UMEÅ TRAIN AND BUS STATION
– A STRATEGY FOR AN ENVIRONMENTALLY FRIENDLY FUTURE

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Umeå is one of the few growing cities in the north of Sweden. Due to the city's geographical location, its economy is in large part dependent on its connection to larger cities in Sweden such as Stockholm and Gothenburg. As a result of this dependency, fast traveling options are a must for Umeå to continue growing. Today, aviation is the only traveling option available which provides the speed needed for travel between Umeå and larger economies in the south.

This paper analyses how the process of centralization has caused this large dependency on the economies of Sweden's larger cities. The conclusion drawn from this analysis is that for Umeå and the northern reaches of Sweden to become less aviation dependent, the region needs to become more independent. A stronger northern economy would lessen the need for traveling to, for example, Stockholm.

The purpose of the study is to pinpoint some measures which would lead Umeå and its surrounding areas towards this independency. To this end, several measures of change are explored from new laws and regulations promoting the countryside to investments in internet connection, public service and infrastructure. These strategies need to be looked into and implemented simultaneously for Umeå and the north to have a more independent and environmentally friendly future.

The research continues by focusing on of these parameters more specifically train and bus infrastructure. The study concludes that there are many investments that could be made in order to strengthen both passenger and freight infrastructure in the north of Sweden. These investments include restoring the inland train line and extending the bus network to include a larger part of the countryside. For this to be possible, several changes need to be made including building a new train and bus station in Umeå to support the increase in passengers and traffic. Such a station would act as a hub for the passenger traffic of Norrland as well as become a new public space for the city of Umeå.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>4</td>
</tr>
<tr>
<td>1.1 BACKGROUND: THE HISTORY OF UMEÅ AND NORRLAND</td>
<td>6</td>
</tr>
<tr>
<td>1.2 THE ENVIRONMENTAL IMPLICATIONS TRAVEL</td>
<td>10</td>
</tr>
<tr>
<td>1.3 TRAVELING OPTIONS IN UMEÅ TODAY</td>
<td>13</td>
</tr>
<tr>
<td>1.4 CENTRALIZATION</td>
<td>16</td>
</tr>
<tr>
<td>STRENGTHENING THE INFRASTRUCTURE OF NORRLAND</td>
<td>18</td>
</tr>
<tr>
<td>2.1 PASSENGER TRANSPORTATION IN NORRLAND</td>
<td>18</td>
</tr>
<tr>
<td>2.2 FEREGHT TRANSPORTATION IN NORRLAND</td>
<td>21</td>
</tr>
<tr>
<td>2.3 INVESTMENTS TO STRNGHTEN NORRLANDS PASSENGER AND FEREGHT INFRASTRUFTURE</td>
<td>24</td>
</tr>
<tr>
<td>2.4 LOCAL INFRASTRUCTURE IN UMEÅ AND ITS SURROUNDING REGIONS</td>
<td>27</td>
</tr>
<tr>
<td>A NEW TRAIN AND BUS STATION IN UMEÅ</td>
<td>31</td>
</tr>
<tr>
<td>3.1 THE SITE</td>
<td>31</td>
</tr>
<tr>
<td>3.2 THE PLACEMENT OF THE BUILDING</td>
<td>34</td>
</tr>
<tr>
<td>3.3 THE PROGRAM OF THE BUILDING</td>
<td>36</td>
</tr>
<tr>
<td>CONCLUSION</td>
<td>37</td>
</tr>
<tr>
<td>SOURCES</td>
<td>39</td>
</tr>
</tbody>
</table>
CHAPTER I
INTRODUCTION

“Two roads diverged in a yellow wood,
And sorry I could not travel both
And be one traveler, long I stood
And looked down one as far as I could
To where it bent in the undergrowth:

Then took the other, as just as fair,
And having perhaps the better claim
Because it was grassy and wanted wear:
Though as for that, the passing there
Had worn them really about the same,

And both that morning equally lay
In leaves no step had trodden black.
Oh, I marked the first for another day!
Yet knowing how way leads on to way
I doubted if I should ever come back.

I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood, and I
I took the one less traveled by,
And that has made all the difference.”

Robert Frost, The Road not taken
Traveling is a magical thing. It’s a freedom to visit new places and experience new cultures. It is fascinating to over the course of a couple of hours be somewhere completely new, seeing people living their daily lives in a place so foreign to what you yourself consider home. Traveling doesn’t have to be exiting though. When one takes the same bus home every day the trip might not be as exhilarating as when flying to the far reaches of the earth. The same can be said for airports, train stations and bus stops. For one person it is the first glimpse of an alien and fascinating place. For someone else it is a mundane stop on the way to work. In a city traveling is a vital part of the urban fabric. The roads, the railway, the underground and the airport all form the infrastructure from which the city is built.

As an architect I find these connections between people and places interesting. How does this network these modes of traveling form the urban fabric we live in? Urban buildings such as train stations, bus stations and airports serve several purposes. They are hubs in a network of communication, inks in a chain of traveling, connecting far of places with one another. The buildings are also part of the local infrastructure as well as public spaces in the city.

When looking at a city such as Umeå the possibility of connecting to other places is of vital importance for the city’s growth. Yet, the common modes of travel are also a great threat to the environment today. So just like Robert Frost society has to find the road less travelled by, a road which leads to sustainable, prosperous and environmentally friendly future.

To this end the Swedish government assigned all county administrative boards to develop a regional climate and energy strategy. In 2012 the Västerbotten strategy was developed in cooperation with the municipalities, governmental agencies, industry and other organizations with the goal of making Västerbotten County the most sustainable region in Sweden by 2020.¹

The strategy involves the whole of the society, from businesses and urban planning to consumption and lifestyle since all these factors are interlaced and affect each other. For example the need for fast transportation is caused by the demands and expectations of businesses and private citizens. How these transportation systems affect the city fabric is a result of how politicians, urban planners, architects and engineers work with these elements.

To rethink the role of these infrastructural elements in a city and adapt the modes of traveling to the future was the starting point of my thesis project. My research led me to question how economic and political powers have been centralized to the large cities of Sweden such as Stockholm and Gothenburg. With Umeå as my city of focus my thesis project is a small piece in a large puzzle aiming at making Umeå and the Northern regions of Sweden, referred to as Norrland, more self-sustaining.

¹ Västerbottens Länsstyrelse, 2012 p. 1
To this end I have chosen to design a new combined train and bus station in Umeå. This is in order to promote and extend communications between the cities of Norrland. Within this thesis text I will explore how such a building can be a part of a stronger and more independent Norrland.

