

## Synopsis

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The Problematization of Compact Urban Development – a case study of the municipality of Aarhus' Master Plan 2009

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This project aims at investigating how the dominating discourses in the municipality of Aarhus' Master Plan '09 conforms to state-of-the-art knowledge about urban structures' influence on travel behavior and by which mechanisms of power this knowledge has been filtered through the decision-making process. The project will further investigate the practical implications of this in regards to the goal of minimizing the amount of car traffic, influencing the modal split in favor non-motorized means of transport, and ultimately the goal of mitigating CO<sub>2</sub>-emissions from transportation. The study shows that growth, competitiveness, freedom of choice, and small-scale change are key-elements in the dominating discourses and in the filtering of knowledge about urban structures' impact on travel behavior and the dismissal of the compact city strategy. This entails extensive greenfield development outside the existing city with neighborhood-scale built environment characteristics, which makes it questionable whether the stated goals of minimizing the amount of transport, because metropolitan-scale variables exert stronger influence on travel behavior than local scale variables, and it also entails several road capacity expansions and opposition against restricting car traffic, which makes it questionable whether the modal split will shift in favor of mass transit and non-motorized means of transport. Ultimately this makes it questionable whether the goal of mitigating CO<sub>2</sub>-emissions from transport will be successful.

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# 1 Introduction

*This chapter will give an introduction to the many issues regarding sustainable urban development and mobility in an international context and especially in a Danish context. The chapter will initially focus on the global incentives for placing the sustainability discourse on the international political agenda and how this has transformed into the Danish political agenda. Subsequent the chapter will focus on the sustainability issues regarding road based transport and possible solutions and barriers to the issue.*

## 1.1 Sustainability

Sustainable development was introduced to the international political agenda in the UN report "Our Common Future" in 1987. Sustainable development was defined, as development that meets needs of the present, but does not compromise the ability of future generations to meet their needs. Following the discourse about sustainable development there has been different focus areas and challenges throughout the last two decades. Reduction of pollution, e.g. ozone layer depletion and particle pollution, and protection of natural areas and arable land have received a lot of international and local attention. In the last decade the international political debate has centered on reducing energy consumption and mitigating greenhouse gasses (GHG). This agenda has especially been promoted by the forecasted depletions of the oil reserves, the security situation regarding oil producing countries, and most pronounced the four IPCC reports that have painted a rather bleak picture of the risks regarding the world's climate, if the emissions of GHG are not severely mitigated (Næss, 2006, pp. 2-4).

It can be argued that there has not been a lot of progress on the international political scene to this date; in regards to an agreement on mitigating CO<sub>2</sub>-emissions, if you look beyond the Kyoto protocol from 1997. The European Council has however agreed on a climate strategy; the so called "20-20-20 Plan". The member states has agreed to mitigate 20 % of their CO<sub>2</sub>-emissions, to increase energy efficiency by 20 %, and to increase the share of renewable energy to 20 % out of the total consumed energy before 2020 (European Union, 2007). The Danish Government has ratified the plan, but has gone further by committing to expanding the renewable energy production, so it covers 30 % of the total energy consumption before 2025. Furthermore, the Government has a long term goal of making Denmark completely independent of fossil fuels (Klima og Energiministeriet, 2009).

To date, Denmark has been quite successful in regards to reducing GHG emissions from the manufacturing industry and dwellings due to new energy saving technologies, but the same progress cannot be registered in the transport sector (Næss, 2006, p. 3).

The transport sector is today completely dependent on fossil fuels and is responsible for high energy consumption. The transport sector's energy consumption represented approximately a third of the total energy consumption in Denmark in 2007 and has increased by approximately 32 % since 1990 (Energistyrelsen, n.d.).

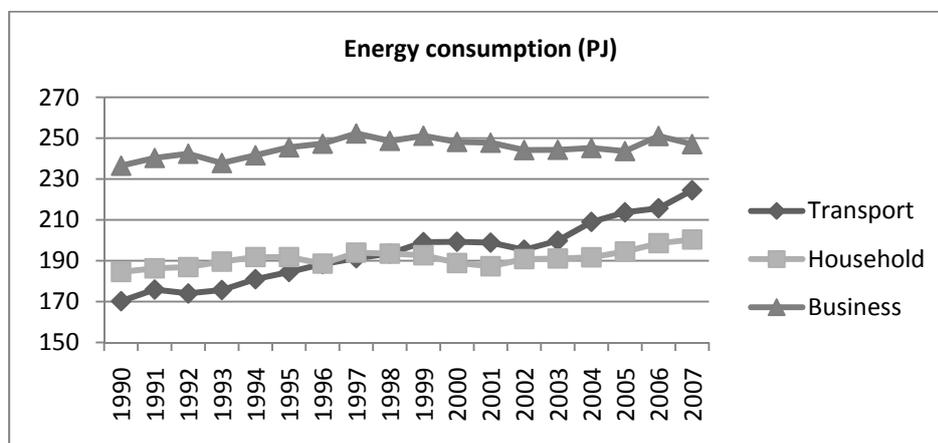


Figure 1: Energy consumption (PJ) in Denmark from 1990 to 2007 divided into sectors (Statistics Denmark, n.d.).

Road based traffic is the highest energy consumer in the transport sector with approximately 78 % of the energy consumption stemming from road based traffic (Energistyrelsen, n.d.).

Due to the lack of alternative fuels CO<sub>2</sub>-emissions from road based traffic has risen from app. 9.2 M tons in 1990 to app. 12.6 M tons in 2006 (Statistics Denmark, n.d.). The Danish Government has so far appointed most attention to increasing the share of biofuels and levy deduction from electric and hydrogen fuel cell cars. Additionally they have put more focus to strengthening the rail network (VK Regering III, 2007). The IPCC has recommended similar initiatives in regards to alternative fuels and taxation/levies on cars. They have additionally recommended a long list of other measures and instruments, which has been proven to be environmentally effective (IPCC, 2007).

Sector	Policies, measures and instruments shown to be environmentally effective	Key constraints or opportunities
Transport	Mandatory fuel economy, biofuel blending and CO <sub>2</sub> standards for road transport	Partial coverage of vehicle fleet may limit effectiveness
	Taxes on vehicle purchase, registration, use and motor fuels, road and parking pricing	Effectiveness may drop with higher incomes
	Influence mobility needs through land use regulations, and infrastructure planning Investment in attractive public transport facilities and non-motorised forms of transport	Particularly appropriate for countries that are building up their transportation systems

Table 1: Excerpt from IPCC's Fourth Assessment Report: Climate Change 2007 – Chapter E (IPCC, 2007).

It can be seen from the list that there are three categories of instruments that can influence the GHG emissions from transport. These are in short; 1) technological efficiency improvements, 2) economic instruments, and 3) strategic land-use/infrastructure planning.

The IPCC claim that these policies, measures, and instruments have an effective influence on the environment, or in other words mitigate GHG emissions and other types of pollutions caused by transport, so it is peculiar why the latter category is not represented in the Danish Governments, or for that matter the EU's, list of measures to mitigate GHG emissions. Decreasing the amount of transport does not only mitigate GHG emissions, but also mitigates particle pollution and other substances associated with fossil fuel combustion. This is especially relevant in urban settings, where the environmental impact on human's health is an expensive issue. This can be combined with the large number of casualties and injuries caused by road based transport. Furthermore, minimizing the need for road based transport can lessen the depletion of arable land and nature areas.

In order to explain why reducing transportation has become a politically caveat, it is needed to explain how transportation has become an integral part of the city to such a degree that it is almost impossible to look at one without the other.

## **1.2 Sprawl: an inconvenient urban form**

The urban form has changed immensely from the first known urban settlements to the modern city, which to a great extent has to do with the emergence of new modes of transport. The early urban form in preindustrial times evolved from the peasant society due to several needs and discoveries. Irrigation increased the yield, and hence population growth, but also created a need for a central administration of the water resources. The discovery of new trade routes by sea made it possible to trade surplus of commodities into other commodities, which further enhanced the need for administration and skilled labor, which could turn the surplus of goods into monumental public works; such as administration buildings, places of worship, and defensive fortifications, which stimulated further population growth. Thus the early preconditions for capitalism were founded, and as well feudalism/Hereditary rule (Pacione, 2005, pp. 39-50).

In the mid eighteenth-century an aspiring capitalism began to push aside the remnants of the feudal system. The system change was fueled by the first of what should become a series of innovations that ushered in the industrial revolution. The innovation of steam and coal engines made transport of goods and people less time-consuming and spurred growth, but it was the

invention of mass-production and the combustion engine that radically changed mobility and the urban form during the nineteenth-century. Mass-production increased productivity and output, which made larger industry scales economically possible. The industries clustered together in the urban landscape due to the demand for supplementary products and a large labor force, which urged a large urbanization in the late eighteenth-century and the beginning of the nineteenth-century. The industrial growth was to a large degree decentralized, due to a liberalized view on economic growth, which had a knock-on effect on the demographic composition. The high degree of urbanization created a massive need for new residential quarters in the cities. Housing for the factory workers was generally built in segregated areas in proximity to the factories, but was built poorly and very densely without the proper sanitation infrastructure, which led to highly polluted living conditions and hence regularly typhoid and cholera outbreaks. On the other hand, the upper class primarily segregated themselves in the outer parts of the cities, where living conditions were preferable (Pacione, 2005, pp. 50-59).

The terrible and segregated living conditions for the lower classes led to a call for sanitary reforms and urban planning. Two radically different ideals for urban planning were founded around the shift of the century that should come to put a significant foot-print on the Western European urban landscape.

The garden town ideal was developed by Ebenezer Howard in the late eighteenth century as a direct critique of the living conditions in especially London. The idea was to develop new independent towns outside the central city, where people could live in proximity to nature and arable land. Furthermore, the new towns should have a sufficient number of jobs to be self-supporting and a diversity of activities and social institutions. A strong emphasis was additionally put on the need for controlled growth.

The other ideal was originally launched by the Italian Futurist movement in a manifest by Marinetti in 1909. The Futurist movement envisioned a comprehensively planned city with high-rise buildings, elevated roadways, segregated land-use, and the use of materials, such as concrete and glass, which fit ideally into mass-production. This vision was later refined by Le Corbusier, who wanted to relieve the central parts of the city by spreading the density of development more evenly and also build at a higher density, which would leave more open space between the buildings. Furthermore, Le Corbusier wanted an effective urban transport system with rail and elevated roads that linked all parts of the city together.

These two urban planning ideas gradually became evident in Western European planning during the booming 1950's and 60's. The initial attention was to reconstruct buildings and infrastructure after the war, but as affluence grew the demand for new residential quarters and infrastructure increased, especially since the automobile was now available for larger pools of the public. It was especially accommodation for the growing middle class that was the center of attention at that time. Le Corbusier's ideas that were envisioned as the ideal type of urban settlement for the "modern population" were to a great extent taken into planning in regards to high-rise buildings and segregated roadways (highways), but there was generally put less emphasis on the quality of the surrounding areas. Additionally, the general increase in wealth made it affordable for people, who once were constrained to live in the central city cesspools, to fulfill Howard's visions on "town-country" lifestyle (Pacione, 2005, pp. 166-172). New garden cities emerged at a high rate all over the Western part of the world in the 50' and 60's, but due to the high car ownership and increased focus on providing adequate infrastructure, in order to make it possible for people and goods to travel more or less freely over large distances and hence accommodate growth, Howard's ideas about self-sustaining micro-societies never really found its way into planning discourse. The garden city ideal, or the suburb as we have come to know it, has become a mainstay in urban planning discourse during the last 50 years and has put strain on the rate of which we revoke arable land and nature areas for urban expansion and infrastructure. The city has gone from a small centered cluster of functions to a continuous sprawling entity, where travelling from point A to B has become a fixed part of urban lifestyle. With the increase in commuting within the city and from city to city the need for infrastructure has increased rapidly. This growth in traffic has been accommodated for decades under the guise of rational planning, a so-called "predict-and-provide" approach, and as a natural part of the economic growth discourse. According to Molotch (2005) one pronounced factor for the development of cities is the constant focus on competitiveness that imbues all actors who has interest in land-use. He argues that the political and economic core of any locality is growth, which means that every actor/landowner or coalition of actors/landowners fights for, at the expense of others; to enhance the potential of the land they have interest in by securing a share of the scarce development resources. This means that, if several, geographically dispersed, interest coalitions secures the preconditions for growth, whether this is urban or infrastructure development, the need for travel has been established. This is relevant when the structural conditions dictate a competitive relationship between key actors, e.g. several local governments fighting for the same development resources and preconditions for growth (taxpayers), or strong actors who support growth in different localities.

During the last two decades there has been a slight moderation in the urban planning agenda. The increased effects of globalization have set its marks on the business structure in the Western part of the world. This has led to a substantial decline in industrial businesses, which has led to a lot of vacant lots in the central parts of the city. Politicians and developers have increasingly emphasized brown-field development, since these lots have a high market value, because of the potential for a high amount of residences per m<sup>2</sup> land because of the central location.

