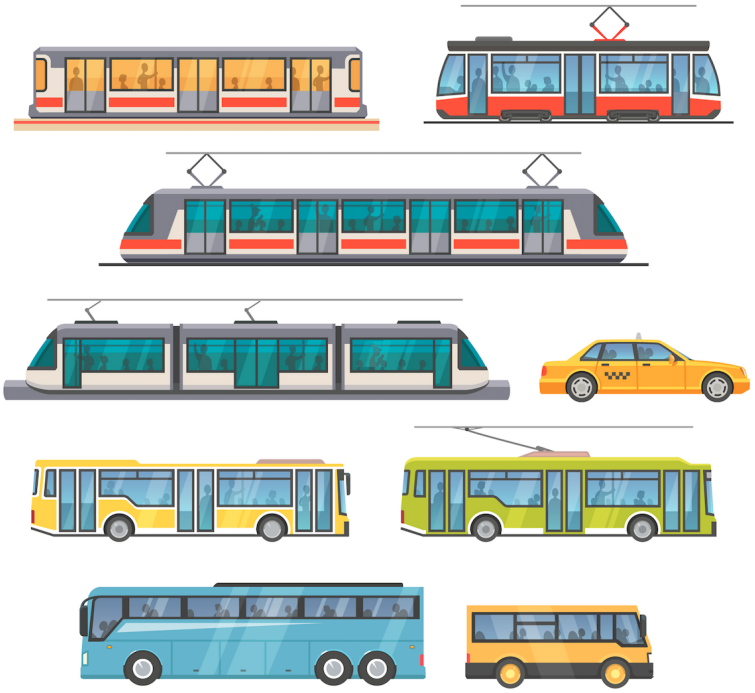
Sustainable mobility

Public transport within Aalborg and Aarhus municipality



Dzejna Lalicic
Mobilities & Urban Studies
4th Semester
Aalborg University
Submission: 25-05-2023

AALBORG UNIVERSITET

School of Architecture, Design and Planning
Mobilities and Urban Studies
Rendsburggade 14
9000 Aalborg
https://www.sadp.aau.dk/

Titel:
Public transport within Aalborg and Aarhus municipality

Project:
Master thesis

Project period:
Spring 2023

Author:
Dzejna Lalicic

Group:
8

Supervisor:
Claus Lassen

Number of Pages: 49
Appendices: 3
Submission: 25-05-2023

Abstract:

This master thesis explores the role of public transport in creating better sustainable mobility within Aalborg and Aarhus municipalities. The problem formulation was "*What role does public transport have into creating better sustainable mobility?*". Here I worked with a quantitative approach since I had five expert interviews. Through the analysis of the expert interviews, I highlighted some of the most influential factors for the public transport, which were the political and financial aspect, and the dilemma of the "whip" and "carrot".
I concluded the following: a shift towards sustainable mobility is a gradual process. It requires political willingness to change, it also highlights the dilemma that both the municipalities and traffic companies faces; providing sustainable mobility options while being limited by available resources.

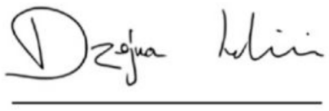
Preface

This master thesis is written by Dzejna Lalicic, a 4th semester student from Aalborg University, enrolled in the Master program *Mobilities & Urban Studies*. The overall focus for this thesis has been been to look at sustainable mobility with a special focus on public transport. Here I have selected 2 of Denmark's 4 largest municipalities, namely Aalborg and Aarhus Municipality, and looking at what they are doing to give the people a more sustainable mobility choice.

I would also like to take this opportunity to give a special thanks to my supervisor Claus Lassen for his support, guidance and constructive feedback throughout the Master program and thesis.

Next, I would also like to give a thanks to Mette Olesen, Simon Wind, Anne Bach, Signe Klintgaard Korac and Niels Melchior, for taking the time to talk about public transport in Aalborg and Aarhus Municipality, respectively, and what the green transition will mean.

Finally, I would like to thank everyone who has contributed to the thesis in one way or another.



Dzejna Lalicic
dlalic15@student.aau.dk

Reading Guide

This thesis is divided into 7 different chapters comprised of an introduction to the topic. Following this, chapter 2 consists of the thesis problem formulation and research questions. Chapter 3 gives an overview into sustainable mobility, the different transportation modes and the political outlook on public transport in Denmark. Chapter 4 consists of the theoretical background. Chapter 5 consists of the methodology, which is divided into two sections: the first section is about the chosen field areas, while the second section is the data collection. In chapter 6 I analyze the initial problem formulation developed in chapter 2, while chapter 7 discusses the findings of the thesis and suggests future work. Finally, chapter 8 concludes this thesis.

The Harvard citing method is used (author, year) and all references are listed in the bibliography alphabetically. Figures and tables are numbered according to chapters and sections, and each figure and table is accompanied by an explanatory text.

Several terms have been used throughout the thesis, which means that a common understanding is necessary:

When talking about urban transportation, its importation to factor in that it can be divided into three classifications:

1. **Private transportation:** privately owned vehicles operated by owners for their personal use, which usually is on the public streets.
2. **For-hire transportation:** provided by operators and available to people which hire them for individual or multiple trips; a taxi is the most common mode here.
3. **Public transportation:** Although there is no rigid definition, Oxfords Learner's Dictionaries defines public transport as *"the system of buses, trains, etc. provided by the government or by companies, which people use to travel from one place to another"* (Oxford Learner's Dictionaries, 2023a). Operates on fixed routes and schedules, and includes busses, trains and several other systems.

Contents

List of Figures

List of Tables

Introduction 1

Since The Brundtland Report *"Common Future"* came out, many countries around the world have started to work towards being more sustainable – by committing on both a national and international scale (Brundtland & Commission, 1987). Especially, as cities – big and small – started to change their modes of transport and shifting towards a more sustainable mobility mode. This development can often be seen in the city center, where almost every mode of transport interacts.

Over time, there have been various factors that have affected human mobility: economic condition, increasing population, urbanisation, and globalisation. As we have all become more mobile, the carbon footprint of our transport activities has grown. Urbanisation and growing cities (from village to city) have also changed society. The car has also played a major role in shaping people's transport behaviour.

However, one thing that has also shaped the mobility for many, has been the creation of what today is known as public transport (also referred to as public transportation, public transit, mass transit or transit). Public transport is a system of transport for passengers – a large group of people – available for use by the general public, which operates on already established routes, follows a daily schedule and charge a fixed price for each trip – depending on the length of the trip and the passengers ages.

But over the last couple of years, the usage of public transport has drastically decreased – both in and outside of Danish cities. One of the reasons being the Covid-19 pandemic. When the first cases of Covid-19 became publicly known and started to spread, large parts of the world began to shut down in start 2020. This thereby changed the way people were moving from A to B. Suddenly those who could began working from home, school was online, most our daily interactions shifted to being online. Yet, besides the pandemic, there are also other possible reasons why people are using public transport less:

- The price of using public transport has risen the last couple of years. In 2023 a bus or train ticket for an adult to travel between two stations is 24 kr.
- The car: since the 1960s has the car industry grown rapidly. Today 63% of Danish families has a car (3.2) and studies have shown that people prefer the car because it gives them freedom and flexibility among other things (Magelund [1997]). Likewise has a more recent study from Danmarks Statistik shows families tend to own one or more cars, if the public transport options are low (Rasmussen Berg et al., 2021,: 1).
- Time: a recent study by Passagerpulsen shows 27% thinks that the public transport travel times don't fit their needs, hence the reason why they don't use it (Passagerpulsen, 2022,: 7).

The three reasons mentioned above, are the most common respondse when companies do surveys/interviews about public transport.

Number of passengers boardings

Below are two separate bar charts – one for busses and one for trains – that illustrates the usages of public transport in Denmark between 2010-2021. The figures are from Trafikstyrelsen, where they have counted the number of boardings for buses and trains. According to Trafikstyrelsen, a boarding is *"(...) counted for each time he boards a bus, a train and/or a metro. The number of boardings will thus always be higher than the number of passengers(...)"* (Trafikstyrelsen [2022]).

The numbers below are from the following companies: BAT, Fanø, Fynbus, Midttrafik, Movia, Nordjyllands Trafikselskab, Samsø, Sydtrafik and Ærø. As the figure below illustrates, between 2010-2019, the companies have had an average of less than 360,000 boardings. During the Covid-19 lockdowns in 2020-2021, was the average just below 194.000 boardings:

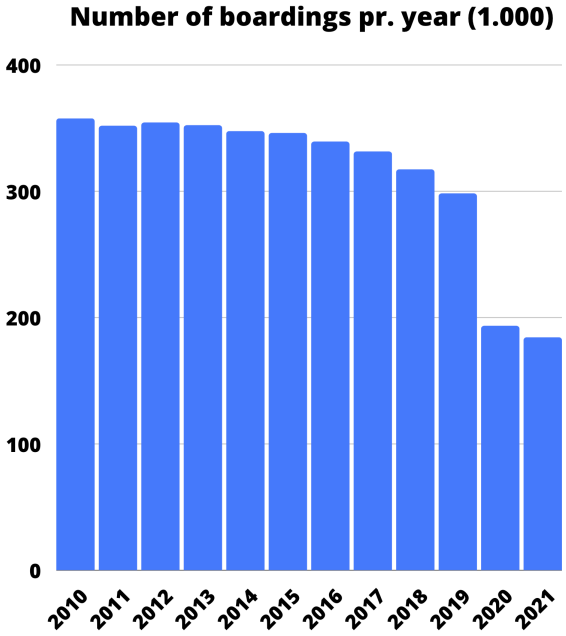


Figure 1.1. Number of boardings for busses pr. year (1.000)(Trafikstyrelsen [2022])

The numbers below are from the following companies: Midttrafik, Movia, Nordjyllands Trafikselskab and Sydtrafik. Between 2010-2017, there was an average of 11-13 mil. boardings, in 2018-2019 (before Covid-19) the average was just around 17.2 mil. During the Covid-19 lockdowns, they had just below 12.9 mil. boardings in 2020, and just below 14.1 mil. boardings in 2021:

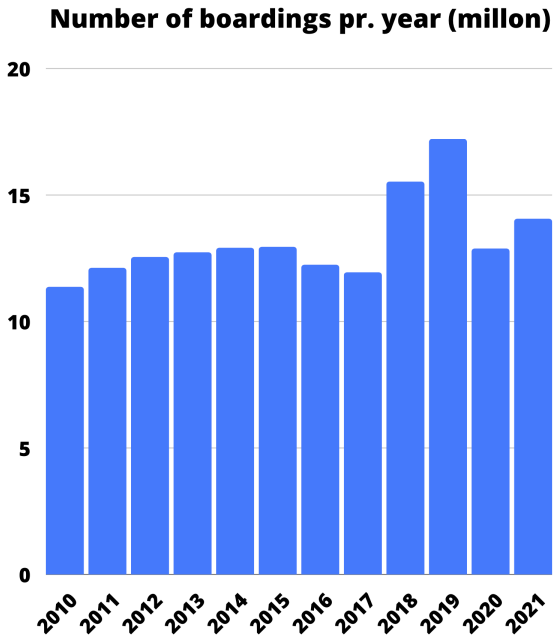


Figure 1.2. Number of boardings for trains pr. year (million) (Trafikstyrelsen [2022])

At the same time, there are different passenger boardings numbers between the individual companies and where in Denmark, they are located. However, the focus in this thesis are the municipalities of Aalborg and Aarhus, where I examine their sustainable mobility strategies regarding public transport. Which is why from now on, I've decided only include numbers from Nordjyllands Traffikselskab (located in Aalborg municipality) and Midttrafik (located in Aarhus municipality) (section 5.2).

The need for a good public transportation system

According to Lahrmann & Leleur, there are several arguments in favour of having a well-functioning public transport system - both in and outside cities (Lahrmann & Leleur, 1994,: 458):

- *The social argument:* it satisfies many of the basic human needs, such as getting to work, to school, to the doctor and to the shops. Not everyone in Denmark has a driving license, so these groups are dependent on other means of getting from A to B.
- *The environmental argument:* having an efficient public transport system reduces congestion and therefore pollution. In urban traffic, a user in a well organised public transport system will take up less space, pollute less and save energy.
- *The economic argument:* in all major European cities, public transport is subsidised. This is because public transport in large cities is socioeconomically profitable.
- *Quality of life:* one of the factors for a better quality of life for people is the availability of a good public transport system.

