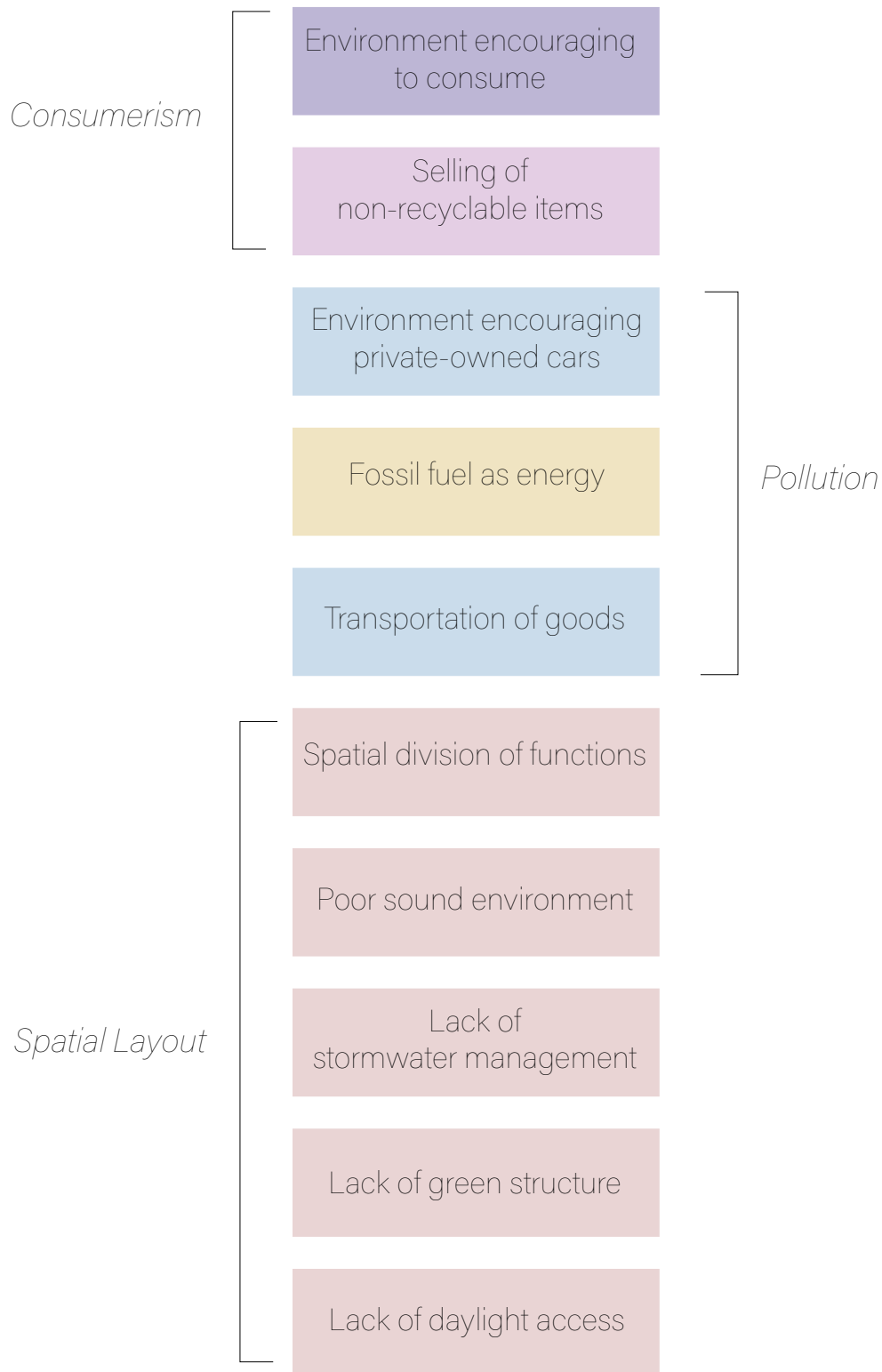


Fig 11. List of Unsustainable Aspects.
Mapping out what needs to be altered to reach the goals for sustainability

Diagram of Connections

Creating the diagram

Looking closer at the list of unsustainable aspects, this diagram has been created to specify the reason behind the aspects - the driving forces, and what kind environmental impacts they lead to. The driving forces are here mentioned in a broader context then just specific for this site.

Driving forces

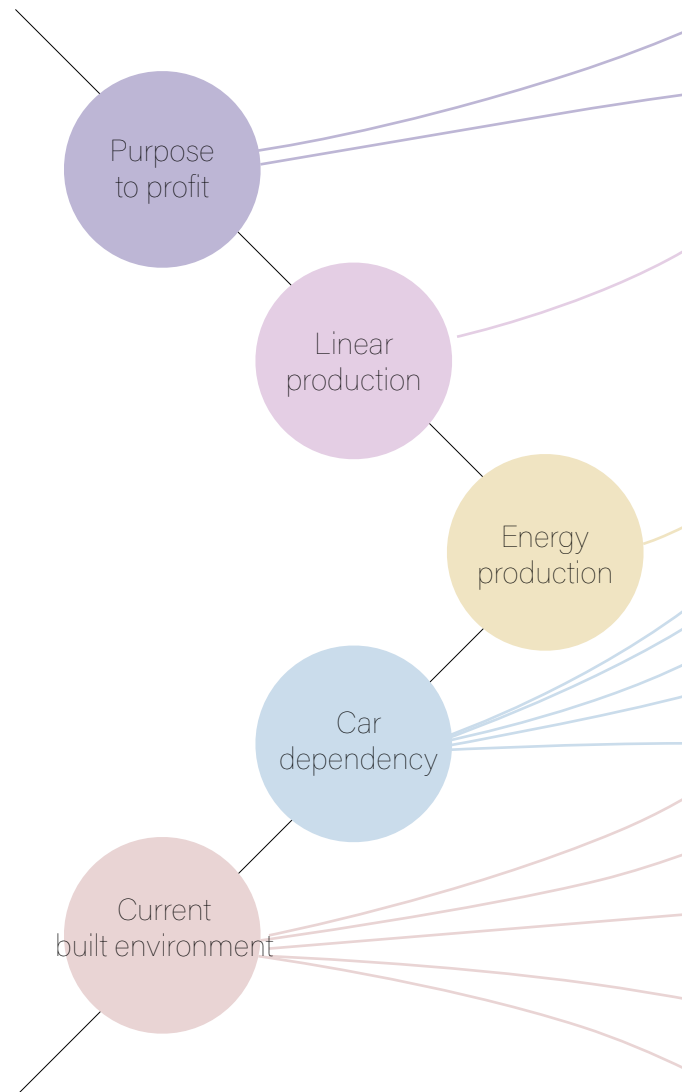
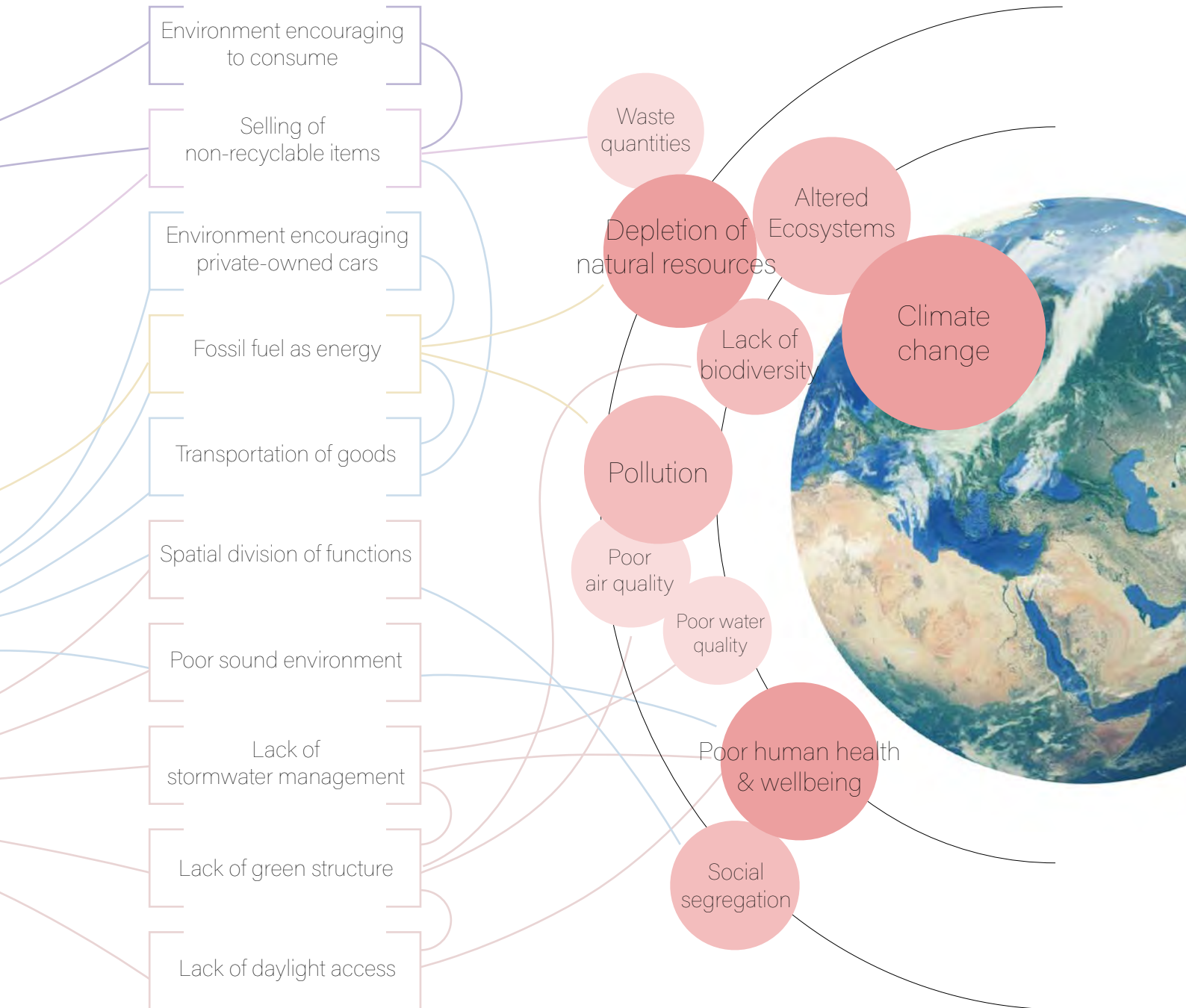


Fig 12. Diagram of Connections.
*Mapping out what the aspects lead to
and the reasons behind them.*

Unsustainable aspects of the shopping mall

Environmental Impacts



D I A G R A M O F C O N N E C T I O N S

Diagram of Connections

Responding to the driving forces

To improve the aspects, 4 responses are created to replace the previous driving forces. These alter the entire chain of connections, with reduced environmental impacts as a result and a framework for the sustainable scenario of the site.

