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BREAKING and ENTERING

- a sustainable urban transformation

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Primary Supervisor: Nicolai Steinø
Secondary Supervisor: Bo Vagnby

Mai Engbo Pedersen

Ragnhild Haslestad

PREFACE

This project is the result of cooperation between two students, one from Architecture & Design and one from Urban Planning & Management at Aalborg University.
The project report consists of four parts; introduction, analysis, theoretical discussion and a presentation. A brief presentation of the result is found in the beginning of the introduction.
A CD with the content of the report in pdf-format and a 1:2000 illustration of the plan is enclosed. Literature references are written according to the Harvard method, where references in the text refer to an alphabetical list of authors in the back of the paper. References to the appendixes will appear in parentheses. A letter refers to the corresponding appendix.
Unless other is noted, the maps and illustrations of the plot are placed facing north.

The report is communicated to planners, municipalities and private developers interested in working with a sustainable city transformation.
The report is mainly directed to Århus Municipality and investors that might be interested in the Katrinebjerg area. In a general context, the report gives ideas on relevant topics and solutions in planning for sustainability in an urban transformation project.

SYNOPSIS

The project is conducted in the light of urban sustainability. Urban sustainability is defined by the principals of a balance between environment, social and economic aspects. The focus is placed on incorporating high density and neighbourhood structures in the transformation of a central city area. The chosen case area lies in Katrinebjerg, Århus, and has previously functioned as an industrial area.
In the report, we therefore analyse theories about density and neighbourhoods as a way of achieving overall directions for sustainable planning and design. The theory has been used to provide a focus within the area of sustainability, and functions as a frame for the intentions and considerations made later in the design phase of the project. A conceptual master plan is made to reflect the key principals of density and neighbourhoods.

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INTRODUCTION

The development of Danish cities is constant, and more than ever, increasing development and land-use makes it important to consider how planning today affects the future. The changes made today will continue to exist as permanent parts of the landscape in the future, and play an important role for future generations.

Planning for urban sustainability affects all stages of the planning process, and while the focus of sustainability so far has mainly been the ecological aspects, there is also a need to address other aspects of sustainability which accounts for the city's ability to meet the demands of its citizens, and function as a place that can keep up with the changes in society.

The author Eric Hobsbawm wrote the Age of Extremes as an historic record of the twentieth century. As the last note he stated what in his opinion would be the key issues of the twenty-first century: ecology, migration and democracy [Hobsbawm, 1994]. As several examples have shown, he was not so far off.

The illustration shows a conceptual master plan for Katrinebjerg in 1:5000. The density of the buildings in the new plan is 170%. The typologies represent the different functions mixed across the area. In contrast to the layout of the typologies, a structure presented as the ribbon crosses the area. The ribbon is a flexible structure that allows for different functions. Green areas are placed in relation to the buildings, and functions as both public and more private areas. On the northern side of Storcenter Nord, a new promenade is tied to the existing buildings.
The plan in 1:2000 can be found in the back of the report.

OBJECTIVES

We approach the project by using theories that link with elements of sustainability. The theory and the analysis of the site will be a parallel work, where the site is mapped out and presented, while the theory will conclude on an understanding of urban sustainability. A discussion on operational considerations leads the theory to intentions for the area. Finally, the findings will provide the basis for a design for the site. The design will reflect the outcome of theory related to the real world (methods and timetable in appendix A and B).

Considerations of sustainability must be made at the first step of a planning process if it is to be carried through to the finished result. Sustainability is important to secure that new areas have lasting qualities and are attractive for people using them. It is also necessary to consider sustainable solutions for urban systems such as public transportation as the changes in one area connects to and affects the entire city.
The goal is that Katrinebjerg will function as a sustainable and dense part of Århus.

DEFINING SUSTAINABILITY

Societies will continue to transform over time, and development is a never ending process. City development should not be made without a thought for sustainability, because sustainability represents a balanced approach to development.

A major dilemma in planning for sustainable cities is that sustainability changes along with society. Sustainability as a term cannot have an exact definition, and perhaps need not to. It is dynamic, and like the ambitions and the issues of development will change over time, so will the term sustainability.
Describing something as *sustainable* has become a tendency in the last few years. Although it is not a modern term, the use of it has become more widespread. A general conception of the term is linked to ecology, but in order to achieve something substantial from this report, we need to define the term sustainable and highlight the importance and meaning of it as we see it.

The term sustainable is, according to the Oxford dictionary, both to be able to be sustained and (of industry, development, or agriculture) avoiding depletion of natural resources. In the historic sense the word has been linked with the term carrying capacity in biology. In biology it is used to describe the number of individuals of a given species that can thrive on a fixed area without the resource base deteriorating, thereby leading to a decrease in the population. The carrying capacity, or sustainability, is surpassed if a given species of animal or plant multiplies in too large quantity, causing the balance in the current ecosystem changes and the physical characteristics and/or components of the animal or plants to become affected.
Carrying capacity used in regards to the human resource consumption relates to the limits of how large impact the natural resources can absorb. This can be in the form of population or consumption per inhabitant. The environmental impacts include both resource consumption of renewable and in-renewable resources and pollution. [Miljøstyrelsen]

Brundtland Report and Agenda 21
So far, the most familiar use of the term sustainable is its appearance in *The Brundtland Report* Which contributed to the extensive use of the term throughout the nineties and until today.
In 1987, The United Nations World Commission of Environment and Development passed The Brundtland Report, known as *Our Common Future*, which was the beginning of the whole discussion about sustainable development. It defined *Sustainable Development* as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs." The purpose of the report was to formulate a global program for changes concerning resources and environmental problems on earth. This report was made to ensure a sustainable development after the year 2000, and to ensure cooperation between the different countries. Because of The Brundtland Report, the focus area of sustainability came to be the environmental aspects.
The cooperation is important because the environmental problems are global, but the solutions must be found in a smaller scale. Small solutions are the answer to the general problem, which is expressed as "think global and act local". [Miljøstyrelsen]

The Brundtland Commissions work was continued in 1992 by the United Nations World Commission of Environment and Development in Rio. On the Rio Conference the Rio Declaration and Agenda 21 were passed. Agenda 21 is still the basis for working towards and implementing sustainable development. There is a broad unity supporting the following main principles:
- Sustainable development is still the overall goal for the development
- Sustainable development contains an environmental, a social and an economical dimension
- Sustainable development demands more than a national effort; it demands an effort on all levels, from the global to the local level from the grass root level to the consumer and business level.
- Sustainable development demands international cooperation. [Miljøstyrelsen]

Most importantly, the Agenda 21 recognises that there are different dimensions of sustainability. Agenda 21 has been imposed in all cities, and each city has made its own local agenda, where their priorities are specified.

Urban sustainability

Urban sustainability is an integral part of sustainability in general. It implies examining the process of urbanization within the context of dynamic and complex social, economic, and ecological processes producing sustainable or unsustainable urban landscapes. [Lake, R.]

When dealing with sustainability, there is a vast field of information and considerations to account for. Not all issues can be solved, some of them are bigger than our area of influence, and will continue to exist in years to come. The topic of sustainability can be handled both in macro and micro level dealing with both issues such as global warming and smaller issues around recycling of household waste. There are some issues that we sympathise with, but are not operational, for instance creating a sense of community among the citizens, which would require a project of its on, or details about recycling of water and waste which will require more expert knowledge than what we possess.
There is a general consensus that there are three pillars of sustainability: economic, environmental and social. Each pillar represents different aspects of development, but they also overlap. There is a need to look more at the complete picture around sustainability. In order for development to be sustainable, it must include something in all the abovementioned areas; social, environment, economy.
We choose to follow this classic division as most aspects of development are seen to be represented in one of them. However, others have chosen a different approach, such as including a physical dimension. The social, environmental and economic dimensions have thus represented metaphysical dimensions.

We wish to discuss some particular relations that can be relevant in an urban context. This being said, a more limited and operational definition of sustainability must be made. The limitation is done through the scale of the case area, and the issues relevant to its size.
The basic conception in this project is social – how layout and mix can provide a solid area. Economic – how this influence the planning, looking at the economy in relation to the master plan, environment – the physical environment, what considerations to make in order to preserve land and improve the use of space. We have chosen not to go into other aspects, although a long list can be made. Some issues are too detailed for us to consider, while others are more related to the city as a whole or larger contexts.

NABU (Norske arkitekter for bærekraftig utvikling) has presented a tool for evaluating sustainability meant to be used as an indicator of sustainable development for buildings, cities and towns. Its purpose is to provide a scientific fundament for comparisons. The tool is based on a complete view of sustainability, which outlines the importance of a balance in the three fields of sustainability. One simple question can be asked: if a house has zero energy use, but is very expensive and ugly, is it at all interesting? [Norske Arkitekters Landsforbund]
The following diagram displays a list of keywords used in NABU's tool. This is used as a template for the choice of topics in this paper. But in order to understand what the prioritised keywords contain, an exploration is needed, and comes in the theory and intentions chapter.

The *social* dimension of sustainability can be explained in different ways, but we choose to focus on what social qualities a sustainable place should offer to its users. A place that doesn't incorporate the user dimension fails to establish a balanced society. The more traditional topic of mixed user groups is also considered.

Environmental sustainability is focused on the physical elements of sustainability, such as green areas and density. It is a very important part of the "thinking", and it requires solutions that ensure a sensible use of environment and resources.

Economic sustainability is limited to small scale economy. These considerations could include the running/maintenance/operation of the area or its buildings, the cost of construction, the cost of living.

Keywords:

SOCIAL: composition mixed population diversity room-hierarchy complexity possibilities for exclusion and interaction
exchange aesthetics artistic soft values identity image variation mystic experience activity
safety low crime transparent sense of belonging and of ownership access inclusiveness co-operation participation shared responsibility involvement

EVIRONMENT: area use area efficiency density ecological footprints nature green structure productivity
transport public transport energy efficiency pedestrians and bikes climate and landscape shaped plans and design
energy minimum consumption heat, water and material recirculation minimum water use waste treatment pollution
material recycling and reuse health in- and outdoor climate maximizing natural light minimizing noise pollution air sun ventilation

ECONOMIC: price level affordable costs lifecycle based costs functions individual and collective flexibility durability adaptable over time
institutions shopping service public service finance structures diverse workplaces financial and trade sustainability ownership financial accessibility
loans and credits arrangements communication circuit, speed efficiency and openness administration processes partnership operations maintenance

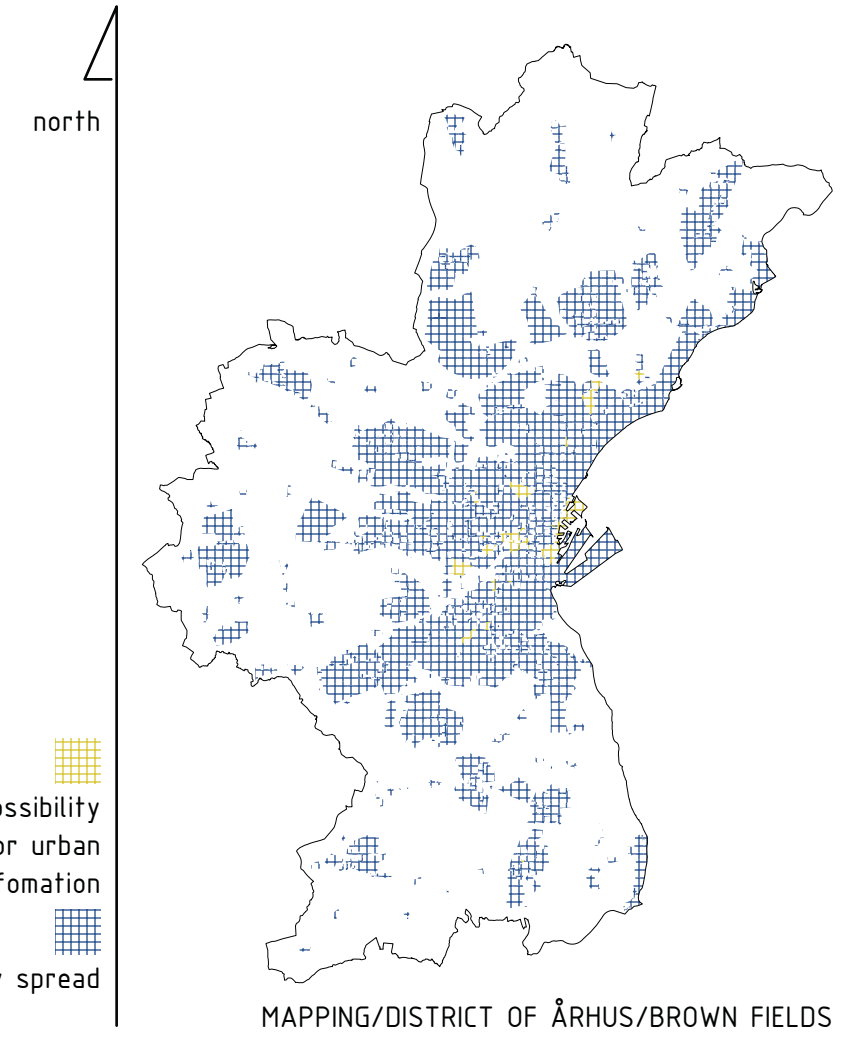
The prioritised keywords are marked with black colour. While the black words are seen as the most relevant and important for finalising this project, the other words are understood also as relevant and relational, but not further explored.

THE SITE

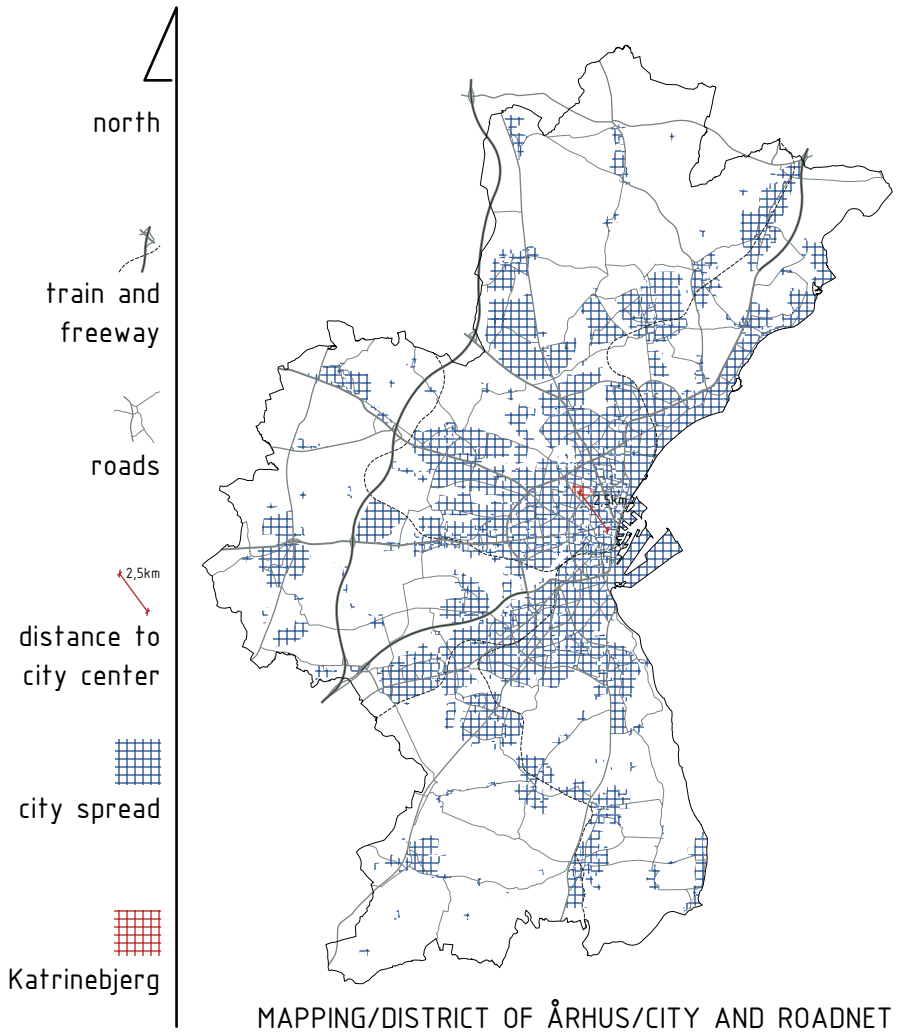
Århus holds almost 300.000 inhabitants and 700.000 people live within a 30 minute drive from the city centre, making it the second most populated area in Denmark after Copenhagen. Århus is situated on the eastern coast of Jutland and claims the unofficial title "capital of Jutland". The city lies roughly in the geographical centre of Denmark with large nature areas nearby. Forests stretch from the south into the city. The city lies at the junction of railway lines from all parts of the country. Like Copenhagen, it is linked to ring roads and radial roads reaching out to the surrounding suburbs.
The city is built around the harbour which is predominantly industrial, although a large recreational marina is situated to the south of it, as an extension. The Port of Århus trade millions of tons of goods each years, and is the largest harbour in Scandinavia.
One of the prioritised architectonical principals of Århus is the skyline which is made up by the churches, the city hall, *Europahuset* and the silos by the harbour. The most recent addition to the skyline is the shopping mall *Brunns Galleri.* [Århus Kommune I, 2001]

The Future Development of Århus
In the future, the close structure of the central part of the city and the adjoining city areas, such as the harbour and the areas round the radial roads is maintained. The green wedges between the radial roads must be strengthened to preserve the green structure. [Århus Kommune I, 2001]
Århus has decided to extend their public transportation network by adding light rail to their range [Århus Kommune]. This will extend the possibilities for arriving on time in the rush-hour traffic and will increase the overall quality of the public transportation network. The first line will run on *Randersvej* just east of the project area going north/south from the new *Skejby* hospital to the city centre. There is a possibility that *Randersvej* is too narrow and this can result in the light rail moving closer to Katrinebjerg.

