The expansion of the South Railway line through Lund and the district of Klostergården
- A study of the local impact of a national infrastructural development
Abstract

This dissertation is written in the context of sustainable urban development, the importance of transport infrastructure and railway stations as a potential growing structural element in the on-going urban redevelopment of the city. The base of this claim is that through effective land use and good connectivity to other modes of transport railway stations becomes an important mean to influence the use of common and environmental friendly means of transport. They are an important component both for the functional value of the transport system and the access to the city. In reverse they also create a link to the region and a therefore a doorway to a wider market of work, business, leisure and service.

The purpose of this thesis is thus to study and show how a national infrastructure project affects the urban development on a local level. Every infrastructure development is unique and its impact can be viewed through different perspectives and on different geographical levels. In general a large infrastructure project will lead to a change in accessibility that may which may affect the localization of activities and land use development. In addition it can be followed by an impact on the economic and socio-spatial conditions as well as have environmental consequences.

The target for this study is the expansion of the south railway line which is a national railway line running from Malmö to Stockholm. It has a central distributing role in the southern regional parts of Sweden. The south stretch between Lund and Malmö is the most trafficked railway line in Sweden, burdened with intense local, regional, national and international traffic. This makes a potential lack of capacity limiting for a continuous growth and an important matter in a local, regional and further on national perspective.

The local impact of the South railway line is examined by studying the prospects of an additional train station in the south periphery of Lund in the district of Klostergården to evaluate its practical use and spatial consequences. The general question is, in a local perspective, how to best make use of the current infrastructural change and how will this affect the future development of the district? The result is illustrated through a design proposal of the station and its surrounding area. The design work is of a schematic character, which means that the design will show, through diagrams and low detailed plans, the elements and functions of the area and how they are connected. It gives an idea of how the area can be structured and organized in terms of infrastructure, plots, functions and open spaces. In addition to a possible location and form of the train station, possible measures to reduce noise, vibration and the barrier effect are presented as a starting point for a continued urban development.

An important conclusion of this study is that the development of a train station may help to create a mutual target point in the area and increase its availability to the local and regional transportation system. This in turn would mean that the barrier effect caused by the railway line may decrease and the spatial relationship on each side of the track is strengthened. A high effective land use development with housing, offices, education and mixed areas for services and commercial or public activities may provide the base for travelers to a station as well as
users of a district center. Important to be aware of is that a dense urban structure may have an impact on the local environment creating more traffic with increased level of noise, pollution and safety hazardous as a consequence. Another issue is as a response to the design proposal, land that is presently used for valuable leisure and social activities have to be change and activities relocated. Important for a successful design of this area is to consider these issues and give them a central role in the development. This means that the design must enable low impact from the car traffic and good opportunity for movement and access for bicycles, pedestrian and bus traffic. Special attention also has to be taken to the green structure inside the area as well as a good connection to other surrounding green target points.
I would like to extend my gratitude to the people that have helped me to complete my work.

The municipality of Lund who provided me with basic material, devoted their time and gave me the professional input I needed to confirm and anchor my work, especially Astrid Avenberg Rosell and Ole Kasimir. My tutor, Abdelha Aberkan, at the University for your feedback and guidance. Per Delakant and Anette Linders who copy edited the work. Special thanks for your devotion and personal commitment.

And of course, to my family Maud, Philip and mother in law Yvonne. Thank you for your patience and support.
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1. Background- Sustainable urban development

Sustainable development can be defined as from the following quotation of the UN Brundtland commission from 1987:

“...Sustainable development is development that meets the need of the present without compromising the ability of future generations to meet their needs”

The general aspect of sustainable development is to economize and minimize the outtake of our shared natural resources. The concept of sustainability does not only concern environmental issues but also social, economic and in some aspects cultural. Every aspect of this concept is in one or the other way connected and dependent of each other which mean that every aspect has to be considered in order to achieve a sustainable development. In other words, our natural environment and resources has to be preserved and at the same time a positive, fair and balanced social and stable economic development has to be sustained (Gregner & Wegener 1997).

It’s a complex issue to determine the practical use of sustainable development. It’s easy to be clear on the general meaning but its complexity makes the interpretation of it very open and applications very dependent on which type of level, field, place or context it concerns. It’s also very easy to end up in a conflict of interest and different aspects may very easily end up as each other’s counter pole. For this reason there must be an awareness and concern about the totality of the progression, its impact in a wider context and its consequences for the future (Gudmundsson & Höjer 1996). The Swedish state authority Boverket expresses Sustainable urban development as a conscious direction for a positive progression of our cities in which different aspects have to be weighed in processes, with the intent to form a comprehensive view in a local, regional, national and global perspective. (Boverket 2004)

1.1 Urban processes of change - challenges in a sustainable urban development

Development represents changes and a good sustainable development means the ability to adjust to new conditions. Our society is frequently undergoing changes in the urban environment derived from new developing economic and social, political constellations and structures. Newman and Kenworthy explains the origin of urban process of change as being a combination between market, government and the civil society which each play role and all have the initiative force to invoke change. Sustainable urban changes are more likely to occur when these forces act together and are in balance (Newman & Kenworthy 1999). There are externalities that affect and drive these forces for example the advance in technology and research.

Our modern society is very much based on information, technology and knowledge development. The fast and extensive technical development that has progressed during the last century mostly in the second half has allowed us to communicate, interact and transport
ourselves in new ways that has changed our lives in many aspects. The contemporary information and knowledge society have mostly affected behavioral patterns. The increased option for faster communication and mobility has meant new conditions for work, consumption, and lifestyles. Above all it has meant that the relationship between different activities, home and work is not necessary geographically determined as it was during the pre-industrial age. This has lead to the fact that we currently travel longer distances on daily basis than ever before. (SKL, Boverket m.fl 2007). Also many activities no longer require a physical presence and are not bound to any specific location. This changes many structural relationships in the urban environment. Some of the places that previously served as obvious meeting places has either lost their value or have disappeared completely. For example, individuals can instead of going to a bank or postal offices manage these errands online, which erases these institutions as physical meeting places (Boverket2004).

The technical development particularly the communication technology has created new ways of interaction and sharing information, which has created new options for trade, connections and exchanges across national borders and further on a wider global level. This has come to be known as the process of Globalization. The National encyclopedia describes the progression as:

“…a processes of change where states and societies all over the world are connected in a relationship of mutual dependence.” (NE.se /Globalization

In the context of economic relations the terms regards to

“….the later phase in the development of capitalism under which the national economies have become more and more integrated.” (NE.se / Globalization)

A contributing factor for this global development is conscious decision and political ambitions from government to create higher market integration, lower transport and lower transaction costs (in the issue of both time and money) across national borders (Region Skåne 2010). Characteristic for a global economy is a general ongoing structural transformation. Nations and regions have to continuously work to secure old competitive advantages and at the same time gain new ones. A toughened competitive situation has driven industries and companies to a more extensive specialization and change of production. Instead of producing physical merchandise, the most dominating features of production in a global market are information, knowledge and specialized knowhow (Boverket 2004). Effective mobility and accessibility is viewed as an important factor for regions competitiveness.

The structural changes in industry and labor that have taken place in many parts of the world have not only a larger concentration of business activities in the city but also a stronger overall urbanization with a stress towards the big city regions and metropolitan areas (Regeringen 2008). One of the reasons is that the technical development hasn’t undermined face to face contact or eliminated the need social encounters. On the contrary it has widened our sphere of interaction and excelled the city as a platform for personal meetings, creative activities and knowledge development. These types of environment are more attractive and
suitable to businesses specialized in information and technology than large scale industrial activities which instead have very rapidly moved out to low-wage countries. (Priemus 2006)

A larger concentration of people and activities means larger movements of masses in and out of the city which has brought a general need for an urban restructuring to both logistically solve issues in transports as well as to supply the need for new functions and services. Cultural and esthetic values are necessities that have to be emphasized and be a part of this development to create attractive living spaces to stimulate the social production and to establish good business climate.

The urban population and the urban economy are growing in many places and the city is once again the arena and center for social and economic exchanges with new conditions, needs and structural elements.

1.2 The need for Sustainable transports

Transports and its infrastructure is an important and pervasive element in society, integral for its economy and its social life. It distributes movement which connects places, functions and people. It creates accessibility and welfare that makes communities and societies grow. Mobility and transport is therefore essential for an economic and social sustainable development. However, transports generate a large number of undesirable side effects and impact on our natural environment. Pollutions, waste, consumption of natural resources and energy originate to a large extend from our use of combustion motor based transports. Statistics from the EU Member States show that transport stands for 31% of the total energy consumption and 98% of these transports are combustion based and oil dependent. The average amount of road transport in the EU is 83,3 percent (2008) and 40% of the total emissions of road transport are generated by urban transport (European commission 2006).

Fossil fuels such as oil generate a large amount of air pollution and co2 emissions which is the main reason for the effect of Global warming. Transport not only has an ecological impact but also affects the urban environment negatively. The use of combustion based transport as well as its structures, which is a huge consumer of land, is associated with having economic, socio economic and socio spatial consequences. Intense traffic, especially in dense urban areas, causes traffic congestions which are impeding the flow and access to the city. It also creates an unattractive, noisy and unhealthy place to dwell in. Declining city centers, urban sprawl, traffic noise and high traffic related accidents is some of the consequences and prices paid for an increased level of mobility in the public room (Gudmundsson & Höjer 1996). The huge impact caused by motor based transports has made the work of deducing the impact as well as our dependence of motorized transports a large part of a sustainable urban development (European Commission 2006).
1.3 The revival of the railway traffic

The demand for energy efficient, environmentally friendly and accessible means of transportation has made the railway bound transport the target for new investments. Advances in technology have made the railway faster and more energy efficient. The railway is because of this more competitive to the aviation traffic and a good alternative to the car. It offers a mutual way for people to travel and it’s also a safer, more comfortable and more productive option (time for rest or work on board the train). It is viewed as an effective way to relieve the high pressure of urban areas from motorized transports as well as provide for transport over longer distances (Banverket 2009).

Some professionals may claim that the railway traffic is experiencing a revival or even a renaissance, which can partially be said to be true. At least in (western) Europe, together with investments in light rail and other modes of public transportation the railway’s role has generally been strengthened. It is being more and more incorporated as the backbone in a local, regional and national urban sustainable public transportation strategy. Although parallel to this development the car use as well as aviation traffic has continued to increase and the modal split of train passengers by comparison remains on a modest level (Priemus 2006).

A study of EU statistics confirms this and shows that there has only been a minor increase since the early 1990 in railway transport, while the car and airtraffic has had a stronger development. The estimated average assessment in the EU of railway passenger transport is 7.5% of the total passenger transport which is an up going curve of 0.9% in the modal split between the years 2000-2008. In Sweden, for the same period, the average is 9.3%, which is an increased value of 1.7%. The growth has been slow and in some eastern European countries there has even been a negative progression. This could be explained by the economic crisis in the beginning of 1990’s. Recent years of downfall in the financial market in the world has also left its mark and slowed the demand for railway traffic. Although with less rolling stock and a decrease in the railway network, the average travelling distance of EU citizens still remains at 2 km per day, which would indicate an increase in system efficiency. (www.epp.eurostat.ec.europa.eu/ train passenger modal split)

In Europe, the increase in traffic and interest of the railway in the later years has supposedly to do with the high speed railways that are being developed. The continued development of the so called Trans European Network (TEN) is high on the EU political agenda and has strengthened the connections between many cities. It has also enabled interregional connections as well as contributed to a wider linkage in both passenger and goods transport between European countries (Priemus 2006).

The increase of the number of travelers in the later years and together with a privatization of railway companies has led to not only an increase in economic interest for rail traffic, but also to its stations and its surrounding areas. One of the reasons for this is that the function, form and location of the Railway stations have changed over the years. Many cities has grown in size and therefore moved the railway station, which most commonly was constructed in the outskirt of the city, to a central position in the city. Also today, due to technological
development it does not require the same space and facilities which means a huge change in movement. More space unlocks new prospects for the change in land use and localization of functions around the train station (Bakerson 2010).

Railway stations are today considered to be important urban generators. They are an important link between the local regional and national transportation network as well as to the city. Train stations and their surroundings are the focus and common as targets for redevelopment plans in many places in the world. In Europe this is particularly evident along the routes of HST railway line for instance in Sweden Holland, France and Germany in which many redevelopment programs has successfully turned station areas into vibrant urban nodes (Bertolini & Spit 1998). Stations in Amsterdam, Holland and Lyon, France are examples of such places.

Image 1 A current Swedish railway station development, Mölndal railway station. Image source: www.flickr.com
2. Introduction

I have found it interesting to study urban processes of change and to examine its effects and consequences on the urban environment. I will conduct this study through the perspective of transport infrastructure, particularly on railway, thus the effect of such a structure can mean a direct physical change and because of this have a large spatial impact. An infrastructural change may lead to a change in accessibility which can affect the localization of activities and land use development. It can in addition be followed by an indirect impact on the economic and socio spatial conditions as well as have environmental consequences. This dissertation is written in the context of sustainable urban development, the importance of transport infrastructure and railway stations as a potential growing structural element in the on-going urban redevelopment of the city. The base of this claim is that rail way stations are today not only considered to be nodes that transfer people from one mode of transport to another but also holds a higher value as a place in the city and an important mean to influence the use of common and environmental friendly modes of transport. They are an important component both for the functional value of the transport system and the access to the city. In reverse they also create a link to the region and a therefore a doorway to a wider market of work, business, leisure and service (Lund 2010).

The study area

The target of study for this thesis is the city of Lund and the development of a possible additional train station in the it’s south periphery, between the city district of Klostergården and the far south part of the West city district. The districts are divided by the south railway line which is a national railway line running from Stockholm to Malmö. It is an important and high traffic railway line with pressure of local, regional, national and international transports. The stretch between Lund and Malmö is currently at maximum capacity with 380 trains running through per day which makes it the most trafficked railway line in Sweden. The capacity of the track is at the moment insufficient due to a high demand for more space in the system. The demand is also expected to increase due to a general increase in population and expected continuance of economic growth in the region. It is estimated that the track needs to increase its capacity to 470 trains per day to supply for the future demand of transport.

The municipality of Lund has requested a study about the location of a new train station and the prospects of future development close to the area in question. The reason for this is the suggested solution from Trafikverket to resolve the issues caused by the lack of capacity by increasing the number of tracks, from two to four in the first phase from Arlöv to Flackarp and in the second phase further on up to Lund central station. According to Ole Kasimir, planning architect from the planning office in Lund, this measurement will most certainly increase the capacity level, leaving room for more stations without slowing down other traffic. As he explains it, slow train traffic with more stops as a complement to the fast regional and high speed national trains, will raise the level capacity of the track even more. It will also
increase the accessibility to the area in question and possibly stimulate new development close and around the station.

The wide area of influence makes this infrastructure project particularly interesting to study from a sustainable urban development perspective and its impact can be viewed from a number of different levels. The increased capacity allows for more space in the system so a continued development of the TEN and high speed trains (HST) can be possible further up the country. The expansion of the South railway line is because of this a national priority that will enable increased level of connectivity in the nation and strengthen the railway traffic as an alternative mean for passenger transport next to the aviation traffic. From a regional perspective the level of connectivity can be increased between cities and other neighboring regions with the benefit of a wider business, labor and housing market as a result, which may strengthen the regional competitive force and further on its level of attractiveness. The infrastructure project may, together with an integrated joint land use strategy, create a more economic, social sustainable urban structure with a transportation system that makes mobility more effective and favors public transport as well as commuting by railway over road transports. As an effect of the infrastructure project the district of Klostergården may prove to be an interesting target to discuss for strategic densification of the city with a focus on land use development around stations and transit points. Strategic densification of the existing built environment means, among other things, that development on valuable agricultural land outside the city can be diverted from exploitation and preserved as much as possible. It is stated by the municipality of Lund that periphery areas, with low usage of green areas, buffer- and safety zones as well as areas around infrastructure may successfully serve this purpose and enable a good densification of the city (Lund 2010).

2.1 Purpose

The purpose of this thesis is to study and show how a national infrastructure project affects the urban development on a local level. This is exemplified by the case study of the South railway project and its impact on the city of Lund. Its affect will also be examined on a single district by studying the prospects of a new train station in the city district of Klostergården and evaluate its spatial consequences and practical use.