Responses

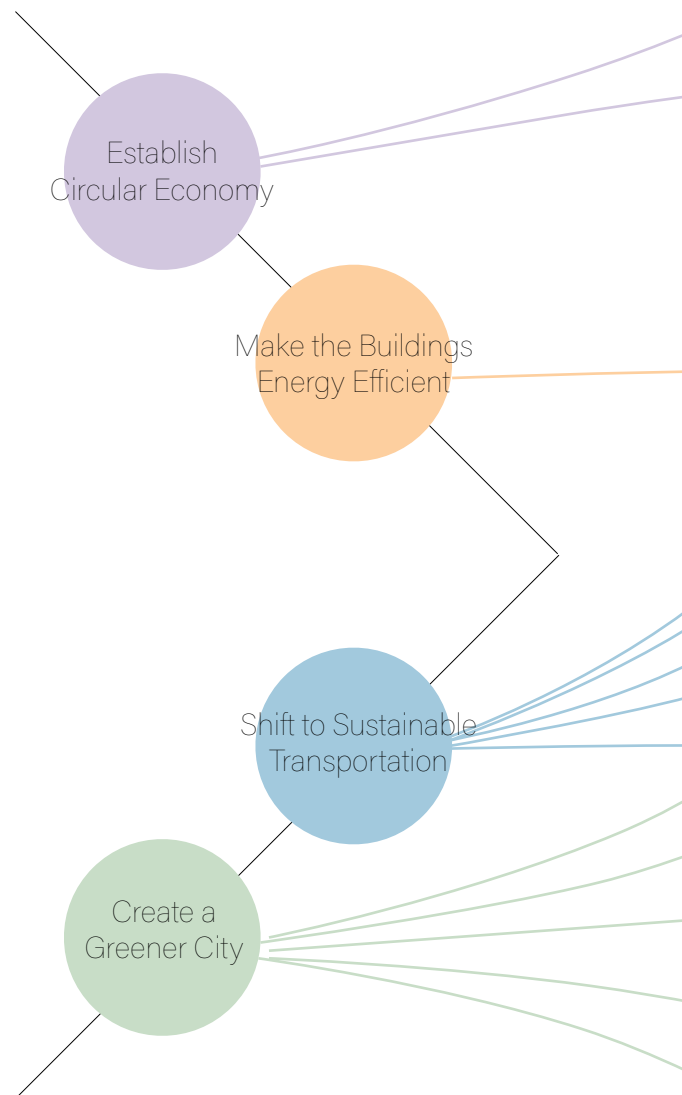
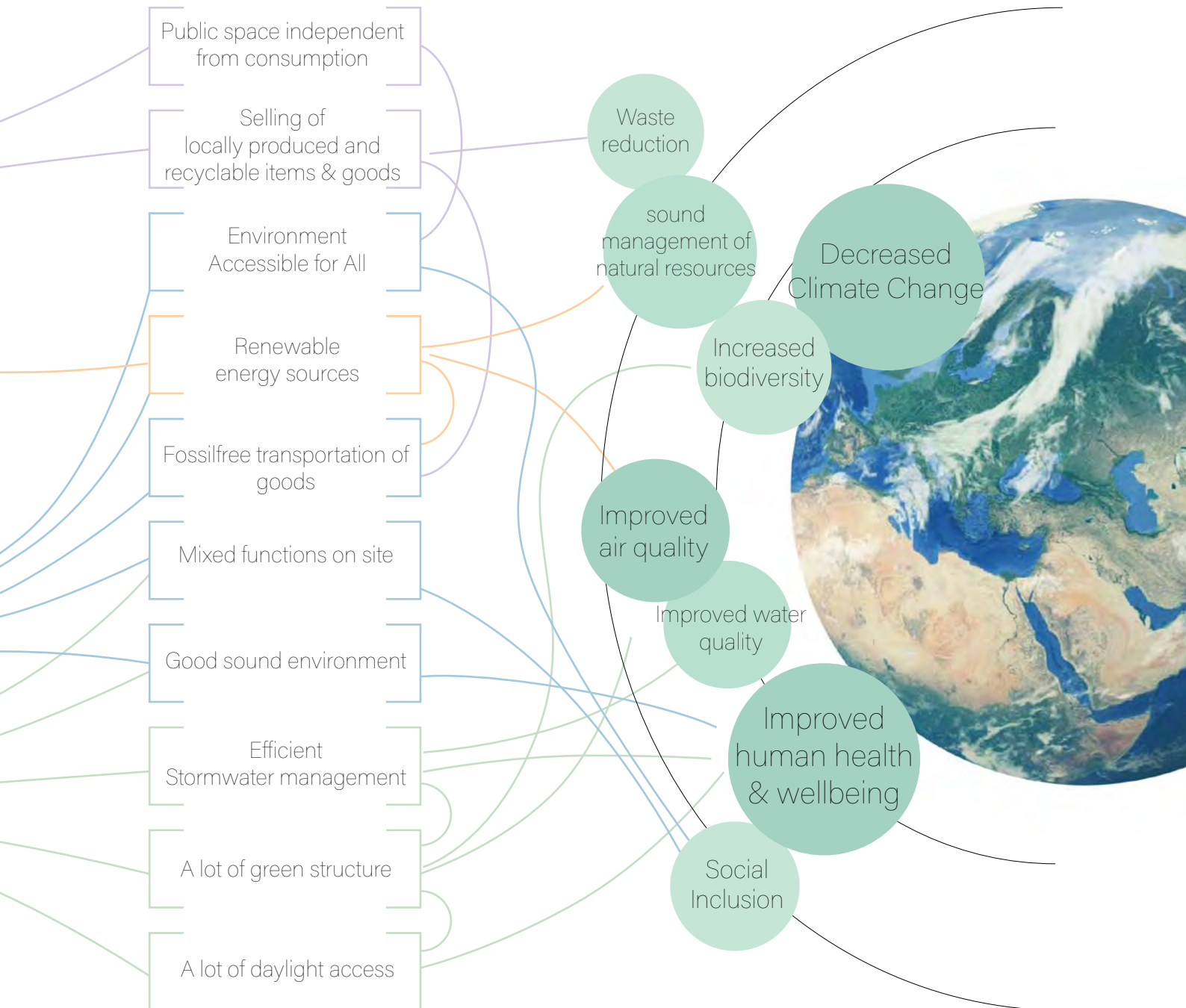


Fig 13. Diagram of Connections, Altered.
Responding to the driving forces, creating responses that alters the aspects and the environmental impacts.

Altered aspects of the shopping mall

Environmental Impacts



Summarized goals

Connecting the goals to the site

Knowing what needs to change on the site, the next step is going back to the goals and connecting these to the site. The goals related to the built environment are summarized, turning 40 goals to 11, and grouped into the four different responses. Each goal ends with a reference to the original goals. 'SDG' stands for Sustainable Development Goal from the UN, 'SWGG' stands for Sweden's Generational Goal, and 'SWEO' stands for Sweden's Environmental objective.

Establish Circular Economy



Circular Lifestyles

People have an awareness for sustainable development, and lifestyles that are in harmony with nature. The pattern of consumption cause the least possible problems for the environment and human health. (SDG 12.8, 13.3, SWGG 7, SWEO Reduced Climate Impacts)

Making the Buildings Energy Efficient



Energy Efficiency

Production processes and buildings have become more energy efficient. (SDG 7.3, SWGG 6 & SWEO Reduced Climate Impacts)



Handling Waste

Material cycles are resource-efficient and free from dangerous substances. Natural resources are managed sustainably. Waste has been reduced through prevention, reduction, recycling and reuse. (SDG 3.9, 6.3, 11.6, 12.2, 12.5, SWGG 4,5, SWEO A Protective Ozone Layer, & A Non-toxic Environment)



Sustainable Energy Production

Renewable energy is used, with minimal impact on the environment. (SDG 7.2 & SWGG 6)



Circular Legislation

Companies have adopted sustainable practises and integrates sustainability information into their reporting cycle. Industries have been retrofitted to increase resource-use efficiency and adopted clean and environmentally sound technologies. Economic growth has been decoupled from environmental degradation. (SDG 8.4, 9.4, 12.4, 12.6, 13.2, SWGG 7, SWEO Reduced Climate Impacts)

Shift to Sustainable Transportation



Accessibility for all

The way of transport is sustainable and reliable. Accessibility is affordable and equitable, and for everyone - with special attention to children, older persons and persons with disabilities.

(SDG 9.1, 11.2, SWGG 3 & SWEO A Good Built Environment)



Clean Air

The air is clean and no health risk to humans, animals, plants or cultural assets.

(SDG 3.9, 11.6, SWEO Clean Air, A Protective Ozone Layer)

Create a Greener City



Green Public Space

Environment that has positive impact on human health has been promoted. People have access to safe, inclusive and green public spaces, that are rich in biological diversity. This is a basis for health, quality of life and well-being. There is a special attention to children, older persons and persons with disabilities

(SDG 11.7, 11.B, SWGG 3 & SWEO A Rich Diversity of Plants & Life)



Biodiversity

Values of biodiversity and ecosystems are integrated in local planning, and there is an increase of financial resources to conserve and promote biodiversity.

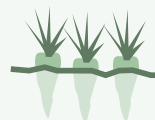
(SDG 15.5, 15.9, 15.A, SWGG 1, 2 & SWEO A Rich Diversity of Plants & Life)



Handling water

Capacity for adaptation to climate change and extreme weather have been strengthened. Water use-efficiency has been increased and the ground water contributes to viable habitats for flora and fauna.