Lately there has been a growing interest in sustainable urban development and sustainable mobility. Sustainable urban development is characterized by a holistic approach, where environmental integrity, economic vitality and social well-being are key factors (Pacione, 2005, p. 187). Sustainable mobility is a key factor in achieving sustainable development. The concept of sustainable mobility involves a volume of physical mobility, a modal split and a transport technology that meet basic mobility needs in an efficient way, take care of ecosystem integrity, limit emissions to an environmentally sustainable level, and are safe and consistent with human health (Næss, Næss, & Strand, 2010). This has resulted in a focus on working against sprawl and minimizing emissions from transport by changing the modal split, so a higher share of the transport is conducted by mass transit or non-motorized means of transport. This focus has led to a focus on changing land-use in a way that favors mass transit and non-motorized means of transport and also de-emphasize automobile transport. There has been advocated for a densification of the current urban landscape, a central location of residential areas and businesses, mixed land-use, and a commitment to strengthening mass transit. Additionally there has been put attention to decreasing parking spaces and road capacity in the city. This approach to sustainable urban planning is known as *The Compact City Model* or *Smart Growth* (Pacione, 2005, pp. 182-183).

## **1.3 The Compact City**

### **1.3.1 Compact Urban Development is Feasible**

Oslo Metropolitan Area has since the 1990's focused immensely on concentrated and compact urban development and strengthening the mass transit network. The mass transit network has been expanded by a metro ring, priority lanes for busses, and new and improved streetcar lines with a higher frequency of departures. The population density has increased by app. 7 % in the continuous Greater Oslo urban area by 11.6 % within the municipality of Oslo between 2000 and 2009. The density increase has been highest in the inner city, where the population has grown by 15 % from 2000 to 2008. There has also been a high increase in workplaces in the inner dis-

tricts of Oslo. However, approximately half of the growth in jobs has taken place in the three largest second-order centers in the metropolitan area, but most of the locations are close to mass transit lines. There has been an increase of approximately 22.000 highly skilled jobs from 2000 to 2008 and 70 % of these job were located within the municipality of Oslo and 21 % in the second-order centers. The densification of residences and general central location of jobs implies that the share of employees living close to the largest concentration of workplaces has increased considerably and hence the growth in the overall amount of motorized travel has declined. Adjusted for population growth, the traffic increase has only been 7 % in the Oslo Metropolitan Area and 1 % within the municipality of Oslo from 1996 to 2008, even though there has been considerable highway development and increase in parking spaces at the same time. For comparison, the increase in traffic, adjusted for population growth, was 23 % in Copenhagen Metropolitan Area from 1995-2007 (Næss, Næss, & Strand, 2010).

The implementation and success of the sustainable urban development and mobility approach in Oslo Metropolitan area has been due to several landscape characteristics' and structural conditions. First of all, Oslo has a natural border to the north, which is a rather large forest area that has great importance to the locals in regards to outdoor living. Additionally the surrounding area is hilly, which makes it quite expensive to build infrastructure and ripe the land for development. More importantly, there has historically been a national interest in minimizing the confiscation of arable and natural land for urban and infrastructure development, which has led to several legislative efforts in that direction. Most noteworthy is the so-called *National Policy Provisions for Coordinated Land-Use and Transport Planning*, which was enacted in 1993 and has increased the pressure on the municipalities to focus on densification instead of urban expansion through greenfield development (Næss, Næss, & Strand, 2010).

### **1.3.2 Danish Practice**

The same national interest in advocating compact urban development has to date not been seen in Denmark. The first tangible subject is a white paper from the Ministry of the Environment from 2008. This white paper states that, because of the fact that more than half of the population in Denmark resides in the suburbs and that the suburbs occupy more than half of the area occupied by cities in Denmark, the suburbs are the center of attention when it comes finding solutions for the modern sustainable city. The report suggests three types of solutions that should minimize the energy consumption from housing and car driving and the confiscation of arable land and nature areas. This is densification and mixed land-use in the suburbs, investments in mass transit options, parking spaces in proximity to mass transit stations, and technical solutions that can reduce the consumption of energy and water, minimize pollution and noise,

and create more security (Miljøministeriet, 2008). There are also a few, but very vague notions in the proposal for the National Planning Act 2009, where it is suggested to focus on coordinated land-use and transport planning. This focus includes densification through brownfield development and location of businesses and residential areas in proximity to mass transit stations (Miljøministeriet, 2009). The point being is that the national agenda on compact city development is drawing in different directions and is generally very imprecise in its approach to creating national guidelines on the subject.

There has although been a more comprehensive approach to the subject in coordinating land-use and transport planning in Copenhagen Metropolitan Area. Coordinated land-use and transport planning in Copenhagen Metropolitan Area has been managed through the Finger-plan that originally was developed in 1947, but has been carried on into the present. The latest National Planning Directive from the Ministry of the Environment (2007) states several development goals, e.g. location of housing and businesses in proximity to mass transit stations, densification instead of sprawl, strong limitations to greenfield development, and promoting mass transit and bicycling.

However, several experts on transport planning have recently criticized the current directions in regards to business location and infrastructure investments that are in direct opposition to the intentions stated in the Fingerplan 2007 and the Government's policy on promoting "green transport". They criticize the local government for careless location of businesses along the freeways, where access to mass transit is very limited and hence forcing people to commute by car. In contrast only 60 % of the residents living inside Ring 3 are living in proximity to a mass transit station, when the latest leg of the metro ring is done in 2018. Additionally, they criticize the Government for continuing to promote massive investment in new freeways around Copenhagen, which will arguably further intensify the problematic development (Bredsdorff & Østergaard, 2010 A) (Bredsdorff & Østergaard, 2010 B). This development is a national problem, which is especially evident in East Jutland, where there has been zoned app. 1800 hectare for businesses along the freeway since 2005 (Bredsdorff & Østergaard, 2010 B). This development is unfortunate in regards to the intentions in the Finger-plan and in regards to national interests in mitigating carbon-emissions. The development seems to be restorable in Copenhagen Metropolitan Area, if the guidelines in the Fingerplan 2007 are complied with. The lack of similar guidelines for the other Danish cities might exacerbate the problem.

### 1.3.3 Aarhus Practice

The municipality of Aarhus has recently committed themselves to being CO<sub>2</sub>-neutral in 2030 and has in continuation hereof initiated a long list of measures to mitigate carbon-emissions. In their latest Master Land-use Plan they incorporate coordinated land-use and transport planning and as well a plan for strengthening the mass transit network. The Master Land-use Plan 2009 operates on a basis assumption of a growth in population by 75.000 and a growth in jobs by 50.000 until 2030. This will according to the plan lead to a significant increase in traffic and therefore the plan has incorporated a series of measures that should influence the modal shift in favor of mass transit and non-motorized means of transport. This includes a shift in land-use, a light rail network that is fitted together with the existing local rail lines, bus priority lanes, and an expanded bicycle lane network (Aarhus Kommune, 2009). I will give a short description of the basic outlines of the plan and as well the environmental assessment of the plan in order to give an overview of how the municipality of Aarhus has chosen to mitigate CO<sub>2</sub>-emissions through coordinated land-use and transport planning. A more in-depth analysis of the Master Land-use Plan 2009 can be seen in chapter 4.

The Master Land-use Plan 2009 appoints several new urban development areas, where there are app. 375 hectares in brownfield and densification development and app. 3.400 hectare in greenfield development, which is an 20 % increase in the total landmass occupied by the city (COWI, 2008). It is estimated that there is space for app. 3 million floor square meters in the urban renewal areas, which is expected to amount to app. 15-20.000 residences and 35.000 workplaces. The potential for densification is limited to this relative low spaciousness, because of a general objection to changing the existing residential areas' urban profile and since they state that densification will entail an increase in traffic (Aarhus Kommune, 2009).

The extensive greenfield development is prioritized due to the relatively low potential in urban renewal and densification development. The urban growth strategy is divided into several phases of realization, which has a total timeframe of at least 25 years. The first phase is land that was appointed in the Master Land-use Plan '01, which is located in continuation of the existing city. In the next phases there will be built 5 new settlements outside the existing city and they are estimated to have a potential for 25-50.000 residences. The new settlements have been located in accordance with 1) the city's radial axes, which have been defined in accordance with an adopted finger plan, 2) an even geographical distribution, 3) the road infrastructure (in proximity to the freeway and main roads), 4) existing local railway stations, and 5) compliance with the goals concerning exemption of urban structures in the green belt around Aarhus (the latter location requirement is included in accordance with the green structure strategy in Master Plan '09).

The light rail will follow these axes, so it supports the new settlements with a high frequency mass transit option (Aarhus Kommune, 2009).

It is planned that the new settlements will be radically different in their urban profile than the “normal” suburb. The new settlements are envisioned as independent cities with an identity that matches the inner city. They shall be large and compact enough to have their own urban center that has a mixed use of residences and businesses. The density of the settlement varies with the distance from the center, which means that the peripheral parts will be open for detached housing and that the central parts will be high-density housing mixed with businesses. The settlements are centered on mass transit stations. The high-density core shall support an increased share of mass transit users (Aarhus Kommune, 2009).

#### **1.3.4 Environmental Assessment**

The Municipality of Aarhus has obtained an environmental impact assessment report (EIA) on the Master Land-use Plan '09 that in general terms compare the environmental impacts in the Main alternative (the presented plan) and the base-alternative (a hypothetical “business-as-usual” alternative). The EIA has been carried out by a private advisory company (COWI A/S). The base alternative is constituted of almost the same land-use projects as the main alternative, although the main alternative includes all five new settlements, where the base alternative only includes the two first realizable settlements (Lisbjerg and Elev). Due to this peculiar arrangement there is app. 400 hectare more urban growth in the main alternative and hence the base alternative has been added a successive outwards urban growth from the periphery of the existing city in order to make an even comparison. The EIA concludes that the base alternative has a larger impact on the environment, since the larger degree of densification in the main alternative will revoke less land and because the base alternative will have an impact on nature areas in close proximity to the city (COWI A/S, 2008). This is a quite strange conclusion on different levels. First of all, they established an even comparison in the beginning, so the two alternatives have the same amount of greenfield development. The degree of densification in the main alternative should not have an effect on the previously established size of land consumption. Furthermore, the EIA distinguishes between the location of the land that is consumed by the two alternatives, which to some degree is fair in consideration to the need for nature areas close to the city, but since the new settlements are located in relative proximity (see appendix 1) to the existing city then it seems irrelevant to make the distinction.

The EIA also concludes that the planned mix of a multitude of functions, densification, and proximity to mass transit stations in the new settlements in the main alternative will minimize the

amount of transport and influence the modal shift in favor of mass transit and non-motorized means of transport, when compared to the urban development in the base alternative that according to the EIA primarily will be mono-functional open-low housing areas with long travelling distances to other functions. The EIA states that the relative longer distance from the city center to the residential location in the main alternative should increase the amount of transport and transport distance, but it is argued that longer distance will be counterweighted by the proximity to a variety of functions within the settlement. Furthermore, it is concluded that the even geographical distribution in the main alternative will spread the traffic to other roads and hence remove congestion, which will minimize local environmental impacts (COWI A/S, 2008). It is hard to argue with the conclusions stated here without going more thoroughly into the theoretical assumptions about urban structures' influence on travel behavior, but it is relevant to criticize the fundamental premises for the comparison. The base alternative in the EIA is constituted by a range of assumptions that distort the process and conclusions in a manner that to some degree is counterproductive as a basis for decision-making. It would arguably be more productive to set up a base alternative that is radically different from the main alternative. The process and the conclusions would arguably be more transparent, if an extreme case had been chosen as antagonist, whether this would be a case of extreme sprawl or densification or both.

## 1.4 Recapitulation

The modern cities have evolved into vast marketplaces, where “time less spent” is a highly valued commodity in itself. Therefore, rapid transportation of goods and workforce have always been pursued, which in modern time has led to a much smaller world - time-geographically speaking. Simultaneously, transportation has arguably been accepted as an indicator of growth, high mobility equals high affluence. However, this development has come with a price in the form of fossil fuel dependency, local pollution, global warming, and loss of arable land and nature areas. These issues will only worsen, when/if the developing countries reach a similar level of affluence. Much emphasis has been put on finding technological fixes that can free us from being dependent on fossil fuels and hence mitigate the associated types of pollution, so we can continue our present living style. Continuing down that path does however not free us from all the disadvantages of transportation (accidents, loss of nature and arable land), so would it not be more sustainable to change the underlying causes for why we absolutely have to travel to such an extent and over great distances?

The Oslo Metropolitan Area case showed that it certainly is possible to change transport behavior through land-use planning. It was also showcased that there has been efforts to coordinate land-use and transport planning in Denmark, but that there has been different approaches on how to tackle this issue and problems in complying with the demands. The lack of a clear direction is also evident in the municipality of Aarhus case, where there are both densification and urban expansion approaches integrated in the Master Land-use Plan. This raises several questions on what basis this spatial planning strategy has been selected and whether it will change the travel behavior and ultimately mitigate CO<sub>2</sub>-emissions.

## 1.5 Problem Statement

Urban planning is not a rational science that provides the society with a clear-cut answer book on how to resolve all current and future issues we may face. Urban planners analyze and interpret human interaction with our physical surroundings, compare and contrast it to knowledge on similar patterns, and ultimately provide decision-makers with a set of possible solutions to the problem at hand. This could be characterized as the ideal for how knowledge concerning urban planning is filtered through an institutional setting. However, there are almost always different opinions on what is most important to prioritize and this prioritization is not always transparent. Urban planning impacts land-use, which can be viewed as a form of control of the market forces, and is hence subject to a multitude of interests. This creates an arena where powerful actors or coalitions of actors fight to gain favor for their specific interest. The spectrum of actors has expanded with the shift from government to governance. The outcome of a planning process is hence subject to power and rationality from various levels of the society (Jensen, 2007; Flyvbjerg, 2002). As Pløger states: *“planners must move within a political field of reason, interests, norms, and ways of thinking about planning, plans and public participation; their actions are shaped by this field”* (cited in (Jensen, 2007, p. 107)). Planning is hence not only subject to post-rationalization by powerful actors, but subject to constant pressure where the planner must navigate between various interests and systems-of-thought. The knowledge-filtering process is therefore a complex process that will be conformed to the dominating interests and system-of-thought within the planning process.