2.2 Research questions

The logic behind the thesis structure is that through describing and analyzing the process of a large national investment in infrastructure we can identify and describe the general issues and consequences surrounding an infrastructural development. If we can learn of its background we may then more easily elucidate the local complexity of problems and speculate on a specific area’s spatial potential for development. Together with existing local and regional objectives and conditions, a general aim and strategy may then be developed for the area and its land use. This objective and strategy can then function as a framework of design that in
addition will provide necessary guidelines for the localization and form of a potential station. This design standpoint will then found the base for a potential sustainable urban design in the district. The result of this study will be illustrated through a schematic design proposal for the station area and its surroundings.

The general question is, in a local perspective, how to best make use of the current infrastructural change and how will this affect the future development of the district?

In the context of sustainable urban development this has lead me to the following formulation of research questions.

1. **What are the objectives and background of a national infrastructure development/investment?**

2. **What economic, spatial and structural consequences does a large infrastructure development have in a local context?**

3. **What location and form of a new railway station in the district in question would be suitable as a base for a sustainable urban design and what kind of development could this station generate?**

### 2.3 Method and research approach

#### 2.3.1 Pragmatism

The Research approach of this thesis reflects in many aspects a pragmatic approach. Pragmatism is originally a philosophical tradition which is focused on finding links between practice and theory. Opposed to post positivism, which is mostly centered on proving theory through empirical data, pragmatism is more focused on applications and solving a problem. In pragmatism, a pluralistic approach is used to understand the problem. This means that the research problem is constituted by a diversity of conceptions and stand points oppose to a single approach or method of interpretation. Characteristic for a pragmatic research is the search for the “what “and the “how”. A benefit in a pragmatic approach is that it is not committed to any particular philosophy or reality which means that the research can be mixed with different methods, techniques and procedure of research to best the meet the nature and need of the specific topic. The collection of data can both involve quantitative and qualitative data research (Creswell. J W 2011)
2.3.2 Quantitative and qualitative methods

This study grazes on different fields of profession i.e. the planning of transport, urban planning and urban design. They all concern the urban structure and are very much interlaced but they have different methods of approach, focus and work on different levels in the urban realm. I have because of this found it necessary in this dissertation to have a mixed methodological design and use different research techniques.

I have found it useful to apply both quantitative and qualitative methods to this study. Quantitative methods of collecting data have the aim of establishing the quantity of something, i.e. the amount of or how often a phenomenon’s appear or take place. It is purely objective method and example of this is statistics, surveys or pure experimental studies. Qualitative method is more of finding the essence of a specific phenomenon that either is typical or diverts them from others. Example of this are studies which has its base from Interviews, personal experiences and observations such as case studies, ethnographic studies and so on. The work has included quantitative data research, literature studies, interviews, quantitative descriptions and map analysis (Holme & Solvang 1997).

The theoretical division of this work has purely consisted of quantitative data collection including statistics and literature studies. The qualitative approach is mostly used in the practical work process i.e. the design work and site analysis in the form of expertise advice, comments and interview discussions. I have also allowed represent from the municipality comment on the issues concerning the project and the municipal stand point on certain matters. The qualitative communication with the municipality has in many aspects confirmed the collected data and allowed additionally to anchor my work.

2.3.3 Framework of design

In an urban design process a central issue is the exploration of problems through the study and testing of different solution. Problems that appear in the field of urban design are often very difficult to define and without a clear or common agreed solution. Moughtin describes the character of the urban design process as often being dialectical, which means that the arguments and counterarguments for problems and solutions are faced in a continuous process of critical appraisal. Through this process the problem eventually clarifies its definition and the direction of the investigation which Moughtin means is necessary to be able to seek out the solution. He continues to say that design concepts i.e. ideas of a design or solutions of a problem are the base line of creative processes and show different ways of understanding a problem. These design concepts can have different origins and be created using several different procedures. They can be generated by the analysis from the site, a study of the historical patterns, theoretical propositions and lateral thinking and so on (Moughtin 1999).

The method of design in this thesis has its basis in a set from a design framework which is defined by the area objective and design guidelines. These guidelines are founded from literature studies, the quantitative research, the area site analysis and the qualitative...
interviews. The design work is of a schematic character, which means that the design will show, through diagrams and low detailed plans, the elements and functions of the area and how they are connected.

2.3.4 The area and site analysis

An area and site analysis is an integral part in the work of identifying the elements and the flow of movement in the area. Existing paths, important axels and large spontaneous flows of movement is important especially in the construction of a new station. This analysis allows us to better see how new flows of movement will develop depending on the placement of the station. By conducting an area and site analysis one can establish a good ground for the placement, physical shape and design of the station, the area elements and other functions and how they relate to each other. The area site analysis also gives a comprehensive view of the architecture and history of the area in question. This is important in and helps to establish a good base for creating a good environment with natural flows of movement and spatial relations. (SKL, Boverket mfl. 2007)

There are different methods that can be used to conduct an area and site analysis and they can consist of quantitative, qualitative, perceptive and objective techniques. Qualitative and perceptive techniques are based on how the area i.e. its structures and elements, is perceived and comprehended by either the people who uses it or the person who studies it to determine its values and qualities. The nature of the Quantitative and objective techniques are focused on conducting the analysis through a more rational and methodical process.

I will not do a deep structural analysis of each specific neighborhood but instead focus on the general aspects of the area. This includes an inventory of the area functions and land use as well as main target points, main roads and paths and how they are connected. I will also turn my attention to the history of the area and its development, both in a city and area context. The urban development will also be investigated with an area map analysis. The map analysis is done both through a study of current maps and also of older maps from important times of development. The study of these maps will help to conclude what the main issues of development have been.

_The city, its role and relation to its surrounding_

Another important issue to study, particularly in infrastructure development, is how the city included with the specific area in question relates to its surroundings. Different places and cities have their own unique qualities and different supply of housing, work places, education and culture. They have different connections and relationships both in its near vicinity or connections that extend outside its regional boundaries. Together they form a context, a mutual urban structural pattern, a network of different size cities which are all in various degrees connected and dependent of each other. This context can be studied both in a
quantitative and qualitative way. A quantitative relationship is how the place is connected through infrastructure, its public transport and level of traffic. It also concerns how the city functions in a regional perspective with regards to for instance its housing market, education and business life. Quantitative relationships regards to how it is perceived in the urban context which means its identity, status and level of attractiveness (SKL, Boverket m.fl 2007). I will in this study mostly focus on the quantitative aspects in this issue which means the use of statistics, surveys and quantitative area descriptions of the city and further the region. Through this I will determine its role in the regional urban network. This will enable a further analysis on the effect of the infrastructure investment.

2.3.5 Literature studies

This thesis work has a very wide field of focus which has made it necessary to study several fields of subject. I have therefore not been able to conduct any extensive literature research of my own in every particular field. I have instead relied much on others compilation of data and in certain cases complemented these with own closer reading at sources of particular interest. My sources of literature have included articles, field literature, doctor dissertations and licentiate dissertation, state rapports as well as European and national statistics. I have found some of the empirical data and theories difficult to apply on this particular target of study and context. Projects or application are often described through large scale projects of either main central stations or the redevelopment of existing ones. Few sources I found targets development strategies of additional local railway stations such as the nature of this project. Though the principals are the same it has limited my ability to work using qualitative methods with other station area developments as reference or as case studies. My main source of literature in which I have collected my primary guide lines and design principals has been the state authority rapports. For example “Traffic for a sustainable city” and “Sustainable cities and conurbation” written by among others Boverket, Trafikverket and SKL (Sveriges kommuner och landsting). These state rapports, though a bit normative, have in many aspects been satisfactory though they are quite current and coherent with the recent fields of research as well as of course state legislation and objectives. I have also to a certain degree relied on interactive data in which I have been able to received access to among others statistics and historical data. Images and maps that are presented are the effort of own production if nothing else is mentioned.
3. Mobility and transport infrastructure- its impact and relationship to the urban development

This chapter aims to offer a background on the subject in the context of our mobile and technical development and its influence on the urban environment. This background study will help to describe and explain the current situation, its dilemmas and contemporary aims and challenges of a sustainable urban development. Some of the data of this chapter are from a general perspective which most certainly have formed under different conditions but are common challenges and dilemmas in the urban environment around the world. This wider perspective of the subject will help to understand some of the mutual factors and consequences of urban process of changes.

3.1 Our mobile and technical development

From preindustrial to industrial city

From a historic perspective, one of the strongest contributors to how our cities have been developed and shaped up to our present day is our physical ability to transport ourselves and goods. It has also in many ways defined the cities and given them purpose of existence (Greene & Wegener 1997). The ancient city was formed because a concentration of settlements meant a better prospect for trade, human interaction and general safety for outer threats. Many cities were located in places where transport was optimal, either alongside or by the junction points of travelling routes. But the largest and most prosperous ones grew along the shore lines of lakes, coasts and up rivers. Ships were for a very long time the easiest and most efficient way of transporting people and goods. But in the cities, there was still a limitation of growth, mostly to do with the transport on land which was limited to horse and cart or simply to walk. This created smaller and more compact cities. The production of daily supplies was very much dependent on the city’s location and in relation to whom it supplied (Bruinsma 2008). Although cities have grown over the centuries, its immediate physical expansion has been very limited since about 200 years ago when the industrial period was initiated. New forms of energy, first steam and then electricity, together with technical innovations and new means of transports, evolved during these times which lead to many structural changes in the city as well as contributed to its expansion. New effective ways of producing merchandise turned small scale rural manufacturing and craftsmanship into larger scale industrial production. Industries and production became more and more concentrated to cities and with it followed capital and an increasingly growing urban population (NE.se/stad).

The railway was an important part of this progression. The railway made possible a fast and reliant way of transporting goods and people in larger quantities on land. The railway started its development in the late 18th century in Great Britain and was soon followed by the rest of Europe and Northern America during the 19th century. Very fast it became one of the most important means of transport on land. Many cities were able to develop and grow because of the railway, especially those in the inlands. The railway also enabled a wider connection
between cities which resolved many spatial and social problems that was the result of a more extensive agglomeration in cities. Many conurbations developed and grew along the railway line corridors and in its junction points. After the 1930’s the railway more or less stopped developing as transport of goods and people started more and more to move over to combustion based transport i.e. the car. The train wasn’t able to compete with the speed of the airplane and the flexibility that the car offered which resulted in stagnation of the railway traffic. (Bertolini & Spit 1998) The development of the car was very swift and allowed people to effectively transport themselves between cities outside the railway network which soon created new urban structures and settlement patterns (Banverket 2009).

**The modern city**

One may say that after the 20th century, the modern city was formed under the ideals of modernism which can be described as having a more “mechanical” approach to urban issues and life in general. In broad terms modernism meant the idea of zoning and a strict separation of home, work and other city functions and through extensive development of urban infrastructure a new order could be established in the city. Urban strategies as such were developed and extensively spread as universal solutions to resolve the economic, social and spatial problems in the city (Newman & Kenworthy 1999).

In many parts of Europe, especially in the period following the Second World War, large inner city areas were demolished and transformed to make way for the new infrastructure and urban development. In the 50’s the development took on another form. As a way of resolving the overcrowded, spatial and low standard of living, that many cities still suffered from. New concentrated housing settlements were developed in the fringes and in the rural areas. These smaller self-providing communities next to the main city were often well defined areas with their own city centers, effectively linked by large car routes. Together with the main city they eventually formed a new urban context. The development of satellite cities and rural settlements intensified in the 60’s and continued well into the 70’s. As the general use of cars continuously increased, more effective car routes were demanded and the road network continued to grow. Over time, as the areas next to these routes grew accessible and therefore more attractive, businesses and smaller independent housing settlements could grow discursively along these routes. This then further increased the demand for more roads which made the network intensify and grow even more. This development continued and has over the years which have led to the urban spatial organization that has grown to be very complex and lead to a decentralized and spread out urban landscape (Bergman 2008).
3.2 The dense and diversified city

A comprehensive image of our mobile and technical development in the last century, with the car as a front figure, is that it has given us new means of easy, flexible and physical mobility to transport ourselves and our goods. It has also meant a larger individual freedom of choice when determining where we work, live and spend our leisure time. The development of the car has since its introduction been very fast and its position has over the years been more and more strengthened and acted as a central figure of our urban development. Among other things the car has opened up for a greater physical mobility, which in turn has led to the fact that the distance between the functions and elements of the city has been able to increase. This has contributed to a more complex decentralized urban context and dissolved formerly concentrated urban structures. Many cities in the world have been experiencing large structural changes in the urban environment that have sprung from the increasing use of the car and modernistic urban ideals. Zoning and sprawling behavior is some of the issues in our urban development and mutual factors that contribute to a de-centralized and disbursed urban landscape which induces our dependence of the car even more. The upcoming of new commerce centers and larger outside city establishments is of particular concern, which today has become both complementing and competitive to the city and to the other suburban centers as new travelling targets and nodes in the urban landscape.

The structure of the urban form and the localization of functions affect distances which directly affect our need for travel and indirectly how we choose to travel (Boverket 2004). A cohesive urban structure is important. When distances increases, bicycle traffic and the pedestrians are undermined and a well-functioning and effective public transport is difficult to uphold. (SKL, Boverket m.fl 2007)

A general approach in sustainable urban development has revolved around densification and the creation of a more diversified and mix functioned city. This approach is to various degrees and form being incorporated by governments as a way to use our resources more efficiently and reduce our need for travels.

The concept of compact city is a commonly used model that has gained ground in the field of sustainable urban planning. The concept means that the city resources are being effectively used and saved through a more mixed, denser and functional urban area structure with several centre formations. The main gain is the shorter distances between each city element and function, reducing unnecessary travels. Mobility is built upon effective public transport. Walking and bicycling is encouraged while the car has less focus, but is not eliminated. In the same way and for the same reasons inspirational glances have also been casted back to the ancient and traditional city, much due to its dense and variation in its urban patterns as well as its proclaimed social qualities (Schylberg 2008).

But can a densification of the city join the urban structures, save resources and reduce or need for travels?

Many studies have certainly shown that more densely populated cities generally have an overall lower consumption of petrol. Comparison studies have been made between disbursed
Western cities and densely populated cities in Asia to prove this theory. There are professionals that claim that our sprawling behavior not just comes from our increase in car use. Instead it rotes in social economical differences, differences between people and cultures in overall behaviors and personal values of what is considered to be quality of life, which then have sprung in an increase in the level of car ownership. Many therefore believe this to be the source of the new culture of travelling in which one should look for answers concerning urban settlements and travelling behavior and how they develop. (for more references see Alvesund1998) The general discussion on the subject also expresses the city as a more complex and dynamic place with activities and urban relationships that has extended wider than its physical boundaries and outside the traditional urban core. Turnström for instance claims that the vision of the sustainable city is resting upon the idea of the dense, traditional and well defined city with a large focus on the city core. First of all Turnström argues that the claim of this urban model lacks a realistic discussion of the cities congestions, spatial conflicts, noise and the social exclusion (Turnström 2009). She also says that the vision of this model is at the expense of other parts of the urban landscape and argues that the idealization of the traditional dense city is excluding the modern urban environments and branding them as a negative consequence of the urban development (Turnström 2009). According to Bergman it is also argued by some professionals that the traditional city approach is a retrogressive perspective of urban development. The contemporary suburban and city landscape is an irreversible breach against the previous European traditional city constructional ideals which has been enforced by the new economic and structural condition that is transforming our lives in new ways. Because of this urban planning in our contemporary society requires other approaches. Their opinion is that it’s better to recognize the urban situation and work from the perspectives of its conditions, limitations and potentials that are a result of the increase of mobility in the public room of the city, as well as other digital forms of communication (Bergman 2008).

3.3 The issue of Accessibility

The ability to travel and the access to different means of transport are fundamental issues when it comes to creating social and economic values for a country’s citizens and business life (SKL, Boverket m.fl 2007). It’s important so that people have good and equal access to the different parts, functions and activities in the city. A good mobility opens for better integration, potential for employment and an overall better quality of life in the city. Accessibility becomes a central factor with regard to transport and urban development.