My research is divided into several parts. Firstly I have outlined my projects background, summarizing the history of Umeå and Norrland and how transportation has influenced the areas growth and stagnation.

I. I BACKGROUND: THE HISTORY OF UMEÅ AND NORRLAND
- THE IMPORTANCE OF TRANSPORTATION IN RELATION TO GROWTH

Norrland’s coastal cities such as Härnösand, Sundsvall, Umeå, Piteå and Luleå were founded by the Swedish state in the 1600’s. The newly founded cities had a relatively bleak beginning yet by the second half of the 1800’s things change. When the industrialization started in England there was an increased international demand of timber. A timber industry started to grow in Norrland resulting in a population boom. As evident in the

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6 Westin Lars. 2015. p. 4
The immigration continued even farther north. In the 1870’s the northern rail network was extended, reaching Kiruna by the end of the century making it possible to mine valuable iron ore located in the mountains of Kirunavaara and Luossavaara. Apart from the iron ore in Kiruna, the timber industry was the main source of wealth in the area. The railroad and the rivers were vital to the growth of the timber industry. Timber was transported on the river from the forests in the inland to the sawmills located in the coastal cities. Here the timber was refined and transported by train or boat. The train made it possible to transport heavy loads through the country faster than by steamboat. The railroad connected the industries in Norrland with the southern regions of Sweden.

The depression in the 1930’s didn’t affect the northern region. However, the timber dominated regions of Jämtland and Västernorrland start to stagnate during the 1920’s. This is mainly due to the profit from the industries not being reinvested in developing the counties. The two regions recovered after the Second World War. Yet, in the 1950’s a long period of poor competitiveness initiated affecting all of Norrland. Jämtland and Västernorrland whom had just recovered from stagnation in the 1920’s were the most affected and population in the two counties hasn’t recovered since. The population decline was largely due to centralization. The financial and real estate markets in the northern regions weakened and were slowly relocated to Stockholm. People also started to move

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Note: The diagram shows the population growth in Norrland’s counties and five of Norrland’s coastal cities. The graph below Västernorrland becomes the epicenter of this population storm. At the time Sundsvall as the main city in the northern parts of Sweden.

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3 Statistiska centralbyrån
from the countryside and smaller cities to the larger cities in Sweden as a result. Stockholm, Gothenburg, and Malmö experienced a large increase in population at this time.

This trend changed slightly during the 1970’s. A stronger public sector started to develop resulting in a population shift from the city center to the residential areas in the outskirts of the city. With more jobs in the public sector people started to move from Stockholm, Gothenburg and Malmö to the medium sized cities that became service centers to the smaller cities and towns nearby. This shift in population gave a boost to the cities of Norrland where schools, hospitals & universities could offer jobs.

The economic crisis in the 1990’s affected all of the four northern counties. The Swedish economy quickly adapted to focus on knowledge based technical and service orientated production. This made it harder for the medium sized cities to compete with the larger city’s effective and more attractive labor markets. Västerbotten was the counties fastest to recover from the crisis. By the middle of the 1990’s the population was again on the rise and soon became the largest county in Norrland, as evident form graph II. What differentiated Västerbotten from the other counties was its ability to adapt from an area specialized in timber production to an area with a growth of knowledge based sector and a strong public sector as shown in the graph below.

Today Umeå is one of the only growing cities in Norrland while many of the smaller cities in the hinterland are decreasing in population. The decrease in population is due to several factors. One of the foremost is the difficulty for businesses to thrive in these remoter areas. The catchment area is too small and there is a difficulty in working towards other cities with a larger economy due to the remoteness. The municipalities in these areas are also struggling. Health centers close down due to lack of funds and employees. The police also have difficulties. In the hinterlands of Västerbotten it takes more than 40 minutes for the police to arrive. However, in other parts of Norrland people have waited for several hours when calling 112.

It is clear that cities with a natural influx of people have better conditions for growth. An example of this is how large seats of education provide a natural influx of students and professors as shown in the right diagram below. The movement of people coupled with a larger economy and catchment area for businesses help these cities to thrive.

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5 http://www.dn.se/ledare/signerat/svensk-polis-befinner-sig-i-et-miserabiligt-tillstand/
6 http://www.svt.se/nyheter/lokal/162b7f70b8f3b1cf4f9f4/zwesterbotten-lang-vantan-pa-polisen-i-inlandet
What becomes evident when looking at growth historically is the importance of connection between people and places. To be able to ship goods and people is a key factor for businesses to thrive. This is especially the case in smaller cities where the local population and economy is too small to support larger businesses. Here a connection to larger cities and economies become vital for future growth. How these connections have been established has, as mentioned above, changed with time. Today, with the internet as a new tool for communication physical transport is not as necessary as earlier. Yet, the need to meet physically still exists. Here aviation has become the main mode of transport when traveling long distances. However, in an environmental light the CO2 exhausts from aviation is a large climate threat.\(^7\)

\(^7\) WFP, 2014, p. 6
\(^8\) http://climate.nasa.gov/causes/
A large majority of climate scientists agree that the foremost cause of global warming is human influence. This is evident from the increase of greenhouse gases in the atmosphere causing heat to be trapped underneath it. There are several gases which cause global warming including water vapor, methane, nitrous oxide and chlorofluorocarbons. However, it is the increase in carbon dioxide which is released when burning of fossil fuels that has caused the change in the earth’s average temperature. The effects of this temperature change can already be observed. Glaciers are disappearing due to the higher temperature. The changes in participation and slight shift in seasons have affected where plants grow and caused trees to flower sooner. This has in turn affected the animal life, forcing the wildlife to adapt to the new conditions.

IV - THE GLOBAL CO² EMISSIONS BY SECTOR

As presented in the diagram above the emissions of transportation are 17% of the global CO2 emissions. Within the transportation sector 10% of the emissions are from cars and other vehicles traveling by road, 4% by aviation and 3% from other forms of transportation such as ships and trains. When narrowing the field of study to Sweden the percentages shift slightly.

In the diagram below one can see that transportation contributes to 32.7% of Sweden’s total CO2 emissions. Domestic flights account for 4-5% of Sweden’s carbon dioxide emissions.12 Yet, 90% of flights by Swedes are international. However, international flights are usually not included in national statistics as in diagram V. This is due to the fact that international flights are outside the Kyoto protocol an agreement on how much carbon dioxide each country may emit. If international flights were to be included aviation emissions would amount to 10% of the country’s total emissions.13

V - Sweden’s Total CO2 Emissions by Sector 14

These figures are to be compared to the emissions of Swedish traffic by road such as cars, buses, trucks and motorcycles. These vehicles produce close to 30% of Sweden’s total emissions.15

The emissions of each mode of transportation have to be compared to the relative speed of travel. There is always the question of how reasonable a length of a journey is. One would not bike from Sweden to South Africa even though there would not be any CO2 emissions. The same is true for many other environmentally friendly traveling options. The

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12 https://www.swedavia.se/om-swedavia/miljo/#gref
15 http://www.trafikverket.se/for-dig-i-branschen/miljo---for-dig-i-branschen/energi-och-klimat/Transportsektorns-utslapp/
time it takes to travel will always be a factor. This is the chief reason why aviation is such a popular mode of travel.