In 2015, all United Nations (UN) membership countries agreed to 17 global goals – and 169 targets within these goals – regarding human rights, hunger, the climate and more. These goals are also called *Sustainable Development Goals* (SDGs), and the goal is to achieve them by 2030 (United Nations [n.da]).

Figure 1.3. The UN 17 SDGs. Highlighted are the four SDGs that are relevant to the transport sector.(United Nations [n.da])

The figure above illustrates the 17 UN SDGs, with the goals for health and well-being, industry, innovation and infrastructure, sustainable cities and communities and climate action highlighted. Especially Goal 11 *"The world's population is constantly increasing. To accommodate everyone, we need to build modern, sustainable cities. For all of us to survive and prosper, we need new, intelligent urban planning that creates safe, affordable and resilient cities with green and culturally inspiring living conditions."* and its target 11.2 is interesting for this thesis *"By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons"* (United Nations [n.db].

Within this goal, UN considers that 500 metres to be the walking distance from a reference point such as home, school to the public transport reference point (United Nations, 2018,: 2). Likewise in a report from the European Commission, the distance is set to be a 5-minute walk from a reference place to a bus stop, and a 10-minute walk to trains/metros (Comission, 2015,: 3). If there is no access to public transport within this distance, the level is labelled as *No access* (Comission, 2015,: 3).

Problem formulation 2

As mentioned in the previous chapter, countries worldwide have been working towards sustainable development at both a national and international scale. Factors such as economic conditions, population growth, urbanization, and globalization have influenced human mobility and increased the carbon footprint of transportation. Public transport has played a significant role in shaping mobility patterns, but its usage has declined in recent years, partly due to the COVID-19 pandemic; likewise has other reasons such as increasing prices, the dominance of cars, and perceived time constraints also had a role. However, a good well-functioning public transport system offers social, environment, economic and quality of life benefits. Thus, the chosen problem formulation for this is:

What role does public transport have into creating better sustainable mobility?

In order to answer the chosen problem formulation, here are some of the topics that were researched further:

- What is sustainable mobility?
- What types transportation modes are there?
- What are the national climate goals regarding public transport?
- What rationality of transport are there?

Contextual background 3

In the following chapter, the context background of the thesis will be introduced. First, I'll explain what mobility is and then move on to what sustainable mobility is. Then, I'll move on to showcase the different transportation modes, there are available – with a focus on Denmark. Lastly, I'll end the chapter by looking into the more political aspect of public transport in Denmark.

3.1 Is there such a thing as sustainable mobility?

Before diving into the term *'sustainable mobility'* it's necessary to first know what mobility is. According to Mimi Sheller mobility can include three things (Sheller, 2021,:10):

1. *Examining the constitutive role of movement within the workings of most social institutions and social practices*
2. *New ways of examining different modes of mobilities and their complex combinations, i.e., corporeal travel of people and physical movement of objects*
3. *Focusses on analyzing networks, relations, and flows and circulation and not fixed places. It challenges the idea of space*

By looking at Shellers definition, it becomes clear that mobility is not so simple as one would think. It's not just traveling from A to B, but becomes a means to understand how mobility can be seen in other research fields *"... thus overlaps with some aspects of globalisation studies, communications research, migration and boarder studies, tourism studies, cultural geography, transport geography, and the anthropology of circulation..."*(Sheller, 2021,:12).

Sustainability is a broad topic that can cover several different areas. There are several types of definitions and descriptions, such as this one from Oxford Learner's Dictionaries, where sustainability is *"the use of natural products and energy in a way that does not harm the environment"* (Oxford Learner's Dictionaries [2023b]). But the term is often used in the same context of creating better conditions for future generations by taking better care of the environment. Therefore, there can be different ways to take care of the earth, such as water consumption, using less electricity or sustainable transport solutions.

When combing *mobility* and *sustainability* into one *sustainable mobility* the term becomes a means to investigate how we can change our current movements / how we can change our current travel choices, both today and in the future. This however is something that not only lies on the transport sector, but also the on the people and the politicians; if we are going to meet the future generations needs and secure a more sustainable development. When looking at the transport sector, it covers plenty of the modes humans use when going from A to B, such as cars and air-travel (3.2).

The European Union Council of Ministers of Transport defines a sustainable transportation system *"allows the basic access and development needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations"* (Council, 2001). Sustainable transport also demands conditions that ensures reliable modes of transport that fulfil the demands of the individuals in the urban space. Here the aim is to ensure the smooth travel of the population, promote public transport, improve the environment, and increase the safety and traffic flow (Mikušová et al., 2021,: 43).

In the present day, the largest cities are characterised by their high population density which results in a struggle for space within the city centre. Public transport and cycling are important parts of the transport system and congestion is a major problem. The interaction between urban and transport planning has a major impact on urban quality, and the impact of traffic depends crucially on the balance between transport modes (Transport, 2018,: 16). However, it also becomes clear that the political changes – that both the citizens and (even) some politicians want – often end up conflicting with other modes of transport, especially when it's about the use of private motor vehicles. Thus, cities often must decide whether to benefit one mode more than the other. Historically, this consideration has been done differently throughout the world, as *"the UK and the USA have given the green light to the private car"* and *"instead of catering to ever more motor vehicles by expanding roadways and parking facilities, Dutch, German and Danish cities have focused on serving people, making their cities people-friendly rather than car-friendly"* (Pucher & Buehler, 2021,: 496).

3.2 Modes of transportation

There are different types of transportation modes available for people moving from A to B in Denmark: walking, cyclists, cars, public transport, and air-travel. This following section will give a general introduction to these five modes.

3.2.1 Walking

There are several ways to define what 'walking' are, and The Cambridge Dictionary defines it as *"to move along by putting one foot in front of the other, allowing each foot to touch the ground before lifting the next"*(Cambridge Dictionary, 2023). This definition can also be put in same category as being a pedestrian, which according to Cambridge is persons who are walking, especially in areas where vehicles go (Cambridge Dictionary, 2021). There can be many reasons for a pedestrian to walk; get from point A to point B, commuting, going for the street to the store and more (Lo, 2009,: 145).

3.2.2 Cyclists

In the early twentieth century cycling was *"the dominant commuting regime in many cities"* (Larsen, 2020,: 127), however throughout the 1940s, cycling was quickly replaced by motorized transport due to new roads designed for cars and increased daily travel distances which were not suitable to cycling anymore (Larsen, 2020,: 128). Today cycling is virtually non-existant in large parts of the world, as a form of transportation.

But in Denmark, cycling is still a popular mode of transport (Pucher & Buehler, 2021,: 498), and according to Det Nationale Videnscenter for Cykelfremme, 70% of the Danes have a bicycle, while 48% women and 52% men have a bicycle in 2022 (Vejdirektoratet, 2022). While the Netherlands is the country with most cyclists per capita, it's the Danish capital Copenhagen, where 62% of its citizens biked for their daily commute (Kelsey, 2021). Larsen describes Copenhagen as being exemplary for the reasons why Danish cities still employ a large cycling modal share: *"The affective capacity required for cycling in Copenhagen is relatively low, as there are separated bike lanes throughout the city on the major roads and they are largely responsible for the fact that most cyclists feel safe. Distances are doable as Copenhagen is compact; the city was only modestly suburbanised and redesigned for cars in the 1960s and 1970s. Moreover, the city is flat and not plagued by extreme temperatures. All this makes Copenhagen suitable for cycling"* (Larsen, 2020,: 129).

If we look at cycling by itself, then it's often seen as an increasingly desirable mode of transport by city governments for the following reasons: environmentally friendly, causes no pollution, utilizes little to no space and provides health benefits to its users (Pucher & Buehler, 2021,: 496).

3.2.3 Public transport

As mentioned in the introduction, public transport is a form of transport system, that is available for the general public as a means for transportation. In Denmark there are two main options of public transport: bus and train. These two can then be broken further down into other categories:

In Denmark, there are several types of **buses**: city bus, tourist bus, minibus, school bus, regional bus, X bus (long-distance), flex (these can both be in form of a car or minibus, depending on the trip) and PlusBus (also known as a BRT (Bus rapid transit)). According to Trafikstyrelsen, there were around 184.132 boardings in 2021 (Trafikstyrelsen [2022]).

In Denmark, there are several types of **trains**: light rail, regional train, metro train, InterCity and lightning train. According to Trafikstyrelsen, there were around 14.044.082 million boardings in 2021 (Trafikstyrelsen [2022]).

3.2.4 Private vehicles

The usage of private vehicles has grown rapidly since the 1960s, between 2010-2022 the number of families with access to their own vehicle increased from 59% to 63% with around 42% owning two or more. This has resulted in an increase from 2.1 million to 2.8 million vehicles in Denmark (Christensen, 2022,: 30). However, this rise in vehicles has created new challenges in some of the more larger cities, and the municipalities for the cities are struggling to find solutions for this. Which is why the most characteristic solutions for Danish towns has been attempting to combine a high car accessibility (e.g., cheap car parking) with an attractive pedestrianised environment, which typically would include this (Lahrmann & Leleur, 1994,: 396-397):

- Bus-only streets, bicycle-only streets, possibly in combination with pedestrianisation
- Car parks or underground car parks
- Special cycle routes through the city centre
- Passages above the zone limit for buses alone

Below is a graph illustrating how many people travelled by bus, train, cars and air-travel were on Danish roads in the period 2017-2021:

Figure 3.1. Busses, trains, cars & air-travel 2017-2021 (Trafikstyrelsen [2022]: Danmarks Statistik)

The data from air-travel is both arrival and departure, and includes the following airports: Billund, Bornholm, Esbjerg, København, Midtjylland, Roskilde, Sønderborg, Thisted, Vagar, Aalborg & Aarhus. Here we can see how during the covid-19 pandemic, the number of private vehicles on the Danish roads, was the one rising, while the rest were going down. Especially air-travel, took a drastic hit during the covid-19 lockdowns.

3.2.5 Airtravel

Aviation has over time gone from being strictly used for military purpose to also include passenger and cargo travel (e.g., produce). In 1949 the first commercial jetliner took flight, which marked the beginning or modern air travel as we know it today (History [n.d]). Before Covid-19 shut down the world in 2019, there were around 4.5 billion people flying globally (ICAO [2019]) – while in Denmark there were around 18.2 million flying (Danmarks Statistik [2020]). For many, flying has become the preferred means of transportation for two main reasons:

1. Often, it's the cheapest way to travel.
2. It's the fastest way to travel (including the time spent at airport terminals and security control), both long-distance and short-distance flights.

Aviation has likewise played a huge role in todays globalised world and has made it possible for people to attend things such as events and celebrations and travel for work (Randles & Mander [2009]).

There are also some more negative sides of both aviation and road transportation, which are their impact on the environment. If we look at aviation first, then from a global perspective around 2.4% of the total greenhouse gas (GHG) emissions from energy use comes from commercial flights (Graver et al. [2019]), and within EU the emissions were around 3.6% in 2016 (EEA et al., 2019,: 8). In 2019 was the total GHG emissions from road transport around 12.3 million tons of CO2 (Energistyrelsen, 2021,: 3).

Another factor is noise, which can be a serious problem in both urban and rural areas. It significantly reduces the quality of life, produces annoyance, sleep disturbance, and health damage. The transport sector is one of the main culprits of noise, contributing to it both by road, rail, and air transport. Below is the World Health Organization (WHO) recommendation for each of the transportation modes:

Transport mode	Recommendation
Road traffic	Noise levels should be reduced below 53 dB (day) and 45 dB (night). Above this level, the noises by road traffic produces health effects and sleep. By acting on sources and infrastructure it's possible to reduces the noise levels.
Railway	Noise levels should be reduced below 54 dB (day) and 44 dB (night). Above this level, the noise by railway traffic produces adverse health effects and sleep. Reduce the population exposed to noise levels above these values.
Aviation	Noise levels should be reduced below 45 dB (day) and 40 dB (night). Above this level, the noise by aircraft produces adverse health effects and sleep. Reduce the population exposed to noise levels above these values acting on infrastructures.