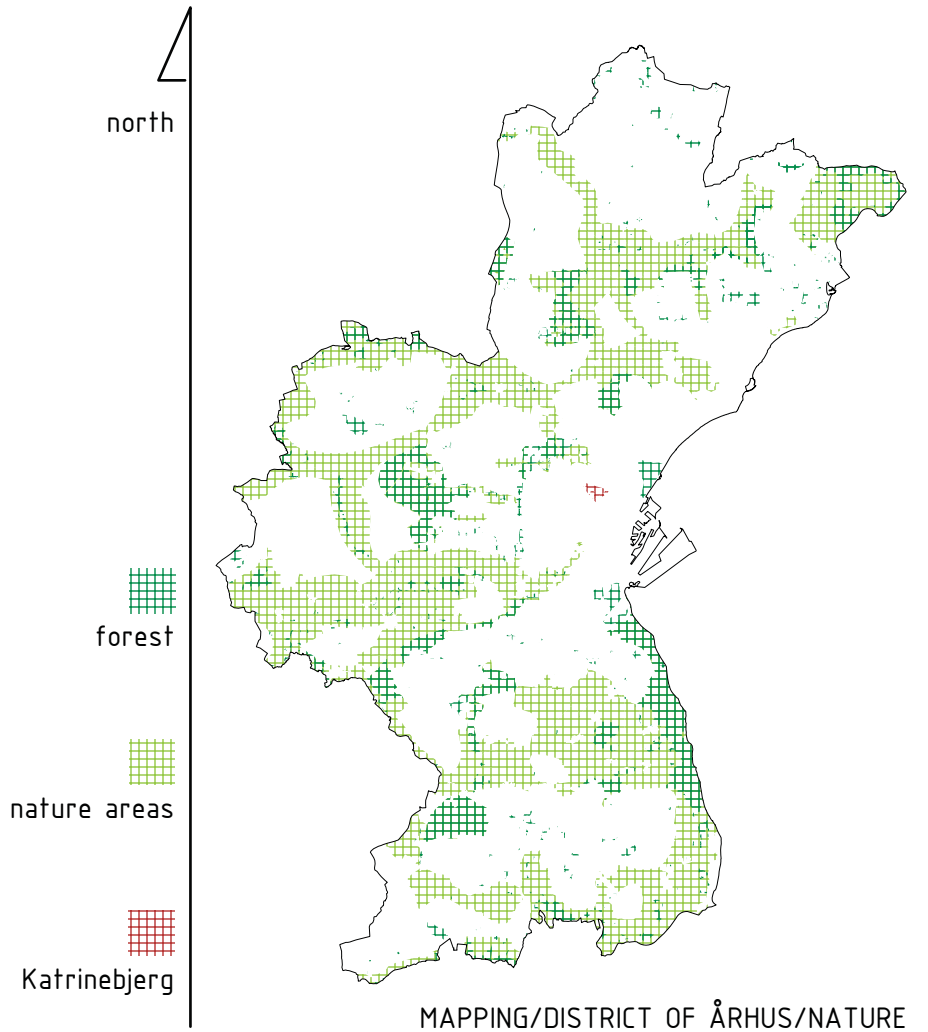
The future need for city development is sought through reusing and condensing the city and through developing new land. The city of Århus must also in the future be able to compete with other cities in having a healthy financial foundation that provides for social and environmental qualities. [Århus Kommune I, 2001]



MAPPING/DISTRICT OF ÅRHUS/BROWN FIELDS



MAPPING/DISTRICT OF ÅRHUS/CITY AND ROADNET



MAPPING/DISTRICT OF ÅRHUS/NATURE

Katrinebjerg

The area chosen for the project is Katrinebjerg. In the municipality plan the area is indicated as an area of future redevelopment. The reason for choosing the area is that it lies close to the city centre and is an interesting, old, low dense industrial area. Because of its proximity to the centre, it is a popular area both for living, education and work. It is one of very few areas still left to transform in the central Århus, and therefore the planning of it becomes very important. The area appears more low profile than the planned transformations in the harbour area, which makes it interesting to see what can be done to make it an attractive area for years to come.

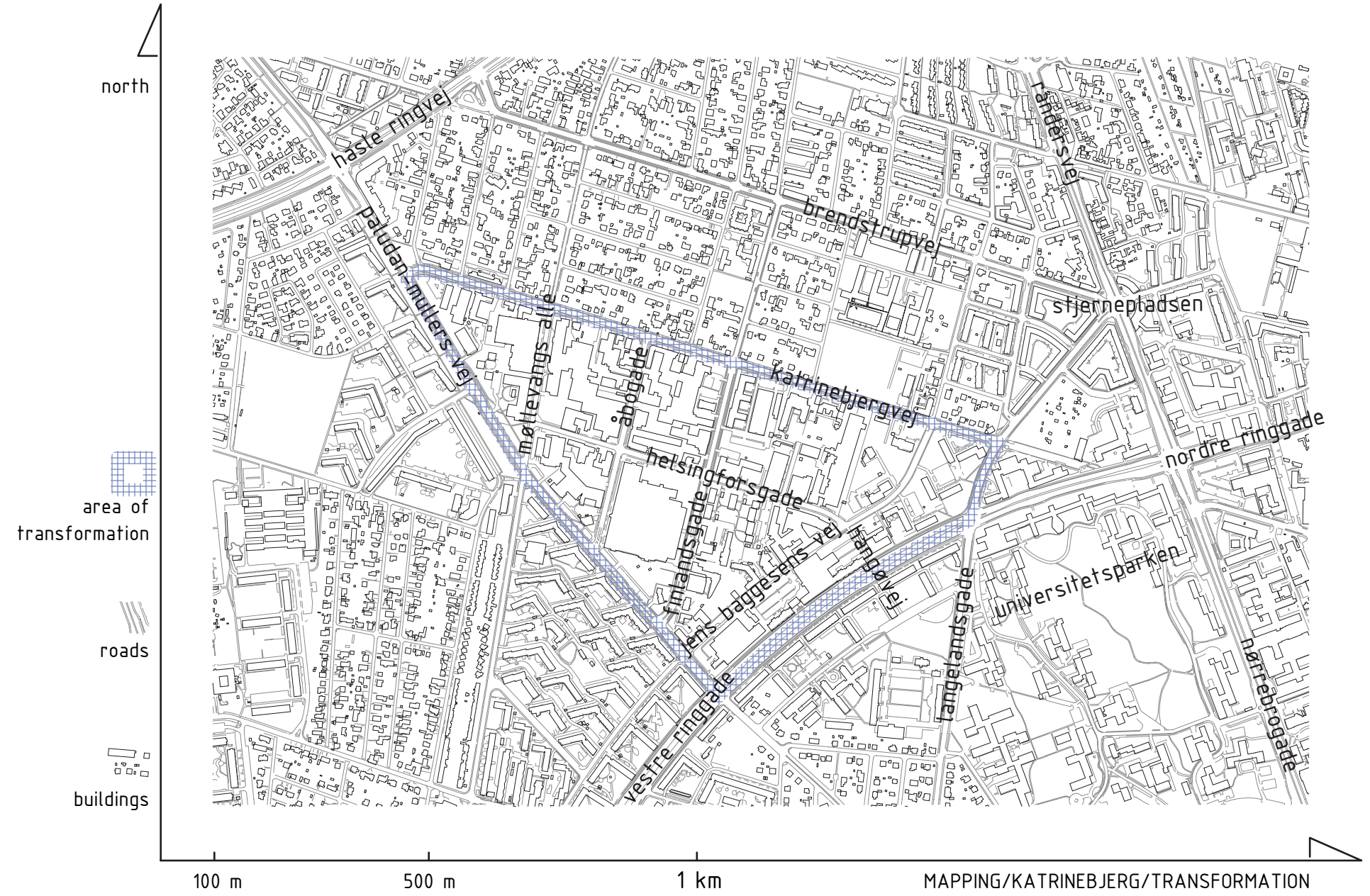
INTRODUCTION TO THE SITE

In 1999 central actors in business, research, county and municipality decided to make plans for developing the previous industrial dominated Katrinebjerg to an ultra-modern software-city. Katrinebjerg is shaped like a triangle with sides made up by three roads; *Paludan-Müllers Vej*, *Katrinebjergvej* and *Jens Baggesens Vej*.

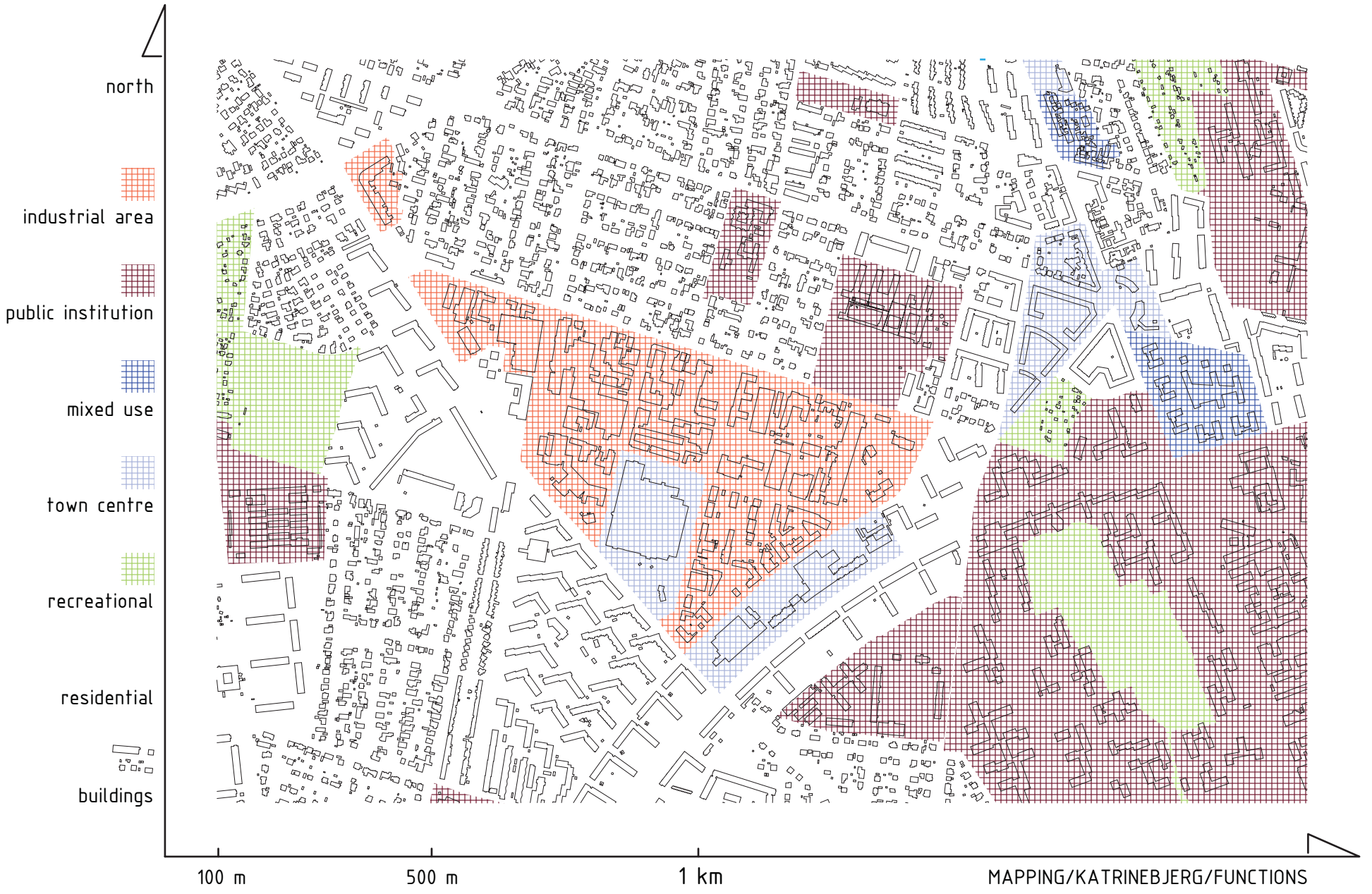
Katrinebjerg currently consist of housing, offices, industry and university. There is also a local shopping centre called *Storcenter Nord*. The houses were built in the 1930's and 40's and most of the area was completed by the 1950's, although more apartment buildings were later added.
The industry in Finlandsgade came about in the 1940's, but since then, a large quantity of the businesses has closed. The area is now considered to be a highly prioritized area for urban renewal. Katrinebjerg is a brown field where urban transformation creates the opportunity to make changes to the existing structures.

The surrounding houses have the characteristics of a garden city with green elements. The area has sports fields, tree avenues and allotments, and lies nearby the University Park. The Municipality plan describes the district the poorest in regards to green areas. [Århus Kommune I, 2001]

MAPPINGS

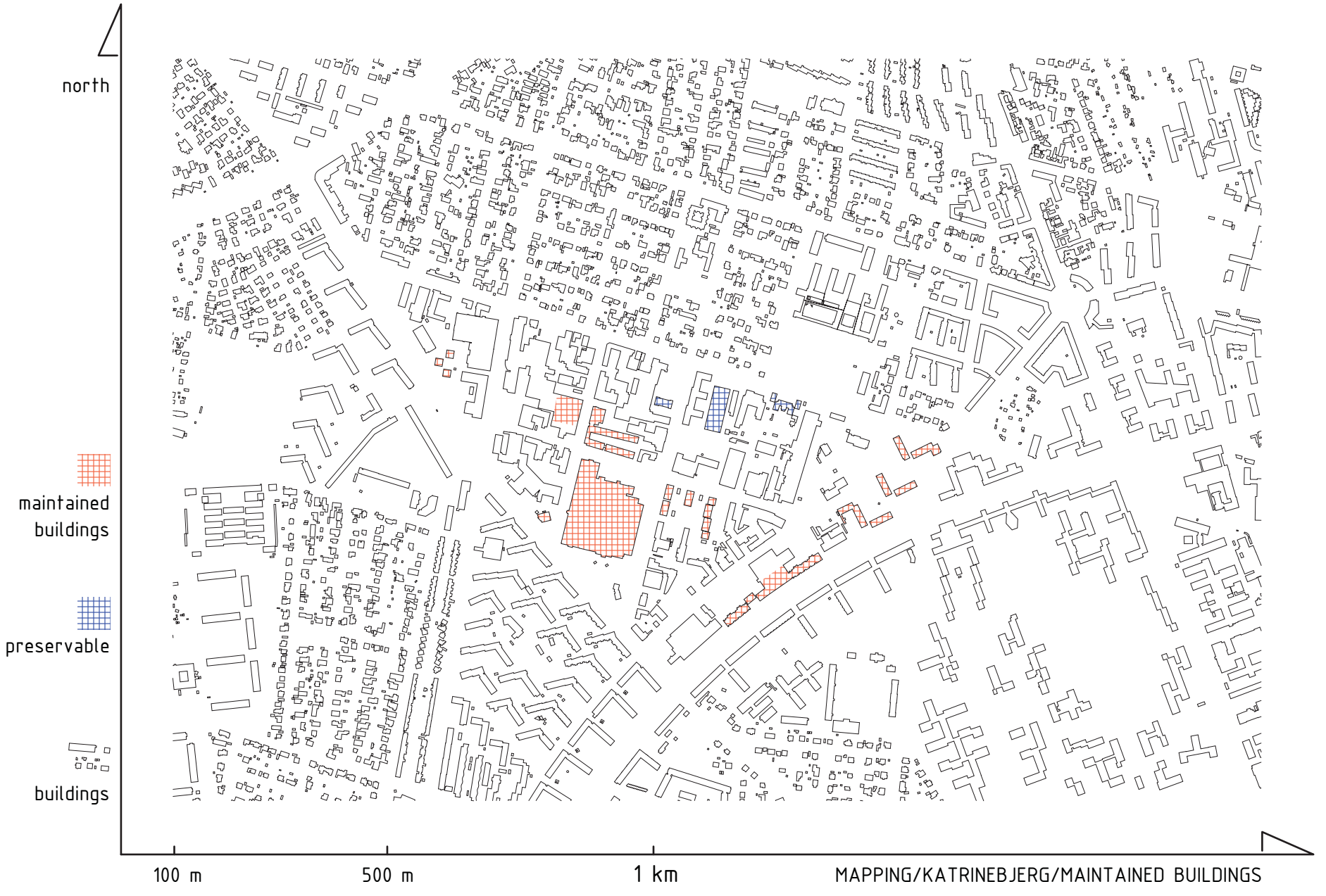


All the mappings are made in 1:10.000. The site limitations are as suggested in the municipality plan [Århus Kommune I, 2001]. The road names used throughout the report is shown on this mapping (see also appendix C for more mappings).



The variety of functions around the area is quite large. There is also a mix on the different types of housing, ranging from detached housing to apartment buildings. The zones are defined from what is planned to dominate the area, for these are the zones used in the municipality plan [Århus Kommune II, 2001]. This is not to say that there are not exceptions to what to dominant. This is shown in the institutions mapping (appendix C) as there is a lot of university campus in the industrial area of Katrinebjerg.