(SDG 2.4, 6.4, 11.B, 13.1 & SWEO Good-Quality Groundwater)



Growing food

Sustainable food production is integrated to help maintain ecosystems and strengthen adaptation to climate change. Food waste has been reduced and the value of biological production is protected.

(SDG 2.4, 12.3 & SWEO Agricultural Landscape)

Strategies

Creating strategies in each group

To reach the goals, strategies are created. They are also grouped into the different responses, with the goals that they are aiming for represented through symbols. These strategies are created for the site of Nordstan, but are written in a general way to be useful for other projects as well.

Establish Circular Economy

1. Transition into circularity

Explore ways that circular economy would change society and the functions of the site

2. Transform the leftover-spaces

As the functions of the site is altered, explore what the new spaces can become

3. Use Circular Design

Only use regenerative or reused materials and elements

Making the Buildings Energy Efficient

1. Unplug the machine

Reduce space in need of heating/cooling by turning unnecessary indoor-space to outdoor. Keep some weather protection for meeting places.

2. Reduce artificial lights

Save energy by increasing daylight access to reduce the need of artificial lights

3. Create energy

Integrate solar panels on unused roof/facade surfaces



Goals towards
Circular Lifestyles



Goals towards
Handling Waste



Goals towards
Circular Legislation



Goals towards
Energy Efficiency



Goals towards
Sustainable Energy
Production

Shift to Sustainable Transportation

1. Alter the way of transport

Ban all private owned cars in inner cities

2. Increase accessibility

Make sure that public transport is well connected to the site and that all public areas are reachable for everyone.



Goals towards
Accessibility for all



Goals towards
Clean Air

Create a Greener City

1. Create green public spaces

Increase access to child friendly green public space on the site

2. Take care of the rain

Implement storm-water management through green structures and vegetation. Collect rainwater for watering vegetation

3. Make the bees feel welcome

Plan for biodiversity by having undisturbed vegetation and a diverse flora. Connect green structures to improve conditions for movement of small species.

4. Grow food

Create public agricultural areas that can connect to local restaurants and markets



Goals towards
Green Public Space



Goals towards
Biodiversity



Goals towards
Handling Water



Goals towards
Growing Food

3 VISION OF NORDSTAN 2031

We are now moving into the part about how to transform into this future version. The chosen future year this project is aiming for is the year of 2031. This year is chosen because it is one year after the United Nations Sustainability program is supposed to be achieved, the Agenda 2030. This is achieved through applying the different strategies to reach the goals of establishing circular economy, making the buildings energy efficient, shifting to sustainable transportation, and creating a greener city.





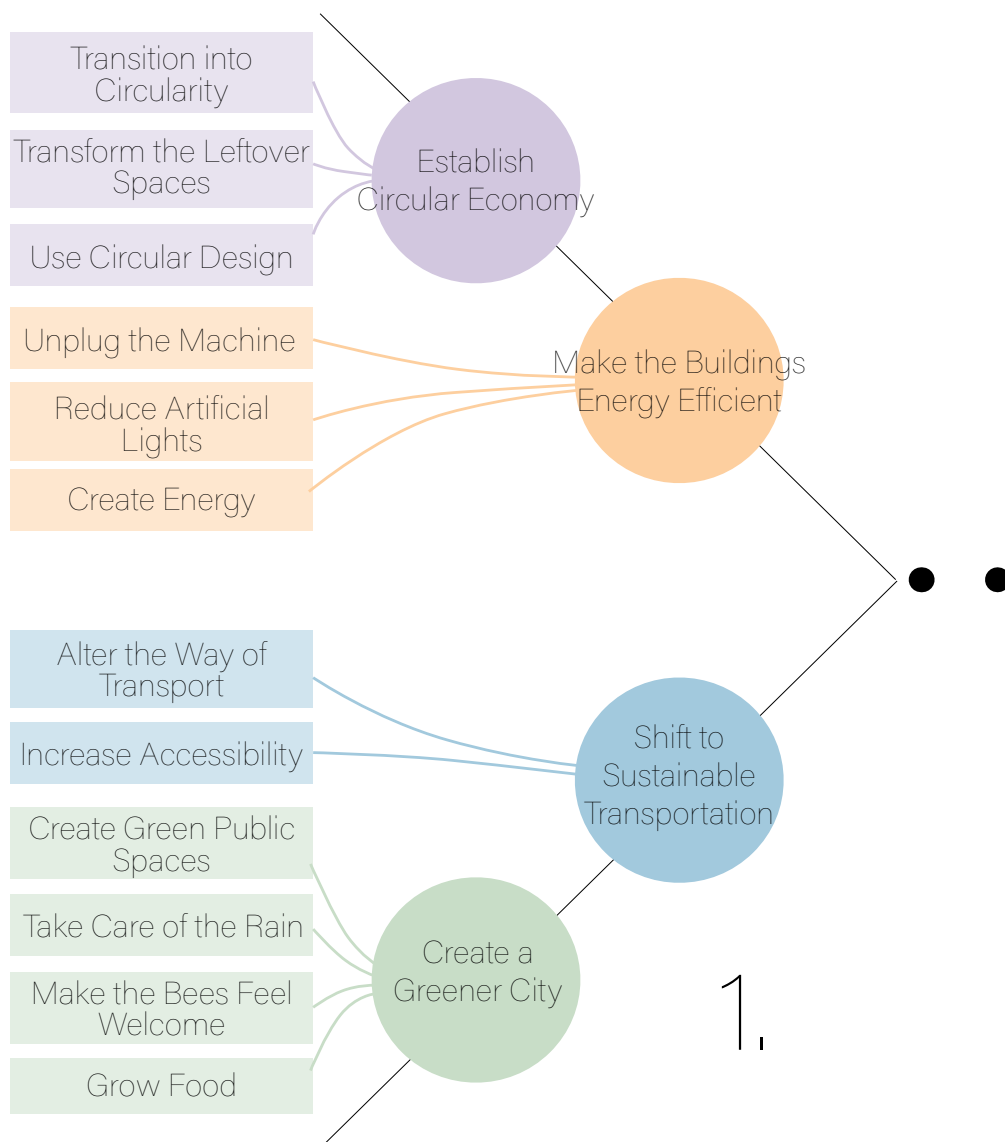
STEPS OF TRANSFORMATION

1. Applying the strategies

Specifying how the strategies created in the previous chapter can be applied to the site of Nordstan.

2. Telling the story

Imagining how to accommodate the growth of Nordstan in 2030, creating a narrative in 4 steps, starting with the current state and ending in 2029.



mplish the Agenda
ve of transformation
n the year of 2026, and

3. Visioning the year of 2031

Getting a feeling on what this future version could be like, conceptually altering 2 photographs from today, showing the transformation.



Fig 14. The Transformation Process.
Showing the different steps of creating the vision.

Transition into
Circularity

Transform the Leftover
Spaces

Use Circular Design

Unplug the Machine

Reduce Artificial
Lights

Create Energy

Alter the Way of
Transport

Increase Accessibility

Create Green Public
Spaces

Take Care of the Rain

Make the Bees Feel
Welcome

Grow Food

Applied Strategies

In this part, the strategies are specified on how they can be applied to the site of Nordstan. They are grouped together after the responses created in the research process, with one page for each response group.

Establish Circular Economy



Goals towards
Circular Lifestyles



Goals towards
Handling Waste



Goals towards
Circular Legislation

Circular Economy is a societal and economical structure that is hard to imagine because we have never fully experienced it. It means replacing the current take-make-waste system of production with a circular approach, only producing things that can be reused and recycled. It also means producing less, and instead taking care of what already exists. The reason we need circular economy to achieve a sustainable

future is because even if we were to achieve the goal of making all energy coming from renewable sources, it would only address 55% of the emissions. The rest 45% comes from the production of items (Ellen MacArthur Foundation, 2019). To better take care of our natural resources, the lifestyles of people and the business model in industries need to change.

Strategy 1.

Transition into circularity



In creating the vision, this thesis explores how circular economy means changed societal values and therefore also alters the functions of the site. This is made through a narrative, found in the next step of transformation. It considers what would happen to the spaces if there was a decreased demand for purchase, in combination of industries no longer producing non recyclable items. Commercially dependent spaces will be decreased and the former spaces altered into other functions. In the narrative, other events considering the public transport, energy efficiency and greenery are intertwined and mentioned as well.

Strategy 3.

Use Circular design



As a design principle, added elements to the vision shall be made from renewable or reused materials. Overall the transformation of the site has been more focused on removing elements than adding, for example creating the rooftop park by keeping the pillars from the former parking garage but opening up the structure by removing levels and walls. As this is a conceptual vision, the choice of material and construction has not been made in detail. To simplify, any added elements are chosen to be visualized as wood, which can be seen as the most common choice of sustainable material in Sweden.

Strategy 2.

Transform the leftover-spaces



As a part of the narrative created in the next part, some spaces are more difficult to alter from being commercial to other functions. These spaces are the former bigger stores, with no access to daylight and therefore hard to rent out without rebuilding them. In this vision, these spaces are programmed to become public functions for culture, education and sports.

Making the Buildings Energy Efficient



Goals towards
Energy Efficiency



Goals towards
Sustainable Energy
Production

Energy efficiency is a highly relevant topic when it comes to making the built environment more sustainable. This project will not cover the exact energy need of Nordstan, but rather work on the assumption that it is better to have less space

in need of a controlled indoor climate, and that increased daylight access reduces need for artificial lights.

Strategy 1. Unplug the machine



The total average energy use for shopping malls in Sweden is around 260 kwh/m². In other retail trade facilities, the average is around 180 kwh/m². The building electricity and thermal energy is both included in these numbers (Stensson, 2014). In this vision, the streets are transformed from indoor to outdoor, which means that the volume with controlled indoor climate is reduced by approximately 11%. In a shopping mall, the most demanding in thermal energy is most likely to be bringing fresh air into the building. By opening up the inner street structure, not only people can move freely through the site, but the air also becomes accessible for the lower levels of the buildings. With lesser need for comfort cooling, pumps and fans, the site becomes more energy efficient. This transformation of the streets means a rebuild of the former storefronts as well, turning what used to be open spaces into well isolated outer walls.