Table 3.1. Recommendations of the World Health Organization for transport noise (World Health Organization [2018])

3.3 Climate goals regarding public transport in Denmark

In the light of the oil crisis in the 1970s, the need for a climate and energy policy emerged, which today covers various areas: energy prices, security of supply, greenhouse gas emissions and more (Energistyrelsen [n.d]). The work on sustainable development in Denmark can be divided into three political levels: global, national and regional. Looking first at the global level, Denmark, through its membership of the EU and the UN respectively, has committed itself to working on the green transition within the environment (Energistyrelsen [n.d]). The Paris Agreement from 2015 and the UN SDGs goals (chapter 1) can be mentioned here, among other things. At a national level, Danish climate policy is greatly influenced by both their UN and EU commitments, but also the Danish Climate Act from 2020. Socialdemokratiet, Radikale Venstre, Socialistisk Folkeparpti and Enhedslisten signed the *"Agreement on the green transition of road transport"* on 4 December 2020. Here, the parties agreed on a number of measures, all aimed at promoting the green transition of transport (Energistyrelsen, 2020,: 19). Of these measures, two in particular can be emphasised (Energistyrelsen, 2020,: 20:

- 75 million DKK to accelerate the conversion of green buses.
- The conclusion of climate cooperation agreements on green public transport and zero-emission zones with a number of the country's municipalities and regions. The primary purpose of the agreements is for the country's municipalities to commit to a green transition of public bus transport.

At a regional level, in addition to being bound by the Danish laws, the municipalities themselves are also working on a number of initiatives in relation to energy and climate policy (section 5.2).

The way that we measure the environmental impact transport has in Denmark, is also being looked at the same three political levels (Vejdirektoratet, 1999 in Jensen, 2001,: 27):

- Global: the greenhouse effect which is considered the most serious.
- Regional: include air pollution (such as NOx emissions), which causes acidification of the aquatic environment and the deposition of nutrients in the natural environment.
- Local: include acute air pollution (such as NOx, smog, and particulate matter), noise and road accidents.

In 2019, the greenhouse gas emission (GHG) from the transport sector were 13.5 million tons, which is around 29% of the total GHG in Denmark (Energistyrelsen, 2021,: 3). In Denmark there are four main types of transport: road, rail, sea, and air transport. These transportation modes can be subdivided at a more or less detailed level and likewise by passenger and goods transport (i.e., car, bus, bicycle, van, and lorry in road transport) (Transport, 2018,: 26). Below is illustrated a detailed table that shows who the investor is, who regulates and the governmental role in these transportation modes (Own interpretation of tables 2.1, 2.2, 2.3 and 2.4 in Transport, 2018):

Transport modes	Who is the primary investor?	Who regulates?	What is the state's main leverage?
Road infrastructure	The state, municipalities	The state, municipalities	The role as infrastructure manager, Planning Act
Rest areas and terminals	The state, municipalities, private	The state, municipalities	The role as infrastructure manager
Goods transport	Private	The state, EU	Goods transport Law
Bus transport	Private	The state, EU	Bus transport Law, Transport companies Law
Taxa transport	Private	The state, municipalities	Taxi transport Law
Public service transport	Private	The state	Transport companies Law
Passenger cars and cargo vans	Private	The state	Taxes on cars and fuel, Road traffic law
Rail infrastructure, including metro and light rail	The state, regions, municipalities	The state, EU	Railway Law, role of infrastructure manager
Terminals	The state, municipalities, private	The state, EU	Railway Law, role of infrastructure manager
Transport of goods and passengers	Private	The state, EU	Railway Law
Public service transport	The state, municipalities, private	The state, EU	Public purchasing, Law on DSB
Ports	Municipalities, private	The state, EU	Role of infrastructure manager of road and rail connections to and from ports
Public service transport	Private, municipalities	The state, EU	Ferry transport Law
Shipping companies	Private	International rules (IMO), state	Role as regulator of ports and infrastructure manager of road and rail connections to and from ports
Airports	Private, the state, municipalities	The state, EU, municipalities	Aviation Act, Law on the expansion of Copenhagen Airports, role as infrastructure manager of road and rail connections to and from airports
Airlines	Private	The state, EU, international rules (ICAO)	The roles of airport regulator and infrastructure manager of road and rail connections to and from airports

Table 3.2. Transport modes investors, regulators and government role (Transport, 2018)

To summarise this chapter, over time there has been an evolution in the way people move from A to B, while at the same time we have become more aware on the impact our movements have on the environment. At the same time, we have a whole variety of transport modes available for us, when choosing how to move from A to B. These transport modes also have a role to play into the green transition and sustainable mobility, that the Danish government has a focus on with their 2020 Climate Law. Here Denmark has must comply with several requirements regarding transport, because of their UN and EU memberships.

Theoretical background 4

This chapter will showcase the chosen theories that creates the framework for the thesis. The focus of this chapter lays on the rational choice that is behind the choices humans make when it concerns our transport habits/behaviour. In the end of this chapter, a model will be presented that will summarise these rational choices.

4.1 Rationals

From a societal perspective, there are three distinct modes of transport, each with different requirements (Lahrmann & Leleur, 1994,: 12-13):

1. Freight transport: movement of materials, semi-finished and finished goods.
2. Home-workplace trip (A-B trips): the journey a person makes (almost) daily (Mon-Fri) from home to work. Also known as *commuting*.
3. Occupational trips: the short trips a person makes outside the home that do not have a fixed pattern in terms of time and space, and thus may change daily.

At the same time, there are several sociological and economic background variables that influence and has played a role into people's transport choices and behaviour over time (figure 4.1). First and foremost, our evolution from an industrial society to a welfare society: here we have two new travel habits, the shopping trip and recreational travel (e.g., sporting activity) (Lahrmann & Leleur, 1994,: 14). Secondly, urbanisation has also played a role in our changing home-work journey; the poor transport options of the time meant that more people moved into the city, as that is where their work was located. This in turn created the need for public transport: thus, trams and buses helped to keep cities moving. With the arrival of the private car in the 1960s, the need to live in the city centre where one's work was often located was no longer so great (Lahrmann & Leleur, 1994,: 15). Another factor that plays into people´s choice of transport is the also influenced by the *traffic environment*, which covers both the environmental impact and the total travel experience (Lahrmann & Leleur, 1994,: 23):

- Physical comfort (e.g., noise, odour, "jumping", cold, damp and wind).
- Safety/fear regarding possible accidents.
- Visual experiences/discomfort during the journey.
- Stress in busy situations (e.g., uncertainty about the duration of a journey)

Thus, it can also be argued that in today's 'modern society' people have to consider all options when making a decision, rather than in the past when people lived in a more *traditional* way (repeating the same things, with little variation) (Jensen, 2001,: 63-64). According to Anthony Gidden's 'reflexive monitoring of action ' is always present in humans and our interactions; we must to a much greater extent relate to the fact that our choices affect ourselves and the community (Gidden's Anthony in Jensen, 2001,: 63-64). This reflexivity is also something that characterises much of today's modern society. According to Gidden's, there is no longer a stable social order when it comes to the formation and implementation of knowledge; on the contrary, knowledge today 'seeps' out almost as soon as it is formed, thus affecting the field of knowledge from the very beginning (Gidden's Anthony in Jensen, 2001,: 64).

This is also where the notion of 'change' comes into play. If we, both as a society and as individuals, want to move the transport system in a more sustainable direction, we need to imagine how this change can look and be utilised (Jensen, 2001,: 64). Ulrich Beck (1993) is one of those who have dealt with 'reflexive modernisation'. For him, it is something that is reflected against in a negative way (Beck, 1993 in Jensen, 2001,: 65). According to Beck, if we look at the challenges that modern society today faces in relation to the environment, these are self-created –> product of our societal development and thus humans are confronted by the consequences of our own actions (Beck, 1993 in Jensen, 2001,: 65). This can also be seen in our transport choices: we want to be as mobile as possible and thus choose the car, but if everyone chooses the car over the other alternatives, the negative effects are expressed in terms of traffic, air pollution, etc. (Beck, 1993 in Jensen, 2001,: 65).

If society wants people to be as mobile as possible in a sustainable way, it is therefore necessary to take a closer look at the factors that influence transport rationales and behaviour.

4.2 Transport rationales ("mobility views") and behaviour

In this section, the first part is about the transport behaviour and how its relevant for sustainable mobility, while the next part about the rationales behind our choice of transportation.

Transport behaviour

An important theory to consider in the context of sustainable mobility is the transport behaviour theory. Næss & Jensens book from 2005 *'Bilringene og cykelnavet – Boliglokaliseringen, bilafhængighed og transportadfærd i Hovedstadsområdet'*, provides insight into the factors that influences human transport behaviour. According to transport economic and transport geography theory, suggests that transportation between different locations is influenced by two main factors: the reason why people travel to the given location and how much inconvenience this travel to the location is likely to cause (Jones, 1973, Beimborn, 1979 in Næss & Jensen, 2005,: 44). By examining these factors closer it will create a better understanding of why humans choose certain transportation modes over others and thereby identify potential barriers to sustainable mobility. The figure below illustrates the factors that influences humans' transportation choice (own interpretation):

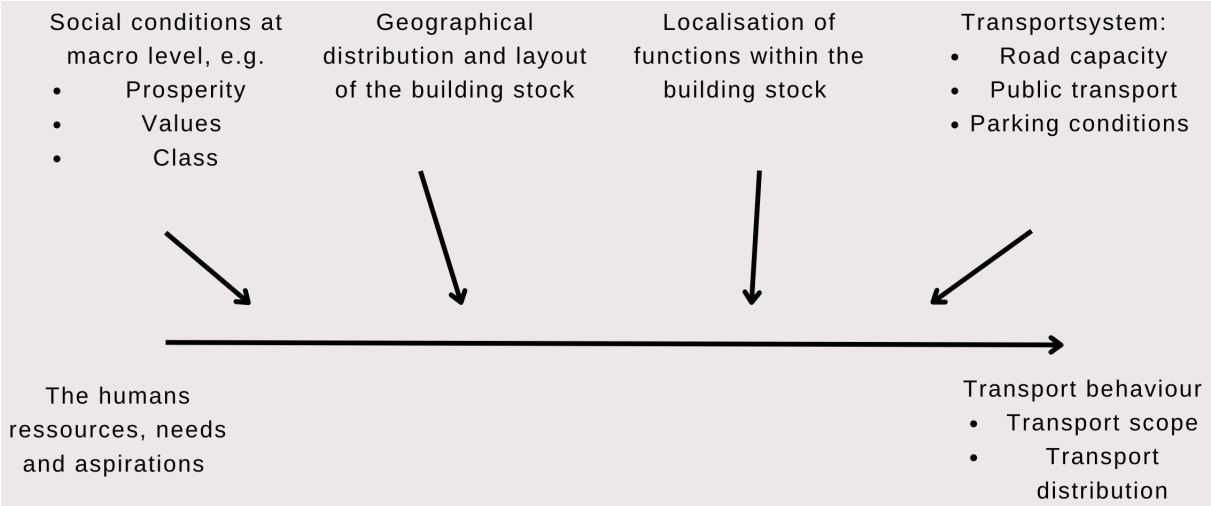


Figure 4.1. Influencing factors (Næss & Jensen, 2005,: 44)

The range of options available for land usage and transport implies the importance of considering the factors mentioned above when delving into the specific details that may impact people's choice of transportation. A good example of this is the John L. Mackie's (1965) INUS-condition (*an insufficient but necessary part of a condition for the result*) (1965). He argues that a factor such as A can only led to event P if it is combined with X and/or Y, which serve as the necessary and sufficient conditions for P to occur (Mackie, 1965: 246, in Næss & Jensen, 2005,: 47). For instance, if someone chooses to drive a car (P) to go somewhere (A), there is always a purpose (X) that motivates the choice of transportation (P). Therefore, considering these multiple factors is essential to understand and influence people's transport choices in a sustainable manner.

According to Næss and Jensen, *material* structures such as roads and buildings can have a significant impact on human behaviour. Moreover, these structures are constantly being modified and altered by human actions (Næss & Jensen, 2005,: 45). This phenomenon can be illustrated

by the reconstruction of the road for the Aarhus light railway, where the original design only accommodated vehicles, bicycles, and pedestrians. However, with the implementation of the light rail system, the road was transformed to include a railway track in the middle of the road (Teknik & Miljø, 2009,: 5-7), indicating how human actions and decisions can lead to significant changes in the built environment.

The relationship between structure and agents has long been a topic of debate among various disciplines. While some social sciences and economics reject the notion that the physical environment can affect human behaviour, Næss & Jensen argue that structures and agents possess unique capabilities and causal powers *"... the structures that surround us are 'socially constructed' in various ways. The constructed can be physical objects such as roads ... or more immaterial structures such as property relations and economic conditions..."*(Næss & Jensen, 2005,: 45). Therefore, it is important to consider both the physical and social constructs in understanding the impact on human behaviour.