The green areas of Katrinebjerg are mostly dominated by avenues of trees. The nearby public schools have football fields and the university has a large continuous park.



Three blue buildings are listed as worthy of preservation in the local plan [Århus Kommune III, 2001]. The rest of the remaining buildings are mainly buildings higher and/or newer than the typical buildings in the area (for a description of buildings see appendix D).

THEORY

In exploring the theory of sustainability, many contradicting issues are found. In the following, some overall considerations are described.

Environment
The environment is the most visible reflection of urban development. The built environment is the product of interaction between society and space [Pacione, 2005]. New structures reflect the growth of the city.
Environmental sustainability also includes the ecological perspective; the balance between the natural resources and the waste produced by everyday society [Pacione, 2005]. Therefore, the built environment has responsibility to include its context, both natural and human.

One of the biggest contradictions when it comes to environmental sustainability is this conflict that lies between the preservation of nature and resources, and the development of the built environment and consumption of goods and services. According to White and Whitney, a city is by definition un-sustainable: it replaces non-renewable resources like fertile land by asphalt and concrete; it overcomes the carrying capacity of its territory by discharging a flow of waste water, air pollution and urban waste to the country side; and it uses resources taken from distant territories [Paddison, 2001]. While some of the problems can be solved and reduced within the city, such as handling of waste and water [Miljø- og Energiministeriet, 1995], other problems requires actions that belong to a larger scale than the city can manage.

Social
Social sustainability aims at improving the quality of life, and a good access to the use of natural and built environment. It includes how planners and designers can provide options that enable different lifestyles. A sustainable development should consider social justice, not compromising the marginalised that often are left with the worst environments to live in. [Gehl, 2003 og Miljø- og Energiministeriet, 1995]

On a general level, one can argue that the social structures in the city consist of difference, diversity and identity; difference regarding class, ethnicity, lifestyle, gender, sexuality, age and able-bodieness. Differences help to create diversity which is reflected in cultures and cultural norms. Although diversity is mostly regarded as positive, a moderate focus on it is needed in order to balance with identity. Identity is made up from social forces, individual personality and life experience, and seen as varying over time as the social context is mutating. The social factors become the foundations of communities, as physical spaces unite the various combinations of people. Awareness and incorporation of difference, identity and diversity will be the basic considerations in further discussion of social sustainability. [Pacione, 2005]

Economy
One reason for looking into economic sustainability is to find the factors that collide with the environmental and social aspects of sustainability. Solutions must be found that favour sustainability in all areas, but at realistic costs.

Economic sustainability is defined by Pacione [2005] as the ability of the local economy to sustain itself without causing irreversible damage to the natural resource base on which it depends. However, society today is based on growth in production and consumption as part of the competitive global market, and growth that does not affect natural resources is so far not possible. So the key question is really; what contributes to high costs for society or investors and how can urban development be planned so the costs of investment and maintenance are not too high?

Focus
The focus of the theoretical chapter is density and neighbourhood structures and their meaning in relation to the different elements of sustainability. We start by looking at the direction of the social structures, where lifestyles and the breaking up of traditional family structure give meaning to a denser city which can support more people. The dense structure makes it possible to support different services and gives better choice of mobility. Neighbourhood becomes a natural structure to review, in order find out more about what considerations should be made when deciding what the area should consist of. These functional aspects are the main reason for looking into density and neighbourhoods.

Lifestyles
We begin by looking at what structures make up society to identify the social patterns and address the needs of the citizens. The changes that bring society forward have impacts on both spatial and social processes. Castells outline the importance of the social dimension in cities as he states that "Space does not reflect society, it expresses it…" [Castells, 2005]. Lifestyle is a highly relevant topic when looking at how people manage their lives, and how their values are reflected in society.

The increased focus on individual lifestyles and materialistic values contribute to a more extensive use of resources. Modern society is split between consumption and moderation as the use of resources increase while the resource base is decreasing. There is a general increase in leisure time and people define their identity by using their leisure time to select different activities. Identity is strongly linked to place and what place can offer and people want to belong to a place that represents their interests and identity.
There is a dilemma between the increasing importance of individuality, demands for experiences and consumption that should be catered for and this must be balanced with the use of resources because it has consequences for the environment. One example of this is how the individual life style generates more mobility and increase in traffic.
The individual is limited in sustainable living by the possibilities that exist in the larger scale, meaning that as consumers, people can only purchase and use the products made available to them. It is not likely that people will give up the benefits of modern society, such as increased possibilities for travel by car or airplane. The changes must be made on a different level, such as implementing renewable resources that have less impact on the environment. A change in the layout of people's daily schedules becomes affected by new possibilities in technology and change of values. New forms of everyday life in the metropolis will emerge, and sustainability might most importantly come from here – from how and to what extent the new lifestyles finds new directions that suits their well being [Manzini, 2003].

The current development in society is showing a more singular culture, where smaller units are the result of the break up of the larger families. The family structure becomes more individualised as single parenting and unmarried partners are more common. This affects how housing, neighbourhoods, public space and transportation are arranged. More single households mean more use of energy since each small apartment still needs approximately the same amounts of energy and there are fewer people to share. Smaller families also mean more houses per family which makes districts bigger as less people occupy more space. In order to keep the districts from growing too big, higher densities must be considered.

Seeing that the social trend creates fewer people per apartment and more space needed for one person, we can conclude that such a development will decrease the total population within a city core. With departure in the growing number of small families, higher density is important because it allows a larger population to support shared services and transportation. Increased density gives more people proximity, which can be used to compensate for smaller and more dense living.

DENSITY

Different city models have been valued in terms of sustainability, but the findings suggest that that the city form relates to the characteristics of each city and therefore is different in each case [Frey, 1999]. The following will address the compact city and its benefits as a city structure.
The attempt to keep the right balance between green and built environment is used to support arguments for higher densities within the already existing cities, as a way of making the city a more sustainable form. Although the aim is to reduce the impact as much as possible, change, growth and development is impossible to achieve without affecting the nature.

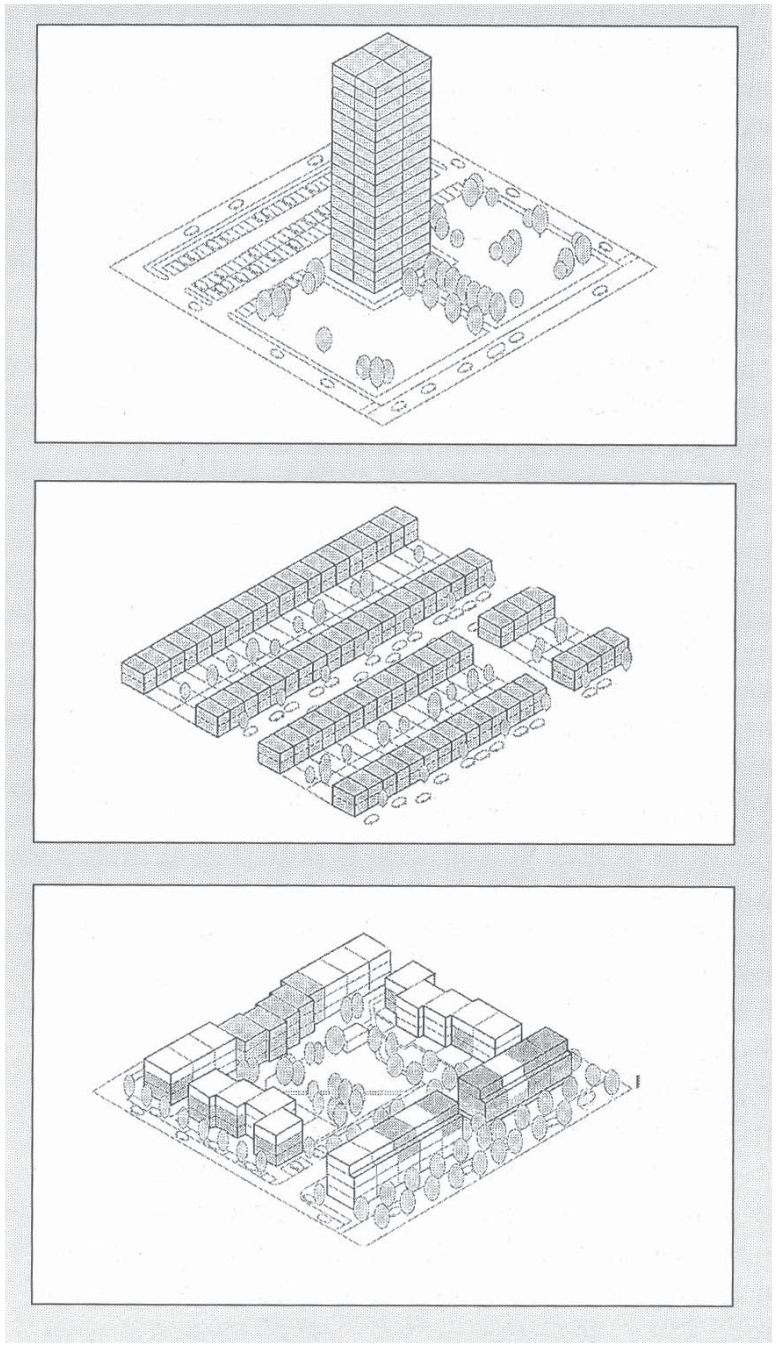
Compact cities can offer a high quality of life while minimising resource and energy consumption by reducing the space needed per head [Manzini, 2003]. Development of greenfield areas is without obligation in a sustainable perspective because it is an easy solution to providing more dwellings within a city. Pressure on greenfields can create a sprawling city, and requires the use of new land, which is a scarce resource. Density has been mentioned as one key in achieving a sustainable environment [Frey, 1999]. This is true for a structure supporting transportation, services, mixed-use and green areas. People of different age, with different lifestyles and family situations need different types of housing

and services, which is difficult to accommodate in a low density areas, as there is not enough people to support the different activities. A dense area can support walking distances to different functions and services. A dense city structure is also important in relation to energy demands, especially for transportation. [Pacione, 2005].

While density might not be the best solution everywhere, it is an important in cities, because a city is by definition a limited area. Horizontal sprawl is, as many American examples show, not a desirable or sustainable city form. High density within the city is therefore essential in the growth and development within the city. Lynch direct critique of the suburbs, especially at their effect on access in the light of energy shortage and on behalf of those who cannot drive, supports one of the major arguments for making cities denser. [Lynch, 1981]

High density also has some drawbacks. Less light, space and privacy, large building masses, lack of view, more required parking and more traffic and more waste are just some. High rise building and density means good economy, but gives some negative effects to the surroundings. Congestion can be a problem in dense areas and dense cities can be compromising for the green areas of the city and the quality of the environment [Frey, 1999]. The objectors of the dense city suggest a multi-nucleated city, the advantage being smaller centres that relieve the traffic to the large core [Frey, 1999]. However, this is undermining the reason for living in the city because people live in cities to be close to all forms of activities and a multi-nucleus cannot support this diversity.

Lynch agrees that there is no such thing as a *general* optimum residential density, because there are substantial differences between nations, but also between social groups within nations. [Lynch, 1981] Although high density is argued as important, there is an upper limit when the positive outweighs the negative. Density is about the more, the merrier. It must be considered in regards to social, historical, topographical context of each place, not destroying well functioning parts of the city. It should not just be a product of its time, but also its place.
The benefits gained for people living in dense areas are closely related to the benefits of neighbourhood structures. This should be an integral part when planning high dense areas.



Picture: 2.2.1 three ways of achieving the same density [Carmona, 2003 p.183]

NEIGHBOURHOODS

The discussion takes departure in what was the basis and principals of neighbourhood structures, while seeking to find some new form and meaning of neighbourhoods in the modern city.

Size

The neighbourhood by Pacione is the immediate area around ones home [Pacione, 2005]. He marks neighbourhoods smaller than communities, and finds neighbourhoods more attach to the spatial boundaries, while communities flow across space [Pacione, 2005]. While the flow of communities might be difficult to regulate, spatial structures are useful to look into for planning purposes. Lynch claims it is only useful to talk about size of neighbourhoods when there is a local unit where people know each other because they live close to each other, and they share some values or services. This size, he says, have no more than 15-30 to 100 households. [Lynch, 1981] The different ideas of neighbourhood size is mostly relevant when talking about the social benefits of neighbourhoods, for instance that people in a neighbourhood should have some sort of consensus and be willing to organize themselves in 'case of emergency'. However, as a physical structure with focus on functions, we choose to define the neighbourhood as a larger area that has the possibilities of supporting different functions.

Structure

The physical structures of a neighbourhood give benefits to its population; the selection of services and increased accessibility are some of the main points. The less mobile are given better conditions when the daily activities are within walking distance and people are spared from making cross journeys if their daily needs can be covered in their own neighbourhood. The critics of the neighbourhood structure argue that people who live in a neighbourhood might not be using the local facilities [Frey, 1999]. An important argument for neighbourhood structures is that they provide services for the less mobile. It is also about giving people the choice of using services near by and not having to travel.

Conceptions of neighbourhoods are argued to be top-down constructions with little meaning viewed bottom-up [Carmona, 2003]. Early neighbourhood structures were based on closed units to supply a closed population. It is mostly these rigid neighbourhood structures that are target for critique, because the social systems do not respond to it [Alexander, 1967]. It is important not to confuse the idea of physical neighbourhood to social communities. Social neighbourhoods, or 'community of interests' are based on the relationships between people and is detached from geographic position. Because of increased mobility and individuality, people now choose from all over the city for activities, jobs and friends. This makes the neighbourhoods weaker in terms of bonding between people that occupy the same space.

The layout of the city and land-use becomes important in finding the balance between the green and the built. Lynch sees the city as a continuous fabric, not a cellular one, meaning that overlapping and interweaving of areas and functions in the city is essential in order to avoid segregation [Lynch, 1967]. The structure can be seen as a centre or a core that reach out to its surroundings. The neighbourhood should be a part of the semi-lattice pattern as described by Christopher Alexander, where the complex weaving and overlapping make cities interesting. [Alexander, 1967]

The main purpose of using the idea of a neighbourhood structure is to see the area in its context. Despite of his critique, Lynch agrees that the spatial form of neighbourhoods can be used, as long as it does not restrain the people from using the whole city [Lynch, 1981].

Early neighbourhoods

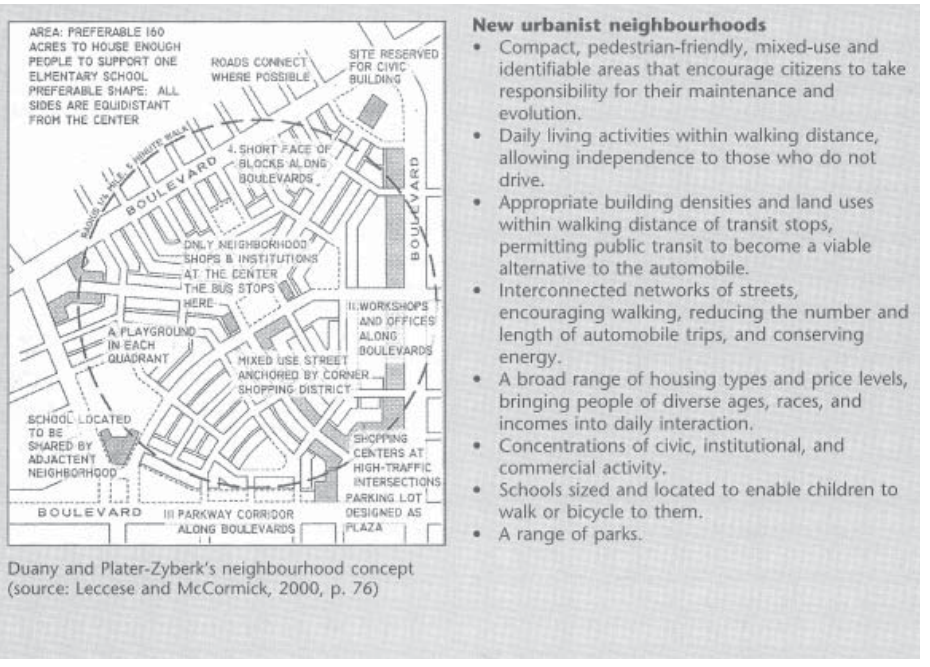
Lewis Mumford [1938] suggested that cities should be divided into manageable neighbourhoods. In his view the big city is mechanical and inhumane. The neighbourhood idea is based on making socially balanced communities in the post-war society. However, the attempts at social engineering undermined the complexity of urban life, so the social irrelevance of neighbourhoods was recognised and the function of the neighbourhood was reduced to concern proximity [Pacione, 2005]. The neighbourhood as a physical unit meant practical considerations of proximity for the family to different activities.

Clarence Perry made a specific scheme for neighbourhoods and proposed that each neighbourhood should contain four basic elements: elementary school, small parks and playgrounds, small shops and public facilities within pedestrian access [1929].
While this might be the most important criteria in the 1920's, it is not necessarily the same today. Lynch criticises the way early neighbourhoods were organised around school units. The people needed to support a school might not be the same amount needed for supporting a grocery store [Lynch, 1981].