So when discussing and comparing traveling options in relation to their carbon footprint the speed of travel needs to be taken into consideration. When doing so the analysis of each mode of transportation in relation to another will be more realistic. Then there is also the issue of how many people can travel in each mode of transportation. Here a bus and a car with the same emissions will have a different environmental impact per person since a bus can take more passengers.

Considering both the speed and the amount of passengers in relation to emissions will give us a different result than just comparing the emissions a 1 hour journeys by two different modes of transportation. The diagram below compares different modes of transportation. Here the carbon dioxide emissions have been divided by kilometer of travel in order to be comparable. The emissions are also divided by average amount of passengers the vehicle can hold. In addition to these figures, the diagram shows the cruising speed of each mode of transportation. This helps us to appreciate which modes of transportations can be considered for which type of journey.

VI - THE EMISSIONS OF DIFFERENT MODES OF TRANSPORTATION PER PASSENGER & MILE

It is evident from the graph above that no other form of transportation to date can compete with the speed of air travel. However, train traffic is a reasonable alternative at

http://www.hallbartflyg.se/flyget-och-miljon/
distances shorter than 500 kilometer. As shown above, trains driven on green electricity have minimal CO2 emissions per passenger. One can also conclude that making it easier for people to use train and bus traffic instead of cars would lower emissions greatly.

I. 3 TRAVELING OPTIONS IN UMEÅ TODAY
- UMEÅ AIRPORT AND OTHER MODES OF TRANSPORTATION

Umeå Airport opened in the 1960’s. Since then it’s been reconstructed and expanded in several stages. Today it is one of the busiest airports in Sweden. Most of the air traffic from Umeå airport is domestic with Stockholm as the main destination. At night the runway is used for airmail. The airport is actually Sweden’s second largest postal airport.17

VII- PASSENGERS AT UMEÅ AIRPORT BETWEEN 1999 & 2015 18

As evident from the graph above the number of passengers using Umeå Airport is steadily increasing. In increase in passengers at the airport has a close connection to the growth of Umeå. At the present there are over 100 weekly flights to Stockholm with the passengers

17 Stensson Peter, Lundberg Maria. 2003, p 11
18 https://www.swedavia.se/om-swedavia/statistik/#gref
mostly being business men and women. The airport is however not only important for business. The university and hospital benefit greatly from the possibility to bring in people with specific competence from other parts of the country. As the city of Umeå grows the larger the need for fast transportation to other parts of the country becomes.

The popularity of Umeå Airport is largely due to the airports location. With the airport only 6 minutes away from the city center traveling times to Stockholm are less than from cities like Sundsvall, which actually are geographically closer. This makes it simple for people to travel over the day to Stockholm without spending large parts of the working day traveling.

Though the location of Umeå Airport is one of its greatest strengths it is also one of its greatest weaknesses. Being located so close to the city center the pollution from the aviation mostly in form of noise affect large parts of the city.

VIII - NOISE POLLUTION FROM UMEÅ

This is clearly shown in the diagram above. The noise pollution from Umeå Airport is the most critical at night when postal flights traffic the airport. Newer, less noisy aircrafts and

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9 https://www.visitumea.se/sv/motestaden-umea
20 https://www.swedavia.se/umea/om-flygplatsen/
green landings have contributed to a lessening of the noise pollution from the airport. However, noise pollution is still an issue in the areas along the air crafts landing paths.22

Due to traveling times there is no traveling option at present that can compete with aviation at a long distance. As evident from the graph below the traveling time to Stockholm is lengthened by several hours when traveling by train, car or buss.

**IX - TRAVELING TIMES TO STOCKOLM** 23

One can also perceive that cities located further south such as Sundsvall have a different situation. Here there is just over an hour’s difference in traveling time between aviation and train traffic. As for Umeå there is the possibility of high speed trains to Stockholm being a feasible alternative to air travel. Traveling at 300 km/h a high speed train could reduce the traveling time from Umeå to Stockholm drastically. 24 The major difficulty with this traveling

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22 Al-turk Ibrahim. 2015. p 11
23 WSP. 2014. p 27
24 http://www.goeuro.com/trains/high-speed
The option is the cost involved. The government is at present considering building a high speed railway between Stockholm and Göteborg, Sweden’s two largest cities. The cost for the project is calculated at the minimum of 230 million Swedish crowns. The expense is so high that the high speed railway might never be a reality. In the light of this, a high speed railroad between Stockholm and Umeå is highly unlikely. Not only would the cost be higher because of the longer distance but the amount of passengers using the railroad would be less. Yet, in the future the building of high speed trains will with all likelihood become cheaper as the technique advances and becomes more common.

I. 4 CENTRALIZATION
- HOW CENTRALISATION HAS WEEKEND NORRLAND

The situation presented above is a hard nut to crack. On one had there is a large need for a strong connection between Umeå and Stockholm for Umeå to thrive in the future. On the other hand this need has a large environmental impact since aviation is the only theving option available which meets the demanded of speed. As stated above high speed trains is a costly but environmentally friendly option to replace air travel. However, instead of focusing on replacing aviation one can question the need for traveling between Umeå and Stockholm.

The need as described in chapter one, is derived from the process of centralization. Over the last 50 years power and economy has gone from being scattered through the country to being moved to the larger cities of Sweden such and Stockholm and Göteborg. Smaller cities such as Umeå are therefore dependent on the larger economies of these cities in order to thrive. Yet, if Norrland was to be strengthened as a whole the dependency on the south of Sweden would be less.

For Norrland to become more independent several strategies would be needed. These range from local and regional projects to national laws and regulations. On the regional scale an extension of the railway and buss traffic between the coastal cities of Norrland as well as the less populated cities and towns in the hinterland is needed. For Norrland to be able less dependent on Stockholm it needs to become a strong entity where the cities within can connect with each other.