Transport rationales ("mobility views")

Let us revisit the concept of rationale that was introduced earlier in this chapter (section 4.1) and establish a stronger connection between it and transport behavior. Generally speaking, transport rationales are dependent on three factors (Næss & Jensen, 2005,: 165-166) (own interpretation):

1. *Location:* limitation of geographical distances, limitation of time, desire to choose the best facility, and perception of atmosphere and aesthetic qualities.
2. *Transport mode of choice:* opportunities and constraints by virtue of mobility resources, time use, economy, physical endurance/convenience, flexibility and freedom, desire for exercise, lifestyle markers, habits, and social norms.
3. *Route choice:* safety, time use, length/distance, and views/aesthetics.

Furthermore, it can be argued that there exists a hierarchy among the above rationales. For instance, it is plausible to assume that the importance of a transport's aesthetics and scenic views may vary depending on the context. One may prioritize these factors more on a vacation than during everyday commuting (Næss & Jensen, 2005,: 166).

In summarizing the rationales and behaviours associated with transportation choices, it becomes evident that multiple factors come into play. These factors influence over individuals' decisions regarding transportation modes. Moreover, it is important to recognize that these factors not only impact individuals themselves but also have broader implications for the community at large. This is why, it's important to see transport and going from A to B, is more than that.

4.3 Why we travel?

As mentioned in section 3.1, mobility is more than moving from A to B. Over time, technological advancements have brought about significant changes in our society, leading to social and cultural transformations that impact various aspects of contemporary. In his book Sociology beyond Societies (2000), Urry argues, that there are four types of travel (Urry, 2000: Chapter 3):

1. *Objects*: things bought to producers or consumers.
2. *Imaginative* travel: to be transported elsewhere through images, encountered on the TV and radio.
3. *Virtual* travel: to "travel" with help of the internet.
4. *Corporeal* travel: being 'on the move'.

These four types of travel have profound implications for social life. They not only bind people together but also shape patterns of obligation, desire, and commitment, transcending geographical distances. Additionally, these various forms of travel give rise to new forms of social inequality and configurations of power and knowledge. Different individuals and groups may have differential access to and experiences of these modes of travel, resulting in disparities in opportunities, resources, and social advantages. According to Urry, there is a need to have a more critical perspective on how traditional research is done "*Transport researchers have taken the 'demand' for transport as a given, as a black box not needing further investigation, or as derived from the level of a society's income. Also transport researchers tend to examine simple categories of travel, such as commuting, leisure, or business. This though presumes that social activities can be divided up and then explained through such 'transport' derived categories. What is rare is to begin from the complex patterning of people's varied and changing social activities . . . understanding such connections should not begin with the types and forms of transport (...)*" (Urry 2003: 156). Here he argues that the crucial aspect of transport, the social embedment, often is being neglected or overlooked when transport is being researched.

Which as mentioned earlier in this chapter, Jensen, and Næss & Jensen, have all three emphasised the existence of multiple rationales that influence people's decision-making when it comes to choose a particular transport mode over another. It is important to recognize that these choices have wide-ranging implications for society; factors such as convenience, affordability, environmental considerations, personal preferences, cultural norms, and accessibility all play a role in shaping these choices.

The concept of modal shifts in transportation entails transitioning between distinct combinations of social practices, technologies, communications, and sensory experiences. This means there are plenty of rationales behind why a person would choose over another:

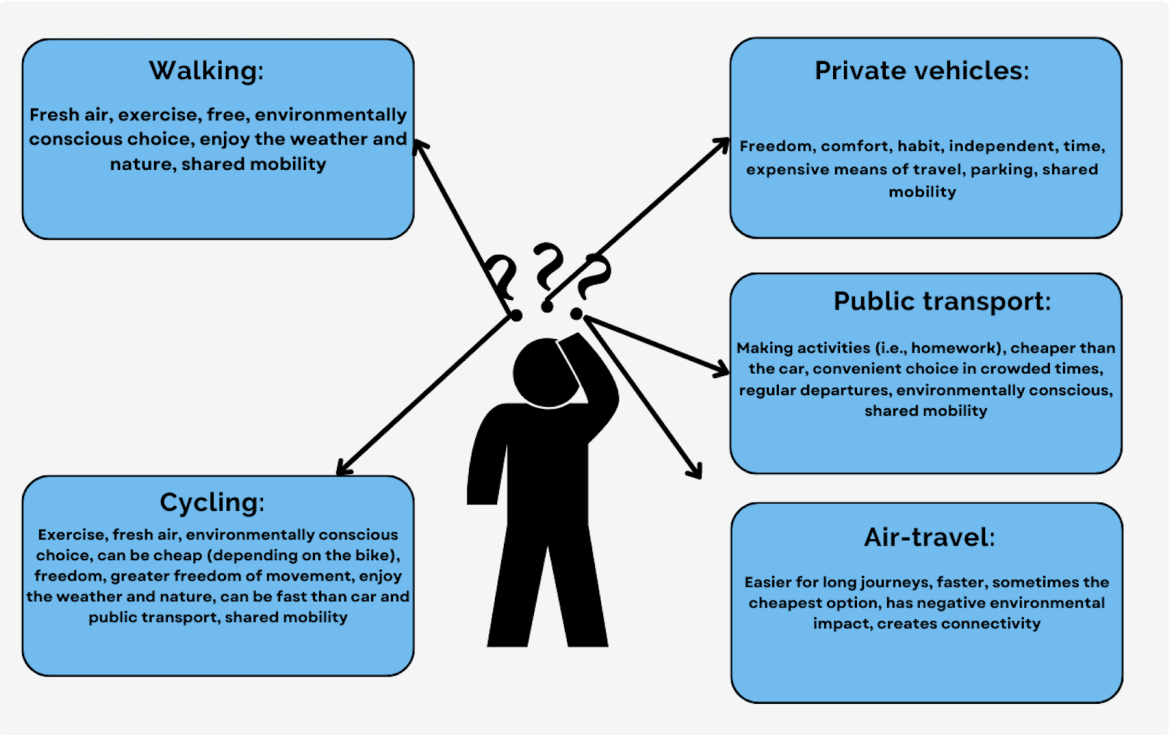


Figure 4.2. The rationales behind transport mode

This I why I've created the model above, which illustrates some of the rationales behind the choice of transport mode.

Methodology 5

The following chapter outlines the researcher approach and the use of different methodology types, and their application within the thesis. These are used as helping tool in unfolding and researching the problem formulation one step closer. The first section of the chapter gives an overview to what case-studies are and how the approach was used by doing a comparison of Aalborg and Aarhus municipalities. The second section consists of the data collection, which is divided into 3 categories: literature review, semi-structured expert interviews, and coding of the interviews.

5.1 Comparative theory-interpretative case study

This thesis can be seen as a comparative theory interpretative case study. This means that theory is used to identify patterns in the collected data, which is done through an active interpretation of the data. The phenomenon under investigation is the work of municipalities on sustainable mobility and the importance of public transport for them. Two different cases are examined, namely Aalborg and Aarhus municipality, which makes this case study comparative. The municipalities were selected based off these criteria:

- Size
- Geographical location
- Connectivity
- Public transport developments

A case study is not a single, well-defined methodology, as it often makes use of a wide range of sources and types of information (Maaløe, 1996: 33, in Jensen, 2001,: 35). This flexibility grants researchers the opportunity to employ different approaches and methodologies to effectively fulfil the research objectives within the case study framework. Yin proposes a four-step approach that serves as a guiding framework (Yin. [1994]):

Stage	Description
Designing the case Study	In this initial stage, the research objectives were formulated, and the scope of the study was defined The theoretical frameworks that would guide the analysis were also identified
Conduct the case study	This stage involved the systematic collection of data from various sources
Analyse the case study evidence	The collected data was carefully analysed to identify patterns and themes
Develop the conclusions, recommendations, and implications	This staged involved the development of conclusions based of the case-study evidence analysis

Table 5.1. The four stages(Yin. [1994])

The table below further illustrates how the case study process has taken place in this thesis:

Purpose of Case Study Research	Types of Case Study Research	Methods of Gathering Data	Data Analysis
Theory oriented	Comparative case study	Meetings Semi-structured interviews Literature review	Pattern matching Narrative analysis

Table 5.2. Case-study process

Methods of data gathering, and data analysis will both be explained later in this chapter (section 5.3.1, 5.3.2 & 5.4).

By following this structured four-step approach, I aim to research further how Aalborg and Aarhus municipalities work towards sustainable mobility, and their public transport options. This will be explored in the next section of this chapter.

5.2 Chosen field area

As mentioned above, this thesis research approach is a case-study of Aalborg and Aarhus municipality regarding their public transportation. This section will give a short introduction to each municipality, its own mobility definition and what their goals are towards public transport.

5.2.1 Aalborg Municipality

Aalborg Municipality is the third largest municipality in Denmark, with about 221.082 habitants, (**?** and the fourth largest city in Denmark with about 143.598 inhabitants (including Nørresundby) in 2022 (Danmarks Statistik [2023a]. Because of its position with having the narrowest point of the Limfjord, Aalborg quickly became a market town in the Viking and Middle Ages (Dansk Center for Byhistorie [n.d.a]). During the 1800s, Aalborg became a more industrial city, with a growing number of factories, however over time the factories closed and moved. This mean that the city started to transform into a more 'modern' bigger city (Dansk Center for Byhistorie [n.d.a]).

For Aalborg Municipality mobility is something that can be seen in *"regards to humans' everyday life, handling of goods, environment and sustainability, the well-being of us all and our future"* (Aalborg Kommune, n.d.). Aalborg Municipality has created a *'2040 mobility strategy'* , where they work towards achieving several goals to create a better mobility flow in these areas: traffic noise, lightning plan, bicycle politics and public transport (Aalborg Kommune, n.d.). More recently, the city is almost finished with transforming the road infrastructure to implement the new Plusbus, which will start driving 23.09.23 and transform the public transport within the city (Andersen & Malling, n.d.). Besides the Plusbus, there are two other options people can use regarding public transport; below are illustrated a table that shows all three choices, the company, and their passenger numbers:

Category	Compay	Passengers (2021 numbers)
Bus	Nordjyllands Trafikselskab	11.599
Train	DSB	2.035.530
PlusBus	Aalborg municipality	0

Table 5.3. Public transport in Aalborg municipality (Trafikstyrelsen, 2022)

For the municipality, there are four types of actions, that they work with, regarding creating a more sustainable transport choice (Kommune [n.d.]):

1. Influencing the need for mobility and the choice of means of transport
2. Efficient use of existing infrastructure
3. Improving existing infrastructure
4. New construction

These four action types will play a role into achieving some of the 2040 milestones for Aalborg: 100% fossil free public transport by 2025 and 100% emission free public transport by 2040 (Kommune [n.d.]).

5.2.2 Aarhus Municipality

Aarhus Municipality is the second largest municipality in Denmark, with 355.238 inhabitants (Danmarks Statistik [2023a], and around 285.273 inhabitants live in Aarhus in 2022 (Danmarks Statistik [2023b]. Aarhus was in the 900s know as *Aros* and due to its location by the river and its good hinterland, a trade town was quickly created in 948 (Dansk Center for Byhistorie [n.d.b]). Between the 1200-1850, the town was a busy trade town, and in the 1700s several factories opened, the corn export became more important, and the improvement and expansion of Aarhus port began around 1810. In the mid-1800s, Jutland got its first railway line between Aarhus and Randers, which meant that Aarhus became the hub for several railway lines, and the city remained a growing industrial and port city. Today, the city is still a growing industrial and port city, but research, education and services have taken on a greater role (Dansk Center for Byhistorie [n.d.b]). There are three options people can use regarding public transport; below are illustrated a table that shows all three choices, the owners, and their passenger numbers:

Category	Compay	Passengers (2021 numbers)
Bus	Midttrafik	35.387
Train	DSB	4.222.350
Light rail	Letbanen	3.978.596

Table 5.4. Public transport in Aarhus municipality (Trafikstyrelsen, 2022)

For the municipality, there are four types of actions they work towards (Teknik & Miljø, 2019,: 2:

1. The road network
2. Intelligente TransportSystem (ITS)
3. Public transport
4. Bicycling and walking

These four types will play a role into their 2050 mobility plan, thus creating a more efficient, safe, and climate-friendly system for both the citizens and businesses (Teknik & Miljø, 2019,: 2.

5.3 Data collection

The data collection for this thesis is divided into 2 different categories: literature review and semi-structured interviews. In order to gather more knowledge about the chosen area, a literature review of existing research and industry documents was necessary. Additionally, a series of semi-structured interviews were also organised with a range of experts, which form the basis of the qualitative data. The following section will therefore describe how these data collection methods was used throughout the thesis. Table 5.5 shows how the data collection methods are linked to the respective topics of this project.