Pacione [2005] argues that by looking at the use of local facilities, personal identification with the neighbourhood, social interaction among neighbourhood residents and residents' consensus on certain values and forms of behaviour, the neighbourhood can be assessed in terms of quality. However, some of these are difficult to measure, because people have different experiences of a place and they use it differently. It also takes the idea of neighbourhoods further than the physical unit, as it represents a view of the neighbourhoods as social structures. Although the social benefits such as relationships and influence in decisions not necessarily reflect real life neighbourhoods, the mix of people contribute to diversity [Lynch, 1981].

Mix is seen as beneficial to a city and there are different opinions on how it should be done. Christopher Alexander argues that a heterogeneous city where people are mixed randomly will eventually become homogenous, as life styles over time become more common. His suggestion involves structuring the mix into different subcultures, each with its own identity. This allows people to choose which subculture they belong to, while still being able to experience different environments from other subcultures. [Alexander, 1967] To some extend, mixing in subcultures will occur by the market, as for example old and exclusive parts of the city are kept for the high income groups, the centre with small dwellings attract young and single, the outskirts become the areas for the lower income groups. The real life difference between engineered subcultures and ghettos therefore seems marginal.

The revitalisation of neighbourhoods is used to recreate its functional qualities because these qualities are still relevant in modern living. The modern neighbourhood 2007 might be a place of balance where different people and services are represented, containing functions to support an individual lifestyle.



Duany and Plater-Zyberk's neighbourhood concept
(source: Leccese and McCormick, 2000, p. 76)

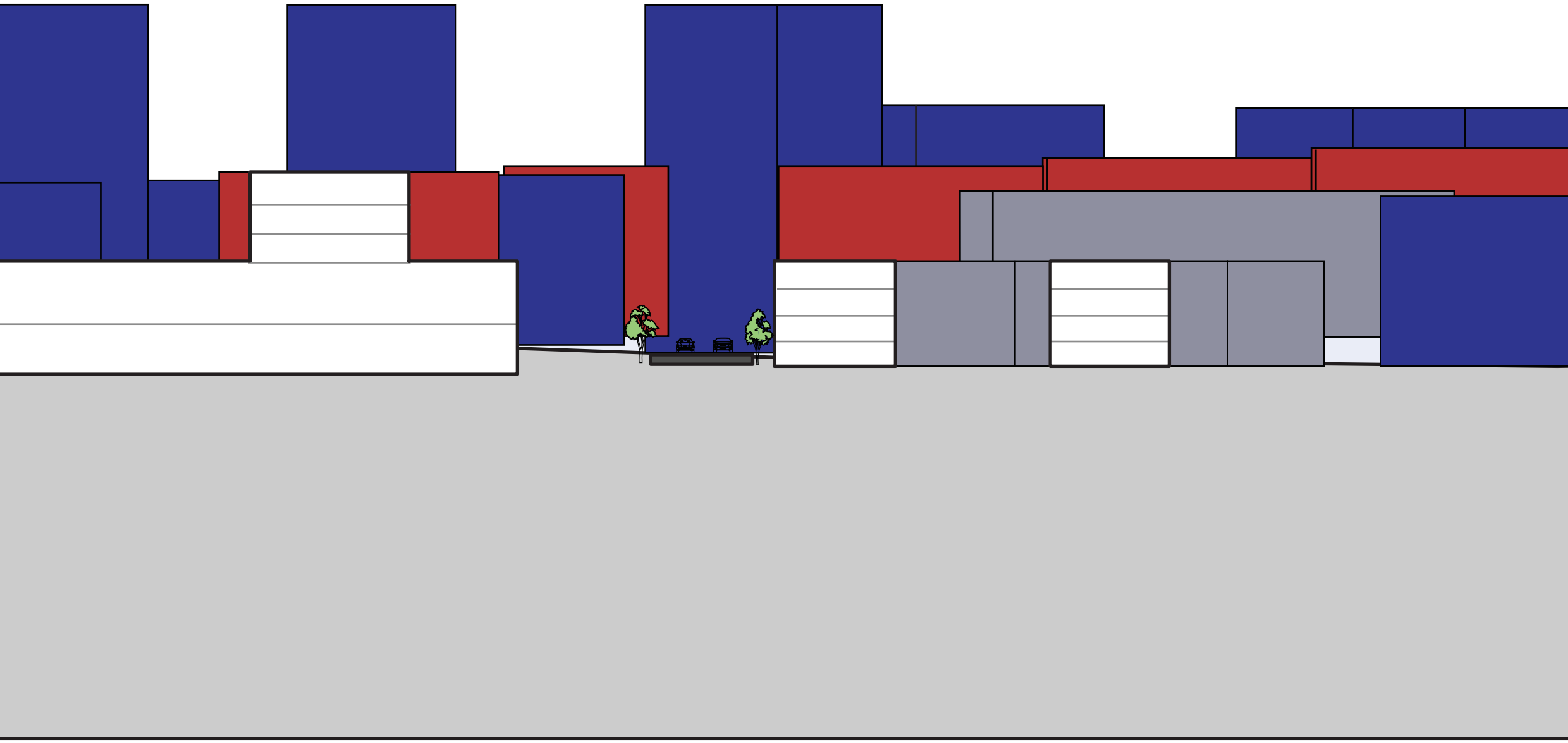
Picture: 2.1.1 Perfect neighbourhood figure [Perry, 1929]

INTENTIONS AND IMPLEMENTATION

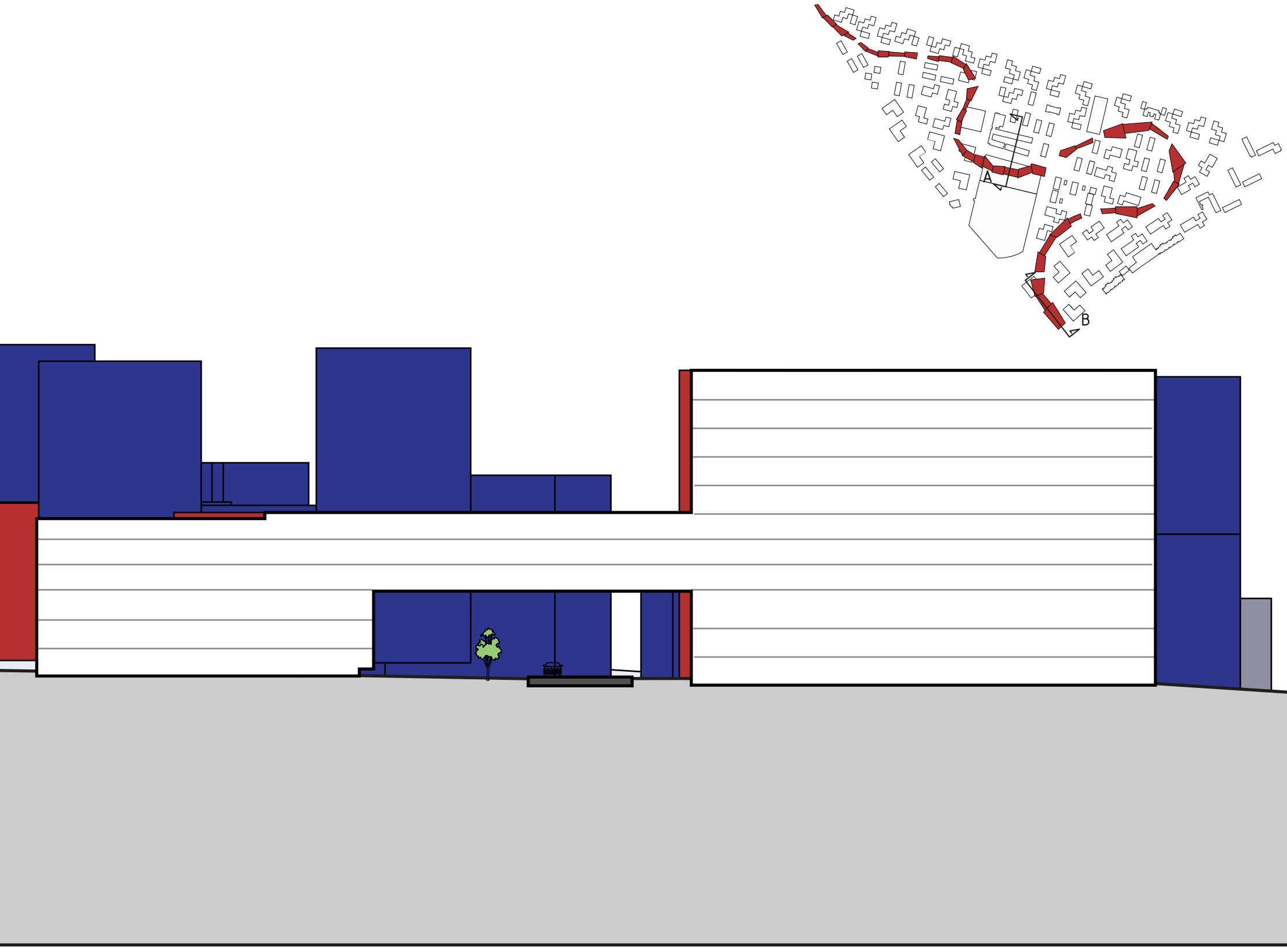
On the basis of the theoretical discussion, what can we draw of conclusions? The theory has given some ideas and inspiration for establishing a certain level of sustainability. Many of the issues are not possible to measure exactly, and how they relate to one another and form sustainability as a whole is what we in this section must establish.
A challenge for designers and planners is to convert the theories into real life, because they are often too general.

Sustainability in cities depends on both the single building structure and the primary structures, such as physical plans, the mixing of work and dwellings, transport systems, infrastructure, energy supply and green structures. These factors must be the point of departure when planning for sustainability. The environmental criteria include public transport, bike lanes, daily services such as shops, density, green spaces, low pollution, mix, and design for different use and users.
Social sustainability includes surroundings and that are based and attractive living and working conditions for all groups. The social criteria are based on inclusion that allows a social balance and supports different lifestyles. Aesthetically pleasing environments as well designed public areas must be provided in order to achieve a quality of living and possibilities for interaction between citizens.
Economic criteria for sustainability include flexibility, affordable housing for different income groups, and forms of management. In terms of profit and expenses, the balance must be in terms with the market.

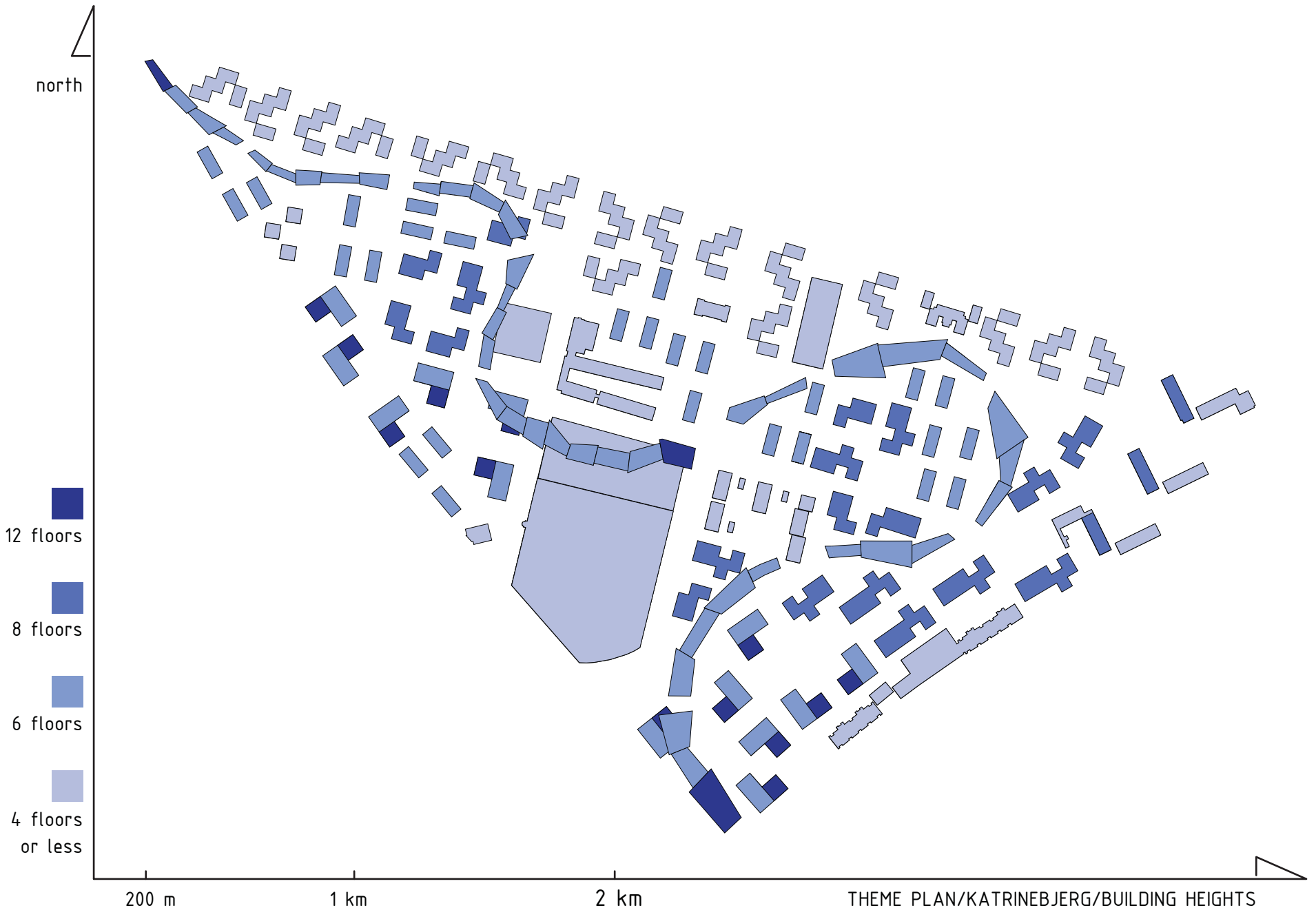
This plan is shown in 1: 5000 and an issue in 1:2000 can be found in the back of the report. Chosen elements of the design process are documented in the appendix (appendix E).



Section A, 1: 500. The section is taken from the area around Storcenter Nord.



Section B, 1:500. The section illustrates the ribbon crossing the road.



The theme plan shows the building heights. As the buildings are fairly tall there are supplementary shadow diagrams in the appendix (appendix G).

Density
There are many issues in regards to high density, and how it should be achieved. A high population density can support viable services, public transport and a range of activities. Creating higher densities in existing city areas can reduce the use of greenfields because the already built environment serve as brownfields and can relieve some will be used more in terms of space.

Creating high rise and dense areas gives a good economy, but also causes effects on the surroundings that are not so good. High-rise buildings are not a solution, as they demand more energy than low-rise. Density should only be created high enough to where it does not compromise important qualities such as sun and light.
High density means more parking. Parking spaces must be provided with restrictions, so that it is more attractive to walk, bike or use public transportation than driving a private car to work. This can be achieved by making fewer parking spaces or by limiting the use by fees or time restrictions.
High density means less energy on transport. But low density give more possibilities for recycling of waste and more opportunities to grow own food. The more dense the city, the more it requires high quality public place.
Building costs are also closely linked with density. Costs rise substantially as densities diverge from the low point in either direction – toward single family housing on the one hand, or toward high-rise apartments on the other. [Lynch, 1981]

The density will be about 170%, which is higher than the density in the surrounding context with density ranging from 25 – 125 % [Århus Kommune II]. Although there are cities that can support higher densities, this is not suitable for a city like Århus, famous for its low-rise sky line. Also, the Katrinebjerg area is not placed in the city centre, but at the inner ring road, which makes it a less appropriate candidate for the highest city density.

This density will be able to support a total of
- Working: 1/3 office space equals 4900 employees
- University: 1/3 university equals 8500 students and 5100 university employees
- Renting: 2/9 residential equals 5100 people
- Owning: 1/9 residential equals 900 people

(Appendix F for calculations)

The criteria have been to establish a balance of each group.
These numbers are based on what the chosen typologies can support.

Mixed functions
The reason for wanting mix is often cultural, architectural, or social considerations.
Among the benefits of mixed functions is better access to facilities, less travel, efficient energy and space use, choice of lifestyle, location and building type, enable walking and biking between work, home and services.
Mix can be achieved in two ways: mix of single buildings or buildings that contain mix. Today, there are more possibilities of mixing functions such as work and dwellings because there are no longer problems with pollution from the factories, as more work places are now offices.
To achieve a successful area with mixed functions, the rules must be established through planning regulation or financial incentives.
Mixing of for instance work and dwellings, give a more even flow of activity in an area because people will be present throughout the day. By making room for different functions that have some form of relation, mix can be achieved.
The possibility of mixed functions within an area or a building supports the idea of robustness, but the economic downside is that the cost of construction becomes higher due to different rules for different building types such as shops and housing, and that different leasing periods reduce the value.
Mixed functions turn out to be hard to achieve within the same block, even with the presence of political strategies. Often it is because of economical or financial reasons.