Another important cornerstone is to extend the digital infrastructure of Norrland. Because of the distances a strong digital infrastructure is needed to supply citizens with services and connect them to other more populated parts of the region. This would further unite the cities and towns in Norrland and make it easier for businesses to connect with each other and work together. The diagram below shows Internet access in the northern parts of Sweden. As one can see the connection in the coastal regions is very high. However, further inland the connection is less than poor making it hard for these areas to thrive.

http://www.dn.se/ekonomi/notan-for-hoghastighetstag-230-miljarder/
In addition to these infrastructural investments there is the need of an increase in public services such as healthcare and schools. Smaller cities have the luxury of offering housing close to nature yet the housing options available are more limited than in larger cities. There is a need for more apartments and row houses for people whom are not interested in living in a large house with acers of land to take care of.

Apart from these regional investments there is a need for National laws and strategies promoting the hinterland of Sweden. For businesses in these areas to thrive there is a need for more equal conditions in all parts of the country. Here one can find inspiration from Norway whom has taken steps in insuring that the whole of their country prospers. In Norway two governmental strategies are singled out as the cause for their countryside flourishing.

The first is a model which was set in place in the 70’s. The Norwegian government decreed that the earnings from natural resources should befall the area where these resources are located. Therefore the natural resource tax as well as property tax payed by hydropower companies goes directly to the municipality of
that area. Since hydropower is largely located in rural areas the model supplies the countryside with approximately 6.5 billion Norwegian kronor every year.\(^{26}\)

The second strategy regulates non-wage labor costs. Instead of the Swedish system of the same non-wage labor costs in the whole country, Norway has chosen to distribute the costs depending on population. As shown in the diagram below, the country has been divided into several zones, each with its own set of labor costs. In the zones with a high population the non-wage labor costs are higher than in areas with a low population. By making it less expensive to hire new employees successful companies have the possibility to provide new jobs and keeps struggling companies from cutting jobs. The gradient system has also made it more attractive for people to start new companies in rural areas, something essential for small cities to grow.

The two Norwegian examples could be adapted and implemented in Sweden. Such reforms would help the struggling countryside becoming an attractive place for people to live and work. The model of directing the tax income from hydropower could for example be applied to other natural resources as well such as ore and timber which are two of Sweden’s largest industries. Yet, for the rural areas of Sweden to thrive there is a need for simultaneous investments in all these separate strategies.

With this in mind, my thesis project becomes a small piece in a large puzzle. Due to my interest in and mapping of traveling options in Umeå - this is what I will focus my thesis on. To this end the next chapter will look more closely at train and bus transportation in Umeå today. However, it is important to bear in mind that this thesis is only one strategy focusing on transportation. Many other of the strategies mentioned above will be necessary to make Norrland a strong and self-sufficient part of Sweden.

CHAPTER 2
STRENGTHENING THE INFRASTRUCTURE OF NORRLAND

2.1 PASSENGER TRANSPORTATION IN NORRLAND
- MAPPING BUS AND TRAIN ROUTES CONNECTING UMEÅ TO OTHER CITIES OF NORRLAND

The three main traveling options in Norrland apart from aviation are car, bus and train. The car is in many ways the most common transportation mode out of the three. This is in large part due to the independence it gives the driver. With the possibility to individually plan ones journey the users don’t have to take bus and train routes into consideration as well as departure times or walking distances. However, as shown in diagram VI cars produce

\[^{26}\text{http://fsv.nu/utr%C3%A4kning-norgemodellen}\]
between 15-18 kg / 100 km per person. This is higher than airplanes where the co² exhausts are about 12 kg/ 100 km per person. When discussing these figures one should take into account that people generally travel longer distances by aviation. However, cars are as a rule used more frequently. Which mode of transportation is the worst for the environment is irrelevant for the purpose of this thesis paper. One can just note that both travel by car and air are environmental hazards. Therefore it is just as important to provide options car travel as it is for air travel. The other two forms of travel namely bus and train can do just that. To this end Västerbotten County transportation plan aims to take advantage of all the benefits and opportunities the Bothnia Line, a train line completed in 2012 which has enabled faster passenger train traffic between Sundsvall and Umeå. The plan which guides the counties infrastructural investments defines three prioritized areas for the counties infrastructural development. The county will prioritize projects which focus on Rail-related measures, traffic safety measures for road infrastructure and/or sustainable traveling options for the local region. Infrastructural projects centered on the first and third aim relate to the goal of this thesis test - to provide alternative environmentally friendly traveling option to strengthen the infrastructure of Västerbotten and in continuation Norrland. In order to define which projects would have the greatest affect it is of import to study the existing infrastructure of Norrland and the Umeå region.

XI - BUS TRAFFIC BETWEEN UMEÅ AND OTHER CITIES OF NORRLAND

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Lundberg Maria. 2014. p 6
The map above pictures the regional bus traffic departing from Umeå. The dark red indicates high trafficked routes while the routes in a lighter red are less trafficked. It is hardly surprising that the E4 between Umeå and Haparanda has many bus lines since this is the main highway in the region. In addition, the E4 connects several of the largest cities of the area - all situated along the coastline. Apart from the central bus routes along the coast only two roads connect the hinterland of Norrland to the more populated coastal regions. The E12 connects Umeå to the very popular ski resort Hemavan. From here the E12 continues into Norway ending in Mo I Rana. Although not as trafficked by passenger traffic as the E4 the E12 is an important part of the freight traffic connecting the harbor of Mo I Rana at the coast if the Atlantic sea with Umeå Harbor which ships traffic the Baltic sea as well as sends goods through Finland and into Asia. The second road with bus traffic passing east to west is road 95 which in the city of Dorotea connects with the E45, the main road in the hinterland of Sweden which starts in Mora and runs all the way to Gällivare. However, there are many areas of the hinterland which have no regional bus traffic connecting them with Umeå. This makes these areas very isolated and their inhabitants solely dependent on the car. In addition many of these areas have very poor internet access as mentioned in the earlier chapter. Another observation is the lack of bus traffic along the south coast of Norrland. Compared to the hinterland the coastline south of Umeå is densely populated with cities such as Örnsköldsjik, Härnösand and Sundsvall.

The question then becomes - does the train traffic compensate for the lack of busses in these areas?

**XII - TRAIN TRAFFIC BETWEEN UMEÅ AND OTHER CITIES OF NORRLAND**
From figure XII it is evident that the train traffic explains a part of the lack in regional bus traffic. The Botnia line which runs from Umeå to Sundsvall in the figure above makes it possible to travel between the two cities in 2 hours and 45 minutes. The equivalent car ride would take approximately 3 hours and 15 minutes according to google maps. These comparisons make the lack of regional busses understandable. Along the coast north of Umeå another situation presents itself. Here the train takes a more inland rout compared to the busses which skirt the coastline. This situation partly explains the lack of regional busses in the hinterland. The train connects the northern part of the inland with the coastal cities such as Umeå Luleå and Skellefteå. In addition the train tracks from Umeå to Haparanda can't support as fast trains as the Botnia line southwards making traveling further north less time effective. Looking westward the only train line connects Umeå with the city of Lycksele leaving most of the hinterland without access to the train. Together with the few bus lines westwards one can conclude that a large part of Norrland’s countryside is lacking regional passenger transportation.