The municipality of Aarhus' spatial planning strategy seems to be a result of various interests and goals, which might be incompatible. Sustainable development in form of densification and strengthened mass transit is prioritized on one hand, but extensive urban growth is prioritized on the other hand. The strategy regarding densification and urban renewal in the existing urban landscape is vaguely described and the process regarding realization of the strategy is almost despairing. On the other hand, there is put much emphasis on the development and design of the new settlements.

It is relevant to assume that there are other goals that have had influence on the spatial planning strategy, but the question is which formulated/non-formulated goals that have affected the outcome. In that connection it is also relevant to investigate whether different systems-of-thought has influenced the direction of the spatial planning strategy. Furthermore, it is possible that the basis for decision has been deficient, because of insufficient insight into state-of-the-art

knowledge about coordinated land-use and traffic planning and/or a biased filtering of this knowledge.

Based on the discussion so far this project aims to investigate the following research questions:

*How does the municipality of Aarhus discursively construct knowledge about urban structures' impact on travel behavior and by which mechanisms of power has it been filtered through the process of formulating the Master Plan '09?*

*How does this process relate to the strategies regarding minimizing the amount of car traffic and ultimately mitigating CO<sub>2</sub>-emissions from transport?*

There are several sub-questions to the overall research questions:

- How can discourses and discourse-coalitions be relevant in knowledge filtering?
- What mechanisms of power are relevant in knowledge filtering?
- What are the dominating discourses in the Master Plan '09?
- What can be considered state-of-the-art knowledge about urban structures' impact on travel behavior?
- How do the land-use strategies in the Master Plan '09 conform to state-of-the-art knowledge about urban structures' impact on travel behavior?

These research questions and sub-questions are structuring for the lay-out of the project. I will go through each chapter to explain how these questions come into play and what kind of information that is needed to answer the questions.

### **1.5.1 Project Lay-out**

This project is first and foremost concentrated on investigating the application and filtering of knowledge about urban structure' impact on travel behavior and the consequences of this process in the municipality of Aarhus. Secondly, the project aims at reflecting upon the conclusions from the specific case by drawing on the national political agenda on the subject and deduces possible casual explanations for the direction of the municipality of Aarhus' Master Plan '09.

Chapter 2 will go through the various forms of information that is needed to answer the specific research questions and which methods that are needed to obtain the best possible information.

Chapter 3 will focus on two different perspectives on power and knowledge filtering. The chapter will firstly discuss, mainly from Hajer's (2004) thoughts on social interactive discourse theory,

how actors filter knowledge by forming discourse-coalitions on specific discourses and overall story-lines that supports their perception or reality – a specific system-of-thought. Secondly the chapter will focus on a broad definition of power and knowledge filtering, which will be based on Haugaard's (2003) seven ways of creating power. These two different but compatible approaches to analyzing power and knowledge filtering in a political framework will form the overall structure for analyzing the policy making process in the case of forming Master Plan '09.

Chapter 4 will take off by exploring the background for the municipality of Aarhus' endeavors into mitigating GHG emissions. This will be followed by an in-depth look into the overall and specific strategies on land-use and traffic planning in the Master Plan '09. The individual strategies will lastly be compared to state-of-the-art knowledge on several topics.

Chapter 5 will initially focus on clarifying which actors have had influence on the formulation of the strategies regarding land-use and transport planning in the Master Plan '09. This will be followed by an identification of the dominating discourses in the process and the main story-lines in the Master Plan '09 and how the knowledge-claims in the dominating discourses conforms to state-of-the-art knowledge about urban structures' impact on transport behavior. This will be followed by a discussion about how relevant knowledge has been filtered through different mechanisms of power and how this has influenced the outcome. Lastly the chapter will focus on the multitude of problems in the planning of large projects and the causes for failure.

Chapter 6 will focus on what can be done to avoid planning fallacies within coordinated land-use and transport planning.

Chapter 7 will sum up the findings and conclude on the stated research questions.

## 2 Methodology

*This chapter will focus on which information that is needed to answer the research questions and which methods that needs to be applied to gather this information. Initially the chapter will go through what theoretical frame, required data and methodological approach that is needed to answer the specific research questions. Subsequently the chapter will focus on the applied methods.*

### 2.1 What is needed to answer the research questions?

The general research questions were enclosed in the introduction in order to scope the project's scientific direction. In the following table a broader spectrum of research questions is unveiled. These research questions are sub-questions to the overall research questions that guide the project in a clear-cut direction without changing the general direction of the study. In the table below I will account for the specific components that are needed to answer the stated research questions and sub-questions. This approach is important to fully comprehend the connection between the research questions, the theoretical frame, the collected data and the methodological approach to collecting the data.

As it was stated in the research questions this study aims to investigate the decision-making process through three theoretical approaches; 1) state-of-the-art knowledge, 2) discourse analysis, and 3) power and knowledge-filtering. The first theoretical approach is undertaken in order to compare and evaluate the outcome of the decision-making process and hence provide a foundation for the analysis of the underlying incentives the involved actors had to choose one strategy rather than the other. The latter two theoretical approaches are needed to analyze what has happened in the decision-making process and why. The discourse analysis approach is twofold: 1) to analyze how knowledge about urban structures' impact on travel behavior is discursively constructed and 2) to analyze whether this construction is rooted in a discourse-coalition based on a specific system-of-thought. The power and knowledge-filtering approach is added to analyze in-depth how and by which mechanisms of power knowledge about urban structures' impact on travel behavior is filtered through the decision-making process. These two approaches arguably analyze two sides of the same coin in regards to the decision-making process and together provide a diverse analytical framework. The discourse analysis is strong at analyzing policy documents, where the dominating discourses and story-lines can be identified, and as well notions on possible discourse-coalitions. The power and knowledge-filtering approach is strong at in-depth analysis of key-moments in the decision-making process, which mainly will be found through more hands-on methods such as qualitative interviews.

Research Questions	Theoretical Frame	Required Data	Methodological Approach
<p>What are the dominating discourses in MP '09?</p> <ul style="list-style-type: none"> <li>• What is the context of what is being stated and to whom is it directed?</li> <li>• How are certain problems represented?</li> <li>• What are the underlying premises for these initiatives to work?</li> <li>• Do the various dominant discourses present a story-line that several actors can conform to?</li> <li>• Which actors could find them self drawn towards this story-line?</li> </ul>	<ul style="list-style-type: none"> <li>• Analysis of discursive constructions of knowledge about urban structures' impact on travel behavior.</li> <li>• Discourse and story-line identification.</li> </ul>	<ul style="list-style-type: none"> <li>• Discursive data about the decision-making process and outcomes relevant to the Master Plan '09.</li> </ul>	<ul style="list-style-type: none"> <li>• Document studies</li> </ul>
<p>How does the framed story and the underlying premises conform to state-of-the-art knowledge about urban structures' impact on travel behavior?</p> <ul style="list-style-type: none"> <li>• Which knowledge-claims have been validated and which have not?</li> </ul> <p>How has relevant knowledge about urban structures' impact on travel behavior been filtered through the decision-making process?</p> <ul style="list-style-type: none"> <li>• Is the dismissal based on a prioritization of incompatible goals?</li> <li>• How (by which mechanisms of power) does the actors/structures influence which understanding that gain dominance and which understanding that are discredited?</li> <li>• On what basis do they validate or discredit the various understandings?</li> <li>• Are there any conspicuous systems-of-thought behind the dismissal?</li> <li>• Are there any conspicuous discourse-coalitions behind the dismissal?</li> <li>• What can the possible consequences be, in regards to the goal of mitigating GHG emissions from transport, from a theoretical perspective?</li> <li>• Who gains and who loses from this process?</li> </ul>	<ul style="list-style-type: none"> <li>• State-of-the-art knowledge about urban structures' impact on travel behavior <ul style="list-style-type: none"> <li>• Casual mechanisms</li> <li>• Residence/business location's influence on travel behavior.</li> <li>• New Urbanism vs. Metropolitan scale planning.</li> <li>• Parking restrictions and travel behavior.</li> <li>• Road capacity and travel behavior.</li> </ul> </li> <li>• Power and knowledge filtering</li> <li>• Discursive power</li> </ul>	<ul style="list-style-type: none"> <li>• State-of-the-art knowledge on urban structures' impact on travel behavior.</li> <li>• Information about the decision-making process.</li> <li>• Relevant research into the same case</li> </ul>	<ul style="list-style-type: none"> <li>• Document studies</li> <li>• Relevant case studies</li> <li>• Qualitative interviews</li> </ul>

Table 2: List of theoretical framework, required data, and methodological approach needed to answer the research questions.

## 2.2 Applied methods

This project uses a variety of data collection methods. The applied methods can generally be divided into two categories; quantitative or qualitative methods. The collected data can be classified in two additional categories; primary and secondary data. This categorization explains the origin of the data, which implies that either you collect it yourself (primary data) or you got it from an external source (secondary data). Primary data can be collected in the field, e.g. surveys and interviews, but also data obtained directly from the source, e.g. official documents and statistics. Secondary data is processed by an external source, which means it might be biased. This classification is not transparent in all cases, since some documents that in this definition is seen as primary data, such as Master Plan's, tend to be based on political decisions and hence not unbiased. Additionally, some documents that are seen as secondary data in this definition, such as research papers, mostly have a high level of integrity. A good example of this double entendre is the Master Plan '09, since it can both be construed as a primary and secondary source of data dependent on the scope of the analysis. If the intention is to analyze discourses in the plan then it is primary data, but if the intention is to analyze the basis of what is being stated in the plan then it is secondary data, since the statements may be biased. The lesson must therefore be to critically assess every type of data obtained from external sources no matter the above classification.

Qualitative data	Quantitative data
<ul style="list-style-type: none"> <li>- Unstructured and <b>semi-structured interviews</b></li> <li>- Photo/video observations</li> <li>- <b>Documents</b></li> <li>- Articles</li> <li>- Notes</li> <li>- Registers/archives</li> <li>- Maps</li> </ul>	<ul style="list-style-type: none"> <li>- Standardized/structured interviews</li> <li>- Surveys</li> <li>- Observation</li> <li>- Statistics</li> <li>- Registers</li> </ul>

Table 3: Different types of quantitative and qualitative data collection methods.

This project will mainly focus on qualitative data collection methods, although there are used a few quantitative data types. The data primarily consist of official documents, such as the Master Plan '09 and The Environmental Assessment Report, and as well interviews with key-actors in the decision-making process. Decision processes are context-dependent and poorly described by

relying on quantitative methods, which creates the need for a qualitative method that can extract the needed data. In a case such as this, where the decision process is dominated by people in management positions in the political system, a semi-structured interview is the preferred means of data collection.

### **2.2.1 Documents**

Different types of data have been collected. First and foremost, data from official documents were obtained from the municipality of Aarhus' homepage and on trips to Aarhus; such as planning documents, an environmental impact assessment report, flyers, and catalogues. Secondly, data from research papers and articles and as well relevant case studies were collected. Research on urban structures' impact on travel behavior has mainly been collected through my supervisor's guidance.

### **2.2.2 Carrying out a semi-structured interview**

The outcome of the interviews is essential to this project, since the interviews are the primary source for retrieving empirical data that can give an understanding of the actors' roles in the decision-making process and their assessment of knowledge about urban structures' impact on travel behavior in the process. It is the main goal of the interviews to obtain information about the interviewee's view on state-of-the-art knowledge about urban structures' in regards to how they discursively construct it and how they have used it in the decision-making process. It is not the intention of the interview to test the interviewee's proficiency in this knowledge, but to obtain information about the underlying motives and decisions made in the process of formulating the Master Plan '09.

In order to successfully obtain this information you need to be well prepared before carrying out the interviews. Sufficient knowledge about the studied entity is needed both in regards to interviewee and the planning case – the Master Plan '09. Moreover, the theoretical frame and methodological approach need to be in place. This knowledge-foundation is needed to formulate an interview-guide which will with great certainty help steer the interview in the intended direction.

The methodological approach to the interview will mainly be based on Steinar Kvale's (2004) thoughts on the semi-structured interview, but also from own previous experiences in the field.

The basis intention of the semi-structured interview is to create an atmosphere of a standard conversation, but with a clear structure and goal. In order to create this atmosphere it is important not to have too many *why* questions, since this type of question will force the interviewee

to think carefully about it and hence increase the risk of speculative answers. It is instead wise to have a majority of *how* and *what* questions, since they will often encourage the interviewee to talk spontaneously about the decision-making process instead of speculative explanations. It is also important that it is mainly up to the interviewer to interpret the *why* question. The interviewer can enhance the chance of getting the required information for interpretation by actively following up on the interviewee's answers with additional questions. These types of follow-up questions cannot be prefabricated and incorporated in the interview guide, since they are dependent on the answers, and the interviewer's immediate analysis in the interview. It is generally important not to have a too extensive interview-guide. It is advisable to have several interview topics with a few *how* and *what* questions. This way the interviewer is able to maintain a free-flowing conversation, since the conversation is not interrupted by a series of questions. However, the interviewer must be intuitive and able to adapt to the direction of interview and not be too caught up in following the interview-guide stringently.