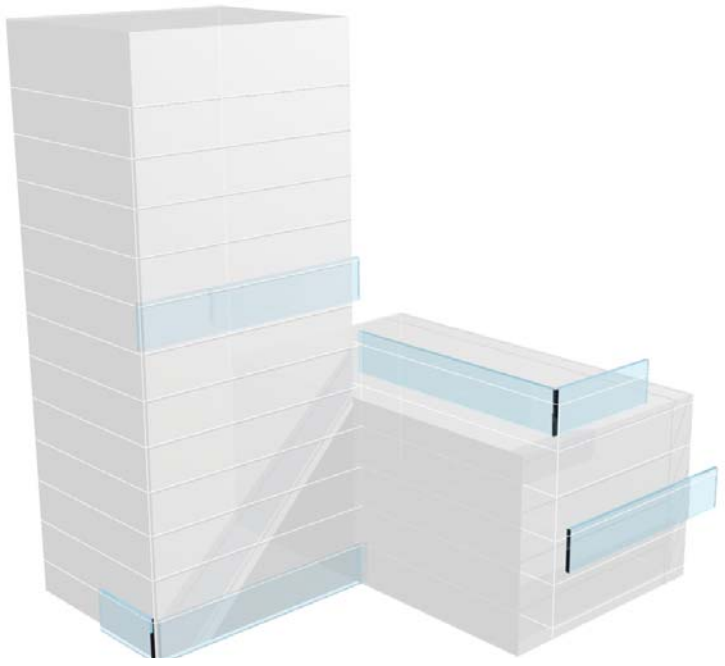
Already the municipality is talking about mixing university and office, but only the existing university is in the municipalities mind. Århus University already lack space and is using some of the outdated industrial buildings in the area. It seems reasonable to presume that the University of Århus will keep expanding in the next decades, as Denmark is concentrating on development in knowledge industries. The most spacious area in the vicinity of the existing campus is the Katrinebjerg area. By mixing the office buildings not only with the university but also with residents, the area will be lively also in the area in the hours after the workers have gone home.

The buildings in the plan are conceptual and they are made to support different functions. The functions are based on the existing activities in the area, and are made to support and balance its context

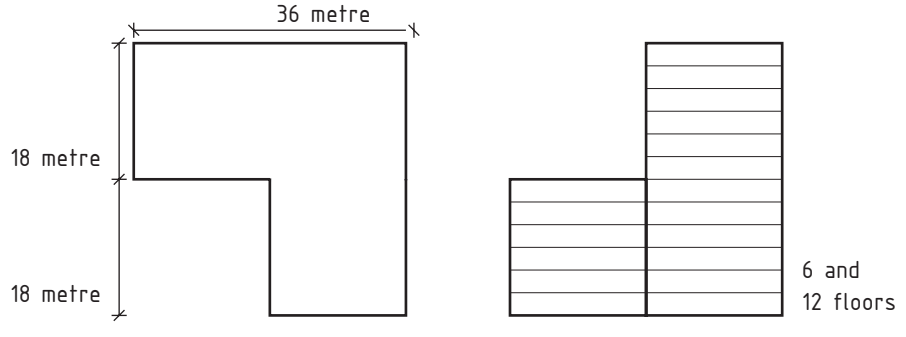

north
housing: owner and rental
institutions: mainly university
industry: maily office and service
200 m
1 km
2 km
THEME PLAN/KATRINEBJERG/FUNCTIONS PLAN

Office

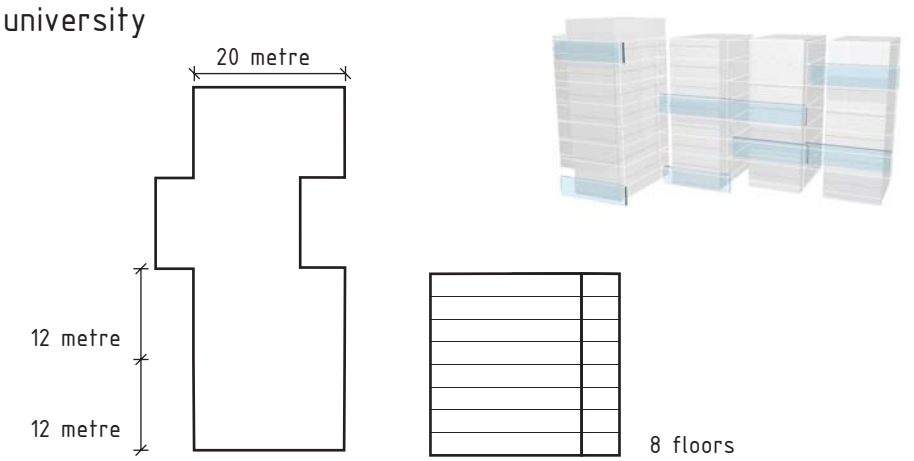
- The idea of the office building is that it is suitable for more storeys than other typologies. The typology is an oblong unite flipped horizontally and vertically. This is the tallest basic typology with its 12 storeys. In the plan, the typology is recognised by the L-form that forms an outdoor area. The 12 storey tower will provide a nice view, and is kept slim so it doesn't block a large part of the view for others. It is made at 12 storeys to avoid conflicts with the wind or casts large shadows for other buildings.

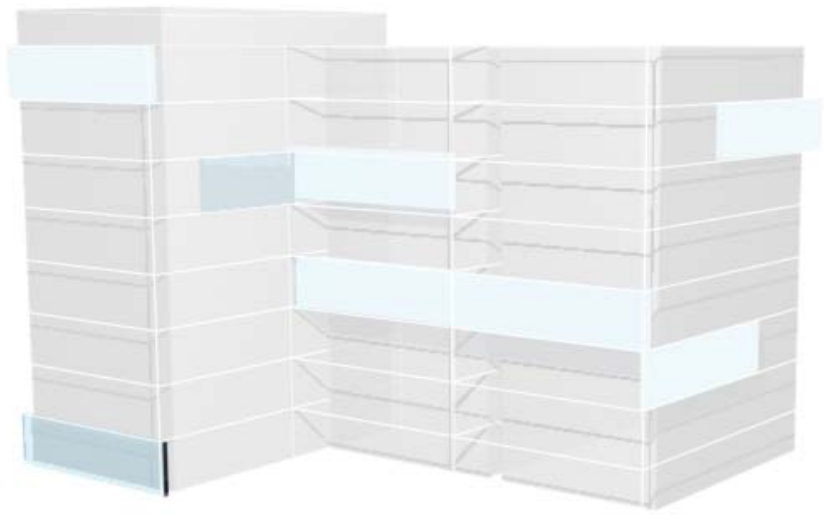


office



university





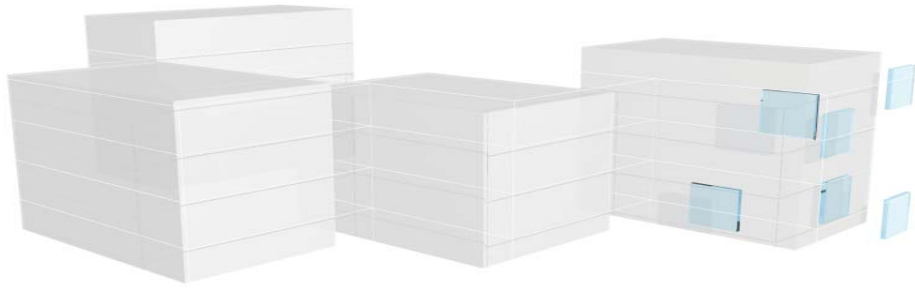
University

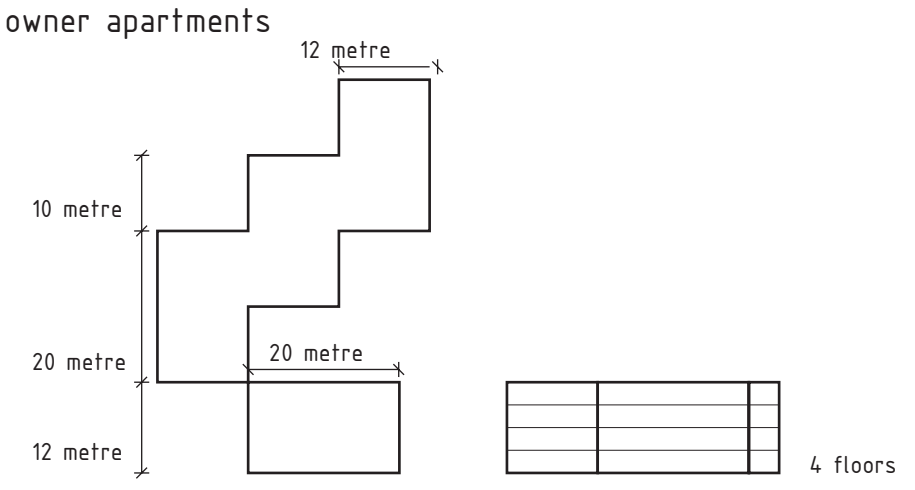
- The typology is a 8 storey lamella building. The lamella is joint by multiple small unites staggered giving the structure a complexity. The length of the lamella is its flexibility, creating variation and contrast. The different sized buildings make it possible to place both small and large faculties in the area.

Housing

- Rental apartments:
  The buildings are owned by housing association and/or are youth dwellings are 6 storey lamellas. The lamella is one large oblong unite that is space efficient. It has a simple shape that is clearly defined and regular in contrast to the university typology.

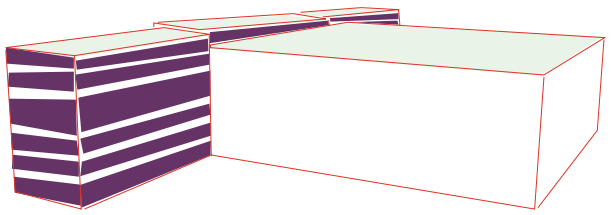
- Owner apartments:
  For family residents, there is anecdotal evidence that dwellings should not be made more than 4 stories high. The problem that arises is that children loose contact with what happens on the streets as buildings grow higher. The possibilities for interaction and visual connection becomes reduced in taller buildings, it erases the details.
  The owner-occupied flats are 4 storeys and the lowest typology of the area. It consists of the same small units as the university typology though they are not joined so close but arranged to form different shapes in outdoor areas and possibly small private gardens. The pattern of the typology is complex.

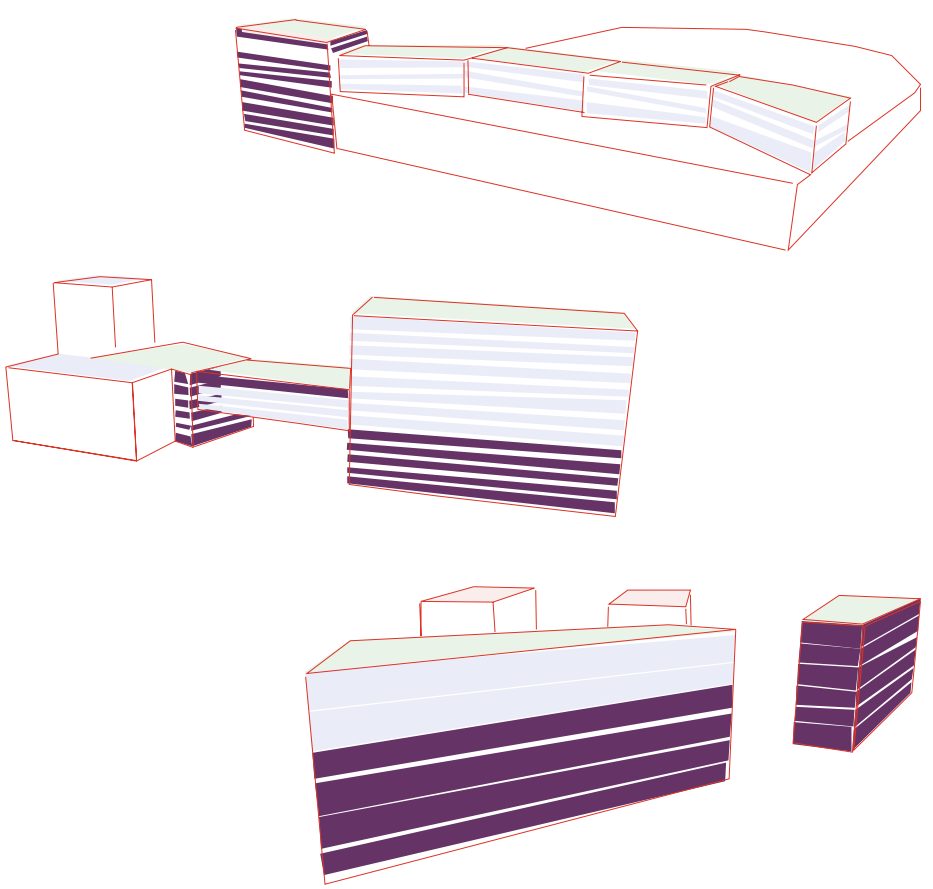




Mix

- The ribbon contains mixed functions and the typology can change in width and height. It can melt together with other typologies, climb over them or stop for roads. Different property owners can build different parts of the ribbon. The roof will be a visual green space not necessarily reachable for the public. There will be a south facing terrace on the 1st floors leading along the building.



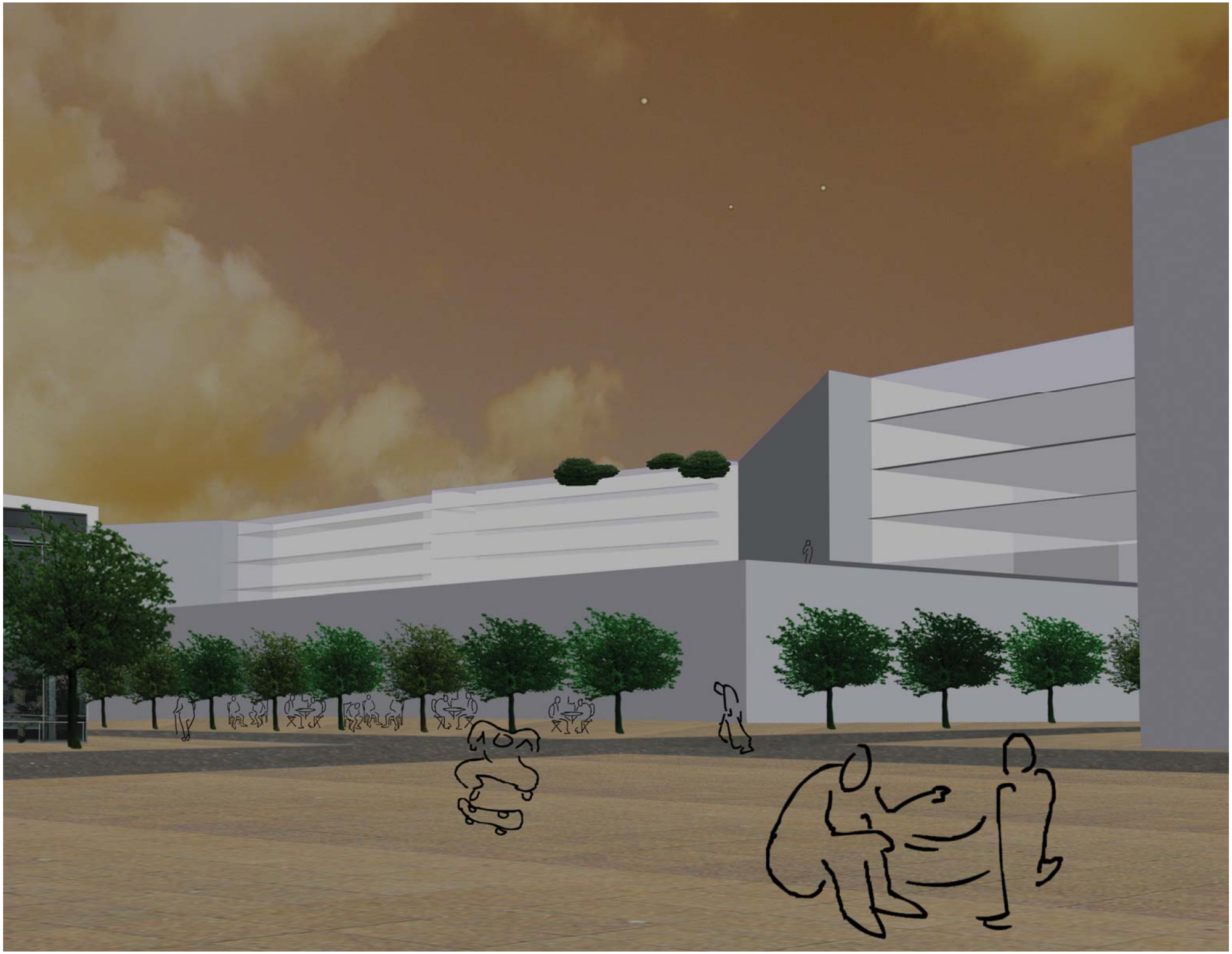


Social mix

Social mix is believed to reduce social and locational stratification and is achieved through high density and a wide range of dwelling types to attract different types of people. Social mixing in the free property market might be difficult to achieve in the long run, because similar people are attracted to the same places. In order to preserve diversity in the urban field there must be a range of offers to accommodate the diverse population, not only the major and homogenous group.
Attempting to create a social mix might be regarded as social engineering, but in this case, the conscious mix is highlighted in regards to the balance of services and supporting the needs of people at different stages of life.