2. 2 FREIGHT TRANSPORTATION IN NORRLAND
- MAPPING FREIGHT ROUTES IN NORRLAND

40 percent of Sweden's export consists of machines and modes of transportation. The export of telecom products is also included in these 40 percent. However, the Swedish basic industry accounts for a significant part of the Swedish exports. When speaking of Sweden's basic industry forestry, mining, the steel industry and the chemical industry are generally included. As a result freight traffic is a large part of the Swedish infrastructure with many of the goods being transported from Norrland due to its richness of timber and ore.

Goods are transported through Sweden by road, railway and ship. Two thirds of the iron pellets extracted and refined in the mines of Kiruna are transported by train to the Norwegian harbor in Narvik and from here shipped across the world. The other third is transported to Luleå harbor which is strategically located in relation to countries bordering the Baltic Sea. As illustrated in the map below goods are transported along the coast and exported out of Sweden either through ports situated in Swedish cities on the Baltic Sea, by train and road to Norwegian ports on the Atlantic Ocean, by boat to Vasa from here into Asia or south into Europe through Denmark.

XIII – FREIGHT TRAFFIC IN SWEDEN

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28 https://www.sj.se/?gclid=CLnztoi2itMCFVdIGQodGc8Dmg&gclsrc=aw.ds#/tidtabell/Ume%25C3%25A5%2520C/Sundsvall%2520C/enkel/avgang//avgang//VU///0//
29 https://www.google.se/maps/dir/Sundsvall/Ume%C3%A5/@63.1039572,17.6603186,8z/data=!4m14!4m13!1m5!1m1!1s0x4664674c9dc6761f:0x683f9bac9f166120!2m2!1d17.306927!1d20.2630354!2d63.8258471!5i2
30 http://www.ekonomifakta.se/Fakta/Ekonomi/Utrikeshandel/Sveriges-export--och-importprodukter/
Zooming in from Sweden as a whole to the Umeå region one can conclude that the population growth as well as increased industrial and transport-intensive industries have resulted in an increased flow of goods in the region. Between the years of 2000 and 2004 the yearly average growth in Umeå’s industrial production output was 8.5% with is very high compared to the national average of 1.5% during the same period. The strong business development is mainly within the private sector and is driven both by industrial investments and business oriented services.

The Umeå region is also very strategically placed in relation to the Swedish Freight infrastructure. The region is located at a crossing of the two main highways passing through Sweden, the E4 in a north–south direction and the E12 in which runs across Sweden from east to west. Umeå is also as mentioned in earlier chapters connected to the Botnia train line which apart from being trafficked by fast passenger trains is a vital part of the freight traffic through Sweden. The Umeå region is also geographically very close to
Finland. Located at the Botnia bays narrowest point the city of Vasa is only 80km from Umeå and therefore geographically Umea’s closest city. Through Umeå harbor goods are transported from the coast of Sweden to the harbor in Vasa to be further transported into Asia. Apart from shipments to Vasa Umeå harbor ships goods across the whole of the Baltic Sea. With a large freight terminal goods can easily be stored and moved from one mode of transportation to another. These factors combined with Umeå airport make the Umeå region an important node in the northern Swedish transportation network. A role Umeå municipality aims to strengthen.

XIV – FEREGHT TRAFFIC IN THE UMEÅ REGION

Stensson Peter, Lundberg Maria. 2003. p 8
[http://www.umea.se/umeakommun/kommunochpolitik/internationellarbete/natverkochvanorter/vanorterochsamarbetssorter/vasa.42aeb9024111d30cge4e6080005f643.html](http://www.umea.se/umeakommun/kommunochpolitik/internationellarbete/natverkochvanorter/vanorterochsamarbetssorter/vasa.42aeb9024111d30cge4e6080005f643.html)

Stensson Peter, Lundberg Maria. 2003. p 8
In order to make Umeå a strong node in Sweden’s passenger and freight transportation network Umeå municipality and Banverket have made infrastructural investments. To meet the increase in traffic the new Botnia track raises the Municipality and Banverket have invested 800 million kronor in a new freight yard. The new freight yard also satisfies the market demand for a more flexible transportation of goods. In addition 200 million kronor are being invested in Umeå Port. Here a new quay is to be built as well. The project also includes a straightening of the E12 road to create a smoother transport route to the port in order to meet the increased freight volumes. These projects don’t aim to increase the capacity of Umeå freight transportation but to strengthen the connection between different modes of transportation.

Västerbotten county and Umeå municipality also have specified several infrastructural project that if realized would further strengthen the region. One important area of development is to strengthen the system effects of the Botnia track and the new freight yard. There are several established companies in the region with a need for better communications in an east – west direction. As portrayed and discussed in the earlier chapter transportation along the coastline is well developed and highly trafficked. The need for a similar transportation system in an east – west direction is therefore hardly surprising.

One important project is to develop the Inland line which runs from Kristinehamn in the south to Gällivare in the north. The railway line was completed in 1937 with the main function of strengthen the transportation and freight network inland as well as further enabling the Swedish military to transport soldiers and weapons during wartime. The government also wanted to promote the rural areas within the hinterlands of Sweden by providing them with an infrastructural link to other parts of Sweden. Today however, the tracks are completely closed between Pilipstand and Mora. The southern part of the line between Pilipstad and Kristinehamn has on the other hand been electrified and are used for passenger traffic. The remaining tracks between Mora and Gällivare are mostly trafficked during summer time as a tourist attraction. The distance is trafficked by busses today since the train line isn’t in condition for supporting passenger traffic today.

Yet, if the tracks were restored and the whole distance electrified Sweden would gain an important link between the inland and the coast. Investments in the inland line would just like in the 1930’s, be an investment in the Swedish countryside.