Strategy 2. Reduce artificial lights



In the building electricity of shopping malls, the use of lighting is by far the most energy demanding (S.Stensson, 2014). When removing the roofs over the streets, the daylight access is increased and the need of artificial lights reduced. At the site, the buildings are between 5 - 8 levels high, which means that the street level that now is outdoor is in some parts rather shaded. As the streets is no longer a part of the shopping mall, this new light condition is acceptable. But to increase

the light, the new facades on level 1 and 2 are made with bright surfaces - letting the light reflect in to the streets.

Strategy 3. Create energy



The possibility for energy production on the site has been investigated through calculating how much roof surface could be covered in solar panels. All roofs are included except for the ones that are angled to the north/northeast and the ones that are shadowed because of nearby taller volumes. The available surface is around 25 000 m² on the site before the transformation, but as the parking garages roof is changed - it is closer to 16 000 m². This would mean that around 9700 solarpanels could cover the unused roof surfaces. To reach an even higher number, Solar panels could be added on unused vertical surfaces as well that are in access to direct sunlight.



Fig 15. Surfaces in Sunlight. Showing the roof surfaces with sunlight access.

Shift to Sustainable Transportation



Goals towards
Accessibility for all



Goals towards
Clean Air

This part is more related to the site in a bigger context than the actual built environment of Nordstan. A quality to keep from the site today is its access to public transport, as it is well connected to the central station, and to Brunnsparken, which today is a big access point for trams and buses. In this vision, the plans from

Gothenburg municipality regarding the west link project has been included as well, activating the area north of the site and increasing access to sustainable transportation even further. The goal regarding accessibility for all is in this vision not completely focused on transport, but rather on how the access the public spaces on the site.

Strategy 1.

Alter the way of transport



In this vision, the urban environment is breathing clean air. This is created through an assumption that all private owned cars will be banned from the inner cities. Instead, public transport and shared commute through electrical driven taxi services will be the way to get around. Prioritized paths for pedestrians and bikes will also dominate the urban street structure. On the site, this vision has included the finished result of the West link, an underground tram system that today is under development in the city of Gothenburg. The West link project is aimed to be finished at the year of 2026. (Trafikverket, 2019). For the site, this would mean that the area north of Nordstan would become a big access point for commuting, and the entire area would develop with new buildings, parks and green pathways. According to the plans from the Gothenburg municipality, new buildings would also be attached to the current North and east facade of the parking garage of Nordstan. The program of the west link in combination with the current conditions of the site means that the area is well connected to public transport in both the north and the south part.

Strategy 2.

Increase accessibility



To make sure that the public spaces on the site is reachable both physically and in regards of natural flows of movement, the main passage north to south of the site has been kept. The rooftop park is made in different smaller volumes and levels, which of course makes it hard to reach if it only depended on stairs as way of access. Therefore the site has a combination of sloped pathways and elevators integrated as central elements. Not wanting to be dependent on electricity for access to all, pathways without stairs are made to reach each level.

Create a Greener City



Goals towards
Green Public Space



Goals towards
Handling Water



Goals towards
Biodiversity



Goals towards
Growing Food

As cities grow denser, there is a risk for green areas to be minimized. Instead of having the urban environment and the green environment as separate, they are integrated to coexist in this vision. More greenery in the city is not just beneficial for the wellbeing of humans, but also

consists of important qualities such as stormwater-management, improving air quality, reducing co2-emissions and supporting biodiversity. It also creates non-commercial public spaces with natural elements for children to play in (EPA, 2017)

Strategy 1.

Create green public spaces



The main green public space is the transformed parking garage. In the vision, this has become a rooftop park. The park is broken up into smaller volumes in different levels, opening up to the south to access the direct sunlight. It is shaped in a scattered way to create a pleasant outdoor environment in a human scale, with the wind flow from the southwest pushed over the volumes instead of tumbling through. The park consists of playgrounds, meeting places, areas for physical activities, an agricultural area and a food market.

Strategy 2.

Take care of the rain



Storm-water management is implemented through green structures and vegetation. Through implemented greenery the flow of water is slowed down, which reduces the risk for floods but also makes sure that the sewage system is not taking in more water than it can handle.

Strategy 3.

Make the bees feel welcome



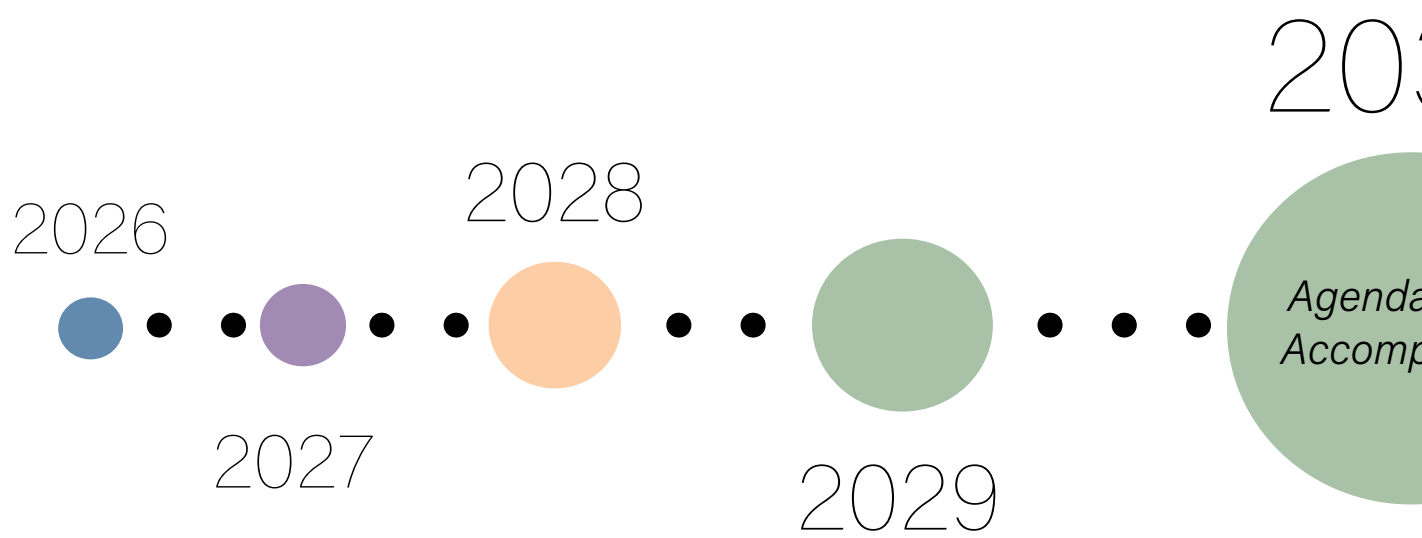
By having undisturbed vegetation and a diverse flora, biodiversity is promoted at the site. Green structures are connected to improve conditions for movement of small species.

Strategy 4.

Grow food



As mentioned above, a public agricultural area is created as a part of the rooftop park. Growing food locally in cities will become a possibility if the pollution from cars is removed. This creates a possibility for city dwellers to buy locally produced food, an important sustainable quality as cities grow bigger and transportation of goods has to be reduced.



30

a 2030
polished



Narrative

The chosen future year this project is aiming for is the year of 2031. This year is chosen because it is one year after the United Nations Sustainability program is supposed to be achieved, the Agenda 2030. To help imagine how this can be accomplished, I have created a narrative of transformation in 4 steps, starting with the year of 2026, and ending in 2029.



2031

2026 - New site

Triggering events

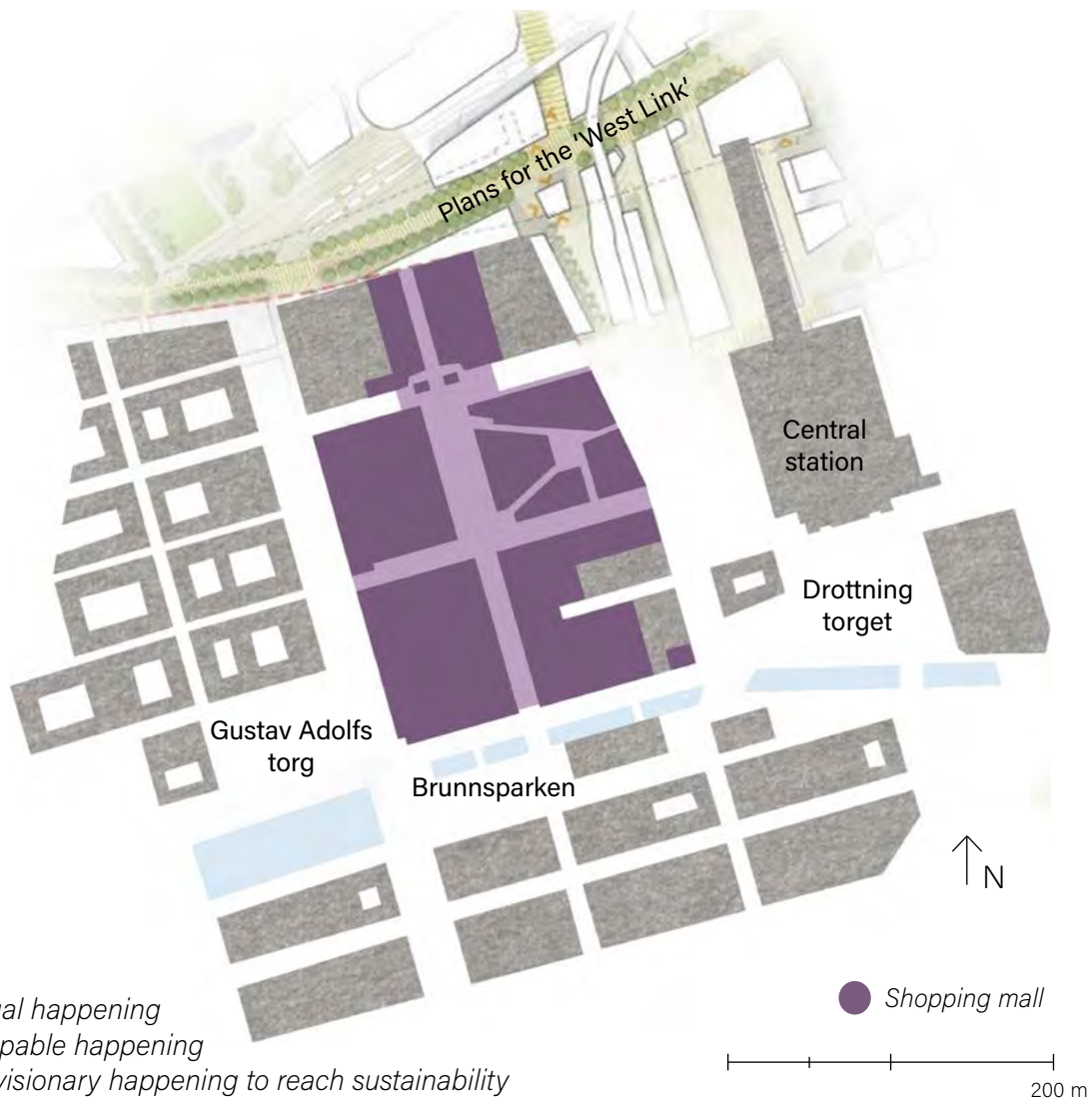
The area north of Nordstan gets developed into a central accesspoint for the new underground tramsystem called "The west link" *