This project focuses on a specific type of interview, which can be categorized as a "*case orientated expert interview*". This type of interview typically focuses on facts, strategies, processes, and is addressed for experts, managers, and politicians (Næss & Jensen, 2000). This type of interview comes with a list of things to be aware of in the interview. Interviewees situated in management positions often have a lot of constraints that follow with the job. They often need to provide answers that follow the organization's agenda. This might lead to the interviewee steering away from certain topics or ignoring follow-up questions. It is therefore important that the interviewer holds the interviewee close to the agenda, and interrupts him/her when he/she diverges from it. However, it is critical that the interviewer does so without forcing the interviewee into a defensive position.

### **2.3 Choice of Interviewees**

Choosing the interviewees was actually rather uncomplicated. It was quickly decided that the Head of the Master Planning Department and the Head of the Transport Planning Department would be the ideal interviewees for this case study. These two actors were chosen based on their in-depth knowledge about the decision-making process, which follows with their position as responsible for land-use and transport planning. Subsequently it was decided to interview a planner from COWI based on their EIA of the Master Plan '09. As mentioned in the introduction the EIA has a range of peculiar constructions and a questionable argumentation for concluding that the Master Plan '09 probably will be successful in moving people from cars to mass transit

and non-motorized means of transport and hence mitigate CO<sub>2</sub>-emissions. However, it has not been possible to arrange an interview with anyone from COWI due to non-disclosed reasons that I have had no influence on.

Finally, it was decided to interview Peter Hartoft-Nielsen who has concluded several studies of urban structures' impact on travel behavior in Denmark. He is currently an employee of the Agency for Spatial and Environmental Planning, where he works with the Fingerplan 2007, which is a national planning directive on coordinated land-use and transport planning in Copenhagen Metropolitan Area. Moreover, he has previously as a researcher at DTU made a proposal for coordinated land-use and transport planning in Aarhus.

### 3 Theory

*This chapter will account for the two main theoretical approaches to analyzing the decision-making process in relation to the Master Plan '09. The chapter will first discuss the relevance of discourse analysis in decision-making processes and how this approach relates to concepts of power. Subsequently the chapter will account for a broad approach to analyzing power and knowledge-filtering.*

#### 3.1 Analyzing Story-lines and Discourse-coalitions

In order to analyze the Master Plan '09 that the municipality of Aarhus has launched, I have decided to utilize Maarten Hajer's thoughts on social interactive discourse theory. His outset is how discourses analysis can be used to analyze the policy process in a given domain. His main focal point is the practice, where actors use social interaction to persuade other actors to perceive reality as they do. He argues that interaction is not subject with rules or ritualized practices, but to discursive practices in which people position themselves in accordance to how they see reality. Although Hajer's focus is on the discursive subjects, he argues that social action originates in agency but in a context of social structures that both enables and constrains their agency, which means that society is reproduced through the interaction between agents and structures that constantly adjusts, transforms, or reinvents social order. This means that discourses are not a sole product of social interaction, but discourses are influenced by the social structures and the derived practices. Actors (individuals or groups) will argue for, what Hajer calls, an argumentative turn. This means that actors will try to sway other actors to support the stated discourse and hence create the dominating discourse (Hajer, 2004).

There are different ways of looking at the various discourses present in a policy making process. In every process there are several actors with different positions and different understandings. These actors constantly struggle for discursive hegemony, which means that they will try to secure support for their perception of reality. This is often biased to a specific system of thoughts; hence the actors will freely filter knowledge and adapt it to their perception of reality. In that sense, it is important to acknowledge that no discourse can be fully understood without looking at the various counter-discourses, especially since power is reproduced through reification of the dominating discourses. An important phenomenon in obtaining discursive hegemony is the simple fact that discourses are often misconceived as "the way one talks". Policies thrive on this misconception of what is actually being said. Hajer argues that policy making depends on, what he calls, discursive closure, which means that the policy in itself can be interpreted in so many ways that meaning actually is lost to some extent. It is exactly this multi-interpretability that

creates political power, because it allows several actors to form a discourse-coalition (I will come back to this later on) on, as Hajer calls it, a shared story-line (Hajer, 2004).

*“A story-line, ..., is a generative sort of narrative that allows actors to draw upon various discursive categories to give meaning to specific physical or social phenomena. The key function of a story-line is that it suggest unity in the bewildering variety of separate discursive component parts of a problem... The underlying assumption is that people do not draw on comprehensive discursive systems for their cognition, rather these are evoked through story-lines. As such story-lines play a key role in the positioning of subjects and structures.”* (Hajer, 2004, p. 56)

Story-lines have the advantage of being so diverse a narrative that all actors can fit their own work into it and the empowering faculty that provides the actors with the competence to argue their own perception of reality. In that sense, a story-line is a powerful political tool that not only brings together actors, but also reproduces itself, since the actors are required to argue within the language framed by the story-line, and hence create discursive closure. Hajer argues that the power of a story-line comes from the basic idea that “it sounds right”, which is influenced by three main factors, which are the plausibility of the argument, the level of trust in the speaker(s), and the practice in which it is produced. On the other hand, he argues that the story-lines depend on discursive affinities, which means that the actors do not understand the separate arguments, because they have a similar discursive structure and therefore will conclude that “it sounds right”. When these arguments not only resemble each other, but interlopes, it is called discursive contamination. This is often utilized in two different manners, which Hajer calls discourse structurization and institutionalization. In order to play on the “it sounds right” factor, a given discourse can either partially adapt, by using terms from another domain, or entirely adopt the discourse from another domain (Hajer, 2004). A discourse could for instance adapt to the “Compact City Model” discourse, by borrowing a term as densification, or completely adopt the entire discourse. This kind of discursive contamination both strengthens the discourse coalition, as more actors would be keen to validate the story-line, and to a high degree weaken the transparency of policy-making.

It is in situations like this that those in power take advantage of the multi-interpretability of the story-line, since the rhetoric and structure of the argument misleadingly will suggest ideal consensus on the matter. Connelly and Richardson (2004) argue that consensus agreements ideally involves all actors, who share risks, costs and benefits, but that is problematic since that in most cases would involve a practically unreachable number of participants. They further argue that in any real situation the various actors will hold incommensurable goals that exclude any chance of

practical consensus, which inevitable leads to exclusion of actors, interest issues, actions and/or substantive outcomes (Connelly & Richardson, 2004). A good example of this is the recently concluded COP15 summit, where the demand for ideal consensus under the auspices of the UN, allowed the leaders of the G77 countries (among others) to muddle the process of coming to a joint agreement on a legally binding mitigation plan, by demanding goals that were incommensurable with the overall goals of the summit.

If the above mentioned problems regarding consensus agreements indeed hold water, then it is legitimate to question; who has access to discourse coalitions and which issues, actions, and outcomes are being filtered?

This is a rather complex question that reaches beyond what the discourse theory that I have laid out here can explain. I will therefore bring in Van Dijk's (1989) and Haugaard's (2003) thoughts on power creation.

### **3.2 Discourse and Power Structures**

Van Dijk argues from a philological background, which means that his point of departure is the use of discourse at the micro level, e.g. the written word. He interlinks it with theories about social power at a macro level, e.g. classes, groups, or institutions, which means that he looks at, how power is enacted, expressed, concealed, or legitimated at the micro level through discourse (van Dijk, 1989). Since the point of departure of this study is an analysis of how the various presented discourses in a given planning document constitute discourse coalitions that enable or constrain different understandings of reality and how that affects the power constellations at an institutional level, I will argue that van Dijk's theoretical and analytical arguments are relevant for this study. I will however not put much emphasis on his theoretical notions on power creation at the macro level, since it is the link between power in discourse at the micro level and social power at the macro level that is key to this study, and because the theoretical level of the discussion resembles Haugaard's theoretical concepts, but in a less extensive manner. His notions on discourse control and discursive reproduction are not far from Hajer's theoretical concepts, and since his theoretical work already constitutes a thorough analytical framework, I will not go further in that direction.

Van Dijk argues that the link should be viewed through the role of ideology, which he formulates through a theory of social cognition. In this formulation he ignores the notion of personal power and directs the attention to societal or social power (van Dijk, 1989). I will hold that the power of

institutions and groups are the most important issue in this study, but one cannot reject the importance of individual power, especially when it comes down to monetary power, which is without any doubt an important factor, when it comes to urban land-use (I will come back to this issue later on).

Van Dijk argues that although there are many classical approaches and discussions on ideology, there is one commonly accepted definition.

*"...the term refers to group or class 'consciousness,' whether or not explicitly elaborated in an ideological system, which underlies the socioeconomic, political, and cultural practices of group members in such a way that their (group or class) interests are (in principle, optimally) realized."*  
(van Dijk, 1989, p. 23)

It is argued that groups or classes are aware of a specific way of thinking, or understanding of reality, that influences all modes of behavior, which steer the various outcomes of these practices in a way that is favorable to their interests. He further argues that ideology is the key to exercising and maintaining power, which takes place through various modes of reification, negotiation, dispute, and consensus (van Dijk, 1989). This means that groups, classes and institutions are able, through a shared system of thoughts, to enable or constrain certain understandings of reality, and hence create a dominant ideology that is accepted as general, natural, or generally misconceived as "the way one talks", as Hajer calls it (van Dijk, 1989)(Hajer, 2004). This struggle for a hegemonic discourse may lead to what van Dijk (among others) refer to as "false consciousness", which forces the dominated group to act against their own interests (van Dijk, 1989).

Van Dijk further elaborates on ideology, which he looks upon as a form of social cognition that is shared by members of social formations or institutions, and not as a system of individual beliefs or opinions (van Dijk, 1989).

*"An ideology... is a complex cognitive framework that controls the formation, transformation, and application of other social cognitions, such as knowledge, opinions, and attitudes ..."* (van Dijk, 1989, p. 24)

Ideology has thus leverage on the foundation and utilization of other understandings of reality, which gives biased understandings of reality, practices, and outcomes. This means that powerful groups and institutions are able to influence various forms of opinions and knowledge, through social practices, in such a way that biased conceptions of reality arises, but how do they obtain and reproduce this cognitive framework? Van Dijk argues that the (trans)formation of the socio

cognitive framework of ideology is a complex process that needs a basis of true or false understandings of reality, but the acquisition of ideology is not instructed by “objective interests”. The formation and transformation of ideology is controlled by discourse and communication, which means that groups and institutions reproduce the ideological framework, that has already been constituted (by others?), in all modes of discourse production and practices, and hence reproduce the power structures (van Dijk, 1989).

### **3.3 Seven Ways of Creating Power**

Within academic literature two radically different ways of conceiving power can be identified. One group, which can be followed back to Max Weber’s conception of power, sees power as coercion, which means that power is repressive and hence is something bad. The other, broadly defined, group sees power as reproduction of social order, which is basically seen as productive. One important factor about power creation in reproduction of social order is, as Haugaard argues, that contrary to structural ways of power creation (power achieved through the control of resources and capacities attached to the structural position of an actor) , social power has the disposition to empower actors (Haugaard, 2003).

*“A society gives actors a capacity to do things which they could not accomplish otherwise if they were not members of society.”* (Haugaard, 2003, p. 88)

Haugaard takes his point of departure in the work of several theories within these two strains of conception of power, although mostly those who conceive power as reproduction of social order. He has however a quite important premises for his re-examination of power creation through reproduction of social order (Haugaard, 2003).

*“...social order is premised upon predictability in social life. At its most basic, the added capacity for action which actors gain from society derives from the existence of social order. If social life were entirely a matter of contingency, social power would not exist.”* (Haugaard, 2003, p. 90)

He postulates that creation of power through reproduction of social order depends on consensus upon how to perceive reality, which is contingent on structuring and confirm-structuring practices. These practices make any kind of predictability within the social domain possible (Haugaard, 2003).

Haugaard has put forward seven forms of power creation, which I will go through, one by one, in detail. These seven forms of power creation will create the general framework for my further study of knowledge filtering in the practices regarding creating the Master Plan '09.

### **3.3.1 Power created by social order**

The first mode of power that Haugaard establishes is called power created by social order. It presupposes that it is possible for one actor to predict another actor's next move, as explained above. Haugaard argues that, if an actor behaves in a structured way, then this act can be interpreted as the same as another act performed by other actor at another time and place. This form of structured behavior leads to reproduction of meaning.

*"While it is true that the reproduction of structure presupposes structuration by an actor A, it also presupposes the recognition of that action as ordered, or meaningful, by an actor B..."*  
(Haugaard, 2003, p. 90)

It is argued that although structuration in the reproduction of social order is important, it is not sufficient for the reproduction of social order, since the recognition of a given action as meaningful by another actor is central to the reproduction of social order. This means that others need to validate an action for it to make sense in society. For instance, any random person could claim that he or she is the President of the United States, but that would not necessarily be true without any actual inauguration, which means that a person does possess power, but comes from the fact that others are willing to confirm-structure, as Haugaard calls it.

### **3.3.2 Power created by system bias**

The next mode of power creation that Haugaard puts forward follows in the footsteps of the first mode of power creation, because if certain actions are confirm-structured then other actions needs to be de-structured. This means that some actors are capable of excluding other actors from certain acts and hence create biased conceptions of reality. This type of power creation is called system bias (Haugaard, 2003).

*"...social orders create specific forms of power with regard to certain issues consequently creating possibilities of empowerment and disempowerment through structural constraint..."*  
(Haugaard, 2003, p. 107)

Haugaard argues that one of the most obvious reasons that de-structuring is taking place is to maintain existing power structures. Controversial issues are most often the pitfall of any power structure, so those in power (or those aspiring to be) will intentionally turn these issues into an area of non-decision-making, which means that when this issue is raised those in power can

claim an inability to confirm-structure. This means that those trying to get a new issue on the agenda need to expand the conditions of possibility of social order and build consensus on new meanings that can be confirm-structured. This is crucial if any form of systemic change, in regards to those who try to maintain status quo, is going to take place. Haugaard argues that this practice of creating rival arenas on new meanings is often performed by smaller groups and that it can be characterized as a form of organizational outflanking (Haugaard, 2003).