The Inland line is an important part of the freight transportation network since it passes through areas with a high percentage of natural resources. Along the line there are several stations and terminals that with restorative measures would supply the forestry industry with much needed unloading possibilities, an industry which is in demand of further shipping possibilities. This would also give the forestry industry located in the inland a fast connection to the large market in the middle of Sweden, something which is essential for the growth of the forestry industries in these rural areas. Such restorations would also

35 Stensson Peter, Lundberg Maria. 2003. p 9
36 Lundberg Maria. 2014. p 15
37 https://sv.wikipedia.org/wiki/Inlandsbanan
38 Lundberg Maria. 2014. p 16
enable more passenger transportation along the coastal Botnia line which today is heavily trafficked by freight transportation. The restoration of the inland line is part of the transportation plan of Västerbotten County. However such a project would need financing from all the counties in connection to the train tracks.

Another project suggested by the county and municipality is developing the light rail track between Storuman and Hällnäs a track which connects to the Inland line. By doing so the county would as stated – strengthen the system effects of the Botnia track. The light rail track was built in 1922 and in use for both passenger and freight traffic until 1992 when the passenger traffic was discontinued. Nevertheless, in 2011 passenger traffic was reopened again between Umeå and Lycksele.

The county and municipality want to develop these tracks making it possible for both passenger and freight traffic during the whole distance in the future. This is also the projects largest challenge – to prioritize measures which enable both freight traffic and passenger traffic to develop with ought limiting one another.

http://inlandsbanan.se/res/hargaran
http://www.jarnvag.net/banguide/halinas-storuman
To identify the most effective measures when developing the Storuman and Hällnäs line, the county and municipality has made a study. The study, which was completed in 2013, identified five important measures which are deemed to both promote the local area and the region as a whole. The first two measures are to develop the freight yard and train station in Lyckele. The third is to electrify the whole tracks which today are trafficked by fossil fuel driven locomotives. Other measures are to regulate heavy traffic as well as double tracks in Åsele. The project would live up to two of the EU – commissions criterias specified in the EU 2020 strategy namely ‘smart and sustainable development for all’ and ‘Sustainable transportation and fewer bottlenecks in important infrastructure’. As such the project would not only fulfill the goals of the county to become more sustainable but be eligible for EU funding.  

To invest in the Storuman and Hällnäs Line would be a good measure in order to strengthen the connection between Umeå and the hinterland of Västerbotten as well as connect Umeå to the inland line. Passenger traffic along the line would give the people in this region an environmentally friendly traveling option, reducing their dependency on the car. Such a project would also lessen the need for busses in this direction making it possible to re direct a portion of the regional bus lines to include areas which are not connected by bus or train traffic today.

For these investments and a further expansion of bus traffic in the region Umeå central train station and Umeå bus station need to be adapted for more traffic. Today the train station and bus station are divided by a road. The Municipalities suggestion is to move the bus station next to the train station making it easier to coordinate the train and bus traffic. The change would entail a new combined station with a shared waiting room, information system etc.

**XVI – MAP OF TRAIN AND BUS STATION IN UMEÅ**

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41 Lundberg Maria. 2014. p. 15
With a new combined traveling center it would be possible to drastically increase the possibility of coordinating existing modes of transportation as well as connecting train and bus departures. As a consequence the system would have a higher capacity for increased traffic in the future. By making the logistics of train and bus traffic more integrated the system will also be able to support more freight transportation which in turn lowers the environmental impact of shipping goods by road.

When zooming in a new station would also be positive for Umeå and the towns in its near vicinity something we will explore further in the next chapter.42

2.4 LOCAL INFRASTRUCTURE IN UMEÅ AND ITS SURROUNDING REGIONS
- WHAT ARE THE STRENGTHS AND WEAKNESSES OF THE LOCAL INFRASTRUCTURE AND HOW CAN THEY RELATE TO A NEW COMBINED TRAIN AND BUS STATION FOR REGIONAL TRAFFIC?

In the previous chapter several strategies and projects for a stronger Västerbotten and Norrland were proposed by the county and municipality. However, what changes are needed on the local level of Umeå?

As a medium sized city in Sweden Umeå doesn’t have a subway or tram system. Instead the city has a well-developed bus system as well as an infrastructure adapted to biking. The local bus lines are centered on the city of Umeå as shown in the map below.

XVII– MAP OF UMEÅS LOCAL BUS LINES43

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42 Lundberg Maria. 2014. p 14
43 http://www.tabussen.nu/ultra/tidtabeller-och-kartor/
In the diagram above the darker red squares and lines represents routes trafficked by the most busses where the lighter red symbolizes routes which are trafficked less frequently. As one can see the main bus route runs from east to west along Umeå River. Along this route there are several important nodes in the bus system.

**XVIII– MAP OF IMPORTANT NODES IN UMEÅS BUS INFRASTRUCTURE**

The nodes are pinpointed in the zoomed in map of Umeå Bus map above. The first and foremost of these nodes is Vasaplan a bus square in Umeå center. The street is the central bus station for the Umeå’s local busses. All local busses in Umeå will either start from, pass through or end at Vasaplan. This is also the main stop for passengers to transfer between different bus lines. Another important bus stop is located by Umeå hospital and University. Here students and professors travel to and from the University coupled with patients, relatives, doctors, nurses and other staff from the Hospital. Together the University and Hospital makes their shared bus stop one of the most trafficked stations in Umeå.
As mentioned in the previous chapter, Umeå Bus station is located across the road from Umeå train station. Although not a part of the local bus system, the regional busses affect the local infrastructure. Therefore, Umeå bus station is an important node in the infrastructure of Umeå with a strong connection to Vasaplan which is located only two blocks further south. The Central train station is like the regional bus station a vital part of Umeå's infrastructure connecting the local busses with regions farther away. Umeå also has a second train station located close to Umeå University and Hospital. Umeå East station, as it is called, connects as its location suggests the University and Hospital with the railway network. As such it is also a node in the local infrastructure with many busses passing from the station into the city center. Umeå Airport is, as mentioned in the first chapters, highly trafficked with several departures to Stockholm each day. As such the airport constitutes one of the pillars in Umeå infrastructural system today. Apart from car the airport is connected to the city by the airport bus which travels from Vasaplan – via the University - to the Airport.

When studying the infrastructure of Umeå city the picture painted appears complete. However, if one looks at the towns located a couple of kilometers outside of Umeå the picture changes drastically. These towns are part of the regional bus system and as such are much less trafficked.44

44 http://www.tabussen.nu/lanstrafiken/tidtabeller/
45 http://www.tabussen.nu/lanstrafiken/tidtabeller/

XIX – MAP OF REGIONAL BUS TRAFFIC AROUND UMEÅ CITY45
The Diagram above displays train and bus traffic in the Umeå region with the gray representing bus traffic and orange train traffic. The dark gray color shows where the bus traffic is the highest while the light gray represents bus routes with a low intensity of travel. As with the regional bus traffic in the whole of Norrland the most frequented bus routes are located along the large roads passing through Umeå. The towns located along these roads have as a result a high frequency of busses into Umeå while towns located in between these main roads have very poor to no bus traffic. People living in towns are as a result highly dependent on the car.