More people live in the urban areas, which results in a higher need of access to public functions **

Privately owned cars are banned from the innercities ***

Narrative

Gothenburg as a city is growing, with more people living in the urban areas. The developed area of the West link are finally finished and connects to the site of Nordstan, with a new travel center built next to the site. At the same time a national legislation takes place to ban all private owned cars from inner cities. The cause of this is not just to reduce emissions, but also to free up space in the streets of the cities, as more people live in the urban areas. The streets becomes safer, with paths for pedestrians, bikes & public transport.



* Actual happening

** Propable happening

*** A visionary happening to reach sustainability

V I S I O N O F N O R D S T A N 2 0 3 1

2027 - Roof is gone

Triggering events

National environmental certification system for all buildings becomes part of building law.**

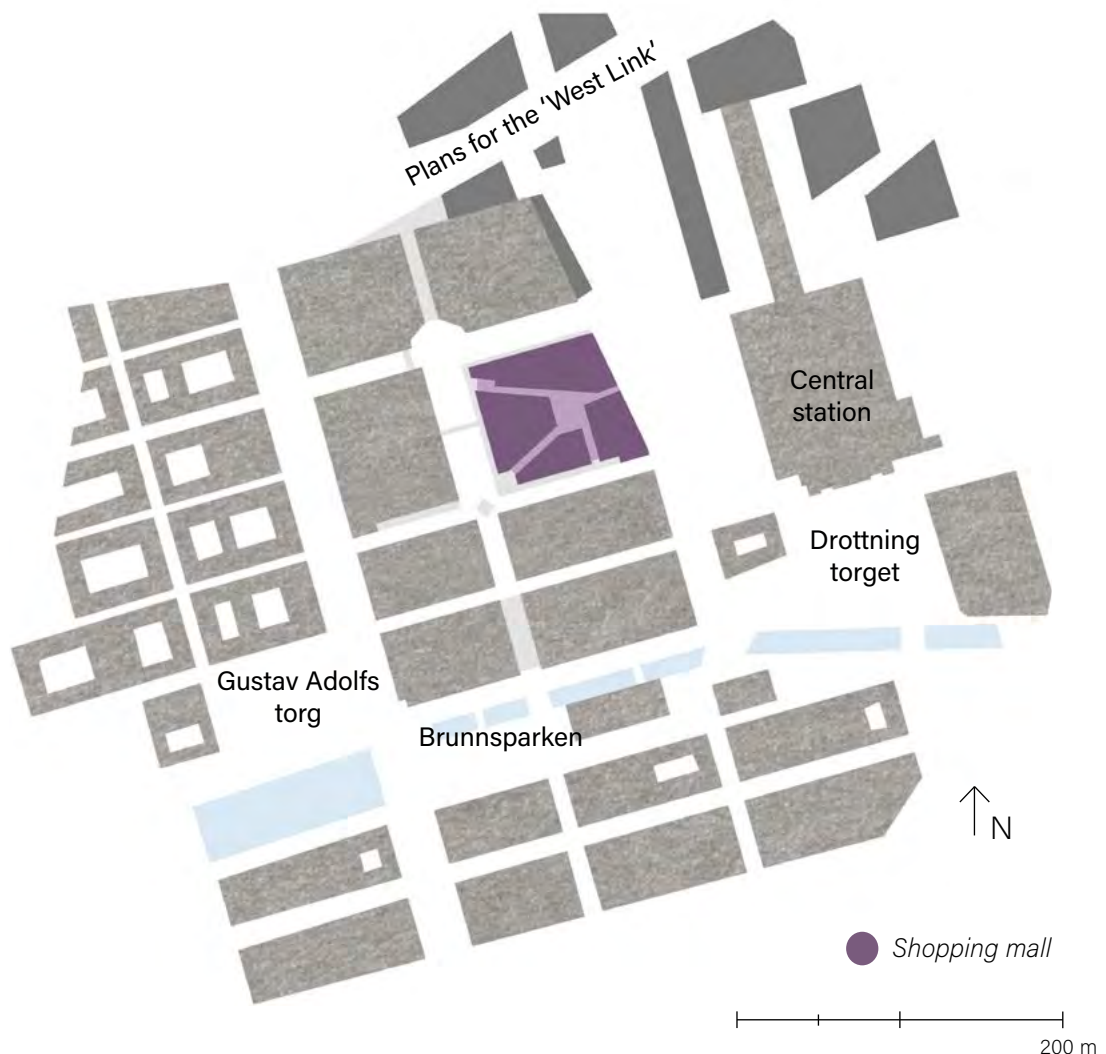
The prohibition against production and trade of none-recyclable items is legislated in Sweden.***

Shopping gets more online-based.**

Owning stuff loses its status.***

Narrative

Things are changing in the society. People do not value the owning of items as they used to, which means that shopping as a leisure activity in the city loses its purpose. Stores and shops need less physical space, and the shopping mall therefore reduces its size to just one building. To better access the parts that used to belong to the mall, the indoor-street structure is opened up. This remodeling also becomes a part of an upgrade to make all buildings more sustainable and energy efficient. Former stores are rented out as other functions, such as for working and living.



N A R R A T I V E

2028 - Vacant Spaces

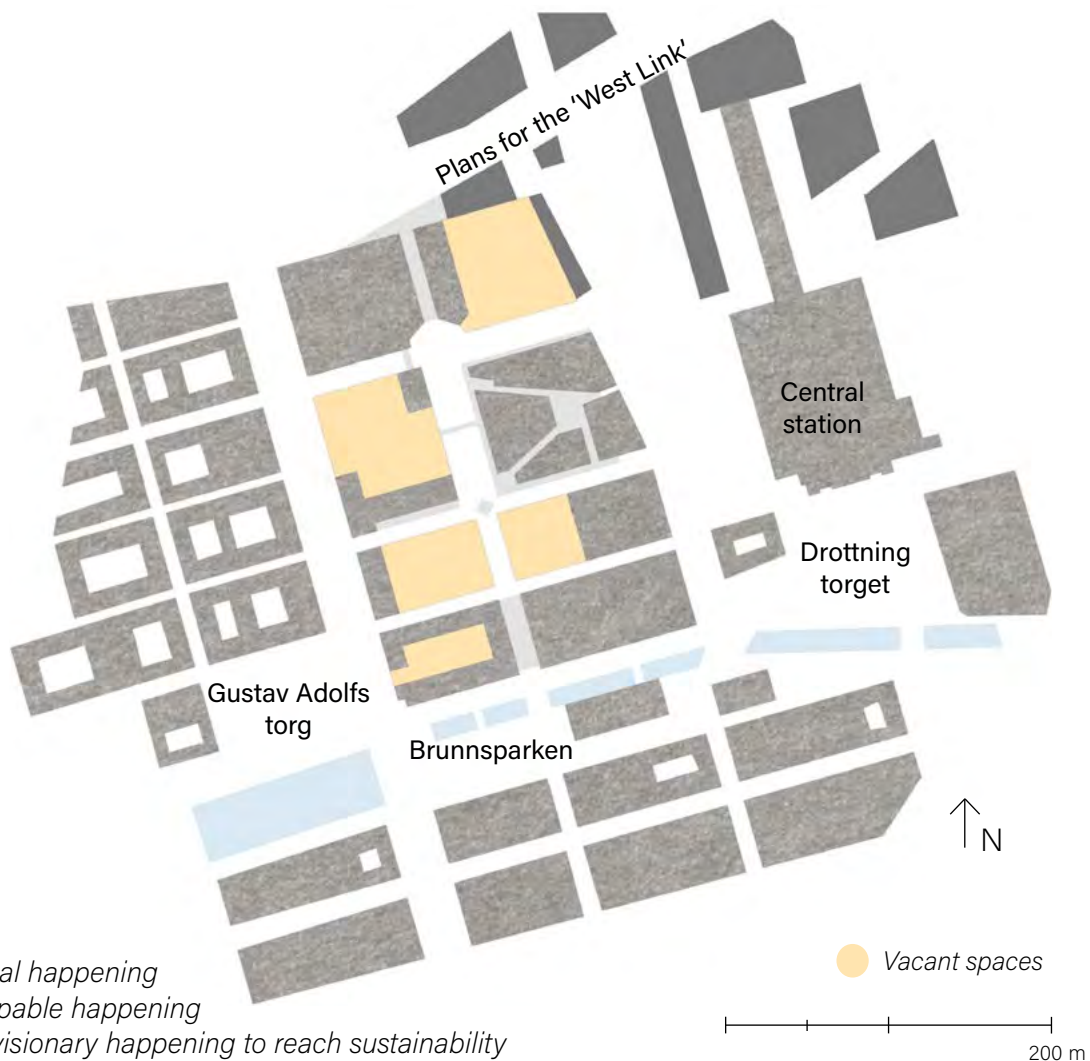
Triggering events

The need for shopping is reduced. ***

The child convention becomes a part of Swedish law, creating demand for a safe and welcoming environment for children in the city. *

Narrative

The spaces in the former shopping mall without access to good daylight becomes hard to rent out and therefore vacant. This makes people protest against having an urban void in the core of the city. Political movement "Taking back the city" gains popularity and makes the municipality of Gothenburg buy back parts of Nordstan, to activate the area. Vacant spaces are transformed into public functions such as for culture, education and sports.