The term accessibility can be defined as;

“...the level of ease in which citizens, businesses and public organizations is able to reach the functions and activities they need and want. The level of ease is the sacrifice in travel time, cost, obstacles, insecurity and the supply of transport they need to reach desired destination.” (SKL, Boverket m.fl 2007 s.67)
A simplified way of measuring the level of accessibility is to calculate the total amount of traveling time for a journey from its starting point to the end. There are several factors that contribute to and affect the journey which makes the term accessibility a more complicated matter. The physical distance affects the level of accessibility which depends on how the urban environment is structured, its level of density and how different functions are relating to each other. It’s also important how the transport system is composed, its level of availability i.e. its standard and how it relates to the urban environment. Another issue is the individual users own personal ability to use and access the system which is related to age, gender, level of income and so on. Also the time of the day affect the level of accessibility due to possible traffic congestions, supply or insecurity. (SKL, Boverket m.fl 2007) In other words the level of accessibility is a relationship between urban form and structure, localization of functions, the structure of the transport system and our own individual ability for mobility.

The infrastructure itself can also be limiting factor in terms of accessibility. Although transport infrastructure has a connecting function its width and intensity of traffic can give it a large area of influence. Without sufficient and safe crossways its physical structure can transversely limit the movement and make the structure perceived as an obstacle or a barrier in the urban environment which mainly affect bicycle traffic and pedestrians. (Banverket 2009)

Due to its large area of influence, transport infrastructure is also very commonly perceived as representing edges and borders in the city. Jane Jacobs, author of the book *The death and fall of American cities* defines a border as a monatomic used piece or stretch of land in the urban environment. It does not have to mean legal boundary of an area but can be a clear visible element that makes it perceived as a border. Jacobs also says that a border can be a passive object but it can also have active impact on its surrounding. It can function as a joining element between two areas or different functions, for example a street, a path or a park where people can naturally, without effort move through. If one physically cannot move across it or for different reasons unwillingly do not move through the particular area it can be perceived in a negative way as a repelling element. The distance might seem too far, unattractive, unhealthy, noisy or even deserted and therefore unsafe. The element then forms a physical or mental barrier which can have a corrosive effect on its surrounding. The main problem with these types of places is that they often form dead ends in the city which limits movement and contains very little life. The surrounding areas becomes unattractive non active places that turns into “vacuum zones”, separating districts and fragments the city(Jacobs 1992). Large transport infrastructure often has this affect, particularly motorways or railway structures. They are static elements and often wide and commonly burdened with intense traffic. This makes the structures very difficult and sometimes even hazardous to cross. As a result this can separate areas from each other, create low level of accessibility thus limit the area integration (Banverket 2009). Also the high level of disturbance that intense traffic brings may have the effect that area around transport infrastructure often becomes unattractive and limited to certain activities, for example industries, parking lots or in worst case underdeveloped deserted space.
3.3.1 Re-distribution and re-localization of assets

Another interesting aspect on the issue of accessibility is its relationship to the value of assets and how it affects different markets. Within national economic, assets, is a term for material assets (for example real capital and natural resources), financial assets (cash or nominal security) or immaterial assets (for example human capital). The value of an asset is the total and relative cost between labor, material, production techniques and the cost of transport (which means its location in relation to its market and other assets). The sum of these factors is comparable to the value to the total asset (NE.se /asset). Generally speaking this means that when a situation occur that changes these factors, it gives companies, organizations and households the incentive for either relocating, change production techniques (a new job for the individual) or re evaluate the issue of transport to uphold or increase the value of its assets (Bruinsma 2008). Investments in Transport and Infrastructure may therefore have large effects on the economy on different levels like mentioned; primarily in the cost of transport and land use development which refers to the value of land and the localization of activities (Westin 2007). Better opportunities for transport as a result of an infrastructural investment can generate a redistribution of assets and welfare\(^1\) that gives advantages and benefits to some places, actors and individuals at the expense of others. (Banverket 2009) This can be perceived in a both positive and negative way.

A change in accessibility, which new investments and infrastructure brings, affects the size and direction of the general flow of traffic and movement. When economic activity is stimulated by new infrastructure investments the increase of accessibility can reduce trade and transport barriers but at the same time open up and expose local businesses for external rivalry. The outcome can be that business and commerce activities can be regionalized and concentrated to larger areas. This can mean a disadvantage for local economy which can create local labor reforms and in some cases closedowns (Bergman 2008). On a wider regional level the redistribution of assets is a desired out come and a way to for example distribute economic growth. This will further be deliberated in chapter 4.3 Regional enhancement and a multiple core urban structure.

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\(^1\)The theory of Welfare; welfare is composed by everything that is of particular value to people in the society, whether it has a (measurable) price or not (NE.se/welfare)
4. National infrastructural development

The aim for this next chapter is from general perspective show how large infrastructural projects are developed i.e. what state organs and actors that participate, what its objective and background is and what factors that sets it limits.

Agents in national community planning and infrastructural development

- **The municipality.** Sweden has 290 municipalities which each have responsibility and freedom to conduct their own planning according to the country construction and environmental legislation (PBL). This means that they decide how and when the land within the municipal border is to be used.

- **The county council (Region nämnden ex. Region Skåne),** is a regional governing force with the overall responsibility for the planning and the development of its county, which includes health and medical care, growth of industry, communication and culture. They work and cooperate in regional planning processes together with the municipalities in its specific county (33 in Skåne) but also if necessary together with other national and international regions. They have a coordinating role for its county’s municipalities, authorities, industries, universities, organizations and individuals as well.

- **The County board (Länsstyrelsen),** is a national authority of supervision which is divided into several branches operating in each Swedish county. This authority has a coordinating and persevering role for the national interest in a planning procedure. They are responsible and obligated to intervene when it comes to issues of national interest, environmental policies, inter municipal interest as well as in the issue of public health and safety.

- **Trafikverket** is the Swedish authority that has the main responsibility for the development of national traffic infrastructure plan. Trafikverket operates under the authority of the Swedish government and is guided by state policies, goals and directives. It is responsible for the planning of the national traffic infrastructure which also involves the construction, management and maintenance of all national and regional roads and railways. Trafikverket operates on more or less every level. According to PBL the authority is obligated to join in the local municipal planning process and it is in accordance to own stated ambitions to join the work in an early stage of the process.
- **County traffic (Region trafiken)** ex. Skånetrafiken is an administration branch within each of the county council that is responsible for the regional public transportation system in its specific county. Their responsibility includes planning, procurement and the marketing of the public transport system. The county traffic is also the responsible traffic authority for the regional and interregional train companies.

- **SJ AB** is the national train company which is solely owned by the state but has since a restructuring of the national railway authority been operating under market condition. SJ runs the national and in some cases interregional train traffic.

- Also worth mentioning is **Jernhusen**, which is a private company also owned by the state which owns, manages and develops commercial stations. Their ownership also includes land and buildings that has previously been used for railway purposes.

### 4.1 The planning of infrastructure

#### 4.1.2 State objective and legislation

The planning and construction of infrastructure is directed through state legislation and norms, policies and objectives. A sustainable development is a general objective of the Swedish government as well as a commitment towards the UN and the EU and sets its base directly from the Brundtland commission definition of a sustainable development, explained in chapter 1. This has lead to direct changes in policies and legislation that further have influenced national environmental goals, planning objectives and legislation.

**Important legislation documents**

The most important legislation documents that controls infrastructure development and in general the urban planning is the environmental code (Miljöbalken (1998:808)) and the code for planning and construction, PBL (plan och bygg lagen (1987:10)). The first aims to secure a sustainable development to ensure a healthy and good environment for future generations. It states among other obligations and conditions for the private sector and individual actors as well as issues concerning national interest. The later constitute principals and regulation in the perspective of the community planning for the local governments. The actual procedure concerning the construction of Infrastructure is further regulated by the law of railway construction (Lagen ombyggande av järnväg (1995:1649)). This for instance states that though a railway is of national interest it cannot be built if it inflicts on the municipal detail plan.
The generation goal

Central in the Swedish environmental politics is the so called “Generation goal” (Generations målet). This goal was formerly known as the national environmental quality objectives (miljökvalitets målen) which was first elaborated in 1999. It is today an important tool and guideline for local and regional state authorities to formulate strategies and goals in their environmental work based on its own specific area state of condition. It’s used as an indicator tool for the state to monitor and further follow up on the state of development, to insure a positive progression in the environmental work. There are 16 different overall goals that cover different fields and sectors concerning the environment which then further are divided into altogether 72 partial goals that each has a set of specific timeframe and focus. The goal that concerns urban planning and the development of infrastructure the most is the objective towards a good built environment (God bebyggd miljö). This goal basically concerns how the urban environment can provide for a good and healthy living environment, how nature and cultural values can be protected and developed, how buildings and facilities can be located and constructed in a environmentally friendly way and how in a long perspective the land, water and other resources could used in a economized way (miljomalen.se)

One of the partial goals in the objective for a good built environment is that by 2010 to set the groundwork to develop programs and strategies for a sustainable urban development within different fields in urban planning.

One part is about;

“…how a wide variety of supply in housing, workplaces, service and culture can be achieved so that the use of cars can be deduced and the condition for environmentally fit and energy efficient way of transport can be improved”.

and another is about;

”…how green areas and water areas in urban or close urban areas can be preserved, cared for and develop for nature, cultural and recreation purposes and in addition how the amount of hard constructed surfaces can be kept limited” (miljomalen.se)

National political goals in the issue of transport

The general political objective in the issue of transports in Sweden is;

“…to secure a national economic efficiency and long term sustainable perspective supply transports for its citizens and business life in the nation” (Regeringen 2008 s 39)

This objective is complemented by two sub targets; the objective of functionality (Funktionsmålet) and the objective of special care (Hänsynsmålet). The first objective concerns the issue of accessibility and the aim is that the form, function and use of the
transportation system should contribute to provide basic and equal level of accessibility with good quality and usage. It should also be just distributed and contribute to the growth and development of the country. The objective of special care concerns the environment and general public safety and health. This means that the form, function and use of the transportation system should contribute to zero casualty and serious injury in the traffic system as well as to increase public health and in addition help to achieve the generation goals. (Regeringen 2008)

4.1.3 National planning procedure

The investment plan

Infrastructure is developed on different level of planning. On a national level it is controlled through different means of financing and investment plans. An investment plan is constituted by two levels of planning. The overall objective plan, “inriktningar planering”, is done across sectors and results in a national infrastructure proposition that is approved by the government. This proposition is to a large extent based on a suggested action plan, “åtgärds planering” which is developed by Trafikverket. This action plan contains an investment plan for the main national road network and the state owned railways. The national economics use and its relation to the politically stated objectives constitute the foundation of the prioritized factors in the national investment plan. On a regional level the national infrastructure is developed on a county level of planning. In short, the Länsstyrelser, county councils and municipal joint committees develops the desired county plans. After this the plan is approved by the state which sets the financial limits with data supplied from Trafikverket, concerned municipalities and responsible traffic authority (Sika 2007).

The comprehensive plan

On a local level the main actor is the local governments i.e. the Swedish municipalities, which has the legal responsibility and planning monopoly for their each own specific area. The government only intervenes in a municipal plan, through responsible organs of authority, if the plan conflicts with the nationally stated interests, objectives or legislation and also if there is an issue of public health or safety. According to PBL the municipalities are obligated to make a comprehensive plan that stipulates the overall planning issues and the current public interests. The comprehensive plan is not a legally binding document but rather a joint statement from the municipality regarding their development and structural ideas for its specific area. It’s an public document to ensure that the planning process is done in a open democratic order. The comprehensive plan must show how the national interests and environmental policies are accounted for and the consequences of the development plans. According to the PBL the comprehensive plan should also constitute the required material to form and support the area regulation documents and the detailed plan document. This
document is, as opposed to the comprehensive plan, a legally binding document. (www.Boverket.se)

The spatial planning is done by the municipalities and communicated with the state and organs of authority through the comprehensive plan and the detailed plan document which provides basic data for the planning of national roads and state railways. This makes the municipal comprehensive plan an important communication tool as well as a coordinating instrument for the state authority in the community development process. In many cases there are also interrelated issues between borders that have effect on a wider regional level, for example in issues of larger traffic infrastructure. Other regional issues are the environment, energy and housing. In such cases other municipalities, actors and state authorities have to participate and in some cases overview the planning process. Though it is highly recommended, there are no stated demands in the PBL neither for coordination between different comprehensive plans nor between comprehensive plans and the national planning of infrastructure. (Banverket 2009)

General procedure

The general procedure of a national infrastructure development is initially that the state make claim (through the investment plan) on land needed for transport communications of national interest. This can include both needed infrastructure (roads or railways) and traffic and transport facilities (airports, terminals and harbors). This claim is made through a function oriented perspective which means that the plans are of pure schematic character and does not contain any details of for instance ownership and management. The plans are elaborated over time in different stages of analyze, planning and consultation with concerned parties and then into a more detailed project plan and finally in a detail projection document. Depending on the width of the project and if there’s any appeals this process usually takes about 5 to 10 years (Sika 2007)

The government claim is not definite; its nature is more of a request for a needed function. This means that due to the fact that the function of the facilities and infrastructure affects the surrounding land use and connecting road network, the placement, the size and in general its sphere of action can be up for discussion and negotiation between the state and the municipality. All though a development of national interest has an upper hand in a negotiation process the plans can still not inflict on the decided municipal plans. For instance, according to the law of railway construction (1995:1649) a railway project cannot be built if it inflicts on the municipal detail plan.
4.2 National Economics and its influence on infrastructure development.

The need for infrastructure development is always strong, new connections and current conditions in traffic and communications can always be improved and made more effective. An infrastructure and communications investment has a large local and regional interest due to its positive impact on the local and regional economy. The state has the responsibility to secure public interest and make sure that the limited joint resources for investments in public infrastructure are well used and equally distributed. But the need usually overweighs the resources and not every need can be satisfied. Limited resources mean that you have to prioritize. Projects need to be weighed against each other and calculated to conclude which is the most effective, necessary and sustainable solution (Sika 2005).

How are projects decided?

National economics is a field within social sciences that studies how a society and different actors uses its resources. It also concerns what effects economic and political measures/ action fuel. Presuming that the measurement is viable the situation can be analyzed using methods within the field of national economics. The methods of analysis are applied when a decision means a choice between several options where benefits and negative aspects have to be weighed against each other. The decisions of the value of an action are based on the sum of costs\(^2\) and uses\(^3\). The reason for this analysis is to provide a complete image of the effects to decide if the project has a national economic value, i.e. if the investment is profitable in relation to the financial cost and public use. The result will, together with additional data material, give policy makers a base for a decision of the specific measurement. It doesn’t offer a complete truth, but a possible outcome fuelled from the changes made. A national economic analysis includes both pure economic analysis and also economic estimations. Social consequences as well as environmental effects are also included in this calculation. Certain aspects that can’t be measured are considered as well but in the form of a consequences discussion (Sika 2005).

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\(^2\)Cost; is the value of the best alternative way of use which constitutes the national economic cost by the consumption of a product or service. It is the value Cost \textit{at the time} of use that specifies the national economic value of a produced product/commodity or service. NE/cost

\(^3\)Use in the context of national economics can be explained as the satisfying effect the consumption of combination from commodity or service gives. NE/use
Method of analysis

There are several methods to be used and it can be applied in many areas of society and on different levels. The most commonly used is the Cost-benefit analysis (CBA), which is an overview of the benefits and costs of the project/investment. This method of analysis derives from the national economic theory of welfare.

Some dominating aspects in the analysis of an infrastructure investment is:

- Travel time saving. This means that a comparison is made with or without suggested change. VOT (Value of time) is a term used to indicate the value of shorter travel time in monetary term. Business travel and movement of goods are rated higher than commuting and leisure time has the lowest rating. The calculation also differs between modes of travel, income classes and other characteristics of travel and travelers.

- The increase of demand for additional travel, changes in transport cost and changes in travel behavior.

- Profits as an effect of the investment for the increase in services, safety and environmental profits are also accounted for, though the two latter can be negative and therefore a cost. (Bruisma 2008 s.149)

Important in national economic analysis is to see if the change causes a major benefit or disadvantage for individual people, certain social groups or regions. (Sika2005) Central in the CBA is the Efficiency and redistribution criteria or Paretocriteria, which is a base model for efficiency criteria in economic theory. According to this criterion a measurement is wanted by the affected parties if it improves a situation for one part without impairing it for another part. When dealing with a change in a state of welfare in national economic decisions a modification of this criterion is made. This is called Pareto enhancements or Hicks-Kaldor criteria. The modification means that if one part is more beneficial to a change than another part (winner or loser situation) a change can still be wanted if the other part can be compensated for its disadvantage of the new situation. If the compensation is realized and satisfactory, the situation can be that of the original Pareto criteria in which both parties are satisfied. this requires that both parties are willing to pay for the advantages or disadvantages caused by the changes made (Banverket 2009).
4.3 Regional enhancement and a multiple core urban structure

Regional enhancement

A good supply of transports is important for a region to secure its industries of sufficient labor and also secure a good base for housings. Individual conurbations have to keep a high level of attractiveness to able to work against a moving out effect and a disseminated community development. A conurbation loses its level of attractiveness as a place to live if the closeness and the supply of jobs, education, services and other public functions decrease. (Boverket 2004) A joint regional strategy can help create focal points for development instead of a disbursed uncontrolled development and create accessibility on a wider level to local necessary functions. A strong regional development through infrastructure development is therefore high on the political agenda in many nations and Sweden is no exception. One of the governments sub targets for transport political goals is for further regional cooperation’s and to improve regional connections. Regional enhancement is a national strategy and the aim is to create fewer and larger functional regions out of many smaller (Regeringen 2008).