This notion of rival groups that create alternative understandings on a controversial issue is rather interesting, because, as Hajer argues, to fully understand a discourse one has to identify all discourses, including the various counter-discourses. In a political arena there are many interests that weigh in on the policy-making process, which will be more or less concealed in the final outcome. In that light, it is important to identify which interests have successfully influenced the policy-making process, which arguments are still in opposition, and through which practices have these arguments been confirm- or de-structured.

### **3.3.3 Power created by system of thought**

The third mode of power is in line with what van Dijk (1989) identifies as ideology. Haugaard however calls it system of thought, but basically it is the same. Haugaard argues that:

*“...systemic biases are based upon particular meanings which do not simply exist ‘out there’ but have to be maintained from knowledge derived from particular interpretative horizons that constitute conditions of possibility of power creation...”* (Haugaard, 2003, pp. 107-108)

This means that de-structuring is not only occurring on the basis of the desire to maintain power structures, but as well because certain meanings are incommensurable with a specific system of thought that entails an explicit interpretative horizon (Haugaard, 2003). Just as van Dijk (1989) argues, this ideology, or system of thought, controls the application of other interpretative horizons through biased practices and reproduces this specific understanding of reality through discursive practices.

### **3.3.4 Power created by tacit knowledge**

The fourth mode of power that Haugaard puts forward is called power created by tacit knowledge. Actors carry a lot of knowledge about social life that is not commonly discussed, which makes it inaccessible to other actors, and hence tacit. This means that a lot of practices of structuration and confirm-structuration are performed out of simple repetition of normal procedure. This makes actors vulnerable to confirm-structure practices that actually go against their own interest. This is what van Dijk (1989) refers to as “false consciousness”. Haugaard argues that in

this context the idea of “false consciousness” can be defended on the ground that actors are being made aware of their practical consciousness knowledge, if the notion of “false” is left out. He argues that social critique (Marxism, radical feminism etc.) entails converting practical consciousness into discursive consciousness. By transforming practical knowledge on structural reproduction into discursive knowledge, it may become evident for the actor that certain structural practices reproduces dominant structures that are inconsistent with the actor’s beliefs, and hence raises the possibility of empowering the actor (Haugaard, 2003). To sum up this discussion, Haugaard states:

*“...the relationship between power and system of thought they have internalized may not be obvious to the actors who structure and confirm-structure largely from practical consciousness knowledge, hence this tacitness benefits the powerful, but, conversely, translation of this knowledge into discursive form will empower the powerless...”* (Haugaard, 2003, p. 108)

This means that as long as a policy-making process remains in the mode of reproduction of structural practices those outside the existing power structures will remain powerless. On the other hand, if these structural practices are taken up in a discursive practice, such as a public participation process, there is a chance for empowering the powerless. I will argue that this is not often the reality, when it comes to the greater scheme of making an urban land-use policy, since it is often more concrete issues that affect citizen’s everyday-life that is the focus of attention. I hold that the initiatives in the Master Plan ’09 that are identified by the citizens as constraints on their everyday life are few and therefore there have been very few issues regarding the overall intentions (in regard to minimizing carbon emissions from car traffic) in the public debate.

### **3.3.5 Power created by reification**

The fifth mode of power that Haugaard puts forward follows from the notion that actors can gain empowerment by transferring practical into discursive consciousness knowledge. Haugaard argues that, if social order is arbitrary then this transfer would lead to systemic instability, but that is not the case. He further argues that structuring and confirm-structuring indeed takes place, and hence actually stabilizes the power structures, because the actors that are involved acknowledge that the structures they reproduce are more than social constructs (Haugaard, 2003).

This has been seen in numerous cases through history and it is still influences our society today. Before the Enlightenment the power of the church and the monarchy was rarely scrutinized, since the systemic power these structures represented was a disciplining power that was ill-

advised to rebel against. So one can question, why people reify these structures and/or truth claims, when they disadvantage them?

The success of the Enlightenment transferred a lot of the power the church possessed previously to science, especially natural science. Science has upheld a strong truth claim in to the modern times and has become a fundamental in how we shape our society. This is evident in our financial, judicial, health care, and governmental system etc. We shape our society in the eyes of knowledge, so knowledge has become power. A strong example of this is how knowledge about CO<sub>2</sub> emissions' affect on the planet's climate has affected almost all other areas of science and policy making. It is this connection between the scientific truth claim and the actual decision makers that is intriguing, because it is not only the common layman that "blindly" reifies the truth claim, but also the ones that must decide upon the importance of the knowledge presented for them.

If we revisit the question of why people reify the various truth claims they are presented for, although they are disadvantaged by them, there is historical evidence that decision making, whether it is papal/royal or contemporary political, influences our will to reify the established truth. In other words, the knowledge that originates from the bible or scientific studies and is conveyed by scholars as the truth is only a tool for power creation to the extent that decision makers allow it to be. By this I mean that a layman would be slightly more likely to question the decision-maker's interpretation of the truth claim than the claim itself, since it is the interpretation that affects the person. The common people did eventually question the systemic power of the church and the nobles, not because they per se questioned the bible, but because they questioned the governmentality (taxing, disciplining etc.). Some of the same features can be traced in the global warming debate. Most people do not question the knowledge presented by various scholars, but the decision makers decision to somewhat accommodate the scientific demand for mitigation is highly questioned. Some places more than others. Climate change skepticism has been and is very evident in the US, because, as I interpret it, here people's lifestyle is going to be most affected by mitigation policies due to living style and work culture bound up on high auto-mobility and flexibility. So all in all, people tend to reify truth claims, especially when they are not presented with the incentives to transform practical into discursive consciousness knowledge.

### **3.3.6 Power created by discipline**

The sixth form of power is a form of power creation that is an essential part of modern society. With the foundation of human rights as a key stone in modern governmentality corporeal punishment was naturally removed as a disciplining power. This meant that the reproduction of the existing structures should be maintained through other forms of disciplining. This is how Haugaard sees the importance of discipline as a mechanism of power.

*"...because social life is stabilized by practical consciousness knowledge, socialization through discipline can be used to ensure that actors have stable and appropriate practical knowledge to secure the reproduction of structures for existing power relations."* (Haugaard, 2003, p. 108)

Haugaard stresses that the disciplining power should provide the actor with practical consciousness knowledge that ensures beneficial behavior in accordance with the existing power structures. This is evident within the rules of the judicial system, where actors who do not abide by the rules are either disciplined through monetary sanctions or incarceration. The latter option is not a strictly positive solution in regards to reproducing structures, since the actor is lost to the society for a given time, but incarceration does provide other actors with a sense of security that is crucial to the reproduction of existing power structures. The incarceration furthermore gives the opportunity to rehabilitate the actor. The mere threat of incarceration or a fine is a disciplining force in itself, since people steer away from illegal actions that they would otherwise be tempted to carry out, out of the fear for the repercussions.

There are of course also other forms of disciplining power that is more relevant to this study. Restrictions on our personal freedom are a commonly used form of power that steers actors into a predictable beneficial behavior. These restrictions could be economically grounded; e.g. be road-pricing or increased fuel taxes, or grounded in an alternation of the physical structures, e.g. decreasing parking spaces and closing car lanes. There is of course also the more positive sense of disciplining, which is to offer carrots for a certain behavior, e.g. carpool and bus lanes.

### **3.3.7 Coercion**

The seventh mode of power is a form of power creation that is only applicable when every other social mode of power fails. This mode of power creation entails physical violence or coercion when social power is blended in. Haugaard states:

*"In its raw form, physical power, violence, creates only two forms of predictability: mutation and death. However, in most complex social orders violence is blended with social power and then we get coercion. In that type of relationship the less powerful actors are conscious of not wishing to*

*reproduce meanings or, alternatively, the outcomes required, but as threat is used to induce them to do so. It is within this context that the modern state thrives for a monopoly of physical violence. However ... a state that continually uses coercion against citizens is usually relatively weak.”* (Haugaard, 2003, p. 108)

I will argue that actors being victim of physical violence or coerced to confirm-structure something they would not approve of otherwise are not likely scenarios in this study. However, mild form of coercion can be at play in political agreements, but it is highly unlikely that any threat of physical punishment is utilized.

	Mode of power	Mechanism
1	Power created by social order	Structuration and confirm-structuration of meaning
2	Power created by system bias	Destructuration of actions
3	Power created by system of thought	Certain acts of structuration are incommensurable with specific ideologies
4	Power created by tacit knowledge	Power over actors unable to convert practical consciousness into discursive consciousness
5	Power created by reification	“Business as usual”-lure
6	Power created by discipline	Reproduction of social order through disciplining mechanisms
7	Coercion	Physical power intertwined with social power

Table 4: The seven modes of power and the mechanisms on which they operate.

### **3.4 Recapitulation**

The first face of policy making, and indeed power creation, is arguable the communication established with the surrounding society that conveys the intentions of the policy. The point of departure of this study is the Master Plan '09, which is a policy document that intends to communicate the local government's intentions on urban land-use, mobility, etc. These policies are presented in a narrative fashion that serves the desire to create discursive hegemony and discourse coalitions on a shared interpretation on the challenges ahead and following actions. The presented discourses are a manifestation of a specific ideology that underpins the existing power structures.

The reproduction of meaning and power structures takes place under different circumstances. It specifically leads to destructuring of other meanings, empowerment of certain actors, and disempowerment of others. This entails the utilization of different mechanisms of power. Actors can be "persuaded" to either confirm-structure or destructure various types of knowledge and action on the basis of relevance to a certain way of acting, agenda, system of thought, and/or truth claim.

## 4 Coordinated Land-use & Transport Planning

*This chapter will initially focus on the background for the municipality of Aarhus' goal to becoming CO<sub>2</sub>-neutral by 2030 and how this is mirrored in the formulated strategies in Master Plan '09 in regards to minimizing car transport through coordinated land-use and transport planning. Subsequently the chapter will focus on what can be considered state-of-the-art knowledge on urban structures' impact on travel behavior.*

### 4.1 Introduction

One of the major contributors to the direction of the Master Plan '09 is the fact that the municipality of Aarhus signed the Covenant of Mayors initiative in January 2009. The initiative is an EU funded initiative that intends signatories to go beyond the joint target for curbing CO<sub>2</sub> emission by at least 20 % by 2020. the municipality of Aarhus has committed to becoming CO<sub>2</sub> neutral by 2030. It is a mandatory part of signing the charter that a Sustainable Energy Plan (SEAP) is submitted within a year after signing. The SEAP is a key document that shows how the local government aims to reach its CO<sub>2</sub> reduction target by 2020. It is recommended that the SEAPs are presented and debated in the civil society. The following, private and public, sectors are targets of action in the SEAP (European Commssion, 2009).

- **Built Environment, including new buildings and refurbishment;**
- Municipal infrastructure (district heating, public lighting, smart grids, etc.);
- **Land-use and urban planning;**
- Decentralized renewable energy sources;
- **Public and private transport policies and urban mobility;**
- Citizen and, in general, civil society participation;
- Intelligent energy behavior by citizens, consumers and businesses.

The municipality of Aarhus' actions on the highlighted topics above are presented in the Master Plan '09. These areas are as well the source for most of the CO<sub>2</sub> emissions in the Municipality (in 2007). The transport sector carries app. 29 % of the CO<sub>2</sub> emissions, where 70 % of this emission is carried solely by road based traffic (car, bus & truck). Electricity consumption carries app. 41 % of the CO<sub>2</sub> emissions, where the largest contributors are private households (27 %), public institutions (27 %), and service/commercial business's (23 %). Heating consumption carries app. 15 %, where 71 % of the emissions stem from private households (Aarhus Kommune, 2008).

Within these three highlighted sectors the municipality of Aarhus aims to curb CO<sub>2</sub> emissions by tightening up the requirements for low-energy housing, urban densification, urban renewal, and

an enhanced focus on moving passengers from car to mass transit and bicycle. The last initiative is supported by a massive investment in a light rail system that interlinks with the local rail systems, improved passability for busses, and an improved and expanded bicycle lane network. There are of course other initiatives, but these are the main focal points of this study. The initiatives are of course a part of a broader strategy which I will explain further here.

## 4.2 General Strategies

The main incentive in the plan is to strengthen Aarhus' position as the most important city in the western part of Denmark and hereby make the appropriate conditions for growth, while maintaining the perception of Aarhus as an attractive and well-functioning city. The overall incentives are supported by the Municipality's general visions; *"Aarhus shall be a city in motion"*, *"Aarhus shall be a good city for everybody"*, and in connection with this the vision that Aarhus shall be an environmentally, energy-wise, and socially sustainable city, and also a healthy city. These visions are supported by several goals, where the overall goal in the plan is that the municipality of Aarhus shall make room for 50.000 new jobs, 10-15.000 additional students, and 50.000 new housing units, which correspond to app. 75.000 new inhabitants, until 2030 (Aarhus Kommune, 2009).