2029 - Greener streets

Triggering events

Green public spaces is promoted to improve air quality and human health. **

Densification in the cities creates a bigger need for planned greenery. **

The only cars present in the cities are taxis and emergency vehicles, which creates empty streets. ***

The child convention becomes a part of swedish law, creating demand for schools and kindergardens to have close access to safe green areas in cities. *

Narrative

The municipality makes the site a pilot transformation in an ongoing project called "greener city", which purpose is to create green pathways of streets that formerly were adapted to car traffic. The former parking garage of Nordstan gets transformed into a public rooftop park. An agricultural area is integrated in this park, making food grow locally. Nordstan as a site is no longer viewed as a noisy shopping mall, but rather a green and active meeting place that welcomes all kinds of people.





One of the indoor streets of the shopping mall.

Vision

To get a feeling on what this future version could be like, these 2 photographs from today have been altered, visualizing what the year of 2031 could become life after following the narrative from the previous step.



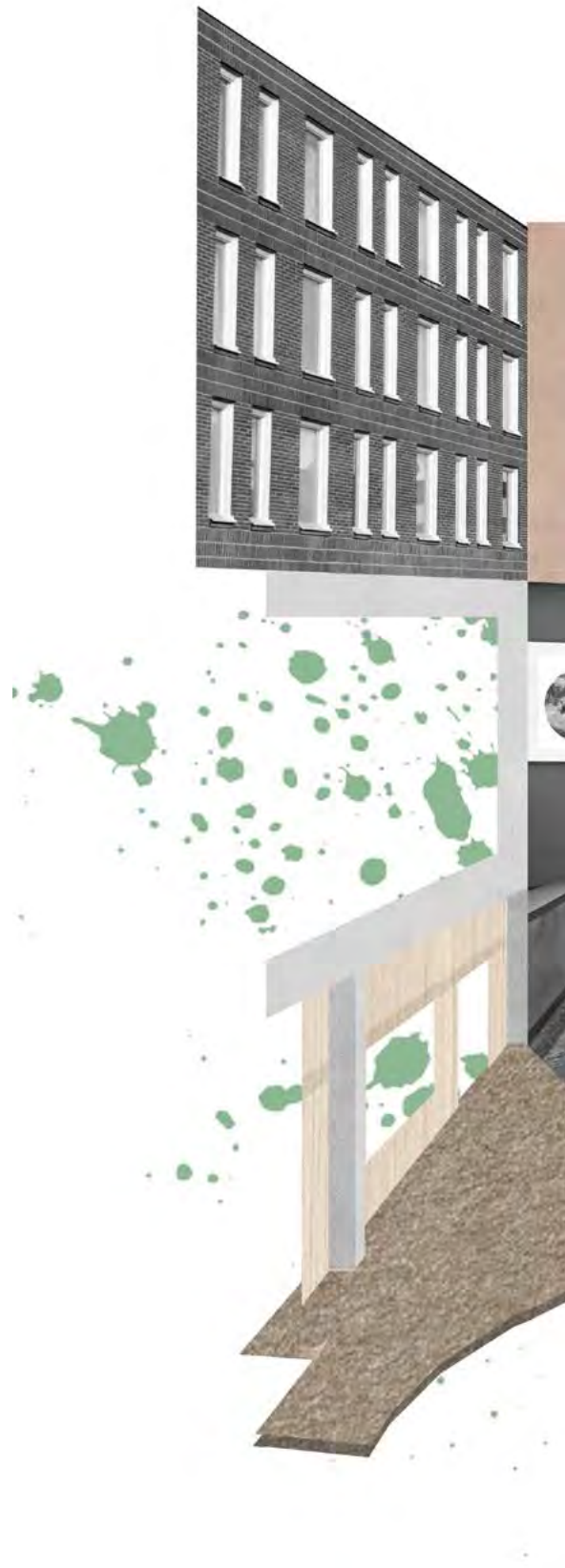
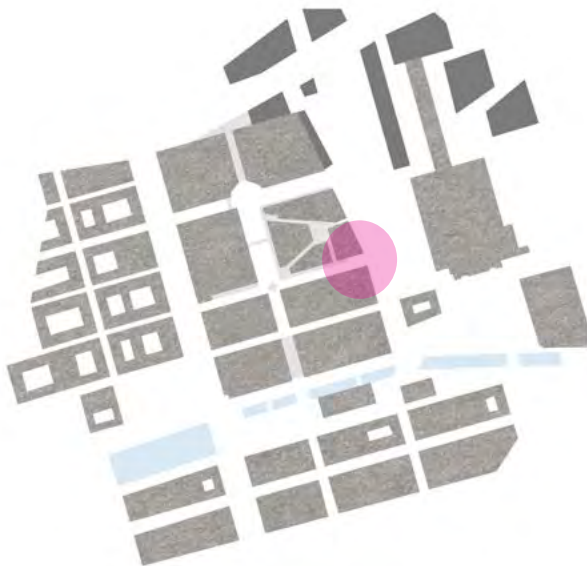
The passage to the central station

Passage to the central station



fig... Photo taken 2020

We are here



V I S I O N O F N O R D S T A N 2 0 3 1

Integrated strategies

Unplug the Machine

Reduce Artificial Lights

Increase Accessibility

Create Green Public Spaces

Take Care of the Rain

Make the Bees Feel Welcome



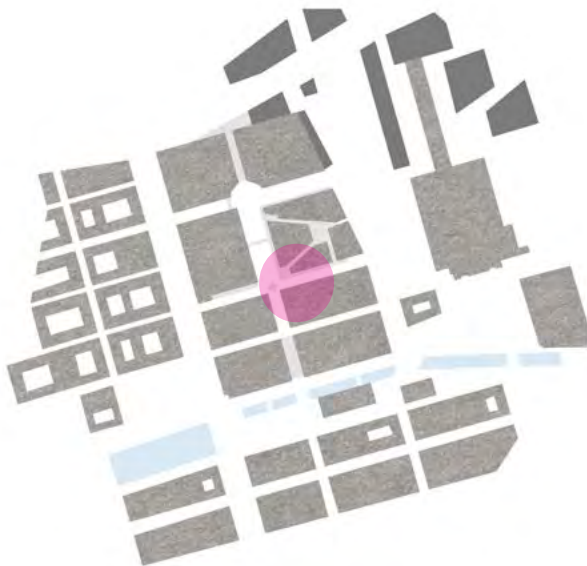
V I S I O N

Former indoor street



Fig., Photo taken 2020

We are here



V I S I O N O F N O R D S T A N 2 0 3 1





Integrated strategies

Unplug the Machine

Reduce Artificial Lights

Increase Accessibility

Create Green Public Spaces

Take Care of the Rain

Make the Bees Feel Welcome

DISCUSSION

Reflections

This thesis has tried to answer the question *'If the sustainability goals were reached in a future scenario - How would the site of an urban shopping mall be transformed to match this future?'*

The result is one version out of many possible ones. What I hope can be useful for others in this field of research, is the approach to start with visualizing the finish line. The aim is to get a clearer view of what it is we want to achieve in the transition for a sustainable urban environment. Hopefully this makes the steps to get there easier to understand.

As this is a visionary project about the near future, there is no means to measure if the goals and strategies for this vision would suffice in reaching a sustainable built environment, as it hasn't been tried out. There has been no calculations. But the vision is anchored in research from what we know today, and based on goals that has been set internationally. But as this has been made as an holistic vision trying to tie the pieces together, there is a lot of room for more detailed research in each of the categories.

The transformation of this site is also done in an unrealistic time frame, and this is made by purpose. The vision is set at the year of 2031, only 11 years from now, to reflect on the fact that the goals for sustainability set by the United Nations are aimed to be reached before the year of 2030.

I hope this thesis creates a mixture of feelings.

1. That we are running out of time and need to stop compromising and start changing
2. Realization that a sustainable future would improve the quality of life. It is not a limitation or a sacrifice.

Left out from the research process

The biggest part of the research has been to map out the international goals for sustainability and sort them in a way that relates to the built environment. There was many different alternatives for this before the concluding to go with the four response groups. On the following pages some alternative mapping is shown, with the narrative in a diagram and all the goals for each category found in a list.

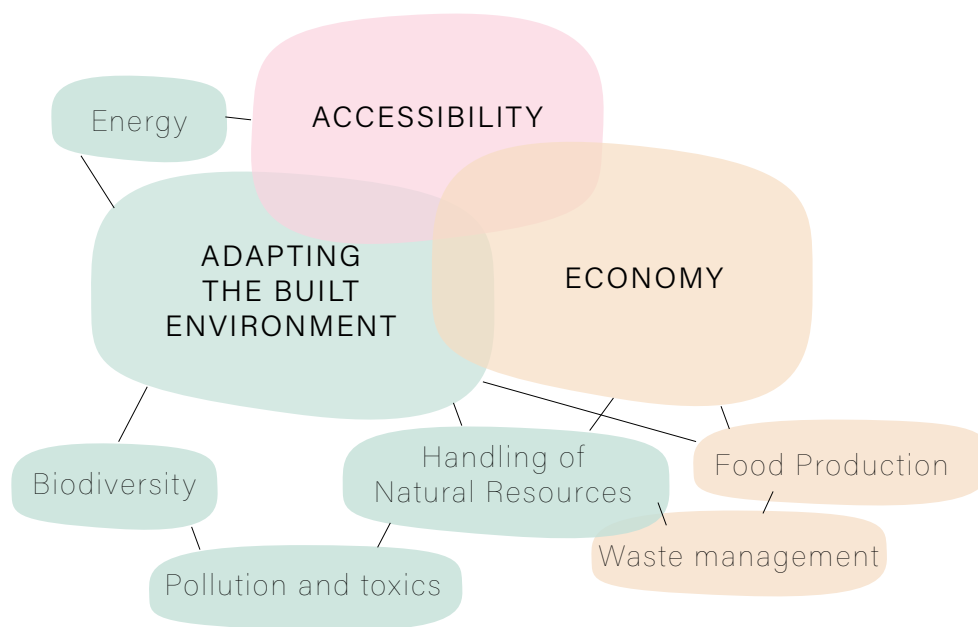


Fig 16. Themes, Early Process. Shows one of the earliest division of themes, after sorting the sustainability goals from the United Nations. These were later changed to be more related to the built environment.