Data collection/ Data analysis method	Project Phase
Literature background	Was used throughout the thesis
Semi-structured interviews	The analysis

Table 5.5. Data Collection Overview

5.3.1 Literature review

A literature review is a analysis of academical publications, books, governmental official documents, journalistic work and other relevant sources, that can be found within a specific field of study. The process involves a systematic identification, evaluation and interpretation of existing literature to understand the current knowledge available within this research field.

Throughout this thesis, I have made use of various articles, books, and documents; everything from journalistic to research to official governmental literature. I will now briefly summarise how these have been used:

- Chapter 1: To gain more knowledge about passenger numbers and why there is a need for public transport, I made use of governmental documentation from abroad and Denmark, as well as an academic book.
- Chapter 3: To gain more knowledge about sustainable mobility, the different modes of transport and the sustainable side of transport, I made use of governmental documents from abroad and Denmark, academic articles, and public websites.
- Chapter 4: Here I used academic research to gain more insight into how people choose their transport mode, and how different factors influences that choice.
- Chapter 5: Here, as in chapter 3, I made use of governmental documents from abroad and Denmark, academic articles, and public websites in order to describe my data collection and the chosen field areas in more detail.
- Chapter 6: To answer my problem formulation, I worked further with the information that came out of my expert interviews.
- Chapter 7: Here, I used the information from the interviews, and discussed them.

5.3.2 Semi-structured interviews

The qualitative data collection consisted of several expert interviews, which had the purpose of exploring the chosen research question more in depth. However, there are several types of interviews, depending on the purpose (Rytter & Olwig, 2018,: 181). But in this thesis, the choice was to have semi-structured interviews, since the chosen informants all can be categorized as experts with relevant knowledge. According to Bogner & Menz *"an expert has technical, process and interpretative knowledge that refers to a specific field of knowledge"* (Bogner & Menz [2009]), which in this case is public transportation. This interview approach provides a lot of flexibility and enables the interviewer to ask open-ended and follow-up questions; thus, creating a new perspective on things or unexpected answers. The interview guide was designed to give an overview of the questions that had emerged from the theory (chapter 4), the literature review and the case study. It was then divided into several themes, as illustrated below:

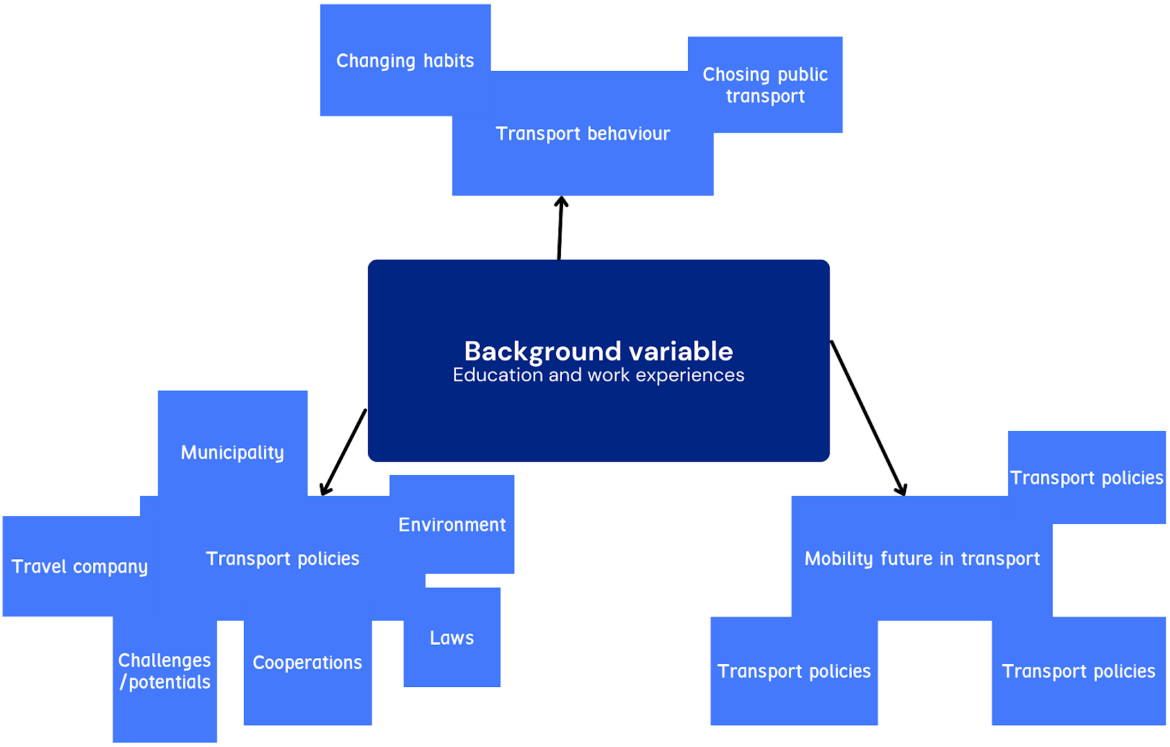


Figure 5.1. Interview guide model

The interview guide, which can be found in Appendix A, is a generic version. This means that all the experts have been asked roughly the same questions.

I had five interviews between April 24th and May 5th, 2023:

Interview	Company	Interviewer's position	Interview location	Length of interview (in minutes)
Mette Olesen (MO)	Aalborg Municipality	Counsellor in Mobility	Online	58:18
Simon Wind (SW)	Aarhus Municipality	Chief Counsellor	Online	52:01
Anne Bach (AB)	Midttrafik	Specialised consultant	Online	51:52
Signe Klintgaard Korac (SKK)	Nordjyllands Trafikselskab	Head of Mobility and Counselling	Physical	47:18
Niels Melchior (NM)	Aalborg University	External Associated Professor	Physical	68:38

Table 5.6. Interviews Overview

As mentioned above, the informants were chosen based on their expertise and knowledge regarding public transport. MO and SW are the experts regarding Aalborg and Aarhus municipality and the more political aspect of sustainable mobility. AB and SKK, are the experts regarding public transport within the municipalities and how they work towards the green transition. NM is the expert regarding both the political aspect and public transport and can give an outside perspective on things.

The interviews were all done in Danish, since both I and the experts speak Danish (B). However, for the purpose of this thesis, the interview guide and the experts' citations will be in English.

5.4 Coding of interviews

In order to analyse the problem of the thesis, it is necessary to look at the qualitative interviews and see what relevant keywords and arguments recur. After transcribing the interviews, I chose to code them using Braun & Clarke's thematic analysis method (Braun & Clarke, 2006), and create a visualisation of the codes.

Thematic analysis explained

According to Braun & Clarke, thematic analysis is a method that can be used to identify and analyse the tendencies (themes) within the collected dataset, which then will create a more detailed picture over the data (Braun & Clarke, 2006,: 79). Unlike other methods, this method is quite flexible to work with, since it is not dependent on one particular theory, and therefore the only focus here is to find tendencies in the data ((Braun & Clarke, 2006,: 78)). When applying this methodology, this can be done in two different approaches (Braun & Clarke, 2006,: 84):

1. The semantic approach, where *"(...) the themes are identified within the explicit or surface meanings of the data, and the analyst is not looking for anything beyond what a participant has said or what has been written".*
2. The latent approach, which *"(...) starts to identify or examine the underlying ideas, assumptions, and conceptualizations – and ideologies - that are theorized as shaping or informing the semantic content of the data".*

The difference between these two approaches, is that the semantic approach addresses the issue more superficially, while the latent approach addresses the issue more in depth. Within this thesis, I have worked with a latent approach regarding the data collection. This is mainly due to two reasons: firstly, by conducting a literature review of existing studies in the field of public transport, and secondly by looking at how the two municipalities and public transport companies work towards sustainable mobility.

Thematic analysis coding process, step by step

To use thematic analysis as a method to process the collected data, it must follow this six steps model (Braun & Clarke, 2006,: 88):

Figure 5.2. Model over the six step process (Braun & Clarke, 2006,: 88)

Step 1. Familiarizing yourself with your data: Each time, I finished with an interview, I started to transcribe them straight away. This gave me the possibility to create a better understanding of the collected data, and to write down the potential themes.

Step 2. Generating initial codes: Here I worked on my initialising codes to be able to process the collected data. In this coding process, I have been inspired by hermeneutics as a way to interpreting the codes. Hermeneutics is the methodology of interpretation, including both theory and practice (Audi [1999])

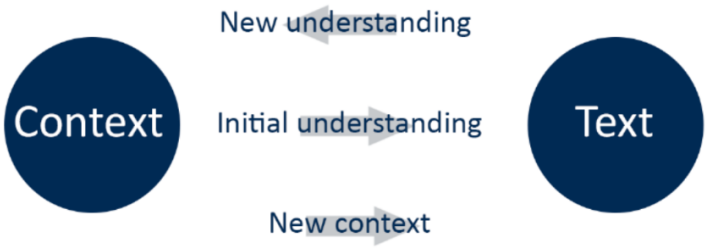


Figure 5.3. Hermeneutics circle (Lalicic et al. [2022])

Here the idea is that the understanding of all the interviews, also depends on the understanding of each interview and how each of the interviews can be interpreted. This can also be explained like this: I wrote down key words that were repeating themselves, put these keywords into similar cluster, thus creating the following three topics:

- **Governance:** This covers the different kinds of political decisions that influences the municipalities and traffic companies when it's about public transport.
- **Challenges:** An overview of the key issues and challenges that both the municipalities and traffic companies is aiming to address; and what is influencing public transport.
- **Goals:** An overview of the municipalities and traffic companies together – and separately – is working towards reaching their goals within public transport.

Step 3. Searching for themes and Step 4. Reviewing themes: By looking at the dataset again based off the xxx topics mentioned above, I was able create the following themes:

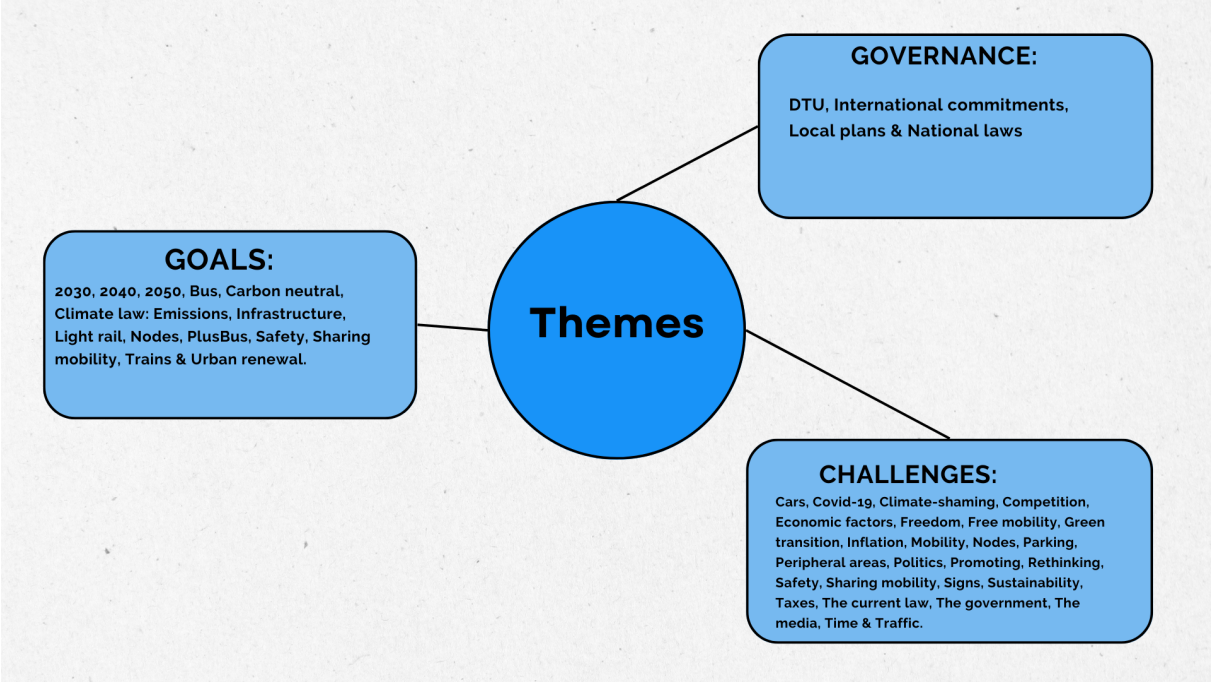


Figure 5.4. The three themes

Step 5. Defining and naming themes: Here I revised the key words under each theme, to see if they should be moved or not. Thus, in the process creating a final version of the themes and their scope:

- Politics and regulations within public transport
- The price of public transport
- The "whip or carrot" dilemma

In Appendix C, there is also illustrated a comprehensive list, which elaborates the meanings and relevance of the selected keywords/codes.