Mixing of different types of dwellings such as rental and owners apartments is a way to offer possibilities for living in the area for different people. Buildings may be owned, rented or subsidised. The aspiration is to attract three main dwellers; students, immigrant and the smaller family units. The wish to attract the students is obvious since the university is expanding; the need for student housing will increase.
The immigrants of Århus are currently being placed in Gellerup Parken, which is an already socially challenged area. In Copenhagen, the municipality has had better success in choosing different areas for immigrants, not concentrating all of them in one area. Because ghettos are an issue in Århus, one would think that the municipality plan would have something to say about how to solve this problem. [Århus Kommune] But it seems not. In order to make a different place for immigrants, we suggest that there can be some large rental apartments in Katrinebjerg. Finally, the small family unit, mainly couples, single parents or young families are intended to stay in owner apartments. These apartments are convenient for the neighbourhood distances for those that might need it the most.

The opposite side shows the centre promenade in the evening. The ribbon melts together with Storcenter Nord and becomes a new addition to the centre with facilities such as cinema and cafés.



The green plan shows the distinction between the large and the small outdoor areas. The large areas are public, while the small areas are intended for people in the surrounding buildings. Trees are shown where the existing avenues are, but also on the green areas to contribute to more enclosed spaces.

Public place

Urban design must connect local life, individuals, communes and global flows through the sharing of public places. The built environment can influence the behaviour and well-being of people by for example encouraging or facilitating interaction. Sometimes it can be a square, sometimes a park, sometimes a boulevard, sometimes a few square meters around a fountain or in front of a library or a museum, sometimes an outdoor café. What matters is the spontaneity of uses, the density of the interaction, the freedom of expression, the multifunctionalism and multiculturalism of the street life [Castells, 2005]. Gehl argues that it is possible to influence how many, how long and which activities there is in public space [Gehl 2003].

Public space is important in high density areas to avoid compromising the citizens need for neutral space and green areas. In doing so, the quality of life becomes reduced and the social sustainability is no longer maintained.

Public space is in essence a space that is freely accessible for everyone and public is the opposite of private. Following this reasoning, we conclude that the quality of space is determined by the users of the space and their values.

A hierarchy of outdoor space will be made throughout the area. The areas have different functions depending on size and position. Green areas will be first priority in the development. Vegetation and forests can be more than green lungs and spaces for recreation. They also play a role in the maintenance of the water regime, and the modification of the climate. Many of these urban design actions are small scale, but they have major effects on the overall nature. The area will contain green spaces that have different functions, either public or private areas. Recreational areas are attractive for leisure life, and provide a good living environment.

In order for the green areas to be attractive, the distance to them must also be reasonable.

The landscape strategies must be made together with the building process in order to become integrated in the area and not just appear in left over areas.

Large meeting place

- The promenade is situated at the northern side of Storcenter Nord where the existing tree avenues are. The trees are maintained and as are the new university buildings, while the other side is renewed. A new addition to Storcenter Nord is integrated with the ribbon, and the facade of the centre opens more outwards towards the plaza. The plaza becomes a meeting place with cafés and activities. A movie theatre and other activities, such a night open café, should be placed close to attract a broader range of people in the evening hours.

Medium common squares

- The medium squares are spaces for activity and for fun. The 6 squares are spread out so that different buildings share the squares. The squares offer an opportunity to meet outside of the shopping area when playing basket, golf or going to the playground. They can also function as spaces where different events and parties can take place.

Small private green spaces

- The small green spaces are the traditional small spaces around buildings. The intended use is small playgrounds, benches and trees and BBQ.

Site specific
The design must be site specific and provide quality in the microclimate. This is also important in the general context of the area, as the development should relate to the existing surroundings, being density, building heights or functions. The position of buildings, roads, trees etc, orientation of spaces and facades towards the sun, grouping and space between buildings, wind, position of entrances, noise and pollution, are all part of microclimatic design, and it supports the existing qualities by making the best use of it. Using the sun for heating purposes and lighting means that energy use will be reduced, and so the impact on the nature. Daylight and natural ventilation should always be prioritised where it is possible. Architecture should cooperate with nature, and both in area and building level, energy and environmental considerations should primarily be solved through design.
The plan reflects positioning of buildings to form different outdoor spaces. The outdoor areas are shielded by the buildings from wind, and everyone has access to sunny areas. The buildings are mostly placed facing south, which will give maximum sunlight. For the detailed site specific planning it is important that this is taken into consideration by each developer.

Flexibility
Long durability is an important criteria for sustainability. The goal is to get a flexible and adjustable architecture that can respond to replacements and change in functions over time.
Buildings that have a short lifespan should be able to transform or dismantle. Conservation, processing and recycling of the existing building mass is important in regards to the handling of resources and waste. Flexible development is also of economic concern. It must be seen in the long term perspective, as initial building costs will be higher in order to reduce the maintenance costs in the future.

Flexibility in this project is represented by the ribbon. It is intended to accommodate all types of functions; work, dwelling and university. The functions will connect in different ways throughout the structure, while they all share a "common ground". The structure is also flexible when it comes to design, as it can have different widths and heights and facades. With its possibility of being programmed for many different purposes, the intention is that it will be a lasting structure.

The opposite side shows the ribbons starting point at the Vestre Ringgade. Here it functions as a landmark for the area attracting visitors to the area.


SX 36 476


north
new redirektions of bus
existing bus routes
ribbon
roads
buildings
200 m
1 km
2 km
THEME PLAN/KATRINEBJERG/BUS ROUTES

Traffic sanitation plan

The efforts made to gain sustainable transportation are based on reducing the traffic by leading the citizens to take public transport instead of private cars, and more rarely, bike or walk. Private transport must be relived by public transport, and easy access and availability is important if the use of alternative means should be considered to compete with the car.

Pollution and noise that comes from extensive use of cars can be reduced by offering a broad network of public transportation and promoting walking and biking through establishing attractive routes. People are quite rational when it comes to transportation they choose the most convenient, it is important to make the connections to public transport available. A proposal for a new bus stop in the middle of the area is therefore used as a mean to make this option more attractive (existing bus route see appendix C).

The layout of the road system must favour slow traffic. This will be done through narrowing the roads and make some of the roads pedestrianized. When making such a grip, it is important to be aware of what the consequences are for the surrounding areas. By reducing traffic in one area, other areas might suffer from an increase. In Katrinebjerg, the actions in traffic reduction will probably only mean positive benefits to Katrinebjerg, and no consequences for other. Because major roads are already established on the edges of the area, they will be the most frequented.

The typologies will have mainly underground parking, and some surface parking around the buildings.

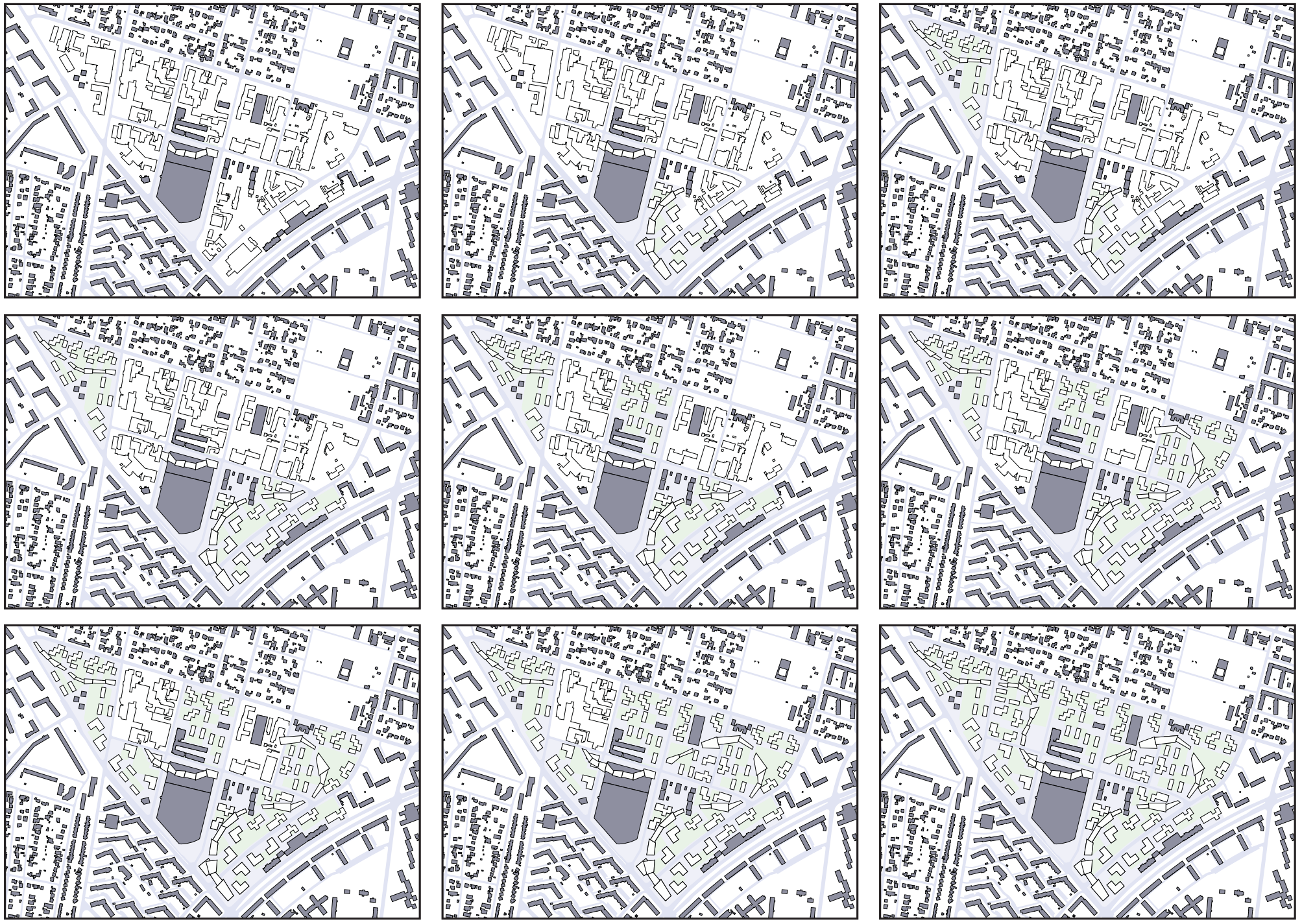
LOCAL PLAN

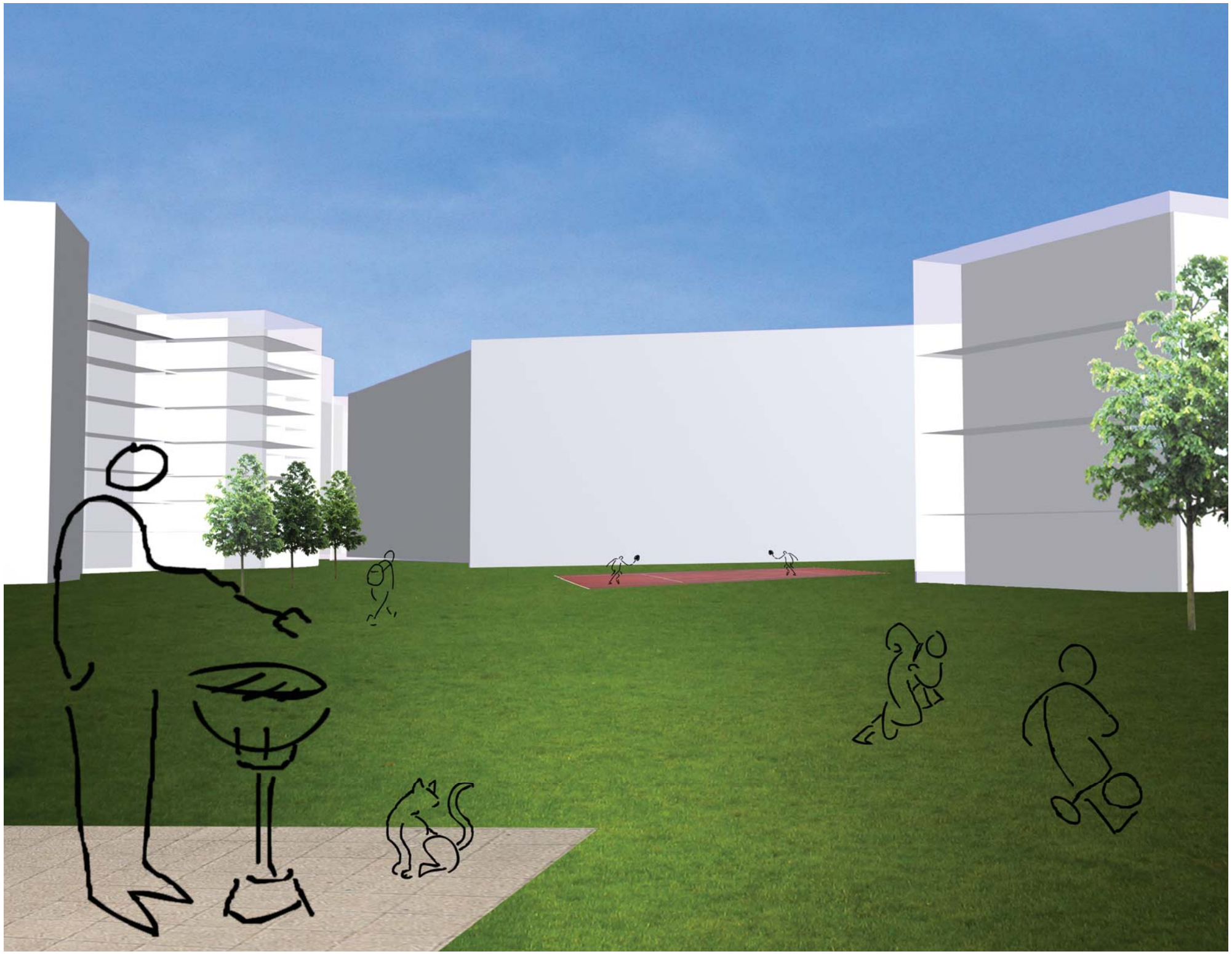
The land registries that for the most part are quite unlike the conceptual master plan will either stay as they are or the property owners will build the part of the plan that is in their plot (land registries see mapping appendix C). The more likely scenario is that more land registries will be bought by the same developers and put together to make larger land registries.
The municipality plan must have an addendum in order to change the status of the area, so that the area is not an industrial redevelopment area, but a mixed use area. The overall structure of the roads remains the same, and as the roads currently are wide enough for heavy trucks they will be trimmed down even though the number of people in the area increases.
The area can be developed as one large local plan but it can also be cut up into smaller local plans but this will most likely spoil the idea of the ribbon.
Because the proposed plan is conceptual, it means that the placement and shape of buildings and green areas are only directional. They function as a guideline for where and how buildings can be placed in order to achieve the qualities discussed in this project,

The construction is suggested to start by Storcenter Nord, where there are plans for an extension of the Storcenter and a promenade. Making the transformation visible from the outside suggest that it would be preferable to start the second phase around the northern and southern end of the ribbon. The plan is however not relying on specific parts to be completed before others.

Local plan purpose:

- to make a high dense area near the city centre
- to make a mixed function area
- to make a continuous building structure connecting the area





DISCUSSION

Katrinebjerg represents an old piece of Århus. However, its close connection to the university makes it different from other areas. The new atmosphere of the area will be affected by the mix of functions. Reaffirming the connections to the university will create a stronger identity in the area, and by adding more university and offices, Katrinebjerg becomes the knowledge zone of Århus.

In the initial phases of the report, it is outlined that environmental sustainability is about creating a balance that allows different functions and makes the area to appeal to a larger diverse group. In the design, the priorities are reflected in the choice of typologies, the variety of outdoor space, the opportunity for different activities and the context which is thought to become an extended part of the area, contributing with its mix and be part of the balance.

The physical elements of outdoor space and the different typologies lead to thinking of social sustainability, which includes providing the possibility for interaction in a diverse population between different groups. The mix of functions makes a good foundation for accommodating different lifestyles. By using typologies that appeal to people with different needs, the intention is to secure the area from becoming exclusive and homogenous. The services and activities also correspond to different needs, such as play, entertainment, shopping and institutions. The different types of outdoor space relates to different interests, and the main public area as a commercial promenade makes a contrast to the small and more private areas for relaxing and tranquillity. The mix of people crosses many groups, as mix can relate to age, gender, race, class or lifestyle. Mix is simply the presence of two or more groups.
The economic sustainability comes in relation to the mix of people. The different types of housing and finance of housing gives opportunity for student as well as more established couples or families to reside in the area. The chosen typologies also reflect economy as they make a good use of space and are affordable in construction costs.

The opposite side shows one of the private green areas in the foreground and one of the larger and more active areas in the background. In the illustration a tennis court is placed in the public area.

In the design of the plan, the ribbon had become an element that gives identity to the area, represents mix and flexibility, breaks up the pattern of the other buildings and ties the area together. The ribbon makes it possible to from mini neighbourhoods within the area, because it goes across the different functions. By grouping together 5-10 buildings with the same function, each small group becomes a small community. The ribbon allows more a more dramatic mix which makes the small communities connected to each other.

The design also reflects a high density area. Prioritising high density means that other qualities are compromised, such as space and sunlight. Although you can never have your cake and eat it too, the layout and shape of the buildings have been carefully considered in order to avoid deprivation of light and air. Some of the functions, such as university and office often shield their buildings from the sunlight because it can get too warm. Therefore, these typologies can afford to be taller and closer to each other. The design is made on the assumption that it will be attractive to different groups of people, exemplified be student, small families and immigrants. These are groups that are thought to appreciate proximity to the city and a variety of services and activities within walking distance. But there are certainly also groups that will not find such a dense area attractive. These get naturally excluded, but might already be the ones living in the suburbs. A city core can rarely offer big houses and gardens.