**XX – MAP OF REGIONAL BUS TRAFFIC IN RELATION TO POPULATION AROUND UMEÅ CITY**

When superposed on a map of the population in the regions around Umeå we can see a clear relation between the two. Towns with a connection to the railway for example have a much higher population than towns in their vicinity. These towns are in fact more popular than towns geographically closer to Umeå but with ought this communing possibility. Similarly the towns along the E4 and E12 have a higher population than towns located next to smaller roads.

For Umeå to become a sustainable city in the future even the towns which aren’t located next to a highway or the train tracks need a high quality of public transport. One suggestion

46 http://www.tabussen.nu/lanstrafiken/tidtabeller/
would be to extend the train tracks in the future to include strain stations in some of these towns. Another suggestion would be to extend the regional busses making the bus traffic to these towns more frequent.

For this to be possible a new bus and train station would be important. With the capability of supporting more traffic a new station would enable the regional traffic around Umeå to expand which is vital for Umeå to become more climate friendly in the future.

CHAPTER 3
A NEW TRAIN AND BUS STATION IN UMEÅ

3.1 THE SITE
- AN ANALYSIS OF THE SITE AND HOW A NEW STATION BUILDING CAN STRENGTHEN THE EXISTING INFRASTRUCTRE

The site, which is shown in diagram XIV is located at the northern edge of the city center. Here the original train station which was built in 1896, the same year that the train tracks reached Umeå. The station was designed by the architect Folke Zettervall and placed on the northern edge of Rådhus esplanade, a road running through the whole city center from north to south. The train station became the northern marker of the esplanade becoming a counter pole to the already existing city hall which marks the Rådhus esplanade’s southern end.

The Rådhus esplanade forms a central axis through Umeå city, from which several perpendicular streets transverse. Two of these east – west running streets are Kungsgatan and Storgatan. These streets together with Rådhusesplanaden form the core of Umeå city. Kungsgatan is the main shopping street while Storgatan is the city’s chief buss street. Here Vasaplan, the main bus stop mentioned in the chapter above is located. The new traveling center with the new bus station for regional busses will have to work in relation to the local buss network. Therefore the traveling center will have a strong connection to Vasaplan something that needs to be taken into consideration when designing the new traveling center.

In the diagram below the original train station and city hall is marked in red. As described the Rådhus esplanade forms an axis in dark red between these buildings. The two highlighted roads passing in an east – west direction are as described Kungsgatan and Storgatan with Storgatan being the northern of the two. The diagram also shows the road configuration around Umeå train station. Here it one can see the main road of the site: road

96 or otherwise known as the Blue road, which divides the train station and tracks from the city. We can also see that the infrastructure in this northern part of the city has been configured with diagonal streets centering on the train station. This configuration is also something to be taken into consideration when altering the site with a new building.

XXI – RÅDHUSESPLANADEN AND THE AXIES OF UMEÅ CITY CENTER

The site is as mentioned located on the northern edge of the city center which gives it a unique character with the city on one side and a residential area, Haga, on the other. The Blue road and train tracks coupled with the train station form the border between these two regions of Umeå. Apart from dividing the residential area from the city the Blue road separates the train station from the rest of the site. The train station is in short squeezed in between these two infrastructural elements.

XXII – MAP OF BOUNDRIES DIVIDING THE SITE
A new tunnel was completed in 2012. The passage connects the residential area with the city center. The tunnel is a tribute to the local author Sara Lidman with art and quotes from the authors work integrated in the architecture. Although the tunnel helps connect the city and Haga the Blue road is problematic for the site. Apart from creating a visual barrier the noise from the traffic makes the adjacent square uninviting. The Blue road is trafficked by 376,560 cars per year, ca 1000 cars per day, making it important to separate pedestrians from the street in order to prevent accidents.

The square called the Järnvägstorget or the Railway square located across the Blue road has developed through the years. When the area was first developed in the 1890’s the first automobiles were starting to be introduced to the Swedish market. The blue road was at the time much smaller and used by horse and wagon. The square was eventually remodeled. The blue road was widened from two lanes to four and a roundabout was built. The sculpture green fire was ordered from Emmaboda glas produceras in Småland and placed in the middle of the square. The square became a parking area for cars with a smaller green area surrounding the green fire sculpture as shown in the top picture below to the left. When the Sara Lidman tunnel was built the roundabout was removed and the whole square became paved. To the left if the square where the tunnel emerges bycycle parking was built. The green fire sculpture still gilds the middle of the square. On the left side some parking was kept in order to supply the customers to the supermarket and restaurants alongside the square. The changes made as shown in the bottom picture below made it possible for the square to be used by restaurants during the summer. However, the lack of greenery makes the whole area appear very hard. The few trees which were planted then the tunnel was built will in time help to partly diminish this sensation. Yet, for the square to become a fully attractive area more greenery needs to be introduced to counterbalance the asphalt, paving and plaster facades.

XXIII – PICTURES OF THE RAIL WAY SQUARE

http://www.umea.se/umeakommun/trafikochinfrastruktur/trafikochgator/gator/gatuarbeten/umea central/stationstunnel4.2e9e22g4c4e7d186cf856.html
3.2 THE PLACEMENT OF THE BUILDING
- IN RELATION TO THE SITE AND AS A NODE IN THE INFRASTRUCTURE UMEÅ

Taking the analysis of the site in consideration the new train and bus station building should aim to minimize the effect of the Blue road to the site as well as provide a connection between the city and Haga.

To this end the possibility of building a station that bridges over the train tracks was examined. If possible such a building would act as a passage between the two areas of the city as well as counterbalancing the effect if the road on the square. When looking into this possibility it was also important to place the building in so that it was part of the central axis formed by the Rådhus esplanade. This would connect the building to Vasaplan. However the building should simultaneously be placed in such a way that it does not interrupt the relation between the original train station and the city hall which as stated earlier has been in place since the 1890’s.

In addition to these factors the new traveling center should be adapted to the future needs of Umeå and the region of Norrland. As such the building should allow for the expansion of train tracks and bus traffic in the future. Therefore a study was made looking into how the tracks and busses could be expanded in the future. The scenario was developed in consideration to the existing residential buildings on the Haga side of the tracks. From the study it was clear that without removing the buildings on the Haga side which were closest to the tracks one new platform could be added. This would mean a slight movement of the road between the train tracks and the residential buildings as well as an extension of the Sara Lidman tunnel. The study also showed that if the regional busses were moved to the other side of the road as suggested by the Municipality the space for which the bus station could expand was almost 380 meters a distance that would more than suffice for the needs of the foreseeable future.
The maps above show the present day site, to the left, and the future scenario, to the right. The red marks the new railtracks and platform and the orange the zone for the busses. This zone is less than the stated 380 m but could as extend westward to include the whole distance.