The general visions presented here are vague. They are inconclusive as an indicator for any measurable goals, especially in regards to the explicit goal of curbing CO<sub>2</sub> emissions, and they do not provide any clues to the basis of the concrete goals regarding growth in inhabitants and jobs. The only vision that vaguely indicates a desire to curb CO<sub>2</sub> emissions is the vision regarding making Aarhus an environmental and energy-wise sustainable city. The issue about this vision is that the word sustainable does not promise anything concrete, because there are infinites of different definitions of what makes something sustainable. Sustainability is a concept that historically has been tied to the environmental movements and most remarkably the Brundtland rapport, where it was infused into the political agenda. The historical ties to the concept and its multi-interpretability are important factors in why sustainability has become a buzzword in policy making processes and a key-stone in countless story-lines.

*"...a city in motion"* does refer to a goal of being a high mobility city, which arguable is a concrete vision, but there is no clear requirements to endorsing a specific mode or all modes of mobility. Just as the visions regarding sustainability this vision is vague at its core, because "motion" can be interpreted in so many ways. Mobility is a broad term that includes a variety of modes of

movement, such as social, economic, and different forms of physical (etc. personal or electronic) mobility.

The other visions are based on a desire to make Aarhus a pleasant city to live in, in regards to general wellbeing and health. Although these visions are very vague they are very hard to argue against.

These various discourses presented here play together and they provide the reader with the first impression of a story-line that promises progress, growth, and prosperity. This story-line is perfectly matched together with the overall goals that promise growth in both occupation and population, and hence economic growth, which is a compelling argument.

### **4.3 Specific Strategies**

There are several specific strategies that aim to mitigate CO<sub>2</sub> emissions from transport and overall energy consumption. They generally target three areas, which are urban densification/renewal, expanded mass transit capacity, and low-energy housing. I will go into every part of the strategy to draw out the specific areas that contribute to the goal of mitigating carbon emissions.

The land-use plan is divided into two steps; a short and long term urban development, where the short term refers to within the next 12 years. The first step of the plan aims to use the areas that were reserved in the Master Plan from 2001. These areas are mostly situated on the outskirts of the city and will therefore round off the city. These areas will have a low density character and consequently do not have a very high potential (6.000) for residents. There will also be built a new settlement at Lisbjerg, which is the first of many new settlements outside the city, which are the main focus area in the plan. The other new settlements are included in the second step of the land-use plan. Lisbjerg and the six other new settlements are strategically located according to 1) a finger plan that concentrates urban development on the radial axis and draws green corridors into the city, and 2) unused road capacity which maximizes the traffic flow on the existing main roads into the city. The desire to improve the traffic flow on the main roads is supported by an investment in expanding the road capacity outside the city, mainly on the roads used by commuters (Aarhus Kommune, 2009).

Concurrently there will be an effort to densify the inner city, which will mainly take place through brownfield development and fill-in of empty areas, such as in between apartment build-

ing. Densification of the inner city is not particularly emphasized in the plan, because it is stated that urban renewal is a slow and complex process that has too many interested parties compared to greenfield development and ultimately since it is stated that the potential in inner city densification (15-20.000) is not high enough to accommodate the previously stated goal for new inhabitants (75.000). It is moreover stated that a densification of the peripheral residential areas in the existing city or a densification of the reserved areas from Master Plan 2001 is not desirable, since densification is not compatible with the architectonic values of the existing residential areas. The planners have instead chosen to incorporate densification with greenfield development, which means an intensified use of land outside the city. The intention is to densify the central areas of the new settlements, which will act as hubs for mass transit solutions. The new settlements will have easy access to high class mass transit (busses and light rail) that connects the residential areas with areas with a high concentration of workplaces, with the intention to move passengers from cars to busses and light rail. Until the light rail project is fully financed there will be reserved road space for busses in order to maximize the flow. The desire to move passengers from cars to mass transit options will be supported by locating the residential/business areas within 500-700 meters from a mass transit station, which is classified as station proximity. There will also be incorporated businesses, daycare facilities, schools, sport centers, communal facilities, and cultural activities in order to give the settlement a more individual and an urban character, which should minimize the need for transport further (Aarhus Kommune, 2009).

Aarhus wants a continued emphasis on strengthening the diversity in the types of housing such as apartment housing, town houses, and single-family houses in the suburbs, in order to not only supply an appropriate amount of housing units, but also to meet the different housing preferences (Aarhus Kommune, 2009).

Whether these strategies will suffice to meet the overall goal of carbon neutrality in 2030 is hard to judge by just looking at the presented policies. It is therefore needed to compare and contrast every single strategy to state-of-the-art knowledge on the subject. This knowledge contains various studies of urban structures' influence on transport in similar cases and will hence provide a reasonable basis for assessing these strategies within a reasonable margin of error.

## 4.4 The Importance of Location

Although the Master Plan incorporates several initiatives that separately have been proven successful in changing people's transport behavior, there are several factors in the way these initiatives collectively have been incorporated into this plan that raises questions regarding whether they actually will influence the modal split and ultimately mitigate carbon emissions. On the other hand, there are also initiatives that directly work against the goal of minimizing carbon emissions from transport.

The first factor I want to shed light on is the relationship between the location of workplaces and residential areas and how this influences transport behavior. As previously described, the Master Plan primarily focuses future urban development outside the city, but on axes that are placed according to a finger-plan. The concept of a finger plan theoretically allows green corridors into the inner city and concentrated urban development along the axes (fingers), which supports mass transit solutions. However, the Master Plan hardly follows this ideal, since there is a strong case of leapfrog development incorporated in the Master Plan, which means that there is no continuous urban development along the axis', which weakens the customer base for mass transit. The axes also follow the current radial road structure, which arguably will influence the modal split; especially if a competitive mass transit solution is not in place. Furthermore, it has been discovered in several other cases that the longer the distance is between home and the city centre, the higher the probability is for transportation by car. It is particularly relevant in this case to bring in Hartoft-Nielsen's studies (2001 B) (2001 A) of the location of workplace and residence and its influence on travel behavior in Aarhus. Other studies of the same phenomena are also relevant, such as Næss's studies on urban structures and travel behavior in Copenhagen Metropolitan Area. The Dutch ABC-model (Engebretsen, et al., 1994) is also a relevant case to take into consideration, since it is grounded in this particular issue. Before going into the different context depend examples I will briefly shed light on some of the meta-theoretical concepts on the various casual explanations in regards to the connection between urban structures and travel behavior.

### 4.4.1 Causal Explanations

In studies on travel behavior the residence is mostly viewed as the point of departure for all the various trips we carry out. A journey is basically influenced by the attractiveness of the destination and the friction entailed by the journey (Næss, 2004). Trips can be classified after how fixed they are in time and space. Most trips on weekdays can be categorized as "bounded trips", since they are fixed in time and location, e.g. commuting to job/school and picking up children. Other

trips are more or less fixed in time or location and some trips are flexible in time and the location may vary. This variation can be viewed as a variation between different aspects of contemporary life. There is the fixed part that entails working and providing for our family and the more or less flexible part that entails leisure activities, such as personal shopping, exercise, and outings etc. We most often choose the closest facility when the various facilities are more or less similar (e.g. grocery shopping, postal services) or have a fixed catchment area (e.g. schools, day-care). On the other hand, we are willing to travel beyond the closest facility when the quality and symbolic value of the commodity or activity we demand. The catchment area generally varies substantially with the degree of specialized workforce the business commands. Non-specialized jobs are mostly occupied by local workforce and highly specialized jobs have a large catchment area (Næss, 2010).

There are as well other factors that influence the travel behavior. This is various demographic and socioeconomic factors, and in addition attitudinal characteristics (norms, values, lifestyle etc.). These various factors form the basic individual travel behavior, but they are modified by the structural conditions that are found in the surrounding society. These structural conditions either enables or prohibits the trip we intend to carry out (Næss, 2004). A model on which structural conditions that influences travel behavior can be seen below.

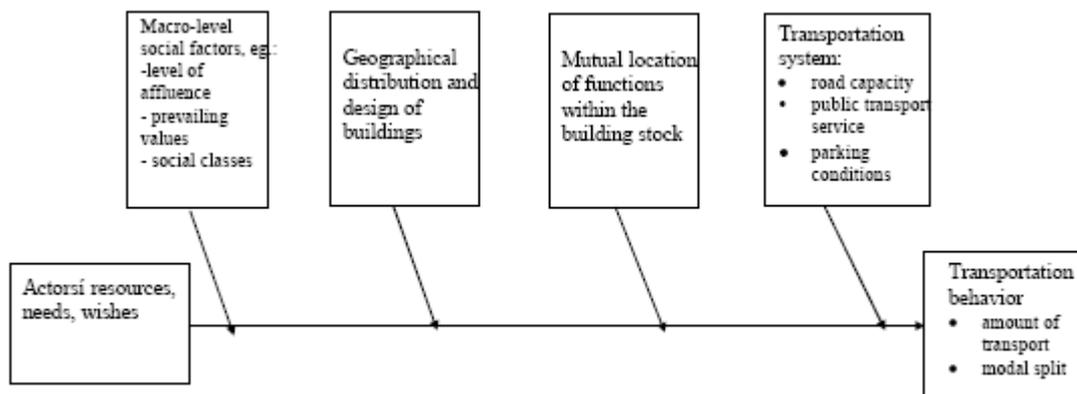


Figure 2: Travel behavior as a function of land use characteristics and individual characters of the traveler (Næss, 2003).

The model operates on several levels of structural conditions. The first box (from the left) contains the actor's basic determinations for travelling. The second box contains social factors at the macro level, which represents factors that determines certain basic conditions for travel. This is e.g. the level of affluence, which has a significant influence on the level of mobility in the society. Furthermore, the prevailing values in a society can advantage one mode of transport, i.e.

through increased environmentalism or a historical popularity for bicycling (e.g. Denmark) or car-driving (e.g. USA). The third box contains that the design and geographical distribution of urban structures influence travel behavior, e.g. dense spatial development minimize car traffic. The fourth box contains that the location of functions within the spatial structures determine the travel behavior, which is partly determined by the third box, but also in regards to the geographical distribution of functions. The fifth box contains the infrastructure, which enables or constraints various modes of transport on different parameters, e.g. a high road capacity and an abundance of parking spaces advantages car travelling. The last box is the actual travel behavior that is observed in reality, when the structural conditions has enabled or constrained the actor's basic offset for travelling (Næss, 2004).

This connection between various structural conditions and individual travel behavior should not be viewed as a deterministic relationship. Condition X does not necessarily lead to travel behavior Y and vice versa. Individuals do not act solely on routinized patterns of behavior that is determined by the structural conditions they are faced with. Individuals have, according to Giddens, three levels of consciousness in acting; practical consciousness (operates on tacit knowledge), discursive consciousness, and unconscious acting. Hence, individuals act to some degree on accumulated knowledge on how to navigate within structures, but will often reflect on and change behavior when faced with changing structural conditions, and this behavior modification is based on tacit knowledge about the structural conditions and individual characteristics (Næss, et al., 2005). Agents influence structures just as well as structures influence agents and structures have casual impacts on travel behavior. A given act is not determined by a given structure, but only contingent on the structure. There are other structures, casual mechanisms, and acts that the given act will be contingent on. A shift in travel behavior in a given setting is hence not determined by the emergence of a new structure, but contingent on this and other structures, casual mechanisms, and other acts. This could for instance be urban spatial structures', attitudinal factors, socio-economic factors, and other structural conditions such as incentive structures prohibiting or enabling a given act (Næss, 2004).

So, building a light-rail from point A to B does not necessarily entail an increase in mass transit commuters on that section, since several structural conditions will have casual effects on individuals' travel behavior, which leads to a multitude of different actions. This could be road capacity, parking conditions, conditions for non-motorized means of transport and prevalence of other mass transit options etc.

I will go through several case studies on this relationship between structures and travel behavior, which have incorporated some of these variables more or less.

#### **4.4.2 Location and Travel Behavior**

Næss' has investigated the relationship between location of residential areas relative to the city centre and transport behavior in several case city's of varying sizes, such as Hangzhou, Oslo, Copenhagen Metropolitan Area, and as well other Nordic cities, while taking account for several socio-economic variables. I will draw out the main conclusions from the study of Copenhagen Metropolitan Area; since it arguably is less problematic to mirror the results to my study. The Copenhagen Metropolitan Area has some of the same hierarchical urban characteristics as Aarhus already has or is planning towards, but on a higher scale. There is a well defined small inner city area that is dominating in regards to population density and workplace intensity compared to other formerly independent urban areas that now functions as second-order centers with decentralized retail stores and railway stations (Næss, 2006) (Næss, 2010).

Compared to the other case studies Næss' study include a broad range of urban structural variables and as well demographic, socioeconomic, and other "non-urban-structural" variables. Moreover, the study is based on extensive quantitative and qualitative data gathered from inhabitants in 29 residential areas (Næss, 2006).

The study established a strong relationship between residential location relative to the inner city and travel behavior even when the various socio-economic variables and as well attitudinal differences among the inhabitants where taken into consideration. The study further showed that there is an effect of the location of the dwelling in relation to the closest second order center and the closest railway station.

A very pronounced factor that strengthens the relationship between the amount of transport and the location of the dwellings relative to the city center is the fact that the study showed that the respondents in most cases emphasize the possibility to chose among a broad range of facilities instead of proximity to one specific facility, which implies that the distance from the residential area to city centre, where the largest variety of facilities are located, is more influential on the average travel distance than distance to the closest facility (Næss, 2006).