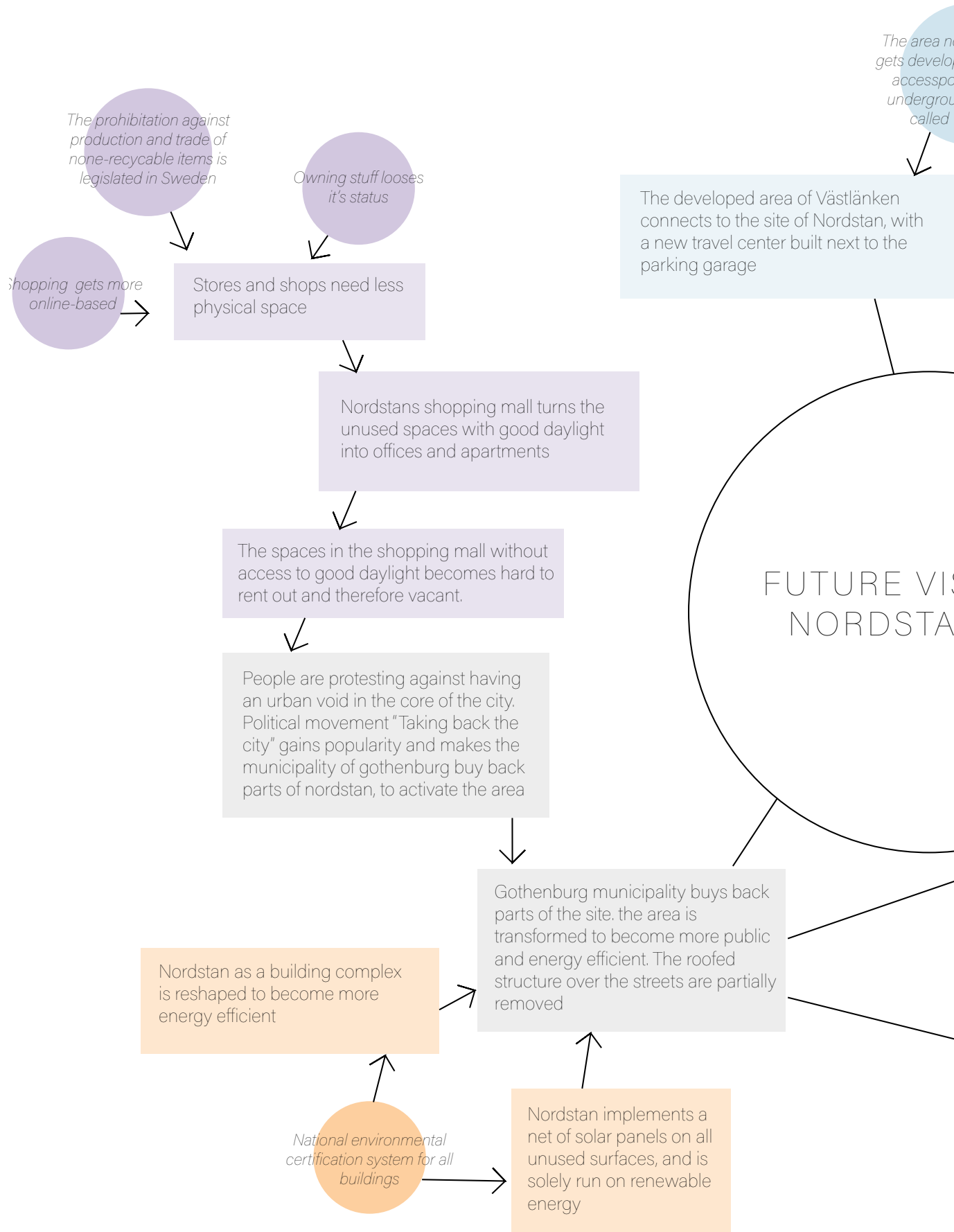
-  = Social (human rights and the wellbeing of humans)
-  = Societal (Structure of community)
-  = Ecological (Climate oriented)



Fig 17. Wheel of Combined Goals, Thematical. *Altered version of the diagram shown in chapter 2: 'Reaching a Sustainable Future.'* The goals have here been moved to fit into each category. The pink theme was added to keep some of the goals that are too general to be put in a specific category.

	SDG	SWGG	SWEO
Relates to all	3.9, 6.3, 10.2, 11.6, 12.2, 12.4, 12.8 & 13.2	· Recovered ecosystems	· Reduced Climate Impacts · Clean Air · A Non-Toxic Environment · A Good Built Environment
Energy efficiency & Renewable energy	7.2 & 7.3	· Renewable energy	· A Protective Ozone Layer
Sustainable Transportation	9.1, 11.2		
Greener Urban structure	2.4, 6.4, 11.7, 11.B, 12.3, 13.1, 15.5, 15.9 & 15.A	· Biodiversity · Human Health	· Zero Eutrophication · Good Quality Groundwater · Thriving wetlands · Agricultural Landscape · Diversity of Plants & Life
Establishing Circular Economy	8.4, 9.4, 12.5 & 12.6	· Material Cycles · Natural resources · Patterns of consumption	

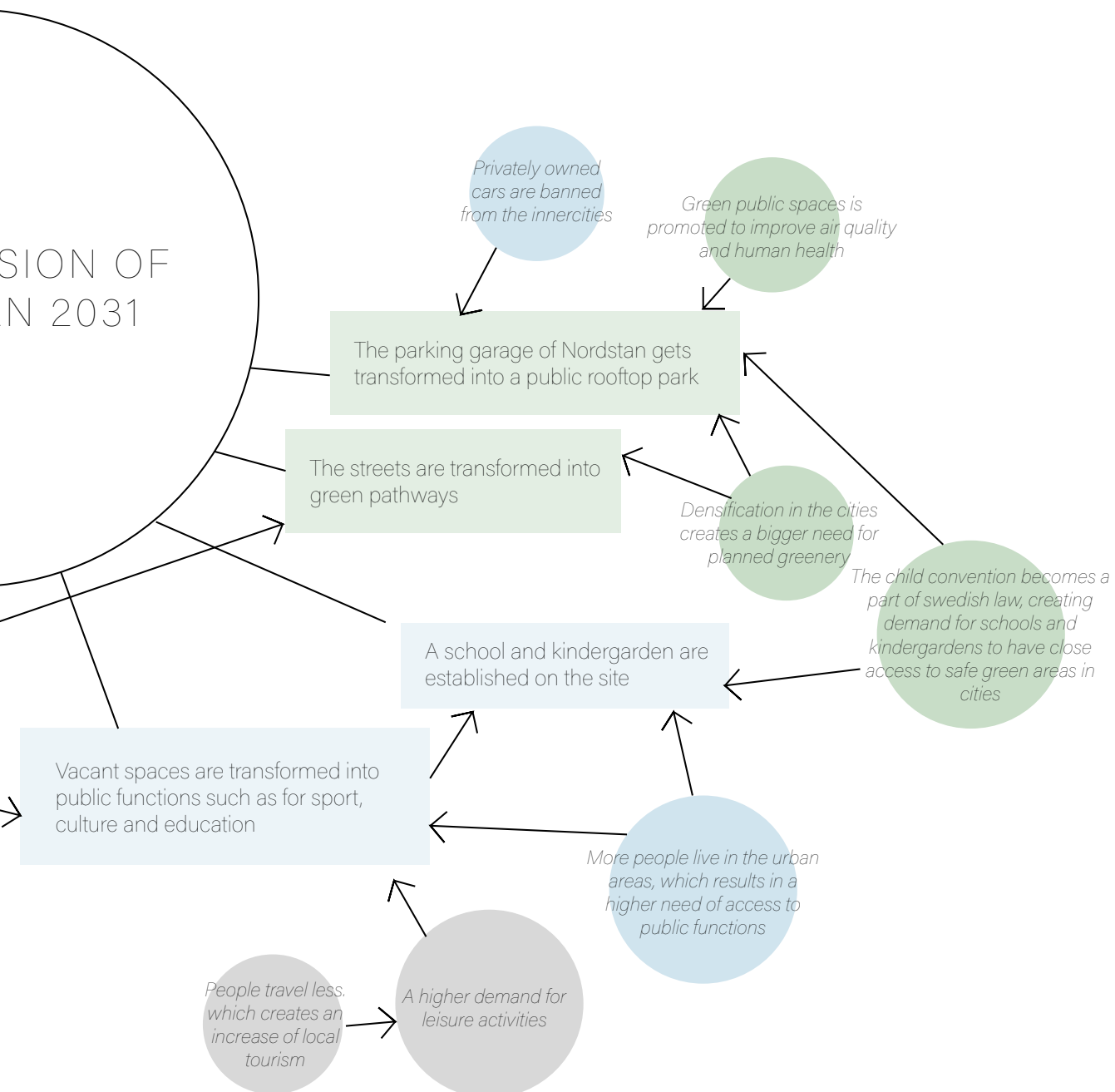
Fig 18. Thematical List of Goals. *Overviewing on what goals are included in each category. Showing the same goals that have been used throughout this thesis, but presented in another way.*



DISCUSSION

North of Nordstan
 led into a central
 point for the new
 and tram system
 "Västlänken"

Fig 19. Chain of Events. When creating the storyline, this diagram showing the chain of events were made to map out how everything could be connected. This was later translated into the narrative presented in Chapter 3. The circles represent triggering events, while the squares are parts of the narrative.



NARRATIVE DIAGRAM

R e f e r e n c e s

Azar, C. (2012). *Solving the climate challenge*. Stockholm: Albert Bonniers

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Figures

All photographs and figures presented in this thesis are taken/created by the author, in the spring of 2020.