Step 6. Producing the report: Based on the five mentioned steps above, it is now time to begin the analytical part of the thesis. The next chapter will therefore analyse the collected data with the help of the mentioned theories in chapter 4.

Analysis 6

The aim of this chapter is to analyse the data, what has come out of the expect interviews. Based on the chosen theories (chapter 4) and the initial interview coding (chapter 5), I was able to create three themes, that will be the framework of this chapter and one step closer into answer the following problem formulation: *What role does public transport have into creating better sustainable mobility?*.

6.1 Politics and regulations within public transport

"Politics and regulations within public transport" is one of the primary themes identified through the experts' interviews. During these interviews with all five experts, it became evident that there is a genuine desire to change the way politicians—both nationally and internationally—perceive public transport. To illustrate different approaches to public transport, David Bannister created a table showcasing the conventional and alternative perspectives:

The conventional approach	An alternative approach
Physical dimensions	Social dimensions
Mobility	Accessibility
Traffic focus, particular on the car	People focus, either in (or on) a vehicle or on foot
Large in scale	Local in scale
Street as a road	Street as space
Motorised transport	All modes of transport often in a hierarchy with pedestrian and cyclist at the top and car users at the bottom
Forecasting traffic	Visioning on cities
Modelling approaches	Scenario development and modelling
Economic approaches	Multicriteria analysis to take account of environmental and social concerns
Travel as derived demand	Travel as a valued activity as well as a derived demand
Demand based	Management based
Speeding up traffic	Slowing movement down
Travel time minimisation	Reasonable travel times and travel time reliability
Segregating people and traffic	Integration of people and traffic

Table 6.1. Conventional and alternative approach (Marshall, 2001 in Banister, 2007,: 75)

The implementation of new legislation on public transport in 2007 (Melchior, 2008,: 10), resulted in various changes. One notable change was the separation of operations and facilities, dividing them into different companies. According to **NM**: *We can probably get over something about the organisation of the whole thing. After all, we have divided operations and facilities into different companies, and that has its advantages and disadvantages.*

Similarly, as emphasised by **SKK** "*(...) But if you sit and order transport for the different*

groups of citizens... let's say 7 different administrations. Who is responsible for looking at how we actually manage the overall supply smartly, plan it smartly and throughout the day and throughout the day and throughout the year, how we actually do it? And it's just legislative, at national level as well as the way we are organised, as well as the way we have plans to support us, we are still in yesterday's thinking. Yes, in the vast... vast majority of places.", there is a lack of clarity regarding the responsible entity for smartly managing and planning transport operations throughout the year.

It is important to note that large parts of the Danish laws are influenced by Denmark's international commitments (3.3). Here especially the Sustainable Urban Mobility Plan (SUMP) "*A Sustainable Urban Mobility Plan is a strategic plan designed to satisfy the mobility needs of people and businesses in cities and their surroundings for a better quality of life. It builds on existing planning practices and takes due consideration of integration, participation, and evaluation principles.*" is relevant for this thesis (Eltis [2023]). Both Aalborg and Aarhus municipality have a mobility strategy (section 5.2). Furthermore, both municipalities share the common objective of achieving 100% fossil-free public transport:

MO: *(...) and that public transport should be emission-free. We've achieved that, there are electric buses and the entire Aalborg city bus network is in that way emission-free public transport (...)*

SW: *(...) We have a goal that our buses should be, what is it called... electric buses in 2027, so we are in full swing with that replacement (...)*

Aalborg Municipality expects to have all 121 electric buses phased in by 2023, this also applies to the new Plusbuses (Løcke, 2022). While Aarhus municipality expects its conversion to be completed in 2027 for all buses that run daily on the street (also called contact buses) and 2030 for the reserve buses. Today, the municipality has about 62 electric buses, and they need another 88 electric buses to be able to convert all their contract buses, and about 30 more for the spare buses (Aarhus Byråd, 2021). However, while **NM** points out that it is fine, how Aalborg municipality choose electric busses, but if the municipality wants to live up to the Danish governments plans and promises, then there are some concerns about this progress:

NM: *Yes, well, now you say electric bus and that's something that has been chosen in Aalborg, and we can go all the way back with the objective that we have in relation to 2030, and now Aalborg has chosen to buy electric buses and that's fine. (...) These buses don't make much of a difference in the overall picture, and I think that if you focus on sustainability, it's not fast enough in relation to the 2030 targets*

Overall, there is a call for political and regulatory changes to support sustainable mobility within public transport. As the rest of the analysis will illustrate, there is a need for more ambitious actions, while also taking into account how public transport is also being impacted by the economical aspect.

6.2 The price of public transport

"The price of public transport" emerges as the second theme identified through the expert interviews. During these interviews, both municipalities and traffic companies emphasised the critical role of the economic aspect in decision-making and strategy development related to public transport. In addition to the inflation, that has affected all of the world, the covid-19 pandemic also had a huge impact on both traffic companies:

AB: *(...) But of course, we saw a huge drop during corona in terms of how many people use public transport, and that was because we were almost saying "stay away. You should stay at home" rather than having to go out and use public transport. But on the other hand, there was also a... not even a desire, but actually almost a demand from the state that we should be available with public transport, because it kind of solves an important social task even during corona, also for the sake of people not standing too close and stuff like that.*

As evident from the above statement, traffic companies faced challenges during lockdowns, experiencing a significant decrease in passenger numbers while still fulfilling their social responsibility of providing transportation services. As **AB** says here "*(. . .) I would say that we measure how many travellers there are, because that of course also has an impact on the economy of public transport"*, if traffic companies don't generate enough revenue from their passengers, this will lead to either downsizing or fewer routes or removal for the public transport.

From the municipalities' perspective, both **SW** and **MO** highlighted the financing of public transport as a substantial challenge:

SW: *(...) What is and has been a challenge in the past, if you look more specifically at public transport, is simply... well, I would say the financing of it, i.e. the degree or need for financing to make public transport competitive in relation to private cars is extremely large. So a lot of money really needs to be invested in both the infrastructure, for example, if we are talking about some of these slightly more high-class public transport solutions, such as the light rail and BRT, they are very expensive to build. But what is actually the huge challenge is the operational side of things. That is, the operating budget that we have to run public transport, and it must be significantly larger if we choose to deliver a service that is competitive with car use (...)*

MO: *But there we just know that money. . . price and time are 2 mega decisive factors (...)*

Both the capital costs of infrastructure development and the operational costs of running competitive public transport services present financial difficulties. Therefore, if the goal from the political side is to make public transport a more attractive alternative to private vehicles, a paradigm shift in understanding the mobility sector is necessary, as pointed out by **SKK** "*(...) because what I am experiencing right now, which I see very critically, is of course inextricably linked, but it is this focus on economic sustainability. There is simply a huge problem. We need some kind of shift and a different understanding of the mobility area in general. There are many things, if you ask me, that are blocking us from getting on a healthier wave.*"

As **NM** points out here: *"You could say that it is one thing to set objectives, but can they be achieved? In the end, it's just a political question of finding the money (...)"*, thus the financial aspect becomes paramount.

In this context, it becomes evident how much public transport is heavily associated with economy, financial pressures, and considerations. While the municipalities on one hand must create and offer sustainable mobility options for all, they are also on the other hand limited by the number of resources that they have available. Thereby, creating a challenge for both the municipalities and traffic companies.

6.3 The "whip or carrot" dilemma

"The "whip or carrot" dilemma" is the third theme identified through the experts' interviews. This theme emerged when discussing the role of the economy in public transport, leading to a conversation about the private vehicle versus public transport dilemma, commonly referred to as *"the whip or carrot dilemma"*. Before delving deeper into this dilemma, a table has been created below, illustrating a person's journey from start to finish when travelling by public transport or car:

Public transport	Private vehicle
Transport from home to bus stop	Walking to the private vehicle
Waiting for bus/train	Switch on the private vehicle
Travelling by bus/train 1	Driving
Change (walking + waiting) to another bus/train	Finding parking
Travelling by bus/train 2	Congestion/traffic
Transport from stop/station to work	Congestion/traffic

Table 6.2. Travel journey when using public transport or private vehicle

However, it is important to consider that both modes of transportation also involve *hidden waiting time*, which is the time a person arrives before an activity to ensure they arrive on time.

As mentioned earlier (section 4), according to Jensen, Næss & Jensen and Urry, there are several different rationales for why people choose one mode of transport over another when it comes to our journey. While Lahrmann and Leleur argue that public transport is good to prioritise in a city (Lahrmann & Leleur, 1994,: 458), **MO** highlights that both municipalities and transport companies face challenges due to individuals' focus on their own needs:

MO: *(...) In terms of individualism, we're just a little challenged by the fact that people want to have their own individual needs covered. So I think the idea that public transport is the way to go is the right one... unfortunately, it's just... what kind of users are we going to cram into the system? And how do we create an incentive to do that?*

DL: *That's also true...*

Simultaneously, Denmark has witnessed an increase in the number of private cars in recent years, while the use of public transport has significantly declined due to the pandemic (3.1). However, the numbers are slowly going upwards, but despite this are both Aalborg and Aalborg municipality struggling with who and how to prioritise, and what to do:

SW: *(...) The other part that we struggle quite a lot with in Aarhus is also what can many say... the political attitude to prioritising? Yes, both public transport, but also cyclists and pedestrians in relation to motorists, i.e. private cars. Because there you could say the way or one of the ways in which you can get more people to do something other than the car ... it's also like ... well, we often talk about this whip or carrot. I mean, it would be great if we could build even more cycle paths and improve public transport ... make it run even more times per hour and cover a larger area and so on, and make it as attractive as possible. But we can see that we don't have*

the means to do that, but we can also... we know from many places that it's not enough to get people to get out of their cars and suddenly choose to take the bus or cycle more often. Then we also need some kind of whip to make it a little more difficult that you can't just drive a car everywhere (...)

MO: *(...) Because you can't prioritise everywhere, that's what's a bit difficult. It's difficult for politicians, also because you don't want to restrict anyone, do you? It's not ... that's the general thing about our entire green transition, the behavioural model ... do we believe in the technology? Does it fix everything, or do we believe that it also requires a change in behaviour? And it's not either or, it's probably both (...) And if you want to get something out of the cars, then I think ... completely recognised research shows that you have to use a whip. And it's exciting to see what politicians are willing to do. Mostly right now, I sense that there has been a willingness to expand, i.e. build cycle paths, do something with some junctions and not so much to use a whip.*

Overall, in this context of "*whip*" and "*carrot*", the following can be said: the "*whip*" represents the idea of implementing measures such as restrictions on car traffic, limited parking, and road tolls to encourage individuals to reconsider their transportation choices. On the other hand, the "*carrot*" symbolises the provision of attractive alternatives like well-designed public transport systems and cycling infrastructure to make sustainable modes of transportation more appealing.