Larger regions and cities are often the center for economic activities and considered to be important national economic growth generators. The pressure of these cities is often very high and by connecting those with other smaller regions through effective transport the pressure can be relived (Boverket 2004). The cooperating regions and cities can benefit and complement each other which will give the region a larger prospect of growth and also enable the local business-, commercial and housing markets to be strengthened. An intensified specialization of industries can be seen as a factor and driving force for a regional enhancement as well as the government ambition to distribute the economic growth to a wider area. The central factor of regional enhancement is to increase the option of commuting which gives the opportunity for larger interaction between actors, organizations and businesses located in different places. It is also a way for the local business industry to better match skills with labor and secure its supply and need for workforce (TOI 2010).

Multiple core urban structure

The concept regional enhancement is built on a strategy of creating a multiple core urban structure connected with an effective urban transport network. This is very much related to the term of Polycentrism. Polycentrism is a concept but also a way to measure the level of connectivity in an urban core structure. This can be studied on several geographical level, from a single municipality up to regional and national level. Polycentrism does not only concern the urban transport network but also how well the different markets are integrated and how large the exchange of other assets are, for example human, education, medical healthcare and business. There are two types of polycentrism; Hierarchical polycentrism, with subordinated centers or complementarily polycentrism with evenly strong regional centers. The strength in a multiple core structure is that a society is less depended of one core which
can enable a more sustainable urban structure. The negative aspects of a single core are that a development can be saturated and lead to congestion in the system, which can mean that the positive effects can be inhibited to spread. With a multiple core structure the economic growth can be distributed and resources more effectively used (Region Skåne 2010).

4.4 The railway in a regional development strategy

Sweden has at present time the benefit of a large network of railways lines, especially in the southern regions. The railway traffic in Sweden represents today an integral part in the Swedish public transport systems. An important competitive advantage is that trains can travel at relatively high speeds which make it more effective over longer distances oppose to car travels. Regional trains can travel at a speed of 180km/h and the fast national trains between 200-250km/h. Another factor is that it does not need to share its track with other modes of transports which means low interference, regularity and punctuality. Time savings becomes important in the perspective of regional commuting and daily based travels, especially to be able to establish and supply a wider integrated labor and housing market. If an individual is supposed to travel longer distances on a daily basis, fast and effective connections is necessary so that the traveling time doesn’t get to long. (SKL, Boverket m.fl 2007)

A Swedish example of a railway development is the regional link in the region of Stockholm-Mälardalen. This so called Svealand link, opened in 1997 and had the main goal of making daily commuting possible in region. By doing this they could balance the labor and housing market and spread the economic growth and ease the pressure of Stockholm to its surrounding regions. The development was a success in that matter because it opened up a new market which spurred into an increase in demand in both transports and housing which was beneficial for the whole region. Five years after it opened it had increased the amount of commuting trips seven times to 1.6 million regional trips per year. (Bruinsma 2008)

To continue to develop the railway and improve its capacity is high on the political agenda in Sweden and an important piece in a regional development strategy (Banverket, 2009 s.9). The railway is a costly and complicated infrastructure to develop. It requires relatively straight lines which makes it a rigid and less flexible construction. The landscape and ground often have to be extensively modified which means that supportive structure such as tunnels and bridges is common parts of the construction. Railway infrastructure also takes a long time to develop, at least 10 or usually up to 20 years which means that it’s possible that the effect of such an investment is something that won’t be seen for a very long time. Once in place though, the system has a long durability, which applies both to the infrastructure and to the vehicles (SKL, Boverket m.fl 2007).

To be competitive to other modes of transport the railway traffic is relying on wide network coverage with good and effective connections to other modes of transports. It also needs a high number of users to be economic and environmentally efficient. An important issue is therefore how well the regional and local traffic is integrated and how well the coordination and transition between different modes of transport is done. It determines the journeys
efficiency, reliance and its comfort, which becomes an important factor for individuals in their choice of transport mode (Bertolini 1998).

The railway station

Railway stations are today have an integral function in an urban network as an intermediary link between the local, regional and national transportation system. A well-functioning station is not only vital for system efficiency but important for a positive view towards the public transportation system and to encourage its use.

Railway stations or transit points in general are also considered to be an important piece in the work of integrating transport and land use development. By establishing cogency between land use and infrastructure development a functional urban structure can be created and supposedly favour public transport, reduce unnecessary travels and enabling and encouraging other modes of transports such as walking and bicycling. In the Swedish state authority rapport Trast (2007), Traffic for a sustainable city, it is argued that railway stations that are located in or close to urban areas are an important part in an effective transportation system and therefore a possible target of a sustainable urban development strategy. A strategy of this kind can involve both the focus of existing stations as well as include potential development of new ones. The urban planning and land use surrounding the station is an important matter that is particularly stressed. This means that a development strategy should take into account how service, work and housing development could be located near the stations (SKL, Boverket mfl. 2007).

Close station area development (“Station närhets principen”) is a contemporary urban development strategy that is common in many parts of Europe, for example in London, Hamburg, Berlin, and Amsterdam. This method starts from strategically placing functions, activities, workplaces and housing near stations and transit points to increase the use of the public transportations system by creating a better base of travelers. That way the development can be focused and steered towards a better co agency between the urban environment and its infrastructure. Copenhagen is an example of a city that has for many years been working from the principals of close station development.

Basically all types of development that are placed close to stations or transit points, with the intent to encourage public transport and other alternative modes of transport, fall under the category of Close station area development. In Northern America there is also a growing trend for railway bound traffic with a special focus on close station area development. The so called TOD or Transit oriented development is a movement with a strong focus on light rail traffic. This strategy is an example of counteractive measures against urban sprawl and general concern about the car dependent urban patterns. The aim is to deduce the need for the car and encourage a higher use of the public transport. This is done by creating an efficient transport network with light rail as its base and a large focus on the urban planning along its stations. The intent is to make the stations into centers of functions and activities with a stress on pedestrian friendly urban structures in its surrounding. (Region Skåne 2010)
5. The expansion of the South railway line and its impact on Lund

The target of study in this study is the city of Lund and the district of Klostergården and the impact of the South railway line project. A large infrastructure project will mainly lead to a change in accessibility that may affect the relationship between markets, the value of assets and land which further may affect the localization of activities and land use development. In addition, it can be followed by an indirect impact on the economic and socio-spatial conditions as well as have environmental consequences. Accessibility represents a potential for interaction which is affected by the quality of the transportation system as well as the land use around the specific area. Due to the fact that different areas have different potential for interaction they also have different prospects of development. For this reason the consequences as a result of an increased level of accessibility is dependent of the economic relationships between areas and whether the infrastructure is used for production or the purpose of distribution (Westin 2007). To be able to analyze the consequences of the project it is necessary to investigate the type of infrastructure that is involved. There is no general model of the impact of an infrastructural change in a specific area because every case is unique. It is all dependent on the scope of the project, the local and its surrounding conditions.

I will start with an overall area study of the city and its regional network to then continue and describe the infrastructural change, its impact and consequences.

5.1 The city of Lund

5.1.1 Present state

The municipality of Lund has a population of about 110,300 (2010) people which makes it the 12th largest Swedish municipality by population. Lund is a growing municipality. In the year 2009 it had an increase in population of about 1,340 people and since the year 2000 the total population had increased by 11,000 people. The population is expected to continue to grow to an estimated number of 117,000 people by the year of 2015. The municipality consists of several conurbations, the largest one being the city of Lund with 81,300 (2009), others include SödraSanby 6000, Dalby 5700, Veberöd 4800, Genarp 2900 and a few other smaller conurbations (www.lund.se/politik--fovaltning/Kommunfakta/Statistik/Befolkning/)

The university of Lund, is currently one of the largest universities in Scandinavia with about 35,000 attending students. 14,000 of these are residents of the municipality. Lund’s University is world renowned and have a wide spread of international cooperation. It is also regional center for education with branches in both Malmö and Helsingborg. The University of Lund is very integrated with the local business market and is an attraction force in the city for knowledge, technical and information based companies. The university is also highly joined with the medical care sector which is also renowned for its specialized knowledge and research. The city of Lund has both small and large scale industries. A large part of this is
research and knowledge based industries which have in the later years increased next to the work intense industries. The medical and health care industry is also a large employer in the municipality.

Between the years of 1993-2004 there was a 24% (17 000 people) increase in employment which is a yearly growth average of 2%. The national average was at the same period 1%. Today the municipality is the tenth largest municipality in Sweden, measured by the number of employment opportunities (Lunds stad 2007).

**Commuting**

In 2008 there were about 65 600 working people in the municipality. About 33 700 of these where commuting in to the municipality to work (1500 from other counties) and 18 300 people was commuting from Lund to other regions to work mostly to Malmö (2500 to other regions) (Lunds stad 2006).

**The functional region**

Travel time by train to nearby cities (with a direct line) is 10 min to Malmö C, 35 min to Copenhagen, 15 min to Landskrona, 30 min to Helsingborg and 30 min to Hässleholm.

**Traffic**

The traffic in the municipality has strongly increased in the later years. The car traffic in the city increased about 10% between 1998-2007 and 30-40% outside on the national roads. 60% of the total amount of trips to and from the city is done by car and 30% of the trips under the distance of 5 km are done by car. the public transportation system is highly developed and well used within the municipality. Every year there are about 7 million bus trips within the city and a total of 24 million trips done either by city bus, regional bus or by train (Lundamats 2009). The bicycle traffic also has a high percentage; in 2007 about 22 % of the total amount of trips made on bicycle. Also 11% was made by foot and 12 % by train. (Lundsstad 2010)

**Transport communications:**

*Roads:* National Motorway E22, E20, E6 and Regional roads 108 and 103

*Railway:* South Railway line and the West coast line

*Stations:* The city of Lund has two stations, one is Lund’s central station and the other is located in the city district of Gunnesbo (West coast line). The municipality also has a small station in the small city of Stångby (South railway line).
Airports: Kastrup is the Danish airport outside Copenhagen. It is reachable by train and the travel time is about 30-40min with a direct line. Sturup is a Swedish international airport located in the municipality of Staffanstorp and can also be reached within 40 min by car.

5.1.2 Future development plans

Housing

The estimated population growth in the municipality is about 1% per year. It’s estimated that 14600 housings need to be constructed between the year 2008-2025 and 63% of these in the city of Lund. A low production of housings up to 2003 and the high business activity that has occurred during the later years has caused high demand for housing. For this reason the ambition is to develop an average of 1200 housings per year up the year of 2013 to satisfy the need. After this the rate is lowered to 600 per year. According to the development plan of the Skåne region about 5000 residential housings per year needs to be constructed in the region, Lund is aiming to supply 18% of this number. In the city of Lund the intention is to construct about 5400 housings between the years of 2008-2013. Development is currently discussed to take place in the north east and east parts of the city with a stress on the city district of Brunnhög which in the future will house the development of two important research facilities ESS and MAX IV. (Lunds stad 2006)
ESS and MAX IV are two research facilities which will be located in the north east parts of Lund in Brunnshög. These are large scale projects that will be competitive on a global market. This development will strengthen Lund as a center for education and research and presumably generate a number of supportive businesses, service and housing developments.

**Business**

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**Infrastructure**

Lund is preparing for an expected intensified traffic situation due to a general increase in population and growth in the city and in the whole region. The city will have to be able to withstand an increased level of traffic with high pressure from both regional and national traffic which has to be coordinated well with the local transportation system. To be able to
secure this development the expansion of the south railway line (which will be described in the next chapter) is an important project to finish (Lundstad 2010). The municipality gives high priority to promote and continue to develop the public transportation system in the city of Lund. One of the reasons is that the character of the inner city area with narrow streets is vulnerable to a high amount of traffic and will easy suffer from traffic congestions. Lund is, together with other regions (among others Malmö and Helsingborg) in the area, arguing for the development of intercity railway lines. Lund is hoping that by the time of 2014 the construction of an intercity rail line can be initiated. This rail line would replace the existing Lundalänken, which is a direct bus line running through the city from Lund C to Brunnshög and covering almost half of the present workplaces in the city (LundaMaTs2009)

5.1.3 Lund in a Urban Network

The Skåne region

Lund is located in Skåne which is a province in the south of Sweden. The total population is about 1,2 million people. It is surrounded by the Baltic sea, Öresund and Kattegatt. Skåne has sea borders with Denmark, Germany and Poland. Denmark is the closest neighboring country separated by the Öresunds channel with just 4 km in between at its narrowest point. Skåne has a large network of conurbations and cities and is considered to be a very large city region. Many cities are of equal size and located relatively close to one another which make the region unique in its network structure. In other Swedish regions there is usually one city that is superior in size and stronger than the others, Stockholm and Gothenburg are examples of
such regions. In Skåne, seven regional centers can be distinguished as generators of growth or good potential for development and therefore important for the region as a whole – Malmö, Lund, Helsingborg, Landskrona, Kristianstad, Hässleholm and Ystad. Malmö is the largest, measured after its size of population (300,000 people in the municipality whereas 275,000 in the city of Malmö) and the level of employment opportunities and overall growth. After in the ranking is Helsingborg (130,000/93,000) and then Lund (110,000/81,000). The Skåne region is currently one of the fastest growing regions by population in Europe. Since the beginning of the 21st century the population has increased by a number of about 10%, a development that has mostly been concentrated to its larger cities (Region Skåne 2010).

Totally the Skåne region has about 500,000 employment opportunities which is a 15% increase since 1999. The growth in the region is mostly located to the western parts both in the level of employment and growth in population which can be explained due to its closeness to Denmark and the growing Öresund region. The overall level of commuting in the western parts has increased by about 30% between 1982 and 2006 (SSSV 2008). The main reasons for this are larger investments and improvements in its transport infrastructure which has resulted in a more intensified regional and inter-regional traffic. The strongest area of growth is the area around the cities of Malmö and Lund both measured by employment opportunities and growth of population. The area also distinguishes itself as an area with an overall high the level of education among its citizens. This has to do with the fact that both Lund and Malmö has a strong position in the region as centers for higher education. It also has high share of office based and knowledge intensive businesses (Region Skåne 2010).

The Öresunds region

The Skåne region is together with the Danish province of Själland (also the Danish island of Bornholm) part of the Öresund region. The total inhabitance of this region is about 3.5 million people which make it one of the most densely populated regions in Scandinavia. (Lunds stad 2006) It physically took shape in the year 2000 with the construction of the Öresund bridge between Copenhagen and Malmö. The opening of the Öresund Bridge created a fixed link for car and railway traffic and has enabled effective commuting and transporting goods between Sweden and Denmark. A trip that was previously only possible by ferry transport. With closeness and train linkage to the Danish international airport Kastrup the region has an effective global linkage. A recently finished project and important for the functional regional development is the train tunnel through Malmö, The City Tunnel, has created an even more effective chain of transports in the region. Since the opening of the Öresund bridge commuting across the channel has increased about 600%, up until 2006 this increased exponentially. The high rate of development could be explained by a large demand for work force in Denmark as well as a large difference in housing prices between the two countries. The development slowed down due to the experienced financial crisis and following low economic activity with only an increase in commuting of 6% correspondingly 2% during 2008 and 2009 (www.tendensoresund.org - Pendling över Öresund)
5.2 The South railway line

The South railway line was constructed in 1856 and was the first national railway line in Sweden. It is today running from Stockholm to Malmö and then further over the Öresunds channel, over the Öresunds Bridge to Copenhagen. Due to its huge importance in the system, the railway track falls under the category of national interest for transports.