The urban spatial structure that the Master Plan '09 advocates for to a large extent resembles a direction that has been very pronounced in the debates among American urban planners and in research into the connection between land-use and travel behavior in the United States. This

research has been highly focused on the influence of local-scale urban structural conditions on travel behavior, which has developed into a particular planning approach called “New Urbanism” (Næss, 2010). This approach focuses on (Pacione, 2005 p. 200):

- densification of demarcated residential areas
- mixed-use
- concentrations of public facilities, leisure activities and commercial activities
- activities in walking distance
- street-pattern design promoting walking/bicycling
- proximity to mass transit stations
- diversity in types of dwellings and prices and hence diversity in people

Næss (2010) argues that the studies arguing for “New Urbanism” have compared high-density areas in the inner city with a square street-pattern to traditional low-density suburban residential areas with a cul-de-sac street pattern and have attributed the difference in travel behavior to the street-pattern and the local density instead of looking at the different locations of the studied residential areas in relation to the overall center-structure in the urban landscape. To highlight the importance of location Næss compares the influences of macro-level and micro-level urban form characteristics on the average travel distance by car based on the study in Copenhagen Metropolitan Area. It is concluded that in general the local-scale variables mentioned as influential on travel behavior have little or no significant impact on the amount of car traffic when controlled for the location of the dwelling in relation to the city center.

It was found that density at the local scale is far less influential on the amount of travel than density within a larger geographical area and that the distance to the closest facility is less important to the travelling distances than the distance to clusters of facilities. Additionally, the connection between travel distances and the location of different facilities are stronger the more facilities that are added to the indices, which means that the travelling distance by car is closer related to the availability of facilities in the proximity to of the residence than proximity to the closest facility.

This means that in general metropolitan-scale urban variables are more influential than local-scale urban variables. However, densification of local areas contributes to the overall density of the metropolitan area, which will minimize the overall amount of traffic conducted by car. But in accordance with the results compact urban development will be more influential on the amount of travelling by car than decentralized urban development as advocated in the “New Urbanism”

principles, because centralized and compact urban development will not only to a higher degree minimize auto-dependency, but also reduce travelling distances, thus enhancing non-motorized means of transport, as well as facilitate better provision of mass transport.

#### 4.4.3 Residence Localization and Travel Behavior

Hartoft-Nielsen's study was carried out as a part of larger study of a selected group of cities in Denmark; the Copenhagen Metropolitan Area, the Aarhus area, Kolding, Vejle, Herning, and Holstebro. The study included a broad range of questionnaire interviews, which were carried out from December 1997 to January 1999. The main goal of the study was to examine whether, and to what degree, spatial planning can contribute to minimizing the extent, environmental impact (especially carbon emissions), and resource and energy consumption resulting from travel (Hartoft-Nielsen, 2001 A).

The Aarhus study included interviews in 10 different residential areas in the Aarhus area, which all have been built in the 1990's. Three of the residential areas are situated within 2 km from the city centre; two areas are situated on the outskirts of the city app. 5 km from the city centre; three peripheral areas are situated in villages 13-15 km from the city centre; and two areas are in neighboring municipalities 15-20 km from the city centre (Hartoft-Nielsen, 2001 A).

The study shows a significant linear correlation between the total average daily transport distance per resident and the residential area's distance from the city centre. The total average daily transport distance grows app. 1 km for every km the residential area is distanced from the city centre. The total average daily traveling distance is 19 km for residents in the city centre. The connection is confirmed or reinforced when it is tested for different income groups, and respondents with car accessibility and driver license. E.g. if the two largest income groups (100.000-200.000 DKK and 200.000 – 300.000 DKK) among the respondents are singled out, then the total average transport distance increases by 1.5 km for every km the residential area is distanced from the city centre (Hartoft-Nielsen, 2001 A).

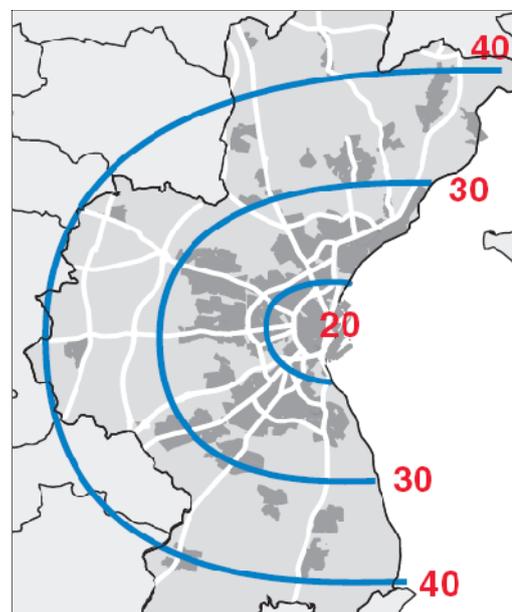


Figure 3: Isometric curves for total avg. daily transport distance among all recipients (Hartoft-Nielsen, 2001 A).

The study has also looked into other transport forms and it was discovered that there was a linear correlation between the total average daily transport distance by bicycle and the residential area's distance from the city centre. Recipients in the city centre average 3.4 km by bicycle/walking per day and recipients farthest away from the city centre on average 1 km by bicycle/walking per day. The modal split for bicycling and walking were highest in the city center (13 %) and lowest in the peripheral residential areas (1-5 %). There was no evident correlation for mass transit travel, since the use was very modest in both the city centre and the peripheral residential areas with a high avg. income. Mass transit did, however, play an important role for the recipients in the peripheral areas with a low avg. income, where the modal split for mass transit was 25-36 % (Hartoft-Nielsen, 2001 A).

Although the study is more than 10 years old I will argue that it is far from obsolete. The spatial structures have not changed much since then and the number of commuters has certainly not diminished with the growing effect of the Eastern Jutland Corridor. The number of employees in Aarhus has also increased significantly (app. 9 % from '97 to '06<sup>1</sup>), where a high share of them is service businesses situated within the city (Aarhus Municipality, 2008), which arguably also has increased the number of commuters. With the drastic increase in house prices the commuting distance has increased accordingly. This arguably means that the same pattern will be evident today and it is therefore extremely crucial that the effort to change the modal split in favor of mass transit is successful, when the location of residential areas takes place in the peripheral areas. This is no easy task considering the modest amount of customers among the recipients in Hartoft-Nielsen's study.

#### **4.4.4 Business Location and Travel Behavior**

Hartoft-Nielsen has also carried out a study in the Aarhus area on how the location of businesses affects travel behavior. This study was carried out among employees in 14 companies located in or in proximity to Aarhus. Three of the companies are situated in the inner city within 600 m from the city centre (central railway station); one of the companies are situated in the inner city 2.5 km from the city centre; nine of the companies are situated in the outermost parts of the city 3.6 – 7.3 km from the city centre; and one of the companies is situated in proximity to an expressway exit 23 km from the city centre. The companies are all office based service suppliers, such as public/private administration, consultancies, bankers, and auditors etc. (Hartoft-Nielsen, 2001 B)

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<sup>1</sup> The Municipal structure changed in 2006, which meant that the Municipalities got bigger. It is therefore hard to compare the number of employees before and after the reform.

The study showed that there was a weak linear correlation between the employees total avg. daily transport distance and the company's distance from the city centre. The linear correlation got even weaker if the outermost company was removed from the equation. The three companies with the lowest total transport distance per employee was all situated in the city centre, so there was some form of correlation. The companies in the city centre also had the lowest proportions of car commuting, 50 – 56 %<sup>2</sup>, whereas the average for all of the companies were 73 %. The total average daily transport distance among the employees varies from 25 km per day to 73 km per day and the average distance traveled by car per day among all employees is 32.8 km. The average distance traveled by car per day was lowest among the employees in the 3 companies located in the city centre, where it varied between 13.7 and 25.4 km. In 8 out of 9 companies located on the perimeter of the city the employees had a significant higher average daily travelling distance by car (31.4 – 67.9 km). The last company had an average daily travelling distance by car of 21.2 km. This is a public administration facility contrary to the others that are private companies (Hartoft-Nielsen, 2001 B).

Only three of the companies had less free non-time-restricted parking spaces than employees, but in all instances the number of car users is larger than the number of free non-time restricted parking spaces. This leads to the conclusion that there arguably are other free non-time-restricted parking spaces in proximity to the companies. Two of these companies are located in the city centre and have the lowest proportion of car commuters. The other company is located on the perimeter of the city. (Hartoft-Nielsen, 2001 B).

Mass transit is generally not a very used mode of transport. Among all the respondents only 14 % use mass transit commuting from home to work. 2 out of 3 businesses in the city centre have a significantly higher share (27 and 30 %) of mass transit commuters, but the third company centrally located company significantly deviates from the other two (15 % mass transit commuters) . Two of the companies on the perimeter of the city have a higher share (22 and 30 %) of mass transit commuters, which is coinciding with a high level of service for mass transit options, but there is generally no correlation between a high level of service for mass transit and the share of mass transit commuters, since the opposite relation is present as well (Hartoft-Nielsen, 2001 B).

The prevalence of employees bicycling/walking is equivalent to the prevalence of employees using mass transit. 15 % of all respondents bicycles/walks to and from work. The 3 companies in

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<sup>2</sup> The car dependency is compared to companies in the city centre of Copenhagen much higher, where the car dependency typically varies between 10 – 25 % (Hartoft-Nielsen, 2001 B).

the city centre have the highest share (19-21 %) of employees cycling/walking and 4 companies on the perimeter of the city have a higher share (15-20 %) of employees cycling/walking. These 4 companies have the largest number of employees, which means that they might have a broader spectrum of job functions and hence might recruit relative more from the surrounding area. The remaining companies all had a share of employees that bicycle/walk of less than 8 % (Hartoft-Nielsen, 2001 B).

This study clearly shows that car commuting is the most important mode of transport between home and workplace and that the daily transport distance by car is somewhat dependent on the business' location in the urban landscape. This relation is most prominent if the most represented type of business (IT/engineering consultancies) are singled out. These companies arguably have a large share of highly skilled labor and hence a relative high car accessibility (or freedom to chose means of transport). The share of car commuters in these companies rises outwards (from 56 % up to 93 %) from the city centre.

This relationship between location of business in the urban landscape and car transport consumption has for several years been implemented in to the Dutch planning system. They have fostered a model that gives guidance to where certain types of businesses can be located in order to minimize car usage. I will go through the basic outlines of these location principles, and studies on the effects of their implementation in the Netherlands, and as well as in a Norwegian setting.

## 4.5 The ABC-concept

### 4.5.1 Intentions and concepts

The goal of the ABC criteria for workplace location is to reduce the usage of automobile transportation and satisfy the need for accessibility through an optimal utilization of the total transport resources. The model is built on two classifications; location and companies' transport demands (mobility profiles). This can also be viewed as a supply and demand correlation. Location is divided into three subcategories that each says something about any location's accessibility to certain transportation modes. These categories are labeled A, B and C (Engebretsen, et al., 1994).

- A-location: This location has high accessibility to high quality public transport. There is no demands to auto accessibility.
- B-location: High accessibility to high quality public transport and high auto accessibility.
- C-location: High auto accessibility. Located at the main roads and therefore suited for companies dependent on goods transported on road.

On the demand side the companies are classified after a mobility profile. This profile is an expression of the companies' demand for transportation of people and goods and which transportation modes are necessary. The company's demand can be expressed as workplace intensity, which is measured as the number of employees per square meter. In the ABC-concept, a density of 40 employees per square meter or less is labeled as a company with high workplace intensity and a density of 100 employees per square meter or more is labeled as a company with low workplace intensity. The higher workplace intensity the higher is the opportunity for mass transit. There is although exceptions where companies have employees who are dependent on auto usage in their jobs, which require good accessibility to roads (Engebretsen, et al., 1994).

A company's mobility profile is also defined by the intensity of visitors, which is measured as the number of visitors per day in correlation with the company's physical size (square meters). An intensity of 1 visitor per day per 100 square meters is categorized as high visitor intensity and an intensity of 1 visitor per day per 300 square meters is low visitor intensity. Companies with high visitor intensity are well suited for a high degree of mass transit, but that is dependent on the purpose of the visit.

The correlation between supply and demand can be summarized into this general guide:

- A-location: Companies with many employees and/or visitors in proportion to the ground area, small auto dependency, and little need for goods transportation. The goal is that less than 10-20 percent of the home-workplace travels are done by car.
- B-location: Companies with a moderate amount of employees and/or visitors in proportion to the ground area, a moderate car dependency, and a moderate dependency on goods transportation. The goal is that less than 35 percent of the home-workplace travels are by car.
- C-location: Relative few employees and/or visitors in proportion to the ground area and a strong dependency on cars for both persons and goods.

There are also other factors that influence car travel. One of the best instruments for reducing car travel is a restrictive parking policy. The ABC-concept has its own goals when it comes to parking. The goal for A-locations is to have a maximum of 1 parking space per 10 employees (Engebretsen, et al., 1994). This is of course of less importance, if there can be found several free non-time-restricted parking spaces in proximity to the business' location.

In order to live up to the intentions of the model it is important that new residential areas primarily are placed within the existing urban areas, since urban sprawl will lead to more car travel. It is only possible as a last resort to build new urban areas outside the existing urban areas; in that case it is crucial to provide good access to public transit and concentrating buildings around the stations.

#### **4.5.2 General experiences from implementing the model**

It has been a general observation that there are significant differences in car usage in regards to different business types and locations, which indicates that these conditions are important to acknowledge in a spatial planning context. It has furthermore been observed that car accessibility has a much higher influence on car usage than mass transit accessibility (Engebretsen, et al., 1994). This is quite interesting, since in this study's case car accessibility to the new urban areas has been highly prioritized, which arguably will influence car usage.