The functional quality of neighbourhoods has been a theme in the theoretical discussion. Katrinebjerg is already housing a number of different functions such as schools, day-care, offices, housing, shopping, public transport, green areas within close distance of the plot. The main objective is therefore to provide the different activities and public areas that will attract people with different needs. The existing qualities in the mix and neighbourhood make it natural and easy to continue and emphasize.

CONCLUSION

The fundament of this project has been to investigate what sustainability means for planners and designers in an urban scale, because the basic conception was that sustainability has to be incorporated at an early stage in planning for urban renewal, and that it needs to focus on all of the elements of sustainability, not only the ecological.
Although we cannot save the world by writing this report, it is important to make choices based on thinking of the future.
In order to explore the world of sustainability, some definitions had to be made. From there on, considerations was made about sustainability in the context of the Katrinebjerg area.
The base was the criteria from the NABU tool, and some keywords were selected for further investigation. Density became a natural theme in relation to this brown field development. This was reasoned by density as a way to decrease the need for travel and greenfield development. From this point, we moved from density to neighbourhoods. Katrinebjerg has already many of the functional qualities of a neighbourhood, and these are worth keeping and reinforcing. The functional qualities being mix of function, social mix, etc. were specified and reinforced in the design work.
The process of designing started with experiments on density. The relationship between height and land use was balanced, and different typologies selected to fit different functions.

The final conceptual plan reflects sustainability as follows:
Environment: density, focus on green structures both in ground level and on the ribbon, mix of functions (service, university, office, residents), site specific in terms of heights
Social: mix of people, different outdoor meeting areas, typologies to fit different needs, different activities
Economic: options for different price dwellings, typologies that have inexpensive construction, good land use.
In order to find the right balance for economic, social and environmental interests, there needs to be involvement of the municipality in forms of regulation and frameworks, private developers and the citizens. In the process of planning, it is important to keep the long term perspective and focus on the robustness of the area. Realising that the future needs of the city might not be the same as they are today is fundamental.

As the final result is conceptual, the intention is that further and more detailed planning of the area will involve sustainability in a balanced form. Although our perception of sustainability, as shown in this report, we also realise that development is a dynamic process, and that what is right in one context might not be for another.

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APPENDIX A: METHODS

The following will describe the methods used through the project to deal with different assignments. A well defined and well considered method gives the project a structured approach and will thus help to achieve the goals of the project.

Introduction
Problem based learning is a method to learn through project work. The project needs to lead through a process of recognition. This means that the project has ongoing reflections of the work and the results both in the phase of the introduction, the analysis and the design.

Theory
The basis for the project work is our theoretical foundation, which gives us an insight to the identified themes of the initial problem. The theory discusses the subject of sustainability.
The theory is used to specify a toolbox for sustainability that will be further developed in the concept. Through the obtained knowledge it is possible to set up preliminary qualitative requirements for the design. The theoretical method is reflective, where reading the theory is reflected in the process of writing a theoretical synthesis. Small case studies will be used to exemplify and qualify the theory and the method used for the cases will be Yin.

Analysis
The main analysis and mapping exercises consist of data collection, organizing and concluding, and using this information directly in the concept or design.

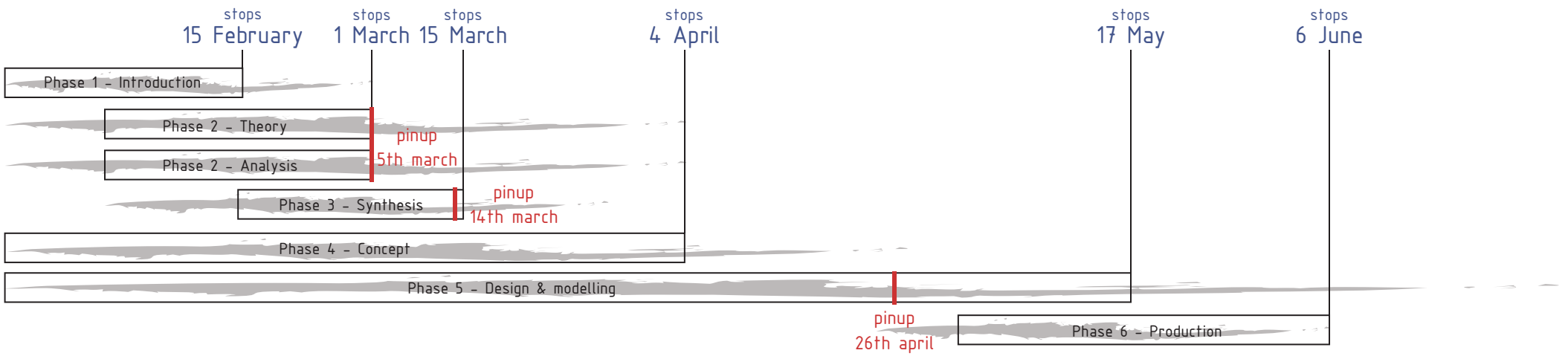
Concept
The concept will be used in the design process, where together with case studies and theories, related to the physical shape of the urban environment it will give basis for shaping a new urban space. The successful completion of the project requires that the knowledge obtained through the project is reflected in the design.

Design
The method of design is based on working with models. This method in it self is a reflective method. Cases will be used as state of the art examples for inspirational purposes.

Iterations
The design will be an ongoing process throughout the project, as will the analysis/theory and reflection. The design asks questions and becomes a spiral process in it self. The more iterations the design has the better the arguments for the end result.

End comment
One objective in the start of the project was to make a toolbox that could be used to measure or identify sustainability in urban development. However, it became clear to us that it would be an enormous task to identify all relevant criteria for sustainability. Therefore the choice was made to focus on density and neighbourhood structures in relation to the case area.
Initially, the idea was to investigate smaller cases that could display some form of sustainability, either as social, environment or economic. Several searches found mainly sustainability expressed as ecology and none of the cases were relevant enough to use as examples for our area.
The working process became different from what was expected. There was less focus on methods and concept than what was originally intended, and the whole process was interweaved, not spilt into sections as planned. This also affected the chronology of the work, and the strict deadlines became more diffuse as the work was on several parts was done simultaneously.

APPENDIX B: TIMETABLE



5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

February	March	April	May	June

Phase 1 - Introduction: Initial Question locating site & theory

Phase 2 - Theory: Problem Formulation Framework

Phase 2 - Analysis: Mapping

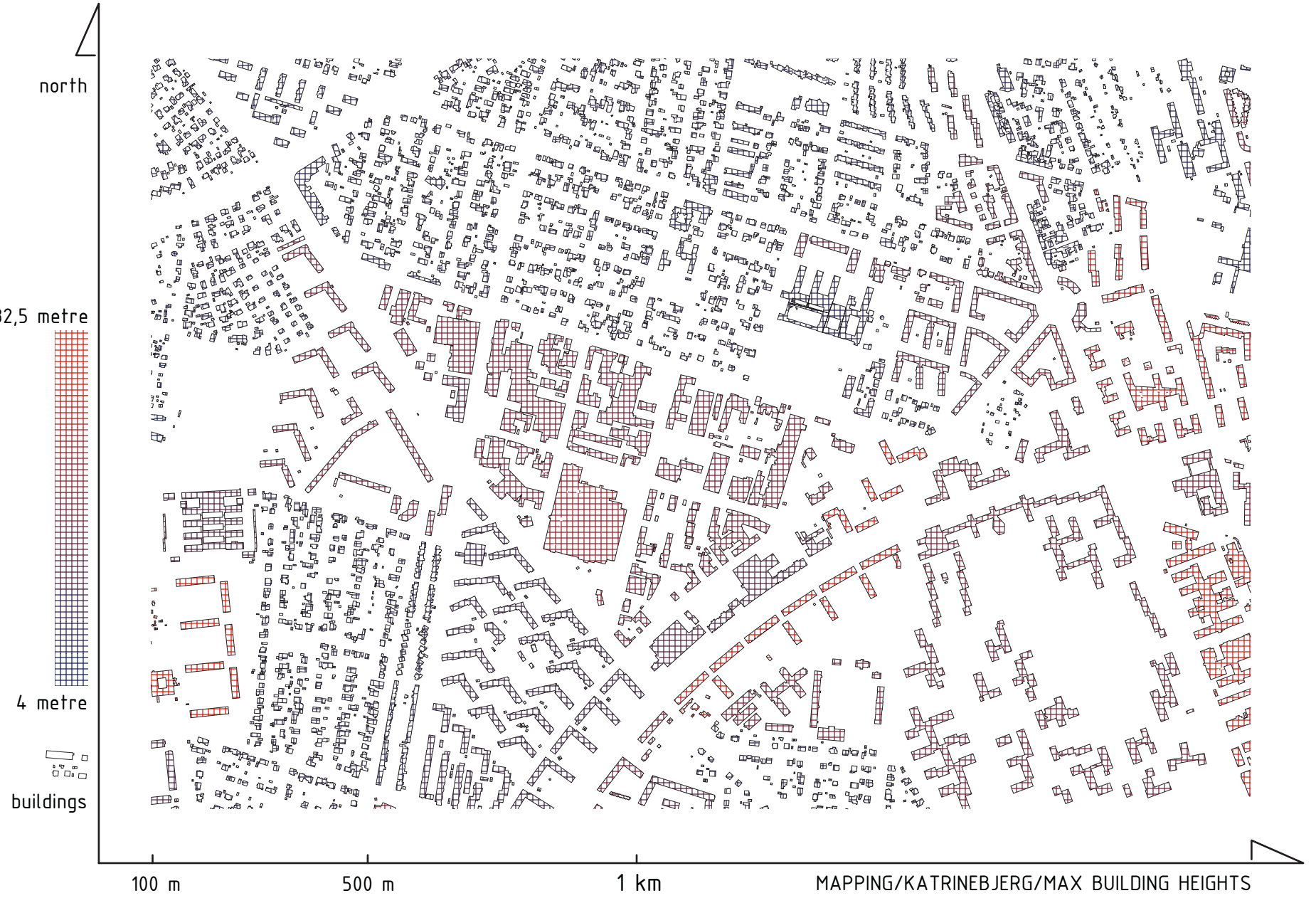
Phase 3 - Synthesis: cases, deviations, results