The track is joined in the north part of Lund by the West coast track. This connection adds to its importance but also causes it extra strain. The track is connected to the Trans European Network (TEN) which is a European rail network for High speed railway and international border crossing transports. It is an important high traffic railway line with pressure from local, regional, national and international transports.
5.2.1 The Expansion of the South Railway line

The stretch between Lund and Malmö is currently at maximum capacity with 380 trains running through per day which makes it the most trafficked railway line in Sweden. It has a central distributing role for the railway network not only in Sweden, but for the Skåne region as well as for the whole region of Öresund. The capacity of the South railway line is at the moment insufficient due to a high demand for more traffic and space in the system. The demand is also expected to rise due to a general increase in population and expected continuance economic growth in the region. It is estimated that the track needs to increase its capacity to 470 trains per day by the year of 2020 to supply the future demand of transport. The expansion of the south railway line, between Lund and Malmö, is therefore a high priority for investments. The lack of capacity is also counteractive for other investment made in the system, the Öresunds Bridge, the City Tunnel of Malmö and other improvements on the west coast track (Banverket 2010).

According to a report done by the SSSV that from a long term sustainable perspective, it is important to keep this level of attractiveness in the region and continue to develop coherent to the level of growth in economic activity and population. The lack of capacity leads to strong limitations for a long term sustainable growth in the whole region. The finished construction of the City Tunnel has solved a lot of problems but to make the best profit of the investments, the work of increasing capacity has to continue throughout the region. An increase in capacity is also necessary for the increased traffic further up the line for the fast national trains where there is demand for more traffic, shorter trips and shorter travel time (SSSV2008). The speed of the national trains is currently discussed to be raised from 200 km/h (present time legislated velocity) to 250 km/h in certain parts of the country, among others the South railway line and the Westcoast line. A decrease in travel time is not possible without raised capacity on the final stretch of the South railway line. (Banverket 2010)

The suggested action is an adding in the number of tracks from two to four on the railway line between Arlöv and Flackarp and then further from Flackarp to Lund, which would resolve most of the problems stated. The four way track between Arlöv and Flackarp is viewed as the most important and necessary project to finish (Banverket 2010), see Annex 2.
The expansion towards Lund

The last stretch from Flackarp up to Lund central station is also an important project. This stretch constitutes the last bottleneck in the system. After this point the pressure of the track is relieved as it is divided and the west coast line (which continues north up to Gothenburg) and the continuing of the South railway line (north east towards Stockholm). But it is still inconclusive of what is the best solution and there are at least two scenarios for this development. One of the options would be to simply continue with the adding of tracks up to the central station of Lund. Another option is together with the continued expansion, rerouting an additional track around the western part of the city for the transport of goods. In the final study of the Arlöv and Flackarp railway line investigation Banverket argued for the option of an outer goods traffic line which should be built around the western part of Lund. This is not afflicting or reducing the necessity of a four way track expansion towards Lund. Banverket also argue, with the statement from the county traffic and SJ AB that the four way track needs to be expanded towards Lund no matter what the chosen solution is for the future development of the continuing stretch. The opinion of Lund’s municipality in this matter is that an outer goods track would be a favorable development because any heavy noisy and hazardous goods transport would be diverted from the city. Länsstyrelsen concurs and is in favor of this development (Banverket 2010). According to, Astrid Avenberg-Rosell plan architect from the municipality of Lund), it is the desire of Lund municipality that the track for goods is to be built before they allow Trafikverket to construct the four way track further up to Lund central station. If the four way track is constructed before the outer goods track, the municipality suspects that the reasons for an outer goods track would be to week and never realized.

Another issue of the project is that the widening of the track will make claim to more land and intensify the level of noise which will interfere with the surrounding urban structure. A larger area of influence means that the impact of the existing environment in the city has to be has to be reviewed. According to Astrid Avenberg-Rosell, an immediate problem is in the last 400 m stretch up to the central station in Lund. In this area a large number of historical culturally protected buildings are surrounding the already narrow two track railway. A breach on this environment would be complicated, next to impossible without a demolishing campaign or tunnelling under the area. A tunnelling would also most probably involve a redevelopment of Lund’s central station to an underground station which certainly would open up for a whole new potential of development for central areas of Lund. This type of project would be extremely costly and may be considered to be unlikely at this time. The city of Lund is still a small city by comparison and the amount of land laid bare after this change and its value would presumably not be not high enough to support this investment. This is an issue that has to be solved.
6. The development of Klostergården and southern West district

The infrastructure investment with an overall increased capacity as a result, will leave room in the time schedule for additional stations along the track without slowing down other traffic. Slow train traffic with more stops as a complement to the fast regional and high speed national trains, will raise the capacity of the track and availability to the system even more. The aim for this next chapter is to examine the prospects of a train station in the south periphery area of Lund by studying the areas spatial conditions. This will help to show the precondition for a station and further land use development.

6.1 The area of study

The area of study is located on the border line to the municipality of Staffanstorp between 1 to 2.5 km straight distance from the central station. It is the city district of Klostergården and the far southern parts of the West district. The two areas are separated by the South railway track which is also the official border between the areas. The west district continues and spreads out north and northwest along the railway line. The district of Klostergården borders in the north to the central city district and to the Järnåkra-Nilstorp district in the east. It then continues south over Höje creek until it reaches the municipal border of Staffanstorp.

To limit the research the surrounding main roads (i.e. Trollebergsroad, Stattena road and the Ring road) and the municipal borderline will define the target area and receive most of my attention. I believe an outside glance is also necessary. I have chosen to view the areas from a radius of approximately 1 km to map out any additional target point and area of influence see Map 4. I believe after my research study that 1 km is a good estimated distance for any immediate impact of the changes done on the railway track concerning land use and base for travelers. Usually the area of influence of a train station is estimated to be 1-2 km equal to the real distance of travel, as opposed to the direct distance, which is a straight distance between two points. An old role of thumb is that the potential base of travelers is located within a radius of 1 km. In a radius of 1-2km the number can be expected to decrease to about 50% due to other factors that affect people’s decisions in choosing transports.(SKL, Boverketm.fl. 256)

The population in the district of Klostergården is currently about 5300 people. In the West district the total amount is about 11 100 and on the south side of Trollebergs road there are about 2400people. This adds up to a total of 7 700 people within the area of research. (www.lund.se/politik--fovaltning/Kommunfakta/Statistik /Befolkning/) A glance at the future development plans of the area shows that the district of Klostergården has a construction plans for about new 650 apartments before the year 2013 see Figure 1. This will increase the population by about 2000 people.
Map 5 Area orientation map.
1. Ideon research park
2. Peoples park
3. St Lars
4. Lunds Business park
5. Water cleaning plant
6. Klostergården park
7. Kloster gårdencentre
8. Patrik Rosengren park
9. City park
10. Källby outdoor swimming
11. Höje creek

Map 4 Overview area map of the main roads, railway line, districts and borders and area of influence of 1km (red dotted line)

Image source: Map archive in the city of Lund (manipulated)
Visual tour of Klostergården and the southern West district
6.2 The urban development

For historical review of the city of Lund see Annex 1.

The southern West district

The West city district was up until around 1850 just countryside with a few farm estates and manor houses. Industry and production was located and constructed in this area which was at the time the far side of the city. In 1914 the city started its expansion on the west side of the track and the West district was formed. The southern part of the district was initially constructed alongside Trollebergs road and was developed into a workers district. The area around Trollebergs road was mostly constructed during the 1940’s. It has a mixture of different house types and structures, single family housing, row-houses, and 3-4 floor lowrise apartment buildings. The areas were further developed during the 60’s through the construction of the neighborhood Solgårdarna which is mostly low-rise residential buildings. The Rådmans square is a central place in the area that was initially constructed as a local square and market place. These activities eventually died out and the square does not have the same function anymore. Just north of the Trollebergs road is the Peoples Park which was founded in 1895.

Klostergården

Up until the 1960’s the area of Klostergården had always been a farm area. In 1959 it was ruled by the municipality to build high residential houses in the area to help with shortage of housing, which was a general problem in the nation’s cities. It was the state’s objective at this time that during a 10 year period in the sixties and beginning of the seventies that 1 000 000 homes was to be developed to resolve the problems. The developments mostly included high rise apartment buildings in the fringes of the cities, but also new well planned settlements outside the city. The developments have had a mixed result and in the later years many have struggled with social problems and a general low level of attractiveness. The area of Klostergården, despite its background from the million housing project, is highly acclaimed for its esthetic and social qualities. Klostergården was finished in 1963. There have been numerous attempts to change Klostergården and its center, though many not so successful. The opposition has been strong from both people living in the area and professionals out of concern for the areas esthetic and its surrounding nature. The continued development and densification of the area has instead taken place in its surrounding vicinity, mostly in the late 80’s and 90’s and is still proceeding. Klostergården has mixture of high rise and low rise buildings (3-9 floors). It has a central market place and an area with a school, a library and a church and the two areas are joined by a central neighborhood park. The neighborhood of Regnbågen is located on the north side of Sunnan road (marked in blue see Figure 3). It was built in 1988 and is a 2-3 floors low-rise housing area. Areas around Östan road started its development in 1996 with complement floors on the existing high rise buildings and the
neighborhood Molnet that was built in 1999 (marked in yellow). The bow shaped step façade building by the bank is the newest addition to the area and was built in 2004.

6.3 Functions and Land use

Green areas

The area is located in the south western periphery of the city, where the countryside meets the city. Nature and agricultural land is due to this a large part of the area landscape especially in the outskirts of the areas. There is a large nature resort around Höjecreek which is currently a well visited recreation area, for promenades, jogging and bird viewing. It is part of a constructed promenade route running from St Lars to Värpinge by.

The natural environment is very integrated inside the area which makes nature a characteristic feature for the whole area. There are three constructed public parks within the areas. Patrik Rosengren Park (West district), St:LarsPark (Located centrally in S:t Lars in Klostergården) and Klostergården Park. The Klostergården Park is a well landscaped and organized neighborhood park with arranged areas for play and rest. Patrik Rosengren park also has the function of a neighborhood park and lies at the end of a green strailing path through the

Figure 3 The urban development by decade.
residential area. It is not as arranged and landscaped in its character as Klostergården Park, as it is mostly constituted by tree hursts with a central open field. The areas are also close to the City Park and Peoples Park. The City Park is located in the central district on the north side of the ring road, accessible from Klostergården through a crossing pedestrian bridge at the northern end of the area. Peoples Park is reachable if crossing Trollebergs road.

Klostergården and the West district have large areas of Garden plots. Garden plots have over a 100 year history in Sweden and in some parts in Europe even longer. Initially the idea of garden plots was pure functional, so that people living in the city were to be able to provide themselves with additional fruit and vegetable crops. Later it also had recreational purposes and became a way for people to enjoy nature next to the crowded city life. The first garden plots in Klostergården and the West district were first built after the 1940’s. It has over the years expanded with more garden plots areas (with attached small leisure housings) and plots only for growing crops which are mostly located along the railway tracks.

Industry

The very southern parts of the West district are known as the southern industry area. It was first established in 1939 with the foundation of Åkerlund & Rausing packaging company, which for a long time was the main actor in this area. The area is today known as Lunds Business park. The present use of this area ranges from large industries, to warehouse facilities and office establishments.

There is also a large watercleaning facility down by Höje creek and a heating plant on the east side of the track in Klostergården. The water cleaning plant was established as early as 1933. The plant covers a large area with its cleaning ponds/pools which is very near, but secluded from Höje creek. It currently suites the surrounding nature well and doesn’t cause an immediate inconvenience for the recreational activities in the area. On the contrary its ponds serve as an integrated element in the picture of the landscape with a very rich nature life.

Public and commercial service

The Klostergården centre is the local market area and meeting place for its district. It has grocery markets, small restaurants and a few shops. Close to the centre there is also a church, parish house, school and a library. A number of elementary, primary and intermediary schools are distributed in the area. They can mainly be found close to the local parks and green areas in the districts. Klostergården is also known for its wide area of sport fields and number of sport facilities located in the northern parts and alongside the railway track. It also includes an outdoor sports arena, with a training field and soccer fields. Since 2008 there is also a new indoor arena for ice hockey, handball and other public events like music concerts. Close to the Höje creek, the area also has an outdoor swimming facility, “Källby badet”.
In the southern parts of Klostergården the old hospital area of St Lars is located which was built in 1879. The area has a long history as a hospital with a focus on mental treatment. Today the area and its facility have a more mixed used function. It still has many medical care functions but many former hospital buildings have been converted to private schools, youth facilities and offices. Central in this area is the S:t Lars Park with Höje creek running through it. Next to S:t Lars is the Ideon Research park which is a renowned area for its science and research.
6.4 Infrastructure, road network and movement

The edges of Klostergården are very much defined by infrastructure, the South railway line in the west, the Stattena road in the east and the Ring road in the north, see Map 4. The ring road surrounds the city's central parts. It is an important distributing road and all of the main roads in the city connect to it. Stattena road is one of these roads that link the highway road E22 to the inner parts of the city. Trollebergs road is another similar road that cuts through the west district and connects the national roads 108/103 and highway road E6/E20 to the inner areas. These three roads give the two areas a good connection to the rest of the city. The Klostergården district has three entrances. Klostergårds road is the main entrance that distributes the traffic either to the residential area or to the area of St Lars and Ideon business park. The second entrance is the Nordan road that together with Västan road, Sunnan road and Östan road circulates the central high-rise building area and distributes the traffic to accessing neighborhood streets and access roads. These are large roads, about 8.5 to 9 m wide which seems in many parts to be oversized, considering the low amount of traffic. The third entrance is an access road to the sporting area and a large parking lot that is linked to the Nordan road. Most of the functions and activities around Klostergården are oriented towards and connected through Nordan road and Sunnan road. In the southern West district there are several entrances that connect to Trollebergs road, see blue arrow in Figure 5. They each transcend into a distributing network of neighborhood streets. The main road of the residential area is Peoples park street that opposite to the other street runs through the area down to the Maskin road. The Maskin road divides the residential area and the industry area with the garden plots acting as a buffer zone in between. The largest road is the Åkerlund & Rausing road that runs up along the railroad up to Lunds Business Park and further to the water cleaning factory. This road generates heavy truck traffic to supply the industry area. The main area for parking is along Stattena road, around Klostergården centre and by Sunnan road. At Sunnan road there are both open parking areas and private parking houses between the high rise buildings. There are also a large number of parking spaces along the west side of the railway track, close to the industry area.

Movement – Pedestrian, bicycle and car traffic

The inner areas in both districts are very much accessible by bicycle or by foot. The railway track prevents any effective crossings between the areas except under the pedestrian pass. If we disregard the outer roads of the districts, the two areas are only joined by a pedestrian underpass (red circle see Figure 5) which is located in the northwest extension of the Nordan road under the railway track. This is very limiting to the movement between the two areas. The only two alternatives to cross the track are either under the bridge by Höje creek (850 m away of the map) or under the viaduct by the ring road (450 m away, green circle see Figure 5). On the other hand there is no direct target point for pedestrians distributed in the south industry area. Along the Maskin road near the pedestrian bridge, the Garden plots, Patrik Rosengrens Park, the school and the residential area are easy accessible from Klostergården by the central placed underpass.
Figure 4: I have in these drawings studied the general road network and divided the roads into, main (outer) roads, primary, secondary, tertiary and access roads. The drawings also show the main parking areas.
These drawings show the general moving pattern and paths through the areas. The yellow lines are movement other than the car traffic (blue line) i.e. pedestrian and bicycle traffic, I have joined these two though the inner areas are very accessible from both traffic perspectives. The orange line is an official bicycle path running from Hjärup through the central district in Lund up north to the district of Norra Fäladen.
Public transports

The bus traffic in Lund is divided into three main categories.

- **Direct lines** (Lines 20, 21), which are mainly trafficked on weekdays and daytime. Its main target group is commuting travelers and is a part of the so-called “Lunda länken” that covers about 25,000 work places in the city. All the direct lines originate from the central station.

- **Service lines** (line 10-12), these are mostly suited for people with special needs, for example elderly and movement disadvantaged people.

- **Regular local bus traffic** (lines 1-6), which is moving during the whole days and every day of the week. All bus lines have its starting points from the central district and the regional traffic start from the central station and mostly runs on the same paths as the direct lines. In the area there is only the second and third category.
6.5 Map analysis

An overview photo from 1940 of the city gives a comprehensive view of the development of the area at this time. The central city has grown outside the old city wall mostly to the east but the west side of the track is starting to take shape. The foundation of the southern west district is starting to receive industry and residential development while the Klostergården remains undeveloped.