To summarise this chapter, I've decided to use a SWOT (Strengths, Weaknesses, Opportunities & Threats) model. SWOT is a way to get an overview of the strategic position of a company or project (Mannas [n.d]). External factors are things that can influence public transport from an inside perspective (strengths and weaknesses), while external factors are the things that can influence public transport from an outside perspective (opportunities and threats). Likewise, we have the positive factors (strengths and opportunities) and the negative factors (weaknesses and threats). All of these factors can influence the strategic direction of public transport:

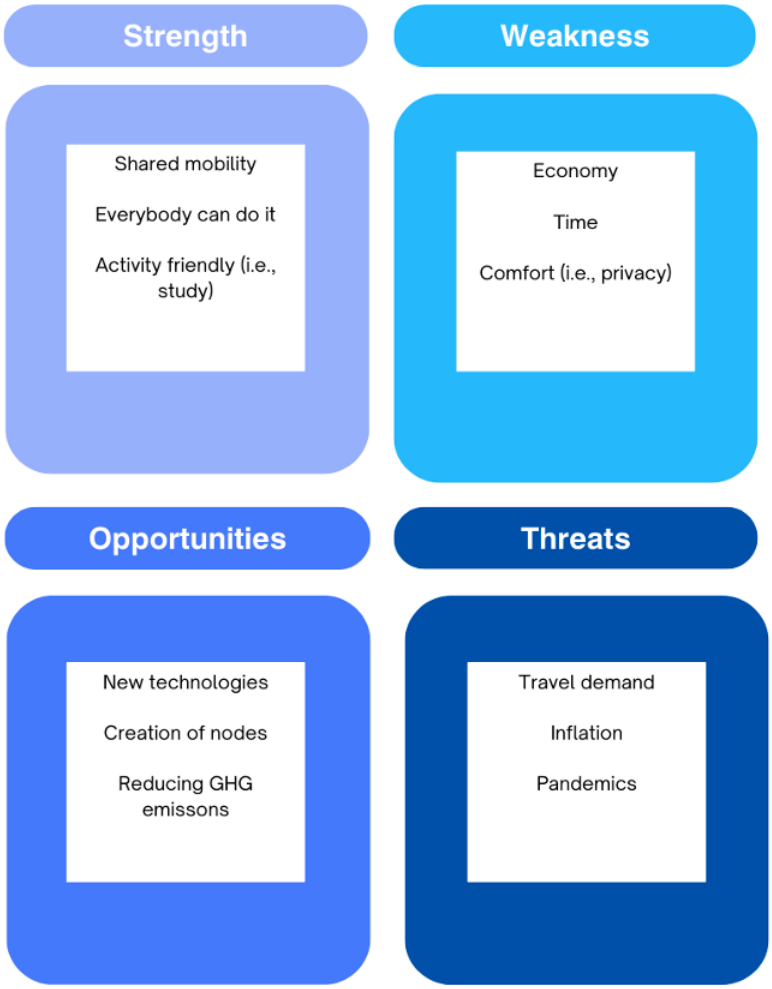


Figure 6.1. SWOT-model over public transport

The internal and external factors mentioned above, are just some that has been identified to influence the public transport within Aalborg and Aarhus municipality.

7 Discussion

Since The Brundtland Report came out, it has become clear with time, that sustainable development is not only about the environment, but also about ecological systems, equity, quality of life and economic growth (Brundtland & Commission [1987]). Similarly, sustainable mobility has evolved over time and has been influenced by various factors such as economic conditions, population growth, urbanisation, and globalisation. As it was illustrated by the SWOT-model, there are many factors that can influence and be influenced by public transport.

First, both national and international political laws and attitudes towards sustainable mobility play a role in how municipalities and transport companies work. If there is a political attitude that '*public transport is only trains and buses*', then it is clear that the transport companies will lose more users. According to **SKK**, we should take a broader view of what public transport actually is: *"It has something to do with the fact that it's been quite a few years since we started talking about mobility and not just being focussed on buses and trains and flex traffic only. But then we should have adjusted the lens and thought much more broadly, because basically we are all of us ... all 600,000 North Jutlanders plus all those who come to visit, and that's a lot. We're actually all mobilists, by implication, we don't do the same thing all the time: sometimes we walk, sometimes we cycle, sometimes we drive a car, sometimes people take buses and so on. But we do realise that it is... that we need a different approach. We have to face mobility."*

It is therefore also debatable whether this political attitude towards sustainable mobility is reflected in the citizens? Both Aalborg and Aarhus municipalities have a low level of citizen involvement in connection with meetings on public transport. Both **MO** and **SW** highlight the challenges they face in engaging people in this process:

MO: *Yes, it is also difficult to get people to get involved, I would say. It's also a general tendency where "I only get involved when something is closed outside my front door". So there's that... so that one, how do you give ownership? How do you involve people in the process? How do you give real ownership? So it's not just a public meeting where you can come and give your opinion, but there has to be something in it.*

SW: *Yes, well, you could say yes... some of this discussion... at least that's how it will be when we talk to our politician and also to the citizens for that matter, a bit of a chicken and egg discussion. Everyone agrees that when you look at mobility as a whole, everyone can understand that we need to do something about fossil fuelled cars if we are to achieve the goal of the green transition. And that ... in the same way, I think that, by analogy, for example, everyone can understand that wind turbines are a good thing, but no one wants to have them in their backyard.*

The Leuven2030 mobility plan is a good example of how to get the best possible citizen involvement. Leuven2030 is a non-profit organisation based in the Belgian city of Leuven, which was founded in 2013. It brings together more than 600 progressive and determined inhabitants, organisations and businesses (Leuven2030 [n.d]). This example showcases a more successful approach to fostering citizen engagement and ensuring their voices are heard in the planning and implementation of sustainable mobility initiatives.

Lastly, in the pursuit of increasing the number of public transport users, it is important for municipalities and traffic companies to first understand the purpose behind such efforts. **NM** highlights the significance of engaging in a political discussion to determine the underlying reasons and goals of promoting public transport usage. It is not merely about getting people to ride buses, but rather about identifying the broader objectives and benefits:

DL: *Do you think we might be able to get more people to choose public transport?*

NM: *Well, I think we should start with, why should we do it? What is the purpose of it? That's a political discussion and I think we should have that first. It's not a goal that people should just drive around in buses.*

He further elaborates: *What is it we want? Is it a good goal to get more people on the buses, or is it better for them to work at home?* Notably, during the COVID-19 lockdowns, major cities such as Copenhagen, Odense, Aarhus, and Aalborg witnessed a significant decrease in air pollution by NOx gases has fallen by about 40% (Miljøministeriet [2020]). **MO** while agreeing with **NM** points the following out: *(...) And it's good that people work from home, but it's certainly a bit difficult in relation to public transport (. . .).*

Conclusion 8

Based on the thesis problem formulation

What role does public transport have into creating better sustainable mobility?

the following can be concluded: the shift towards implementing more sustainable mobility is something that takes time.

Firstly, it is evident that the transition towards more sustainable mobility is a process that requires time and efforts. It cannot be achieved overnight, but rather requires a long-term commitment and continuous improvement.

Secondly, there is a clear need for political and regulatory changes to support and promote sustainable mobility within public transport. These changes should include both ambitious actions and a comprehensive understanding of the economic aspect, as public transport is heavily influenced by financial considerations.

Lastly, both Aalborg and Aarhus municipality are facing a dual challenge: on one hand, they have the responsibility to provide sustainable mobility options for all citizens, and on the other hand, they are constrained by limited resources, which poses a challenge for both the municipalities and traffic companies involved in providing public transport services.

In summary, achieving better sustainable mobility through public transport requires time, political support, and a balanced approach that considers both economic factors and the need for attractive alternatives. By implementing effective strategies and overcoming resource limitations, municipalities and traffic companies can contribute to a more sustainable future in transportation

Further perspective:

One theoretical way, I could have approached is *practice theory*. Here Pierre Bourdieu, Anthony Giddens, Michel Foucault, and Theodore Schatzki are the most known within the practice theory field. In essence, practice theory can be characterized as both the actions performed by individuals and the overarching collective norms and structures that govern and shape those practice(s) (Gram-Hanssen, 2014,: 201). Schatzki further elaborates that practice theory can be understood as "*(. . .) a practice is a temporally evolving, open-ended set of doings and sayings linked by practical understandings, rules, teleoaffective structures, and general understandings. ... the organization a practice describes the practice's frontiers: A doing or saying belongs to a given practice if it expresses components of that practice's organisation*" (Schatzki, 2002,: 87). Practice theory encounters significant opposition from psychological perspectives and their associated

actions and language (Schatzki, 2002,: 77). However, in the context of this thesis, practice theory could have been used as explanation of the practices people engage in that impact their daily transport mode decisions, including their attitudes towards specific modes of transport.

Instead of doing interviews, it would have interesting to work with a quantitative method approach. Brinkmann & Tanggaard (2010) outlines the distinction between a quantitative and qualitative approach. The quantitative approach involves the use of surveys and statistical analysis, whereas a qualitative approach incorporates interviews and ethnographic fieldwork (Brinkmann & Tangaard, 2010,: 15). In the context of this thesis, the chosen approach would have been to design a survey for residents of Aalborg and Aarhus municipalities who have utilized public transport in the 12 months. The survey would encompass questions regarding factors such as transport choice, comfort, safety, satisfaction, drawbacks, and more.

Bibliography

Audi, **1999**. R. Audi. *The Cambridge Dictionary of Philosophy (2nd ed.) Cambridge*, 1999.

Banister, **2007**. David Banister. *The sustainable mobility paradigm.* Transport policy, 14(4), 265-272, 2007.

Bogner & Menz, **2009**. A. Bogner & W Menz. *The Theory-Generating Expert: Epistemological Interest, Forms of Knowledge, Interaction. In: Bogner Alexander et al., (eds): Interviewing Experts*, 2009.

Braun & Clarke, **2006**. Virginia Braun & Victoria Clarke. *Using thematic analysis in psychology.* Munskgaard, 2006.

Brinkmann & Tangaard, **2010**. Svend Brinkmann & Lene Tangaard. *Kvalitative metoder - en grund bog.* Hans Reitzel, 2010.

Brundtland & Commission, **1987**. H. Gro Brundtland & The Brundtland Commission. *Our Common Future*, 1987. URL `https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf`.

Cambridge Dictionary, **2023**. (a) Cambridge Dictionary. *Walk*, 2023. URL `https://dictionary.cambridge.org/dictionary/english/walk`.

Cambridge Dictionary, **2021**. (b) Cambridge Dictionary. *Pedestrian*, 2021. URL `https://dictionary.cambridge.org/dictionary/english/pedestrian`.

Christensen, **2022**. H. B. Toke Christensen. *Bæredygtig mobilitet kræver ændringer i byens indretning*, 2022.

Comission, **2015**. European Comission. *Measuring access to public transport in European cities*, 2015. URL `https://ec.europa.eu/regional_policy/sources/work/2015_01_publ_transp.pdf`.

Council, **2001**. The European Union Council. *The European Union Council of Ministers of Transport, 2340th Council meeting - TRANSPORT / TELECOMMUNICATIONS - Luxembourg, 4-5 April 2001*, 2001. URL `https://ec.europa.eu/commission/presscorner/detail/en/PRES_01_131`.

Danmarks Statistik, **2020**. (b) Danmarks Statistik. *Antallet af flypassagerer stagnerede i 2019*, 2020. URL `https://www.dst.dk/da/Statistik/nyheder-analyser-publ/nyt/NytHtml?cid=30220`.

Danmarks Statistik, **2023a**. (d) Danmarks Statistik. *Folketal 1. januar efter kommune og tid – Aarhus*, 2023. URL `https://www.statistikbanken.dk/statbank5a/default.asp?w=1440`.

Danmarks Statistik, **2023b**. (f) Danmarks Statistik. *Folketal 1. januar efter byområder og landdistrikter og tid - Aarhus*, 2023. URL https://www.statistikbanken.dk/statbank5a/SelectVarVal/saveselections.asp.

Dansk Center for Byhistorie, **n.d.a**. (a) Dansk Center for Byhistorie. *Danmarks Købstæder: Aalborg*, n.d. URL http://ddb.byhistorie.dk/koebstaeder/by.aspx?koebstadID=73.

Dansk Center for Byhistorie, **n.d.b**. (b) Dansk Center for Byhistorie. *Danmarks Købstæder: Aarhus*, n.d. URL http://ddb.byhistorie.dk/koebstaeder/by.aspx?koebstadID=74.

EEA et al., **2019**. EEA, EASA & EUROCONTROL. *European Aviation Environmental Report 2019. Copenhagen*, 2019. URL https://ec.europa.eu/transport/sites/transport/files/2019-aviation-environmental-report.pdf.

Eltis, **2023**. Eltis. *1.1 What is a Sustainable Urban Mobility Plan*, 2023. URL https://www.eltis.org/mobility-plans/11-what-sustainable-urban-mobility-plan.

Energistyrelsen, **2021**. (a) Energistyrelsen. *Klimastatus og -fremskrivning 2021 (KF21): Transportsektoren*, 2021. URL https://ens.dk/sites/ens.dk/files/Basisfremskrivning/4a_kf21_sektornotat_-_transport.pdf.

Energistyrelsen, **n.d**. (b) Energistyrelsen. *Fakta om dansk energi- & klimapolitik*, n.d. URL https://ens.dk/ansvarsomraader/energi-klimapolitik/fakta-om-dansk-energi-klimapolitik.

Energistyrelsen, **2020**. (c) Energistyrelsen. *Klimahandlingsplan 2020*, 2020. URL https://kefm.dk/Media/F/5/Klimahandlingsplan%202020a.pdf.

Gram-Hanssen, **2014**. K Gram-Hanssen. *Praksisteori - for en bedre forståelse af husholdningers energiforbrug. i J Holm, B Søndergård, I Stauning JO Jensen (red), Bæredygtig omstilling af Bolig og Byggeri. 1. udgave udg.* Frydenlund Academic, 2014.