Fig 1. Scale of Rural to Urban - p. 18

Fig 2. Delimitation Diagram - p. 18

Fig 3. Volumes of the Site 2020 - p. 20

Fig 4. World Map - p. 22

Fig 5. Sitemap - p. 23 *Photo retrieved 2020-04-30 from www.googlemaps.com*

Fig 6. Siteplan - p. 25

Fig 7. East Facades - p. 25

Fig 8. The Research Process - p. 32/33

Fig 9. Wheel of Combined Goals - p. 34/35

Fig 10. Wheel of Combined Goals, Sorted - p. 36/37

Fig 11. List of Unsustainable Aspects - p. 39

Fig 12. Diagram of Connections - p. 40/41

Fig 13. Diagram of Connections, Altered - p. 42/43

Fig 14. The Transformation Process - p. 50/51

Fig 15. Surfaces in Sunlight - p. 55

Fig 16. Themes, Early Process - p. 71

STEPS OF RESEARCH

1. Overviewing the goals for sustainability

Researching what needs to change to achieve a sustainable future. Looking at the the sustainability goals set by the United Nations, in the 'Agenda 2030' program. Complementing the international goals with Sweden's national ones, called 'The environmental objectives'

2. Narrowing it down

Sorting out the goals and prioritizing after relevance to the built environment. Choosing them after the delimitation-principle to only focus on the changes for sustainability that either affects architecture and the built environment, or architecture and the built environment can affect.

3. Mapping out the unsustainable aspects

With conclusions from analyzing the site, trying to specify the unsustainable aspects that relates to Nordstan. Mapping out potential reasons behind these aspects - the driving forces, and what kind of environmental impacts they lead to. This is presented through a diagram of connections.

4. Responding to the driving forces

Creating 4 responses that alters the driving forces behind the unsustainable aspects of Nordstan. These in turn alters the aspects and changes the outcome of the environmental impacts - creating a sustainable scenario for the site.

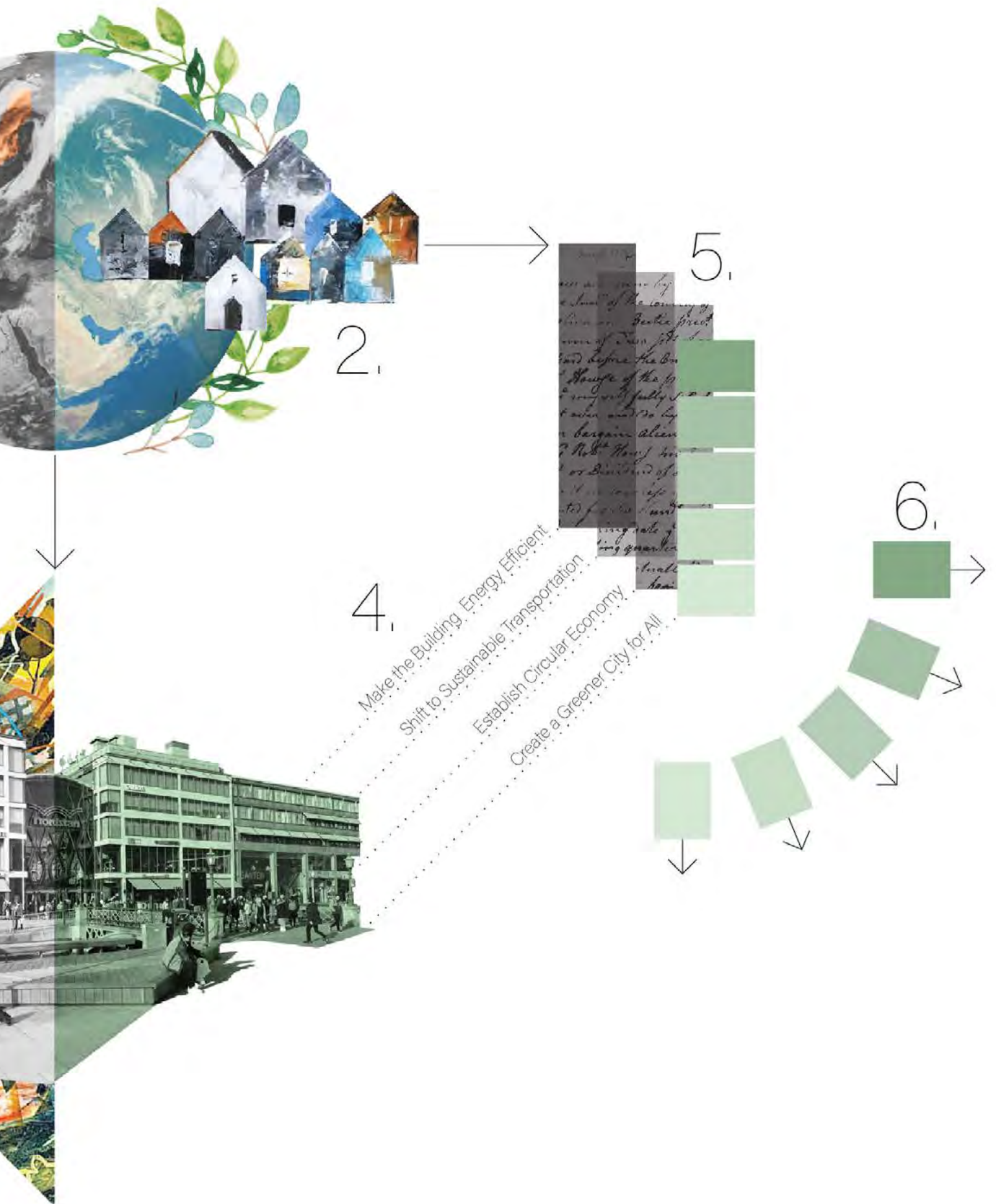
5. Summarizing the goals

The goals that are relevant for the built environment are summarized, turning 42 goals into 11. These are then grouped into the 4 different responses that connects to the site.

6. Creating strategies

Specifying different strategies in each response-group, to reach the sustainability goals.

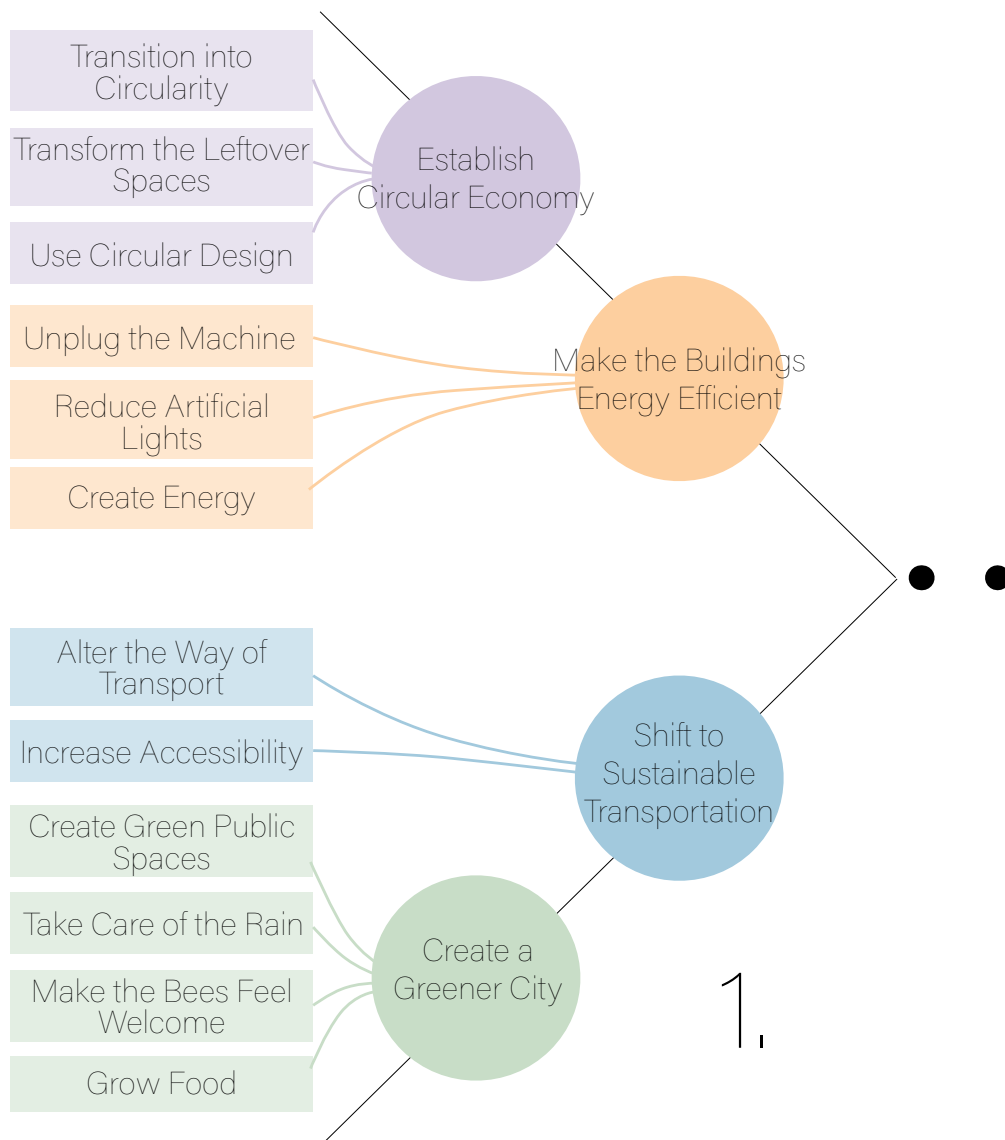




STEPS OF TRANSFORMATION

1. Applying the strategies

Specifying how the strategies created in the previous chapter can be applied to the site of Nordstan.



2. Telling the story

Imagining how to accommodate the city in 2030, creating a narrative in 4 steps, starting with the current state and ending in 2029.



mplish the Agenda
ve of transformation
n the year of 2026, and

3. Visioning the year of 2031

Getting a feeling on what this future
version could be like, conceptually altering
2 photographs from today, showing the
transformation.