Another map from 1965 shows how the two areas were eventually developed. The map shows at that time the recently constructed area of Klostergården, its centre and sporting area. The residential area of the southern west district is fully constructed together with Patrik Rosengrens Park, a school as well as a large area for Garden plots. The industry area and the water cleaning plant are fully established. On the map, the south railway track is clearly visible. It is also apparent how the railway line was used by the industry with connecting tracks in to the area for loading and docking. These tracks are not active today. According to the map there was also an old train stop by the underpass next to Åkerlund & Rausings road, Källby hållplats (red circle see map 8). After a site study one can clearly see reminiscences of it and how the form of the underpass in its original form was shaped to fit it. it is not clear
through the map if the train stop was only in to service the industry or if it allowed regular passenger boarding as well. The map also tells us about the further development plans for the road network in the area. The intention was to link the two areas more effectively through a tunnel under the railway track to replace the existing plan crossing. The crossing road would form an additional ring road which was supposed to run parallel to Sunnan road from Stattena road and further up to connect to Trollebergs road. An intersection was to be constructed on the east side where a new road parallel to the track was to be constructed. This would further connect to Nordan road in the north and continue south across Höje creek. Several constructional preparations were made for this development but were never followed through. The link between Sunnan road and Stattena road was constructed. The development plans from 1965 continued well into the 1980’s when it was supposed to be implemented. The intention then was to, through this road, connect with Värpinge village and the newly established city district of Gunnesbo. The project faced great opposition, as it was considered to pose too large of a barrier between Klostergården and the green areas around the hospital area of St:Lars. The large infrastructural change would also involve a huge breach in the nature zone of Höje creek. By the end of the 1980’s the project was closed down and the ”western ring” as it would be called was instead constructed in the beginning of the 1990’s through the Flackarp countryside, with a safe distance from Klostergården. It is today constituted by the national roads 103 and 108. Without the presence of the “Western ring” the area alongside Sunnan road could be developed and in 1988 the neighborhood Regnbågen was built in its place.
6.6 General impressions

A general impression of these districts is that the urban structure varies with a mixture of both dense to sparse development. The closeness to nature and the countryside in its outer surroundings together with a well-integrated green structure in its inner areas adds much to its natural character. Though separated, added together the area has a multiple use of land with a variety of functions that generates different kinds of activities. A positive aspect is that many of the activities and functions are both local and regional attractions. For instance the nature resort and sport facilities offer recreation and leisure and the business park, Ideon research park and S:t Lars offers work and service.

Overall the areas have a complex spatial situation with different developments to bring together industry, apartment residential, villas and green areas both active and non active. A varied building structure makes densification a complicated project but in terms of proportion and balance. It can on the other hand result in an interesting area structure with a wide variation of both public and private spaces which can contribute to its character and uniqueness. The presence of industry is a limiting development factor and though it has at present a restriction for any housing development close to it. The railway track will also be problematic and a challenge in the issue of area integration. The districts also borders to the municipality of Staffanstorp, which causes an obvious problematic situation, with a clear boundary of governing.

The district has a good connection to its surrounding districts. The large roads that runs outside the areas gives fast access to and from the districts by car, the ring road and Stattena roads are very wide with shifting heavy and intense traffic which induces their character as perceptive barriers surrounding the areas and therefore limiting for movement for pedestrians and bicycle traffic. A walking bridge connects the southern parts of Klostergården with the City Park and further up to the central parts of Lund. This slightly reduces the barrier effect. This closeness to the central parts of the city is good in terms of accessibility but can make the use of a station limited for this area and an argument against such a development. the ring road, which is separating the districts from the central areas, can be considered as a direct physical obstacle, limiting for the movement of pedestrians and bicycles and therefore extending the actual distance.

The main roads in the district of Klostergården are Sunnanroad and Nordanroad which is distributing roads in the area. Most of the activities, target points and housing development
are oriented along these roads which makes them important paths to consider for further development. In the West district the functions, for apparent reasons, are separated from each other. The residential area is located on the northern side and the industry on the southern side with the Maskin road and garden plot area acting as a buffer zone between the two. The residential area has a finer road network while the industry area is more secluded and closed, which inhibits movement through the area. This makes the industry area a barrier between the residential area and the nature resort.
6.7 Pre-conditions for development

6.7.1 Topography

Klostergården and the south parts of the west district have an even sloping topography with some irregularities. I have identified four sloping breakpoints. Starting from the northeast, the highest point (D) just before the ring road the ground is 32 meters over the sea limit. By the underpass (C) it lowers to about 27 m. At the end of Åkerlund & Rausing road (B) it comes down to 20 m and the lowest point to the south west is the bottom of the Höje creek, 8m (A). Between A and B the average fall is about 1,1 m per 100m, between B and C about 0,7m per 100m and between C and D the terrain falls the most with an average of 4,6m per 100m. The railway track follows the terrain for the most parts with the exception from point C where it rises from the terrain and keeps a height of 20m as it passes the creek.
6.7.2 Area regulations

Industry area

The far south area in the West district is labeled Heavy industry area which inhibits residential development close to it. The restrictions are dependent on the level noise and the level of disturbing and hazardous activity taking place within the zone. The degree of air pollution and smell is also a contributing factor.

Waterfront protection

Höje creek is currently protected with waterfront building restrictions, which means that no housing development is allowed within of 100 meters of the creek.

Ground water covered area

This zone is a sensitive ground water area, which means that development in the area has to be supervised so that it does not affect the ground water negatively and causes it to be unfit to be used as drinking water. This can mean restrictions in the use and handling of environmentally hazardous products as well as limitations in land use and development. (SGU)

Agricultural Land and View protected area

The municipality of Lund is surrounded by one of the most valuable agricultural land in Sweden. On a national value at a scale from 1-10, most of the land in Lund is rated 8-10. The preservation it also has a cultural value. The region of Skåne has a long history as an agricultural region. Agricultural land is an important topic to discuss in the issue of future development. Agricultural land is important to preserve for the future supply of local crops and food (www.SGU.se). Many areas, especially in the western part of Skåne, compose a typical characteristic Skåne landscape and is in some cases regulated and protected from exploitation. , agricultural land does not fall under the category of national interest. It is in the hands of the municipality to consider this in their plan for development. In this particular case the municipalities of Lund and Staffanstorp have agreed that the landscape is of cultural importance as it represents a typical image of Skåne agricultural landscape. Development in this area or close to it should be dealt with in a delicate manner (Staffanstorps kommun 2009)
6.7.3 Pre-conditions for development near railway

**Noise, vibration and intensity**

Due to safety regulations and the fact that Railway traffic generates a high level of noise and vibrations there are number of requirements that need to be considered in the issue of land use and development near railway tracks. Noise and vibration can cause inconvenient and discomfort for people living, working or dwelling in an area. The noise is measured in decibels (db), the vibration in hertz (Hz). The intensity of the traffic is also of concern, which means that the amount of trains that passes through per the day is relevant as well as at what time of the day it passes. The maximum allowed level of disturbance is set and depended on where and what kind of area it inflicts upon. It sets the limit of what kind of development, activities and functions that is allowed near the tracks as well as determines what level of measurements that has to be taken for the existing development to ensure a good and healthy living, working and public environment. Higher speed and heavier trains is something that can mean an increase in noise and disturbances (Banverket & Naturvårdsverket 2006).

In the issue of noise the maximum and standard value is for (Banverket & Naturvårdsverket 2006 s 12):

- Indoor living area: 45db (although 30db is a standard value)
- Outdoor living area: 60db
- Education area (inside): 45db
- Work area (inside): 60db
- Recreational area: 55db
- Outdoor resort area: 40db

![Sound level db(a)](image)
**Safety area**

For safety reasons it's important to keep the railway traffic separated from developments and other types of traffic. In general, there is not allowed any housing development closer than 30m. Although activities that are either sensitive to noise or other disturbances, and where people only temporarily maintain themselves, can be located in within this zone, for example storage, garage and parking (Banverket 2009) The safety distance between the railway track and car, bicycle and pedestrian roads is depended on the velocity of the vehicles as well as the design of the roads and the track. It ranges from 9-25m and when concerning parking and terminals it ranges from 9-15m (Vägverket 2004)

Safety distances is decided on a case to case basis, which means that the decision is taken based on which circumstances the area is developed and what measurements have been taken to secure a good living environment. , a good living environment is difficult to uphold at a distance within 30-50m, even with measurements taken to reduce the impact of the railway (Banverket 2009). In general, if the standard values cannot be upheld, the land should not be developed. There are circumstances that allow exemptions from the standard rules.

They are:

- In central parts of cities and larger conurbations with development of a city character for example an arranged urban structure.

- When complementing existing dense urban development or with new development with an arranged urban structure along public transportation routes in larger cities. (Boverket 2008)

In these types of cases other factors have to be considered, for example the building structure so that the residents is given living areas without noise and disturbances. In such a case the development and the single housing structures has to be constructed and designed with a so called “silent side”. The measurement that is taken also has to be viable, construction wise as well as justified in a national economic perspective. They shouldn’t either be limiting for the future development of the railway. (Boverket 2008)
6.8 Local objectives; the comprehensive plan of Lund’s municipality (2010).

6.8.1 Overall objectives for a sustainable urban development

The overall vision according to the comprehensive plan is that the urban development has a starting point from the national stated goals and objectives. The main objective in the comprehensive plan is that the overall Co2 emission in the municipality is to be reduced by 85% by the year of 2050. The aim is that this objective should be consistent on every level of planning, decision making as well as set the standards and influence all activities that takes place in the municipality, both private and public. It involves taking action to secure energy efficiency, setting clear goals and insert measures for people to have the opportunity to make sustainable choices. One strong objective is to reduce the dependence of the car. This will be done by continuing the development of the public transportation system by extending its coverage and efficiency. The extension of the road network for bicycle traffic has a high priority as well as creating good conditions for pedestrians. Another strategy to solve this problem is that locations with good connection to the regional traffic are given priority and everyday service (daily shopping, pre-schools) and well visited workplaces (both by workers and customers) should be located near transit points in the public transportation system so that the trips are as efficient as possible (Lunds stad 2010). The overall preservation of agricultural land is also given priority. The solution to this issue is to strategically density the city so that exploitation of agricultural land can be avoided as much as possible, see page 59. If agriculture land has to be claimed it should be done near stations and transit points with high land use efficiency (Lunds stad 2010).
6.8.2 Urban strategies and guidelines for a sustainable urban development

In the comprehensive plan of Lunds municipality there are 13 different headlines and strategies for a sustainable urban development that originate from the national generation goal a good built environment from 1999, see page 25.

I have extracted and summed up the five first points which I consider to be the most relevant for this study.

1. Preserve agricultural land

2. Create an effective urban structure
   a. Focused development around stations and transit points
   b. The City districts is joined with effective transports

3. Mix the city
   a. Create a safe and attractive environment with variation of the built environment
   b. Offices, institutions, cultural and service is not disturbing activities and does not need to be separated from housings and can blend together.
   c. Mix functions and the house types.

4. Aim for “life bearing city district” centers
   a. Life bearing meeting places means closeness to daily markets, service and cultural institutions
   b. Base of users is established through focused housing development in the surroundings of the centers
   c. Secure accessibility to the center for all modes of transport, including the car.

5. Work for good densification
   a. Roughly there are three categories and reasons for densification.
      1. To set the base for travelers or users
      2. Transformation of land use
      3. To heal the city
   b. There is good potential for densification if the development follows point 2 and 4
   c. Periphery areas, with low usage of green areas, buffer- and safety zones, zones around infrastructure is a good target for densification
   d. Area character and cultural historical values is important and needs to be persevered as well as the city’s parks, green paths and garden plots.
7. Proposal for development (Result)

As an effect of the expansion of the South railway line, the district of Klostergården may prove to be an interesting target to discuss for strategic densification of the city with a focus on land use development around stations and transit points. Strategic densification of the existing built environment means, among other things, that development on valuable agricultural land outside the city can be diverted from exploitation and preserved as much as possible. It is also stated by the municipality of Lund that periphery areas, with low usage of green areas, buffer- and safety zones as well as areas around infrastructure may successfully serve this purpose and enable a good densification of the city (Lund 2010).

This proposal for the development of Klostergården and the south west district offers a possible localization and form of a train station that can set the groundwork for an urban design in the districts. It gives an idea of how it can be structured and organized in terms of infrastructure, plots, functions and open spaces. Possible measures to reduce noise, vibration and the barrier effect will also be illustrated to relive the area of the immediate impact of the railway and as a starting point for further development. The general aim of this proposal is to set the base for a dense and cohesive urban structure with focused development near the railway station to first of all increase and encourage the use of public transport (and other environmentally friendly means of transportation) by creating cogency between land use and infrastructure. It is also the objective of the design to generate positive economic, social and spatial values to the city and the districts in question.

Preconditions

I have in this proposal worked under the presumption that the South railway line will be expanded to a four way track between Arlöv and Flackarp, the widening of the track all the way up to the central station will not be possible due to the presence of culturally protected buildings. I have also assumed that the alternative of a tunnel under this area will be too costly at this time and not generate enough profits. I do not exclude this development from the design as circumstances may change when the city grows and a tunnel may therefore be an option for future investments. One solution could be to lead the widened track up to the viaduct by the ring road, about a kilometre from the central station see Map 11. At this point the train would have to wait for a clear pass through, with this short distance the time would be reduced to a minimum and therefore in my opinion, acceptable. If a tunneling would become a serious option, the track can then be lowered and tunneled under the ring road and further through the city. The project of the south railway line includes issues regarding the transporting of goods. I will not handle these issues since an outer goods track does not undermine the importance of a further railway expansion towards Lund. Because of this we may assume that the construction of the goods track will not inflict on the further development, no matter what the chosen solution will be. For this reason we can view this as a separate project and a remaining issue to deal with. Freight trains are longer, heavier and slower than ordinary trains, which have to be considered in the physical and technical design.
of the railway line. Risks that involve freight trains are also important issues to be aware of. I will in this design work presume that general measurements concerning noise, vibration and safety for personal trains can also be applied to freight trains otherwise an outer goods line outside the city will be crucial for this design.

7.1 Development strategy

Time savings is a central factor when evaluating the common use of an infrastructure project though the total amount of travel time is a simple way of measuring the level of accessibility. Time savings occur when the closeness and the accessibility to home, work, services and other daily needed functions and activities increases, which further affects the cost of transport. The overall cost of transport decreases if the trip is faster and more effective and also removes obstacles and additional travels compared to before.

To map out exactly how large the amount of time saved, as an effect of an additional station, would require a deeper study of the structure of the local and regional transportation system, its network and standard. An investigation of this type would presumably show that this location in relation to the central station would be questionable and the time savings in a city perspective might be small by comparison with existing conditions. In Trast (2007) it is argued, in the issue of encouraging usage of public transport, that the localization of activities and its density has a higher influence and a more important factor than the total traveling distance, within certain limits of course. (SKL, Boverket m.fl 2007) This would mean that if the overall development of the area generates enough profits with an increase in the base for traveler’s i.e. more activities, workplaces and housings, it will increase the demand for additional travels and the further purpose and use of the station would be strengthened both in a local and regional perspective.