Phase 4 - Concept and programming

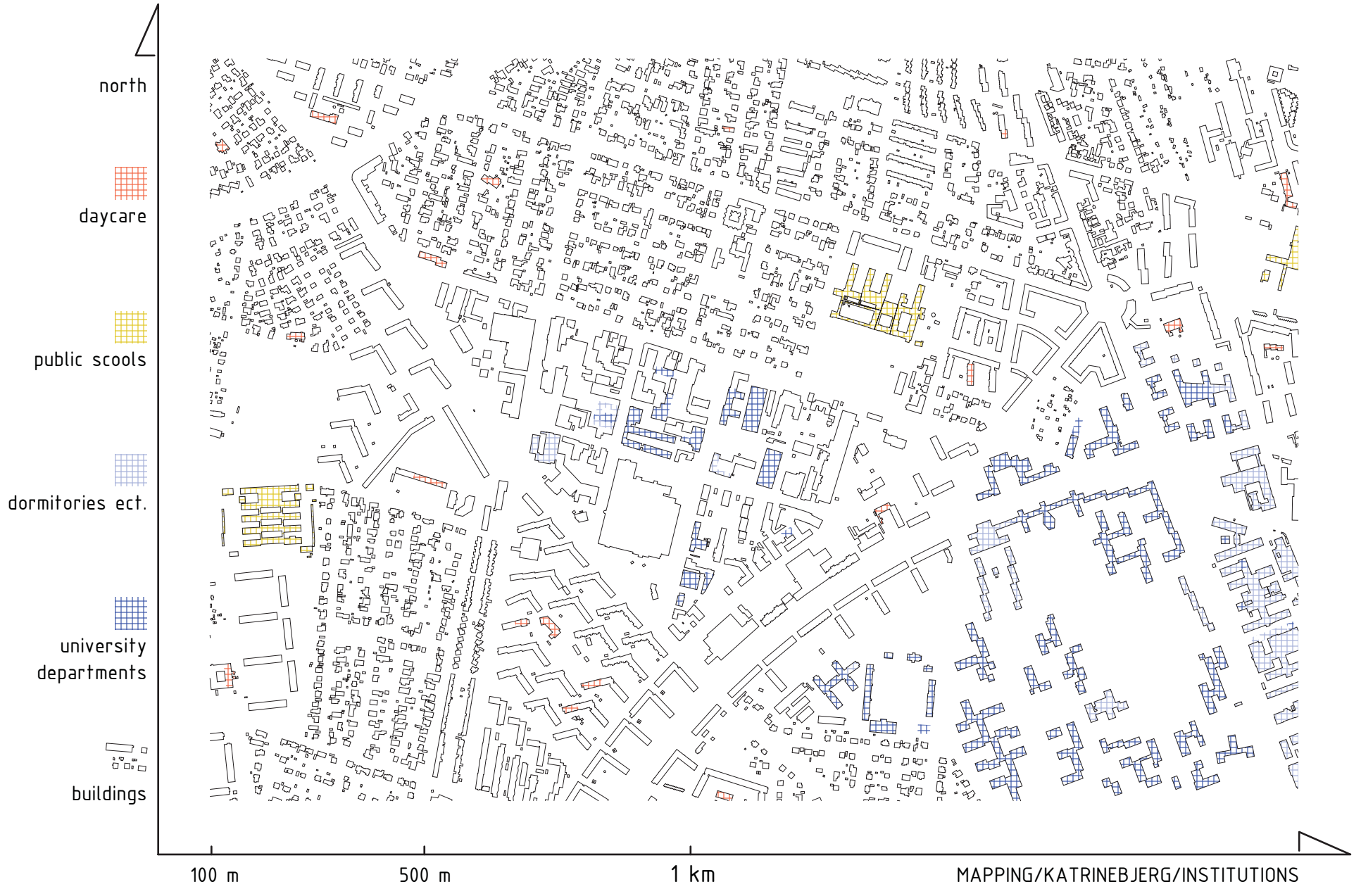
Phase 5 - Design and modelling

Phase 6 - Production: plan, section, photoshop

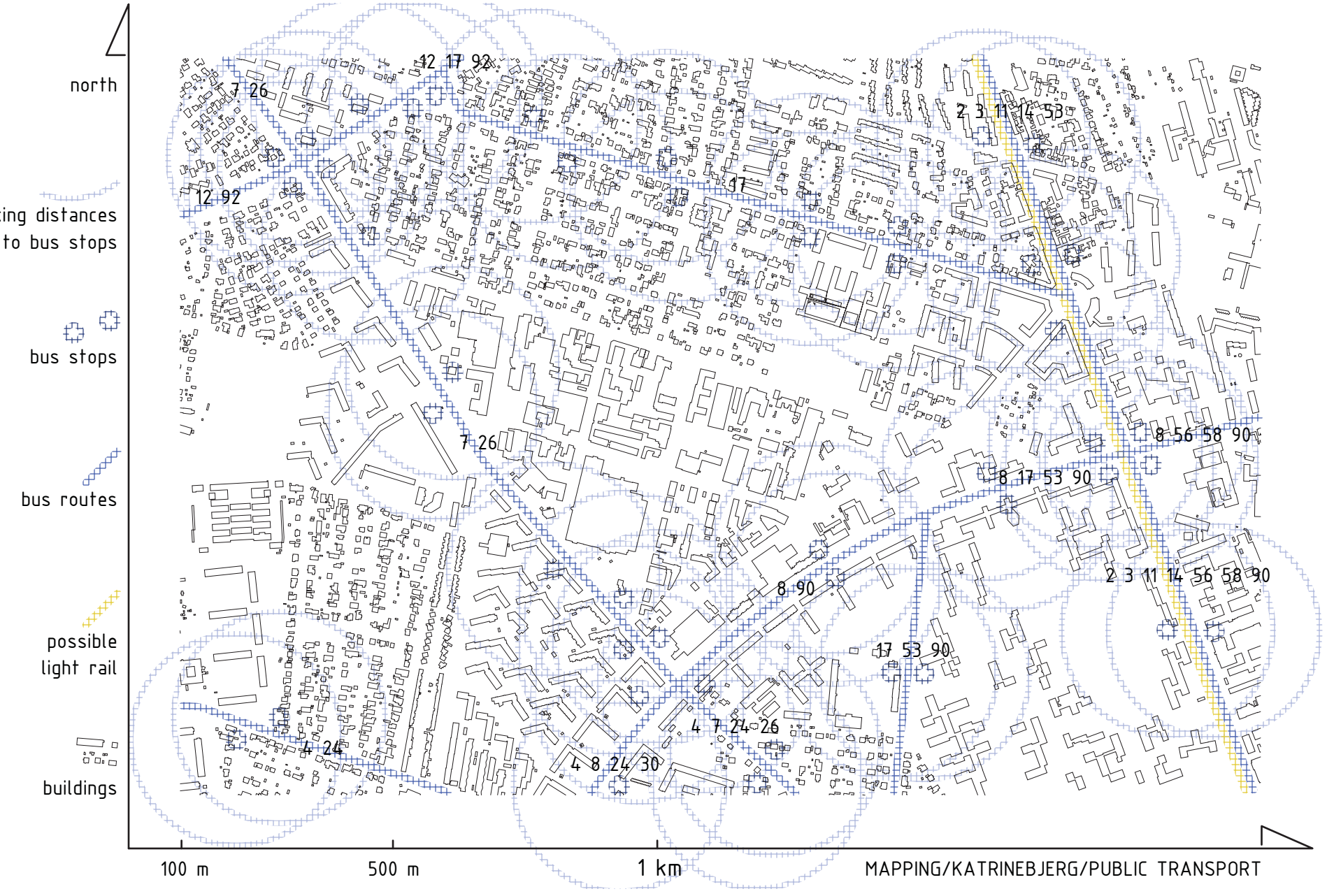
APPENDIX C: MAPPINGS



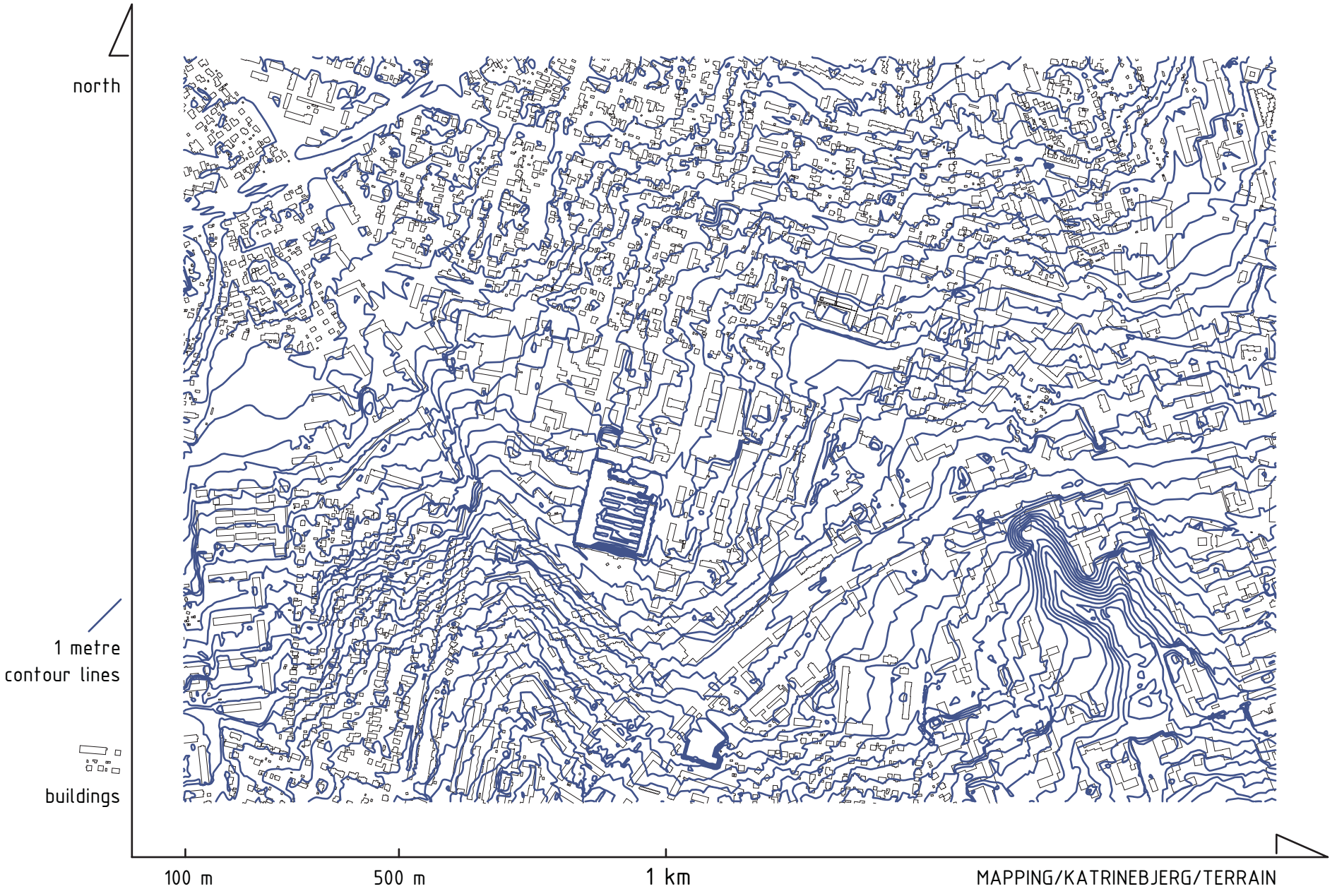
This mapping shows the maximum allowed building height as specified in the municipality plan [Århus Kommune II, 2001]. In the project area only the new and maintained buildings are high, the old industrial buildings are one floor for the most part. The mapping shows how the detached hosing to the north is very low and the apartment buildings to the south are much higher and differentiated in height.



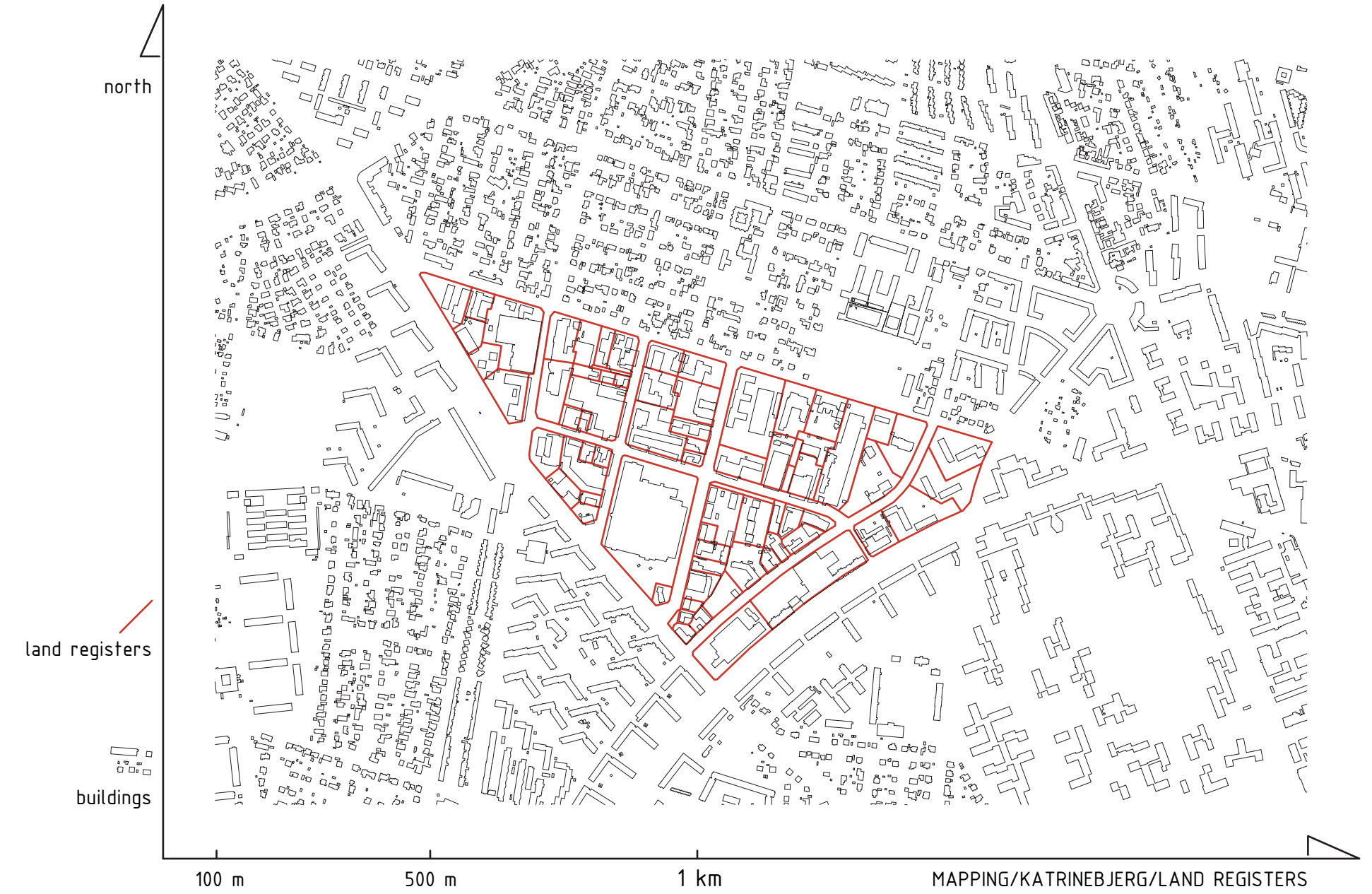
The institutions in the area illustrates that the area can support different people and age groups. The mapping also shows the universities need to spread to the north into the area of Katrinebjerg.



The public transportation network provides a wide range of routes. This is important as a support for drawing more people to the area. It should give good possibilities for public transport instead of choosing private cars.

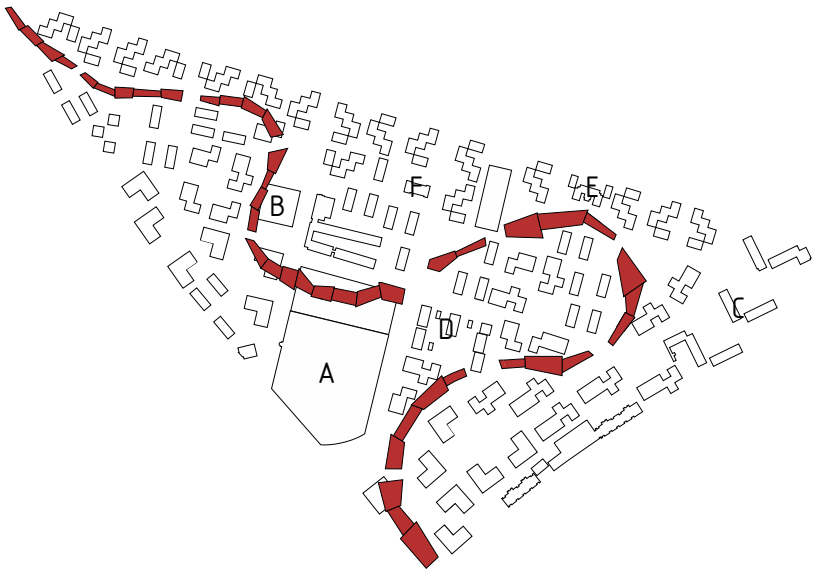


The terrain contour lines show that the area lies up a hill. The high point of the lines is in the northern end of the mapping.



The land registers of the area as they are today [Århus Amt].

APPENDIX D: EXISTING BUILDINGS



A

Storcenter Nord transformed its façade a few years ago. It is now a quite open façade, and certainly visible from Paludan-Muller's vej.

The majority of the existing buildings are old industrial buildings. Many of the old industrial buildings are in bad condition due to lack of maintenance. It seems likely that replacement will only be for the better. They are mostly 1-2 floors and have large ground floors which have inefficient use of space. These buildings have served their purpose, but are now used as anything from beauty shops to IT-offices.

B

The University has already built new buildings. This one is positioned parallel to the backside of Storcenter Nord, and will become a part of the new promenade. The building has nice outdoor areas, open facades and a canteen on the ground floor.

C

An older apartment group is situated along Ringgaden. These are owner apartments and were built in the 1970's.

D

Apartment buildings make up a new contribution in the area. They range from 2 – 4 storeys, and have a good sized outdoor area, mostly used for parking. The buildings are considered to be well functioning, and are therefore be kept in the new plan.

E

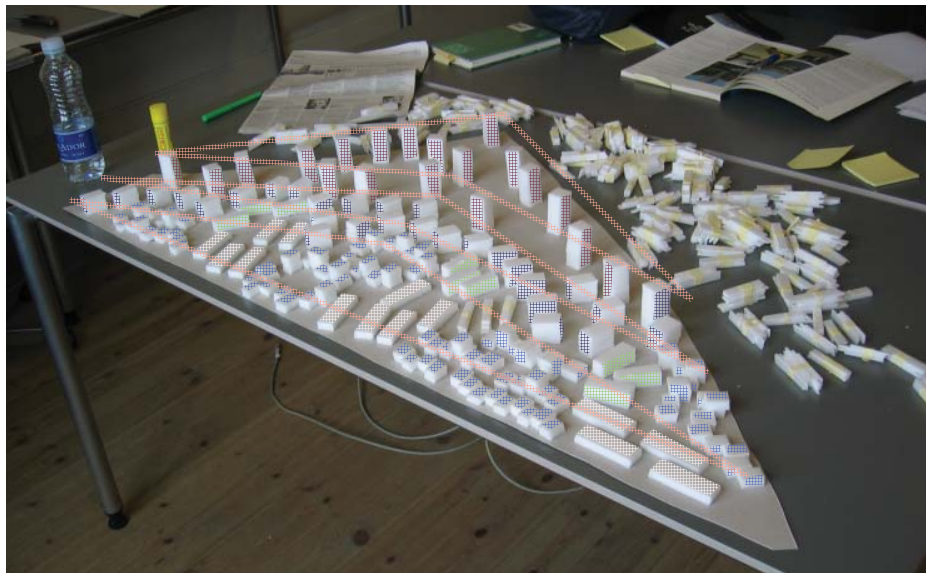
One of the listed buildings in the area functions as a school. It stands out from the rest of the area as a small jewel.

F

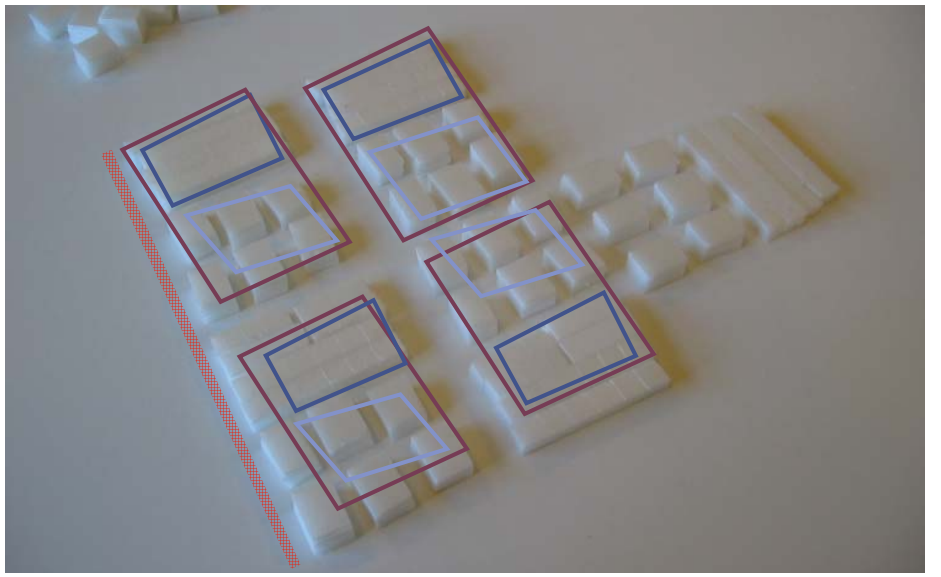
An office is placed in this building that makes a nice contrast to the industrial buildings in the area.

APPENDIX E: DESIGN PROCESS

The design process started with some experiments in regards to density. 150, 200 and 300 % was tried out with different heights and positioning. It was quickly confirmed that a well organised pattern in the layout would be helpful in trying to achieve as much free space as possible. It was also clear that compact buildings with simple shapes would be the most space efficient in the plan. In experiments with high rise buildings, it was found that these automatically require more space and that they will have negative shadow effects on the low rise neighbours.



The height of the buildings was also an issue in regards to the context, and the decision was to follow the heights of the surroundings, meaning that as a general rule, the heights will rise in a slope, and not randomly or next to buildings with big difference in height.



The design workshop lead to experimental patterns that would illustrate how simple a typology and pattern can be while still providing a various number of spaces when copied out on the plan.

The next step was to copy typologies for each function to fill the plan. One pattern was selected for each function and strictly spread throughout the plan.

The result was satisfying, but was lacking an edge. The decision to break the plan with a contrast was made, and the ribbon was laid out across the model. The ribbon is in some cases lifted over the ground, other places it blends in with the existing buildings.

A 3D model was made based on the work model to get a more precise plan.

A presentation of the work model made to illustrate the different typologies, small and large green areas, the road grid and existing buildings.

The finished plan shows the conceptual master plan for Katrinebjerg.

APPENDIX F: CALCULATIONS

30 hectare build 170%

Working:
1/3 office industries equals 4900 workers in the area with approximately 35m2 per employee.

Learning:
1/3 university equals 8500 students and 5100 workers in the area approximately 12.5m2 per person and a 0.6 to 1 division between employees and students as in the rest of the university of Århus [Århus Universitet og Aalborg Universitet].

Renting:
2/9 residential equals 5100 people living in the area, of those:

1/9 area for large rental residential; housing association about 100m2 per unite housing approximately 5 people per unite summing up to a total of roughly 2800 persons.

1/9 area for small rental residential; youth dwelling or hall of residence about 50m2 per unite housing approximately 2 people per unite summing up to a total of roughly 2300 persons.

Owning:
1/9 residential equals 900 people living in the area with 150m2 per unite and 2.5 people per house.

APPENDIX G: SHADOW DIAGRAMS

The shadow diagrams represent the times a day 06, 09, 12, 15 and 18 and show the shadows movement across the area at summertime. The larger buildings are placed in the vicinity of each other so that they rather shade each other than the lower residential buildings. The office and university buildings often prefer less sunlight.