Graver et al., **2019**. B. Graver, K. Zhang & D. Rutherford. *CO2 emissions from commercial aviation 2018, The International Council on Clean Transportation.*, 2019.

History, **n.d**. Airmobility History. *Aviation timeline*, n.d. URL https://www.history.com/news/history-flight-aviation-timeline.

ICAO, **2019**. ICAO. *The World of Air Transport in 2019*, 2019. URL https://www.icao.int/annual-report-2019/Pages/the-world-of-air-transport-in-2019.aspx.

Jensen, **2001**. Mette Jensen. *Tendenser i tiden – en sociologisk analyse af mobilitet, miljø og moderne mennesker, Kapitel 1 - Indledning.* Narayana Press, 2001.

Kelsey, **2021**. Raynor Kelsey. *Which City Has the Most Cyclists? [STATISTICS]*, 2021. URL https://discerningcyclist.com/which-city-has-the-most-cyclists-statistics/.

Kommune, **n.d.** Aalborg Kommune. *Planer for mobilitetsudvikling*, n.d. URL https://www.aalborg.dk/politik/strategier-og-politikker/planer-for-mobilitetsudvikling.

Lahrmann & Leleur, **1994**. Harry Lahrmann & Steen Leleur. *Vejtrafik – Trafikteknik Trafikplanlægning.* Narayana Press, 1994.

Lalicic et al., **2022**. Dzejna Lalicic, Eylul Seker & Petrina Petkova Ganeva. *Sustainable growth between land and air – Aalborg Airport's challenges and opportunities in the context of a sustainable transition*, 2022.

Larsen, **2020**. J Larsen. *Handbook of Urban Mobilities, Chapter 13: Ups and downs with urban cycling.* Routledge, 2020.

Leuven2030, **n.d**. Leuven2030. *About Leuven 2030*, n.d. URL `https://en.leuven2030.be/about-leuven-2030#faq`.

Lo, **2009**. R.H. Lo. *Walkability: what is it.* Journal of urbanism, vol. 2, no. 2, pages 145–166, 2009.

Magelund, **1997**. Lykke Magelund. *Trafikdage: Fordele og ulemper ved at benytte bil og kollektiv transport – hvad siger trafikanterne?*, 1997. URL `https://www.trafikdage.dk/td/papers/paper97/livsstil/magelu/magelu.pdf`.

Mannas, **n.d**. Mannas. *SWOTanalyse – metodebeskrivelse*, n.d. URL `https://www.mannaz.com/da/projektmodel/analysefasen/swot-analyse/`.

Melchior, **2008**. Niels Melchior. *Kollektiv trafik: forudsætninger, planlægning og eksempler, 2 udg.* Institut for Samfundsudvikling og Planlægning, Aalborg Universitet. ISP-Skriftserie Nr. 315, 2008.

Mikušová et al., **2021**. N. Mikušová, G. Fedorko, Molnár V., M. Hlatká, R. Kampf & V. Sirková. *Possibility of a Solution of the Sustainability of Transport and Mobility with the Application of Discrete Computer Simulation—A Case Study.* Sustainable Mobility and Transport, 2021.

Miljøministeriet, **2020**. Miljøministeriet. *Stort fald i luftforureningen efter COVID-19-restriktioner*, 2020. URL `https://mst.dk/service/nyheder/nyhedsarkiv/2020/mar/stort-fald-i-luftforureningen-efter-covid-19-restriktioner/`.

Næss & Jensen, **2005**. Petter Næss & B. Ole Jensen. *Bilringene og cykelnavet – Boliglokaliseringen, bilafhængighed og transportadfærd i Hovedstadsområdet.* Polyteknisk Forlag, 2005.

Oxford Learner's Dictionaries, **2023a**. (a) Oxford Learner's Dictionaries. *Public Transport*, 2023. URL `https://www.oxfordlearnersdictionaries.com/definition/english/public-transport?q=public+transport`.

Oxford Learner's Dictionaries, **2023b**. (b) Oxford Learner's Dictionaries. *Sustainability*, 2023. URL `https://www.oxfordlearnersdictionaries.com/definition/english/sustainability`.

Passagerpulsen, **2022**. Passagerpulsen. *Danskerne og kollektiv transport 2022*, 2022. URL `https://passagerpulsen.taenk.dk/system/files/2023-01/Unders%C3%B8gelse%2C%20Danskerne%20og%20kollektiv%20transport%202022.pdf`.

Pucher & Buehler, **2021**. J. Pucher & R. Buehler. *Making Cycling Irresistible: Lessons from The Netherlands, Denmark and Germany.* Transport Reviews 28, pages 495–528, 2021.

Randles & Mander, **2009**. S. Randles & S. Mander. *Practice(s) and Ratchet(s): A Sociological Examination of Frequent Flying.* Climate Change and Aviation: Issues, Challenges and Solutions., pages 245–273, 2009.

Rasmussen Berg et al., **2021**. Michael Rasmussen Berg, Fenja Møller Søndergaard & Søren Dalbro. *Har adgang til offentlig transport betydning for, om man har bil?*, 2021.

Rytter & Olwig, **2018**. Mikkel Rytter & Karen F. Olwig. *Antropologiske projekter - En grundbog, Kap 11. At snakke om det: Mader at interview pa.* Samfundslitteratur, 2018.

Schatzki, **2002**. T.R. Schatzki. *The site of the social. A philosophical account of the constitution of social life and change.* Pennsylvania State University Press, 2002.

Sheller, **2021**. Mimi Sheller. *Advanced Introduction to Mobilities, Chapter 2 – The formation of an interdisciplinary field.* Edward Elgard Publishing Limitied, 2021.

Teknik & Miljø, **2019**. (a) Teknik & Miljø. *Mobilitet frem mod 2050 – Investeringsbehov og handlingskatalog*, 2019. URL `https://www.aarhus.dk/media/30729/investeringsbehov-og-handlingskatalog_final-mail.pdf`.

Teknik & Miljø, **2009**. (b) Teknik & Miljø. *Tillæg nr.1 til Kommuneplan 2009 – Letbane i Aarhus Kommune etape 1*, 2009. URL `https://www.aarhus.dk/media/9440/tillaeg-1.pdf`.

Trafikstyrelsen, **2022**. Trafikstyrelsen. *Passagertal*, 2022. URL `https://passagertal.dk/`.

Transport, **2018**. Bygnings-og Boligministeriet Transport. *Ekspertgruppen – Mobilitet for fremtiden*, 2018.

United Nations, **n.da**. (a) United Nations. *The 17 goals*, n.d. URL `https://www.globalgoals.org/goals/`.

United Nations, **n.db**. (b) United Nations. *Goal 11 - Sustainable cities and communities*, n.d. URL `https://www.globalgoals.org/goals/11-sustainable-cities-and-communities/`.

United Nations, **2018**. (c) United Nations. *Metadata on SDGs Indicator 11.2.1 Indicator category: Tier II*, 2018. URL `https://unhabitat.org/sites/default/files/2020/06/metadata_on_sdg_indicator_11.2.1.pdf`.

Vejdirektoratet, **2022**. Det Nationale Videnscenter for Cykelfremme Vejdirektoratet. *Cykeltrafik i Danmark*, 2022. URL `https://api.vejdirektoratet.dk/sites/default/files/2022-06/Onepager_infografisk%20data_A4_WEB.pdf`.

World Health Organization, **2018**. (WHO) World Health Organization. *Environmental Noise Guidelines for the European Region; WHO Regional Office for Europe: Copenhagen*, 2018.

Yin., **1994**. K. Robert Yin. *Case study research: Design and methods*, 1994.

Appendix 1 - Interview Guide A

Introduction:

- Who am I?
- What is this thesis about?
- What purpose does these interview have?

Background:

- Education, work experience and current position?

The future mobility within transport:

- How has the discussion - according to you - on sustainable transport evolved over the last few years?
- From a policy perspective, are there any general criteria or indicators that measure sustainability in public transport (or just the transport sector in general)?
- What changes can we expect to see in the next few years in terms of sustainable transport and mobility? (note: ask specifically if the municipality and the company itself have initiated any specific actions)
- What are some of the technological innovations that are currently characterising mobility in the city? (In terms of electrification, automation, and digitalisation)
- Are there differences in how different transport sectors develop and implement sustainable development and innovation? What does it mean that some do it better than others? And what are some of the reasons for these differences?
- Could it be that in the future we will be able to travel "for free" by public transport, so that it will be paid for by taxes (like in Luxembourg?)?
- Which mode of transport do you think will be most common in 50 years' time?

Transport behaviour:

- How can we get more people to choose public transport? (e.g., possibly change people's transport behaviour)
- Which parameters are important for people to use public transport rather than, for example, the car in their home-work journey? (especially those living in peripheral areas who use the car rather than the bus)

Public transport policy:

- Where do you see the greatest potential and the main challenges for public transport?
- What will happen to your older buses/trains when they are phased out? (addressed to NT and MT)
- Are there any requirements for the public transport providers regarding their future cars/trains in terms of making them more environmentally friendly?

Appendix 2 - Interview transcribts B

The interview transcripts can be found attached to the Hand-In in Digital Exam, due to their length.

Appendix 3 - Coding of interviews C

Governance:

- DTU: Danmarks Tekniske Universitet has been granted 20 million from the Danish government, to run an experiment on road pricing.
- International commitments: As a member of EU, many of Danish laws are influenced by this.
- Local plans: The strategies that Aalborg and Aarhus municipality has.
- National laws: The laws that the Danish government creates or have been created.

Challenges:

- Cars: The role and impact cars has had for our society.
- Covid-19: The pandemic had a negative impact on the public transport sector since people more or less stopped using its services.
- Climate-shaming: Today when people with electric cars are using their car more, they don't feel "shamed" because, an electric car is better for the environment than a diesel one.
- Competition: Public transport is in a competiton with the cars.
- Economic factors: The role money have into the decisions both the municipalities and the traffic companies take.
- Freedom: There is a freedom connected closely to the usage of cars.
- Free mobility: People have the right to move freely, and by banning cars it interferes with people's free mobility.
- Green transition: The green transition towards becoming more sustainable all over the world.
- Inflation: The current situation in Ukraine, has made everything from produce to fuel rise in price.
- Mobility: How people go from A to B.
- Nodes: How can the municipalities and traffic companies create better nodes regarding public transport?
- Parking: The sports currently available in the city.
- Peripheral areas: People who live outside the cities, and in areas where there aren't that many, longer distance between neighbours etc.
- Politics: How politics plays a role into planning the future for public transport.
- Promoting: Got to promote the different public transport options better.
- Rethinking: We need to think about public transport in new ways.
- Safety: How can we make the bus stop places, safer for its users?

- Sharing mobility: Here its people who use the same transport modes to get from point A to point B.
- Signs: How does the traffic companies show that this particular spot on this street are where the bus or train will show up.
- Sustainability:
- Taxes: Could there perhaps be some tax benefits for a company if their employees got a electric bike or something like that?
- The current law: Could perhaps use a change.
- The government: The laws voted in proposed by the Danish government, influences the municipalities work.
- The media: The role the media plays into the narrative regarding the municipalities infrastructure and public transport.
- Time: The time is one of the biggest reasons why some choose the car and not the public transport options.
- Traffic: With more people taking their car, when travelling, there is more traffic on the roads.

Goals:

- 2030: The year where Aarhus Municipality plans to be CO2 neutral.
- 2040: Aalborg Municipality mobility plan.
- 2050: Aarhus Municipality mobility plan.
- Bus: The busses that drives around Aalborg and Aarhus Municipality, which NT and MT has responsibility for.
- Carbon neutral: How Denmark is working towards being carbon neutral by 2050, and what the municipalities are doing to archiving this.
- Climate law: Socialdemokratiet, Radikale Venstre, Socialistisk Folkeparpti and Enhedslisten signed the Danish Climate Act in 2020.
- Emissions: The need to lower the greenhouse gasses.
- Infrastructure: How the infrastructure has a role when planning, and how much it can change.
- Light rail: One of the transport modes available in Aarhus Municipality.
- Nodes: How can the municipalities and traffic companies create better nodes regarding public transport?
- PlusBus: The new bus that is going to drive in 2023, in Aalborg Municipality.
- Safety: How can we make the bus stop places, safer for its users?
- Sharing mobility: Here its people who use the same transport modes to get from point A to point B.
- Trains: One of the transport modes available in Aalborg and Aarhus Municipality.
- Urban renewal: Renovating and expanding to increase quality of life and economic growth.