Priemus (2006) argues that large urban networks are often best served through a multimodal approach with several large stations. This is to prevent an over burdening situation that may come from a single station in which all the transport network meet. The stations can complement each other with their own functional programs and special transport features. (Priemus 2006) A comprehensive understanding of the public transportation system in Lund implies that it is very focused around the central station. As the city grows the traffic pressure on the central station will grow and possibly exceed its limits. One vision is that the Klosterård station in the future can function as an unburdening and complementary station to the central station. Both in the issue of traffic and as a city centre with complementary functions and services and transport features. The station may have local traffic as its main base but could also be a starting point for the national traffic, which would make its closeness and connection to the central district more of a benefit than a shortcoming. this is dependent of how the station is prioritized in the cities transport system i.e. its connectivity with the rest of the modes of transports for example the buss traffic and the future light railway development.
The expansion of the South railway line will have a large physical impact on its surroundings. Complimentary bridges, underpasses and supporting infrastructure have to be added or reconstructed and the surrounding urban environment has to be reviewed. Intensified traffic (either with or without the further expansion through Lund) will produce increased levels of noise and vibration in areas where the railway line passes through. The more intense level of disturbance together with the widening of the tracks will mean that its physical presence will be strengthened. It may therefore be perceived more negatively as a larger barrier and disrupting element by the concerned areas. Measures to reduce noise and vibration are essential and arguably the most important measures for the development of this area. This will satisfy the need for the existing built environment and set the base for a continued development. The redevelopment of the railway line presents a good opportunity to insert necessary measures for further development, which at the moment is mostly restricted by the presence of the railway in terms of noise disturbances. Such action may open up for development closer to the track as well as to ease the construction of effective transversal connections. A railway station with sufficient and well placed and safe crossings can join places instead of separating them. With a good connection to the surroundings, development of the stations’ area can be used as more than just a place to start and end a journey. (SKL, Boverket m.fl 2007)

Map 11 The area of development and existing target points outside this area. The area of development covers a zone of approximately 0.5 m. The yellow line is the existing railway track and the dotted red line is the stretch of expansion.
A change in the area’s conditions in terms of noise and accessibility (the development of a station and cross track connections) will probably change the land value and the conditions for transport. This will open up for new possibilities in real estate development. It may also provide a stronger argument for the transformation in land use of the industry area and incentive for its change of production. A possible development is that the new conditions in terms of accessibility and potential for housing development can lure activities and functions that are more dependent on a large flow of people as well as a high access to the city. In other words the development can have the effect of disturbing activities such as the moving of the heavy industries from the area. This would mean that the current restrictions could be removed and new opportunities appear for a denser, more cohesive and mixed urban structure. The industry could then be replaced by other activities such as offices, businesses and services which can create a more dynamic and “life bearing” place. A dense and well visited urban environment close to the station increases the base for travelers (Banverket 2009). With a localization of activities and functions of public interest the area can receive the role as a district center which further could be complementary to the city center. This would be beneficial to the city as more target points for travelers and users of the overall road traffic could be more evenly distributed with less focus on the central areas as a result.

Densification has two dimensions that are important to be aware of, the density of the building structure and the density of people which both can have spatial consequences. A denser building structure may have many advantages. More activities can be concentrated to a smaller area which means that resources in forms of energy and transport of can be focused and used more efficient. A high amount of people concentrated to a specific area can set the base for more activities and service but it can also so lead to an overburdening spatial situation. A densification can mean that the traffic increases which generates more pollution and noise. More people as well a dense urban structure sets a high demand on the issue of transport and energy supply. Insufficient space can also lead to congestions problems in the system which either has to be resolve with more supportive infrastructure or stricter traffic regulations. Supportive structures such as more roads, parking lots may claim more space and suppress other vital elements, for instance green structures. Green areas are important for the general wellbeing of the citizens to create spaces for leisure and recreation. Vegetation in the city is also important to reduce pollution, noise as well as to favor the biological diversity in the city. (Boverket 2007) In other words, urban densification set a high demand on effective transport solutions and on the urban planning in general. Issues regarding densification often involve difficult decisions between different poles of interest for example the construction in green areas, parks or in environments of high cultural value (SKL, Boverket m.fl 2007).

A pre-condition for this development is that some of the activities within the development zone are relocated and the land use of regulated areas is changed. This concerns the schools, amateur soccer fields, the garden plots and the industrial zone. The industrial zone needs to be transformed which is at the moment inhibiting housing development close to it and prevents a varied and mixed urban structure. A current project in the area that in my opinion ought to be reevaluated is the suggested direct link from the Åkerlund&Rausing road across Höje creek down to the 108 road in Flackarp. The main purpose of this road is to redirect heavy truck
traffic from the inner city and bed for further development of the business park. Since the objective of this proposal is to change the land use of the industry area I believe that there are other alternatives that should be considered for this link with the purpose to connect the south sides of Höje creek to the districts and the station. I also believe that the suggested link will continue to stimulate the existing industrial activities in the area which will make its transformation more difficult. A benefit of this localization is that it is constructed on already claimed industrial land and may therefore give the lowest interference with the existing land. However, there is definitely a risk that it will massively enhance the presences of infrastructure both visually and physically at the point of the bridge. The width of the bridge will be at least 30 m and a question is how this will affect the nature resort. A change in land use and the development towards more knowledge and service based businesses would give a higher frequency of passenger journeys to and from this area thus an increased base of travelers. Another issue is the garden plots that need to be relocated for this proposal. These types of activities are considered to be important by the municipality and the community for recreational purposes and it’s a stated ambition to preserve these plots; I believe that the land can be used for other activities that would mean a more densely populated and well visited area. Development that is well visited and well used serves a station and its base for travelers better. I believe that the aim for this project justifies the claim of this land for the benefit of a more effective land use close to the station. In the matter of the schools I believe they can be relocated to new facilities inside the area. The land on the east side of the track where the amateur sport fields are located today is an important area for this development, especially in the initial stage of the project to make the necessary interventions. The land is owned by the municipality and can set the foundation for a continued development and be steered in the desired direction. For that reason the land has to be claimed for exploitation and the sport fields needs to be relocated.
7.2 Area objectives

After a review of the local overall objectives, preconditions, strategies and current area conditions I have elaborated the area objectives which will be used as a framework in the overall design. The general aim is to set the base for a more effective land use and cohesive urban structure of the existing built environment.

**Overall objectives for the area**

- Increase the opportunity for more efficient land use and development as well as satisfy the existing environment by reducing the disturbance of noise and vibration.
- Increase the accessibility between the districts by reducing the barrier effect caused by the railway and to construct a more effective transverse road network that connects the districts and increases the access to existing and new target points.
- Contribute to the regional development as well as the development of the city of Lund by creating potential new attractive areas for work, education and residential housing with high access and closeness to service and other public activities with good public communication.
- Create a mutual target point for the area through a central placement of the station with good connection transversely.
- Place the station in a movement pattern, highly visible with a clear orientation.
- Create a good access to the station and its surroundings with potential for coordination between the different modes of transport and parking.
- Allow good spatial conditions for its surrounding for surplus values as a city districts centre and a dynamic attractive meeting place.
- Enable a low impact of traffic with large opportunity for movement and access for bicycle traffic, pedestrians and buss traffic.
- Enable a good green structure with good connections to surrounding green target points.
7.3 Measures for reduction of noise and vibrations.

With the use of different methods, noise and vibration can be reduced and in some cases eliminated. Walls can be built and constructed using different materials to block out the sound. The ground level of the track can be lowered and even tunneling may be an option. Sound walls are the easiest and least expensive measures because it does not require any reconstruction of the existing track. A wall may have limited ability to reduce the noise and vibrations. In some cases the wall will have to be very high and wide to be sufficient.

The sloping topography of the area presents an effective way of reducing sound and vibrations without noticeably affecting the capacity of the track. By lowering the track in relation to the existing ground, the level of disturbance could be reduced considerably. There are several options that can be tried out and chosen among for the most successful effect. The consequence study between Arlöv and Flackarp tested 1.5 m, 3 m, 5 m and 5.5 m as possible depth for the measures for both in the cities of Åkarp and Hjärup in the first phase of the expansion, see Annex 2. This I believe can also be applied here. The effect to reduce noise and visually cover the railway is better the deeper you go. The deeper you go, the harder it will be to access the station platforms. A depth of 3 m should be enough to reduce the noise and vibration. If necessary, depending on the surrounding built environment, it can be complemented by 2 m sound walls, see Image 3. A depth of 3 m is also favorable for the station platforms compared to a 5 m depth, though the platforms only have to be lowered 2 m in relation to the ground level. This would make it easier to create a good accessibility to the station and further transition to other modes of transport. In the overall stretch, a 3 m lowering of the track means that after point A, see Map 12, the track continues at a height of 22 m above sea level to point B. The track then rises with same angle as the ground level and at Point C the track starts to prepare for the pass over the viaduct by the Ring road at point D. This is an inclination from 27 m to 32 m over a stretch of 250m, which in other words is about a 1, 1°. This degree of inclination I believe would not affect the capacity and further disrupt the traffic but would require further investigation.

The accessibility across the track can be increased by plan crossings, bridges and underpasses. A lowering of the track may also allow for the construction of bridges across the track to be done with fewer complications. Strategically placed crossings could then join the two areas instead of separating them. With the intense traffic situation in mind, plan crossings over the track are in this case not an option to strive for as it creates a hazardous risk when crossing the track and 2 prevents the flow of traffic cross the railway. Bridges and underpasses are therefore a more favorable option. The sloping terrain and the lowering of the track present an excellent opportunity to use both alternatives. An underpass for cars could be constructed by point A where the ground level is already 2 m below the track. A lowering of the terrain of an additional 3m is enough for a clear pass, resulting in a low interference with the rest of the terrain. Bridges might then be strategically placed further up the track in coherence with the location of the station and the new road patterns, see Figure 8.
Image 3 Proposal of how the track can be lowered in relation to ground level

Map 12 Drawing of the station area with new ground levels of the track
7.4 The Station

The objective of this station design is to show a possible localization as well as the organization of important station elements to set a good base for a continued urban design. I will consider the station design in a simplified manner. This means that I will focus on the elements that have the most impact on the movement to and through the station. These include areas for parking, crossovers, station platforms and supportive infrastructure. I will not deliberate on supportive structures (for example station, service and parking buildings and so on) other than I will leave sufficient space so that the station design is not closed for such a development if the amount of users and intensity of traffic requires this.

Based on my own measurement on existing stations for example Lunds central and a few other smaller stations I have determined the general required space for a railway station. There are most certainly many deviations between stations due to different physical and technical requirement, these measurements may be used as guidance in the localization and form of the station. The reason for this is that an exact measurement and dimension is not of significant importance at this stage of design.

**Required space for a Railway station**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station length:</td>
<td>about 200-220 m</td>
</tr>
<tr>
<td>Minimum width of space</td>
<td>18 m</td>
</tr>
<tr>
<td>Platform width:</td>
<td>5-10 m</td>
</tr>
<tr>
<td>Minimum width of the station</td>
<td>23-28 m</td>
</tr>
</tbody>
</table>

7.4.1 Location

The location of the station is important to consider at an early stage of this development. It plays a central part in the movement of people and vehicles. A well placed station with good infrastructure to support it will allow a better flow through the area in question and further determine its level of accessibility. A good location of the station also allows a good form. In this case the form refers to how the station, its platforms and a possible stationhouse are constructed in relation to its functional surroundings, for example accessing roads, parking areas, bridges and under passes and so on. When choosing the location of the railway station it’s important to consider that a station is not just its platforms and tracks; it also includes its surrounding areas, efficient accessing roads for motor traffic, bicycles and pedestrians as well as sufficient parking spaces for cars and for bicycles. Visual axels and functional paths are also important features to establish so that its location places the station as a central focal point. Also important for a well-functioning and attractive station is what kind of activities and functions that can be located near the station (Bertolini 1998).
**Suggested location**

The location I have chosen to test has a central location (D) between the two districts. The distance, measured from the center of the ring road to the center of the station is about 700m. The terrain is favorable with an open area on the east side with a ground level that ranges from 24 m to 26m on a 200m stretch, which is good in relation to the lowered track. The central location also allows a central distribution for the traffic and movement. It can serve as a central target point for the built environment with large potential for development on the east side of the track (after necessary sound and vibration measures have been taken). It is also in the further extension of the Klostergården Park which I intend to further develop in this proposal. Other locations (A-C), have also been considered as possible locations for a station, but dismissed for different reason. This is further explained in Annex 3.
7.4.2 Station form

The suggested location allows a number of forms for the station. Both side platforms and middle platforms can be used. The supportive infrastructure for cars and busses can be constructed in different ways depending on how the movement is intended to be directed. Also parking for bicycles and cars can be built near the station. Functional and effective bus stops near the platforms will enable an easy transition between the different modes of transport. In the final rapport of the first phase of the project Trafikverket investigated the benefits of side platforms versus middle platforms. It was shown that the different alternatives had positive and negative aspects. Side platforms was argued to be more favorable for easy access to the station and also allowed better track geometry. The middle platforms were positive for a clear orientation, this design increased the width of the station and it was more complicated to construct (Banverket 2010). I have chosen the option of side platforms because it saves space and offers an easier direct access to the platforms.

Proposal

The accessing roads will run parallel to the station. A straight line with few curves and obstacles is to be preferred so that buses can have easy and fast access to the station. The station will also be equipped with two pedestrian and bicycle bridges, one on each side of the station for maximum accessibility. Spaces for parking are placed parallel to the track on the far ends on both sides. This space allows the option of a high amount of parking in an area that otherwise may be limited for development. The location of parking give the traveler the option to go directly down to the track through accessing stairs or cross the track by foot using the pedestrian bridges that are placed at the end of each parking lot. The shift to other transport modes, for example buses and taxies is done in the middle of the station with a distance of maximum 10 to 25 m to the platforms to ease the transition between modes of transport.

Figure 6 The station form and organization of roads, parking and bus stops
7.5 Road network

Proposal

The purpose of a new road network is also to support the train station with sufficient infrastructure so that the train station can be available, functional and effective. A new road network is necessary to better reduce the barrier effect and join the two areas together. The new roads will help to connect the existing target points with the new ones as well as to prepare for future development. At this point only the main roads and head connections are considered. The main objective is to connect the areas and the station with the outer main roads as well as to consider a link across the municipal border over Höje creek. The aim for this proposal is to make the station accessible to its surroundings with an effective flow of traffic through the area and up to the station as well as to secure a good movement inside the districts for cars, public transports as well as bicycle traffic and pedestrians.

1. A new car underpass is suggested at the lower south west end of the track. The main aim is that it will function as connective road between the two areas and to the station. It is a similar suggestion as the one that was dismissed in 1983. This road is an extension of the Sunnan road instead of a parallel road and direct connection to the outer roads. Special consideration still have to be made here to prevent the road of becoming a barrier between the area and the nature resort as it was for this reason it was dismissed in 1983. Measurements have to be taken to reduce speed and the intensity of traffic as well as safe cross points for pedestrians and bicycles. Examples of such measurements are a narrowed street or changes in the pavement.

2. Åkerlund & Rausing road connects the station with the Ring road. After it has passed the station it is redirected into the area to further connect with Högsbo road.
3. A connective road is suggested across the municipal border towards a planned residential development in Staffanstorp called “Flackarp garden village”. This proposal is an alternative to the suggested extension of Åkerlund & Rausing road to further link with road 108. The main purpose of this road is to prepare for future concentrated development across the municipal border along this road with the Flackarp garden village as its base. It is also the intention to distribute the infrastructure and the traffic more evenly across the creek.

4. The placement of a new road in this area might interfere with the view protected area, I believe that this development can be integrated in the area and not be a disturbing element.

5. The Maskin road is changed and moved next to the PatrikRosengren Park. The road then further connects to the extended Högsbo road. This road is moved so that future development can be oriented around the Park. The road becomes a joining street between the residential areas and the new development.

6. Close to this street a new walking bridge is added. The purpose of this bridge is to connect the park with the sport field. It also is the intent to connect west side of track to the future development plans of 350 apartments that will be located along Stattena road.

7. The Västan road is removed and replaced by a road parallel to the suggested location of the railway station which will connect to the Nordan road and then further down to Sunnan road. The västan road is then converted into an allé park, integrated with the Klostergård Park.
7.6 Land use and function

Longer work related travels between larger cities and smaller cities are a more and more common phenomenon especially in a region with a strong economic growth. The public transportation system can be strengthened by among other things locating housing development, work related activities near its stations and transit points (Vägverket 2007). It makes its sphere of action larger and creates a better base of travelers. Close station development is one method that has earlier been mentioned, see page Fel! Bokmärket är inte definierat. This principle involves locating well visited activities and functions of public interest near stations within a radius of 500-600 m as an acceptable walking distance is between 500 and 1000 m. Among other things this strategy also argues for office activities near stations which supposedly favors the base for travelers more than for example residential housing. The reason is that offices generate more travelers with the same target point and purpose which opposed to residential housing is more disbursed. The effect is a smaller and more uncertain base of travelers with larger variation. A variation of functions and activities generates life and movement to the area which increases its functional value. It also results in more travels on different times of the day and it gives the option of doing more than just travel from point A to B. Different points of target along the journey make the trip more valuable. If a person can do different everyday errands along the way (for example do shopping, leave children at daycare and so on) it can create a more effective journey and minimize further transports. It can also create good potential for social contact and interaction which is an important feature when creating an attractive urban environment. (SKL, Boverket m.fl 2010)

The new suggested land use and function development should have a stress on office and educational activities since work related activities supposedly benefits the base of travelers the most. The research and knowledge business together with the city university is a large attraction force in the city and therefore important to bring forward and provide a good access to. Housings developments also creates a potential base of travelers and also important to consider in the design. The total existing population is about 7700 and is expected to increase to about 9700 people until the year 2013 (within the defined research area) due to existing development plans as shown in Figure 1.