To be a sustainable building for the future the building design should take both the present and the future scenario into consideration. It should further be designed in such a way that the structure can be even further extended if a situation where more than one new platform is needed.

The entrancees of the bridging building were therefore adapted to the future scenario while at the same time not interfering with the present day site. The positioning of the building was established with the relation of the roads of Haga as well as the axis of the Råshus esplanade in mind. The map below shows an analysis of Haga, its main road called Östra kyrkogatan, marked in pink, Riddaregatan which is the road the tunnel links to, marked in green, and a second road called Korsgatan, marked in yellow. Korsgatan which also links back to Östra Kyrkogatan differs from Riddaregatan since it continues north into haga before turning west towards Östra Kyrkogatan. Therefore it becomes the fastest route for people living west of Östra Kyrkogatan to travel to the train station. Om the other side of the tracks the Rådhus esplanade is marked in orange with the completion of the axis up to the train station marked with dashed lines. To connect the new station with this axis yet avoiding the obstruction of the original train station the new traveling center needs to slightly bridge the axis but not obscure it completely. The red circles mark the two suggested entrances and the line between them the bridging building.
3.3 THE PROGRAM OF THE BUILDING

- HOW THE BUILDING PROGRAM IS ADAPTED TO THE NEEDS OF UMEÅ AND ITS ROLE AS A NODE IN THE INFRASTRUCTURE OF NORRLAND

For the building to be successful, the program needs to respond to the needs of Umeå as well as the region of Norrland. From the beginning it was clear that the building should not just be a place of travel but a public space in Umeå city.

If only a typical train and bus station the building would attract people in the need of travel. It would function as a bridge and therefore be in use by people crossing over the train tracks. Yet, for this building to be a part of Umeå city it should provide with something new for its citizens. This added program should by its nature attract people to the station and make station occupied and used through the day. The program should furthermore be something that can during the spring and summer seasons expand and occupy the Railway square. Such a program would not only give the citizens of Umeå a new space to use but would give the square added purpose.

For the building to be able to supply the city a flexible floorplan is suggested. This would enable the building to adapt to different usage depending on the need and the season.
One feature which would help the building in its function as a node in the passenger infrastructure is a program which focuses on Norrland as a region.

A market area with locally produced food, crafts and goods is an example of such a program. In the winter and indoor market would provide the citizens of Umeå with a new public space and during the summer the market could expand outdoors. The building could also include areas for local businesses to display and market themselves as well as a gallery for local artists to display their work.

The needs of the travelers such as waiting areas, charging docs, luggage lockers etc. would be part of the buildings fixed program along with restrooms and a ticket office. The other suggested program is as described flexible yet with Umeå and Norrland as a theme which permeates the building.

CHAPTER 4

CONCLUSION

This report has aimed at showing how a new combined train station can strengthen the city of Umeå and Norrland as a region. As analyzed in the introduction and background the Northern regions of Sweden have been on the decline in population. The cities which have managed to grow have succeeded due to a close connection to Stockholm and other large cities in the south of Sweden. This situation is a result of centralization where important businesses, cooperation’s and governmental instances have been moved to the south of Sweden. The result has left Norrland utterly dependent on aviation for fast transportation south. Yet, this dependency has a large impact on the climate which makes it an unsustainable solution for the future.

There are two ways to solve the problem. Either a new fast and environmentally friendly traveling option replaces the need for aviation or the need for traveling to Stockholm is addressed. As of today the only reasonable replacement of aviation is high speed trains. This traveling option is however a very expensive project and therefore not likely to be invested in in the foreseeable future. The second option however can be addressed. Measures to lessen centralization and strengthen the region of Norrland would strengthen the market of Norrland, making businesses less dependent on Stockholm and as a result less dependent on flights to and from Stockholm. For Norrland to become more independent several strategies need to be implemented simultaneously. These include infrastructural investments, investment in public services and housing projects as well as laws and policies on a national level which help support the countryside of Sweden.

To build a new combined train and bus station is part of the first strategy mentioned – to invest in the infrastructure of Norrland. By linking the cities and towns of Norrland together it is easier for the region to work as a whole. To know which parts of the current infrastructure could be improved upon chapter 2 delves into the current situation of the infrastructure in Norrland. Here freight traffic becomes just as important as passenger
traffic. The studies conclude that there are several investments short of a new high speed train line that would improve the current situation drastically. These include the restoration of the Inland line and the light rail track between Storuman and Hållnäs.

One of the suggested investments is a new train and bus station in Umeå which would be able to support an increase in passenger traffic. As such a new train and bus station a small part of the larger strategy to improve the infrastructure of Norrland. For the train station to become reality there was a need for an analysis of the local situation of Umeå and of the site in question. Here several factors where determined in order for the building to not only improve the infrastructure of Norrland but the city of Umeå. Lastly a new cultural program was suggested to connect the building with the region of Norrland.

This report discusses the environmental implications of travel yet its purpose is to prohibit traveling. On the contrary it is an effort to like Robert Frost choose the road less traveled by. A road which analysis the situation our society is in today and attempts to change it in order for a sustainable and environmentally friendly form of living, working and traveling to take place in the future.


8. WSP. 2014. Flygplatserna i Västernorrlands län. Umeå


24. WSP. 2014. Flygplatserna i Västernorrlands län. Umeå


29. Umeå - Sundsvall C.
https://www.sj.se/?gclid=CLnztoi2itMCFVdlGQodGc8Dmg&gclsrc=aw.ds#/tidtabell/Ume%25C3%25A5%2520C/Sundsvall%2520C/enkel/avgang//avgang//VU///0//. SJ. accessed 2017-04-23

30. Sundsvall - Umeå
https://www.google.se/maps/dir/Sundsvall/Ume%C3%A5/@63.1039572,17.6603186,8z/data=!4m14!4m13!1m5!1m1!1s0x4664674c9dc6761f:0x683f9bac9f166120l2m21d73069272d62390811tm51m1s0x467c4eb68ad7f90x4034506de8c865602/tid20.2630354!2d63.825847152. Google maps. accessed 2017-04-23


34. Vasa


42. Lundberg Maria. 2014. Länstransportplan för Västerbottens län 2014-2025. Umeå