Proposal

The main idea is that offices and educational activities are placed close to the station, with a radius of 500 m (see Figure 7 red circle) as a base of measurement so that these facilities are easily reached by foot. The additional housing development is mostly placed on the far west side of the track with a few exceptions on the east side. In the closest vicinity of the station the area has a mixed used set of function which is oriented along a central open space consistent on both sides of the track. This central area should contain offices, public and commercial service as well as residential buildings. The main objective for this localization is first of all to concentrate activities and create a vibrant and active place that develops to a
district centre and acts as central feature for this district. It can provide service for the travelers so the journey receives a larger functional value. It may also create an attraction force and give reason for additional travels to this area.

The central open space is a further extension of the Klostergård park. It continues transversely over the station which makes it consistent on each side of the track and joined by the two station way crossings. The objective is to create a central transversal axel (red arrow in Figure 7) that runs through the area and locate important target points along this axel. The idea is to further reduce the barrier effect that would be larger if these target points were place parallel to the railway track thus extending its actual distance between them. This axel also places the station in a central position and in addition giving the area an easy and clear orientation.

Figure 7 New land use and function. The figure also shows a possible plot structure and overall infrastructure. The red circle represents the 500 m radius zone. The dotted circles show locations for existing development plans in the area. The white dotted circle is the inner central area and the red arrow is the transversal axel.
Figure 8 This figure shows the possible plot structure with yellow arrows representing new established connections. The small arrows represent connections limited for pedestrians and bicycle traffic and the thicker for car traffic.

Figure 9 Green structure and green path The green paths (dotted green line) connects the surrounding green structure (full green colored area) and existing parks and nature zones (green dots).
Figure 10 Pedestrian and bicycle a possible movement pattern. The spotted yellow lines are movement through green areas. Overall it shows a high level of accessibility for both pedestrians and bicycle traffic.

Figure 11 Traffic movement. The figure shows the main movement through the area and up to the station for car traffic and public transport.
The distance between the track and the buildings is set to about 40-45m. I believe the closer the better. The intent is to maximize the land use and to establish a good visual contact between the station and its surrounding. The distance I believe also to be sufficient enough to not interfere with any further development of the Railway station which means leaving room for possible supportive building structures. The permitted distance between the housing and the railway line is set by national norms to be not closer than 30m. Within a distance of 30-50m a good living environment is difficult to uphold, see chapter 6.7.3 Pre-conditions for development near railway. I will assume that development within this zone will be possible with the extensive measures taken (explained in chapter 7.3) to maximize the land use and the connection between the station and its surrounding.

**Section 3** This section shows the intended measurements between the housing development, connecting road and the railway line.

**Section 4** This is a wider section through the station area and the central open space. It illustrates how a possible housing development could look like and how it would relate to the station.
Image 4 A visionary image of the station and its surrounding on the southeast side of the track. The station park is visible in the center together with the public service building that is either developed into cultural center or an activity center.

Image 5 A visionary image of the station platform on the south east side
7.7 Summary

I have in this thesis work argued for the importance of the infrastructure and the development of a sustainable transportation system in a contemporary urban state of change. The focus has been on transport infrastructure particularly on railway with the aim to study its objective and background to further learn about its local impact and consequence on the urban environment.

**What are the objectives and background of a national infrastructure development/investment?**

From a general perspective the development of transport infrastructure is often a national state matter and its directives are carried out by different state authorities working on different levels. The community planning is in the hands of the local governments which have the legal authority to decide how and when its land is to be used and developed. This makes the development of infrastructure a complicated matter. The development of infrastructure often becomes a negotiation process between the state and the local governments in which the local interest are faced against the national interest and objectives. Within this process there can be a number of public and private interests that also has to be included and considered. The need for investments in transport infrastructure is always high. The state has limited resources which means that projects continuously need to be weighed against each other and calculated to conclude which is the most effective, necessary and sustainable solution. Time savings is an important factor in decisions concerning transport infrastructure as well as the demand for additional travels, supply of service, changes in transportation costs, alteration in travel behavior and environmental profits. Its cost and benefits is translated into monetary terms as much as possible to finally conclude its use.

National investments in infrastructure often have the target to increase the level of accessibility to the general public and business life on a local, regional and an interregional level. The intent is to increase connectivity between cities and regions to widen business, labor and housing markets by reducing transportation cost through first of all time saving. The main reason for this is to be competitive on a global market as well as stimulate and distribute economic growth, welfare and service on a local and regional level. Investments and improvements are also made out of concern to safety and to reduce negative impact on the natural and on the urban environment. It’s also made to secure the usage of sustainable and environmental friendly transports and strengthen the conditions for these modes of transport both individually and complementary to be functional in a local, regional and further on national perspective. In the issue of railway it means to increase capacity of the transport system and enable a wide coverage by increasing the effectiveness of the national, regional and local network. A good coverage also means a good access to other modes of transport which includes other types of public transport, non-motorized transport such as bicycle traffic as well as a good connection to the car traffic.

A wide coverage and good coordination between different modes of transport increases the effectiveness and accessibility to the transport system and allows people to make sustainable choices in their everyday lives. The connection between infrastructure and land use
development is an important issue in this matter as well as to reduce the need for additional transport. Close station area development is a contemporary strategy that is used to create this synergy and to work towards a more concentrated urbanization pattern. A cohesive urban structure together with an available transport system encourages the usage of public transport and can also stimulate other forms of transport such as bicycling and walking. The aim for close station area development is that by creating a high density of housing and people close to the station a good base of potential travelers can be established. By mixing functions and strategically placing common activities, target points as well as housing close to the station its functional value and purpose can be increased even more.

**What economic, spatial and structural consequences does a large infrastructure development have in a local context?**

The effect of an infrastructure can differ from a case to case basis. It’s all depending on the scope of the project and what type of surrounding its strike upon. Every case is unique and its impact can be viewed through different perspectives and on different geographical levels.

Infrastructure development is commonly associated with relocalization and redistribution of assets and activities as a consequence of changed level of accessibility which can have a large impact on the local and regional economy. Basically this means that if the level of accessibility changes as an effect of an infrastructure development, it can affect the relationship between different markets and the value of assets. This can mean an advantage or disadvantage which may have an effect on businesses and as well as individuals and give them incentive for relocation to either uphold or increase the value of its assets (see chapter 3.3). In other words this means that to a certain level activities as well as people adapt to the level of accessibility. From a regional perspective the redistribution of assets is a desired outcome of a regional development strategy, to distribute economic growth, service and welfare.

In a regional perspective the expansion of the Southern railway line will make the transport system and the distribution of traffic even more effective in the region, with room for more commuting trains, HST and trains for goods transport. The risk for any interruptions caused by single traffic delays and technical problems should be reduced if the number of tracks is increased, so that the traffic is more easily redirected. This will increase the supply of transport and the availability in the system which would mean a high amount of saved travel time. An effective, accessible and reliant transport system increases its attractiveness and therefore also its usage. An expansion of the railway line can benefit the regional development as well as strengthen Lund as a regional center. A good mobility by increased level of availability to the transport system will widen markets and connectivity between places and cities in the region. It will also generate environmental profits by a potential increase usage of common and environmentally friendly means of transports. In other words, the expansion of the South railway line can produce large regional and local profits in a both economic, social and further on environmental perspective.
For the city of Lund the project of the south railway line is important to finish. Lund is a growing city both by population and economic activities which set a high demand for more housing, transport and service that will strain the city and its structures. The expansion of the south railway line will be necessary so that the city can be able to withstand an expected increase in traffic and still obtain a high level of access to the city and its functions. For the city to be able to fully gain from this project the transition between the regional traffic and the local traffic has to be optimized. This can be done by increasing the access and availability to the system by focusing and effectives existing stations and transit points of the public transportation system and if necessary develop new ones. The expansion of the South railway line will leave space for increased capacity in the system with or without the further expansion between Flackarp and Lund. This means that the development of an additional local train station is possible.

With intensified traffic (either with or without the further expansion through Lund) one can expect that the railway line will produce increased levels of noise and vibration in areas the railway line passes through. The more intense level of disturbance and together with the widening of the tracks as an additional consequence will mean that its physical presence may be strengthened and be perceived more negatively as a larger barrier and disrupting element by the concerned areas.

What location and form of a new railway station in the district would be suitable as a base for a sustainable urban design and what kind of development could this station generate?

The proposal that has been presented for the development of Klostergården and the south west district offers a possible localization and form of a train station that can set the groundwork for an urban design in the districts, see chapter 7. It gives an idea of how it can be structured and organized in terms of infrastructure, plots, functions and open spaces. Possible measures to reduce noise, vibration and the barrier effect have therefore been illustrated as a starting point for a continued development. The general aim of this proposal has been to set the base for a dense and cohesive urban structure with focused development near the railway station as a mean to increase and encourage the use of public transport and favor other environmental friendly means of transport, such as walking and bicycle traffic. It has also been the objective of the design to generate positive economic, social and spatial values to the city and the districts in question by among others increase accessibility to the area and enable further urban development.

As it has been illustrated in this proposal a train station can help to create a mutual target point for the areas and increase the availability to the transportation system. This in turn would mean that the barrier effect caused by the railway line decreases and the spatial relationship on each side of the track may be strengthened. With action taken to increase accessibility and reduce the negative impact of the track, the land value may change and give the potential for a transformation in land use. With less disturbing activities the area may be further interesting for real estate development. A denser population also gives better ground
for service as the base for travelers and users increases. A high effective land use
development with housing, offices, education and mixed areas for services and commercial or
public activities may provide the base for travelers of a station as well as users of a district
center.

A change of land use may increase the level of service, activities and accessibility in a local
perspective. Depending on the density level and usage it may also mean that one may expect
a general increase in traffic which in respond can have a large impact on the local
environment. It can create an increased level of traffic noise, pollution and safety hazardous.
Another issue, as a response to the proposal, is that land that is presently used for leisure and
social activities have to be change and the activities relocated to make way for a more
intensified dense urban structure. It first of all concerns the relocation of the soccer fields and
the garden plots that holds a large social value for the city and its citizens. Green space, which
includes both active and non-active green space, is important for social activities, people’s
general wellbeing as well as for a good biological diversity in the city. Important for a
successful design of this area is to consider these factors give them a central role in the
development. This means that the design must enable a low impact as possible from the car
traffic and good opportunity for movement and access for bicycles, pedestrian and buss
traffic. Special attention also has to be taken to the green structure inside the area as well as a
good connection to other surrounding green target points.

A dense urban structure means that valuable land outside the city can be preserved and help to
reduce the need for a further expansion of the city. A station with high a functional value may
also, in a wider perspective, allow the area and further on the city to be more effectively
linked to the regional network with accessibility to more functions and services. In reverse it
will also give the opportunity for this area to be more accessible in a local and regional
perspective so that its qualities of nature, recreation as well as its service, workplaces and
housing can be used in a wider regional perspective and benefit a sustainable development
both on a local and regional level.
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Map 13: The construction of the central station of Lund was finished in 1859 and was at first located in the west end of the city. As the city has grown, the station is today situated in the central areas of the city. From this map of the city from 1866 one can see the recently developed railway line and its station located in the western outskirts of the city.

Image source: www.common.wikipedia.org
File: Karta öfver universitetsstaden Lund 1866.jpg
Around the year 990 the city of Lund was founded. It was at this time part of Denmark, but in the 14th century it was briefly under Swedish ruling and became a definite part of Sweden in the year of 1658 together with the whole landscape of Skåne (also Halland and Blekinge). It is today together with the city of Sigtuna the oldest city in Sweden. Lund was during the medieval ages a religious centre. At the most Lund had a total of 27 churches and monasteries. After the church reformation from catholic to protestant church in the 16th century they were all torn down except the old city cathedral and the monastery church.

In 1668 the University in Lund was founded, which today is a world renowned University and currently one of the Nordic countries largest. It is also next to Uppsala University the second oldest university in Sweden. The university has had a large influence on the city development and has given it much to its character. The city has for a long time been known as a University city.

In middle of 17th century the Swedish government ruled that the street networks in the old cities of Sweden (and also the former Danish cities) should be modernized according to a grid system. This never happened in Lund so the street network of the ancient city has virtually remained unchanged.

In 1856 the railway track between Malmö and Lund was opened, which was the first national railway track in Sweden.

Around the 20th century due a general prosperity, the city started its expansion outside the ancient city wall. In 1914 it expanded to the western side of the track which was the beginning of the West city district.

In 1953 the first motorway was constructed in Sweden. It was called "Autostradan" and ran from Lund to Malmö. The Autostradan marked the definite march of the cars into the Swedish society. It is today known as Highway E22 and runs through the city of Lund.

In 1971 the city of Lund became the municipality of Lund and in 1974 it incorporated the conurbations of Södra Sandby, Dalby, Veberöd och Genarp.

Annex 2 - Arlöv and Flackarp- the first phase

The project between Arlöv and Flackarp represent a total investment of 3 billion SEK. The concerned municipalities Staffanstorp and Burlöv and the region of Skåne are co-financing the project with a total of 250 million SEK (www.trafikverket.se). The project involves expanding the railway line through the countryside and through the conurbations of Arlöv, Åkarp and Hjärup.

The municipalities together with its conurbations are already suffering from the presences of heavy infrastructure including the present day railway line. Part of the project will include minimizing the negative effect of the railway track along the stretch as compensation for this needed expansion. Measurement to reduce the noise and vibration caused by the railway includes sound barriers and lowering of the ground level in relation to the surrounding developments. Some of the conurbations will also have the benefit of further development of its station surrounding areas to reduce the barrier affect caused by the railway but also to better take care of the investment, by increasing the availability to the system (Banverket 2010).

The city of Åkarp

The main target for investment of this type is the city of Åkarp in which the railway line today is considered to be a large barrier that cuts through the central parts of the city. (see Map 3). The future widening of the track will mean that the perception of the railway line as a barrier will be strengthened both physically and visually. An expansion will also mean that the housing and the land use along the track will be affected negatively as well as the visual comprehension of city. In a study done by Banverket (former Trafikverket) in 2010 it has been concluded that at least a lowering of the track is necessary. Through this measurement the railway together with plan separated crossings and redevelopment of the train station the railway as an barrier could also physically and visually be reduced. They also concluded that If a tunnel was constructed the barrier effect would be removed or at least reduced considerably. it was argued that a tunnel might change the character of the city and its historical connection to the railway, as a railway city. A tunneling would also make the transition between different modes of transport more difficult than on a ground level. Both a tunneling and the lowering of the track in relation to the ground level would mean a considerably deduced level of disturbance which would mean greater potential for further exploitation and more effective land use near the tracks. The final conclusion of the rapport was that the economic cost of a tunnel construction would not be reasonable in relation to its use. A 5, 5 m lowering of the track with a partial roof construction was suggested instead as the best alternative. (Banverket 2010)
Annex 3 - Dismissed locations

A. *By the bridge over Höje creek*

Positive aspects of this location are that it would place the station in a central position between the two municipal borders. It would have a clear visual axel and a clear focal point over Höje creek. It would also provide a bridge between the two municipalities and presumably lead to further development and cross border cooperation. An obvious problem would be how to supply its supporting infrastructure. The extension of the Åkerlund&Rausings road would adequately serve this purpose for cars, buses, and bicycles as well as for pedestrians. The infrastructure and supporting housing development would mean a large breach to the environment around Höje å. Also the development on the south side of Höje creek is very uncertain at this point. It would be better to focus on the existing built environment.

B. *On top of a viaduct in the extension of Sunnan road.*

This location would also place the station in a clear visual axel. Its supporting infrastructure for traffic up to the station could be well integrated with the Sunnan road with exchanges for buses and other transport modes under a viaduct. Even so there is a clear risk for conflicts between the different modes of transports and passing traffic, which might lead to safety hazards and congestion problems. The surrounding development would also be limited on the south west side.

C. *By the pedestrian underpass.*

This placement would be the easiest place on which to build a station with the area’s present conditions in mind. There is a natural connection between Nordan road and Maskin road and supporting infrastructure would be relatively easy to construct. This location would be too close to the Ring road, about 450m, thereby reducing its area of influence and thus its overall use. Also, after action has been taken to reduce sound and vibrations as well as the construction of a new road network, other locations may be more favorable.