One important example can however be drawn out of this context, which clearly shows that the location principle cannot stand alone. The Ministry of Housing, Spatial Planning, and the Environment (VROM) moved their administration from the outskirts to downtown Haag, where it was located next to the central railway station, the main bus central, and the main centre for the light rail, which easily can be characterized as an A-location. Furthermore VROM only created 1

parking space per 100 employees and a parking space cost app. 6.000 DKK per year. On the other hand VROM subsidized employees' mass transit transport. The outcome was that the share of car commuters was downsized from 40 % to 4 %, 20-30 % bicycled, and 65-75 % used mass transit. The importance of strict parking regulation and mass transit subsidization is confirmed, when the outcome of VROM's policies are compared to their neighbor, Siemens, where the employees have free car, petrol and parking, and hence a very high share of car commuters (Engebretsen, et al., 1994).

The Dutch experiences with the ABC-model cannot be directly transferred to a Danish planning context, since there are several factors that influence the mobility patterns; such as population density, mass transit accessibility, infrastructure, cost of travel etc. Therefore I will include Kathrine Strømme's (2001) study on how well the built-in premises, in regards to a company's transport demand in contrast to the type of business and location, in the ABC-model translates into a Norwegian context, since this context is more similar to a Danish context.

#### **4.5.3 Implementing the model in Norway**

Strømme has taken an in-depth approach to business location and the amount of transport in Trondheim (app. 160.000 inhabitants) and has explored to which extent the two main premises in the ABC-model are valid in this case. The study clearly shows that the different types of businesses influence the amount of transport. It was discovered that the share of mass transit commuters was highest among employees/visitors in retail and lowest among employees/visitors in industry. The opposite relation was evident for car commuters. Furthermore the average transport distance is longer for employees in industry than employees in retail and office based companies.

The study also showed that the location of these businesses influences the amount of transport. It was discovered that the share of employees traveling by bicycle, walking, and mass transit was much higher in companies in A-locations than B/C-locations. There are also significant variations in the modal split in the different locations. The average transport distance is lowest in A-locations, as well the diversification in average transport distance. Furthermore the number of parking spaces per employee is lowest in A-locations.

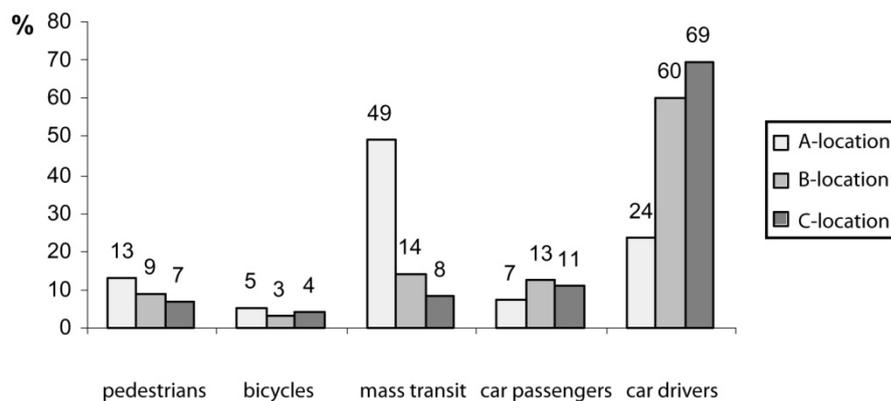


Figure 4: Modal split in different locations in Trondheim (Strømme, 2001).

This study shows a much more significant relation between business type/location and amount of transport than Hartoft-Nielsen's study on the same relation in Aarhus. The difference between the share of mass transit commuters and car commuters in A-locations in the two different cases is apparent. There is a significant higher share of mass transit commuters in A-locations in Trondheim than in Aarhus and a significant higher share of car commuters in A-locations in Aarhus than in Trondheim. In a similar comparison between Aalborg and Trondheim Næss and Møller (2000) pointed towards the amount of parking spaces and good accessibility to downtown Aalborg as explanatory factors in regards to the significantly higher share of car commuters in Aalborg. I will argue that the same factors are valid in the comparison between Aarhus and Trondheim. Aarhus has an extensive radial road network that is supported by several orbital roads, which provides high car accessibility to the inner city. A good example of this is the fact that Aarhus Harbor (the largest container terminal in Denmark) is located in the center of Aarhus and has extensive road traffic through the city. There are as well fairly good parking opportunities in the inner city, since the Municipality stresses in their Parking Policy from 2005 that the demand for parking spaces only exceeds the supply in specific peak hours (Aarhus Kommune, 2005).

## 4.6 Recapitulation

The Master Plan '09 advocates relatively unclear strategies to reach its overall goal of being CO<sub>2</sub>-neutral by 2030, when looking specifically at the strategies concerning land-use and transport planning. There is no evident formulation of goals concerning land-use and transport planning on the overall strategic level of the plan. This part is focused on the compelling story-line about growth, prosperity and sustainable development. Although, the latter part bears no indications of what sustainable development entail.

The specific strategies in regards to land-use and transport planning are split between two different strategies. The Master Plan '09 aims to locate 35 % of the residences and 70 % of businesses through densification of the existing city and brownfield development and the remainder in new settlements outside the city. The extensive greenfield development not only consumes a large amount of land, but also requires considerable investments in increased road capacity. The new settlements strategy is to a great extent hinged up on the principles found in "New Urbanism". Næss' and Hartoft-Nielsens' studies of urban structures' impact on travel behavior in respectively Copenhagen Metropolitan Area and Aarhus brings significant doubt to the municipality of Aarhus' strategies on coordinated land-use and transport planning in relation to their goal to minimize the amount of car traffic. By locating such a high number of residences and business at a relative long distance from the city center the likelihood of less car transportation is low, which makes it even more crucial to move passengers from car to mass transit. Moreover, the lack of clear directions for brownfield development coupled with the indication of a lack of belief in the realization of the brownfield development projects, and also the lack of an order for involving the various areas may spur the development of new settlements outside the city instead of having a balanced development.

Moreover, the lack of car transport reducing measures, such as restrictions on car traffic and parking regulations also brings doubt about the strategy to increase the share of mass transit commuters in light of the experiences from the implementation of the ABC-concept in both the Netherlands and Norway.

## 5 Analysis

*This chapter will initially focus on identifying the actors who have had influence on the decision-making process in regards to the Master Plan '09. Subsequently the chapter will focus on identifying the story-lines and dominating discourses in Master Plan '09 and how the incorporated knowledge-claims conform to state-of-the-art knowledge about urban structures' impact on travel behavior. This will be followed by an analysis of how relevant knowledge has been filtered and by which mechanisms of power. Lastly the chapter will focus on the inherent problems in planning and the causes for failure. This will be followed by an analysis of who gains and who loses from this decision-making process.*

### 5.1 Actor identification

The first part of the analysis will be dedicated to identifying the main actors in the decision-making process regarding the Master Plan '09. It is important to point out the main actors in order to get an overview of who has participated and influenced the direction of the planning effort. With the knowledge at hand about who and from which branches of the local government, and possibly the civil and market society has participated, coupled with the obtained knowledge from the interviews, it is possible to identify the various actors' contribution to the outcome of the Master Plan '09 through specific discourses and the intrinsic systems-of-thought.

As it was ascertained through the interviews with Niels-Peter Mohr (2010) and Anton Iversen (2010), the process of formulating the Master Plan '09 was undertaken by a steering group constituted by the heads of department from Urban Planning & Construction, Nature & Environment, and Traffic & Roads, which are the three major departments under the municipal authority Technical & Environmental services (TE). Moreover, attorneys and developers participated in the steering group. The steering group is supervised by the Chief Financial Officer (CFO) from the Mayor's office. The various departments within the municipal authority are governed by an Alderman and a committee constituted by seven city council members. The steering group formulates the Master Plan in accordance with the approval of the committee and the Alderman. The city council ultimately has to approve the Master Plan before and after every public hearing phase. The organizational hierarchy in the decision-making process can be structured as in the following top-down organizational diagram:

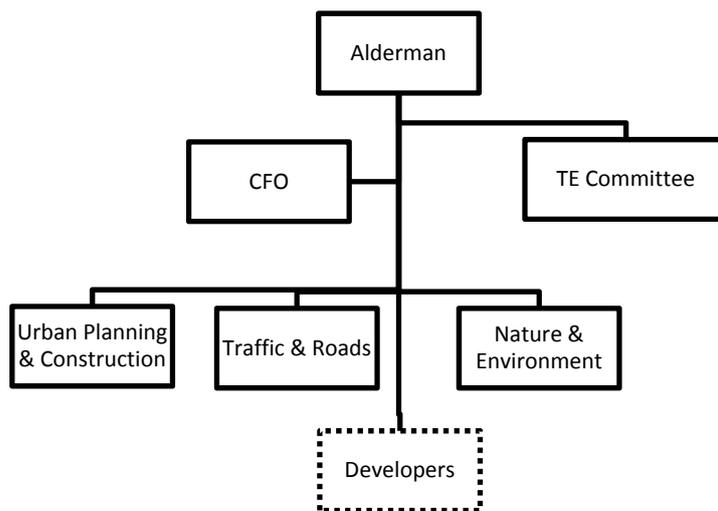


Figure 5: Organizational diagram for the decision-making process for the Master Plan '09.

This model-structure has all the features of a traditional governmental top-down power structure (Jæger & Sørensen, 2003), but the addition of the last box “Developers” adds another dimension to the power structure. The power structure looks more like a governance approach (Jæger & Sørensen, 2003). By introducing corporate actors with great interest in the outcome into the decision-making process the planners and politicians can possibly be swayed into supporting a discourse that favors the corporate actors’ perception of what needs to be done. If so, this would reflect into the dominating discourses in the Master Plan '09. On the other hand, it can be fruitful for the planning authority to empower those who actually are going to fund and realize the various projects. However, it is problematic if it only is a segment of all possibly interested developers.

I have left out the attorneys from this decision-tree. The attorneys are most likely just overseeing the formulation process and do not have any say on the decisions outside what can be considered a legal matter.

There is an actor more that has great influence on the decision-making process, although this actor is not directly attached to the process. COWI was given the task to carry out an Environmental Impact Assessment report on the basis of the proposed strategies in the Master Plan '09. They were hence given the authority to assess, whether the formulated strategies are going to minimize the amount of car traffic and mitigate GHG emissions. As described previously the EIA concludes that the strategies with great certainty will influence the modal shift in favor of mass transit and non-motorized transport, minimize the amount of transport, and hence contribute to the CO<sub>2</sub>-neutrality goal. This report has hence endorsed the formulated strategies, which nor-

mally will be considered a bulletproof argument for politicians to approve of the Master Plan. Niels-Peter Mohr (2010) does however argue that he considered the EIA flimsy and that no one reads it. However, he also states that the EIA could have discovered problems with the formulated strategies, but fortunately it did not. This indicates that he approves of the EIA's conclusions, but does not agree with the means of getting there. The EIA is hence used as an endorsement of the strategies with no regards to the premises from which the conclusions were generated.

## 5.2 Discourse Analysis

The following narrative is a synthesis of the overall story-lines in the Master Plan '09:

*We will position Aarhus as the most important city in the western part of Denmark and furthermore strengthen Aarhus' role as Denmark's most important growth machine together with Copenhagen and additionally improve its competitiveness nationally as well as internationally. This will make it possible for Aarhus to reach new levels of prosperity in the next 20 years and Aarhus will attract thousands of new inhabitants, businesses, and young bright minds. The city will obtain all the characteristics of a Metropolis in regards to compact and attractive urban development, a highly effective mass transit network, a multi-cultural environment, and high mobility; but without compromising our way of life and the local environment we cherish so highly. We will make Aarhus a fair city for everybody to live in, a green city where everybody lives close to the nature, and a sustainable city that significantly contributes to saving the global climate. All together, this strategy accommodates a prosperous development that makes room for a sustainable lifestyle.*

This narrative is constituted by several story-lines: *"Growth and competitiveness", "protection of local environment", "save natural land and land with drinking water interests", "sustainable living" and "freedom of choice".*

This is the overall story-lines in the Master Plan '09 that I will argue has been agreed upon by all actors in the decision-making process. It basically "sounds right" and it is hard to argue against it. The narrative encompasses multiple perceptions of reality, such as economic, environmental, governmental, and social systems of thought.

In order to give a comprehensive breakdown of the multiple levels the story-lines cover I will go through the dominating discourses in the Master Plan '09 and present various counter-arguments. The dominating discourses are deduced from the Master Plan '09 and the interviews with Niels-Peter Mohr and Anton Iversen.

According to Hajer (2004) it is needed to look at all possible counter-discourses in order to fully understand a discourse, but since I have not been able to pinpoint any counter-discourses in the decision-making process in regards to the strategic decisions on coordinated land-use and transport planning, neither within the local government or the civil society, I have chosen to present counter-arguments to the dominating discourses. These arguments are not discourses per se, since the arguments are based on scientific research rather than a more or less speculative per-

ception of reality. However, the arguments can more or less be fitted into what can be called “the Compact City strategy” discourse.

Whether the lack of visible counter-discourses in the decision-making process is due to the methodological approach in this study, due to actors being persuaded to support the dominating discourses, or due to a lack of knowledge/interest among the actors (or a mix of all the above) is difficult to give a clear answer to without investigating it further. I will go deeper into this dilemma later on.

### 5.2.1 Dominating Discourses and Counter-arguments

**Aarhus can expect massive growth.** It is uncertain whether the stated goals in the Master Plan '09 are realistic. The expected population growth is significantly higher than Statistics Denmark project (Statistics Denmark, n.d.). They project a population growth of app. 44.400 inhabitants from 2010 to 2030, which means that the municipality

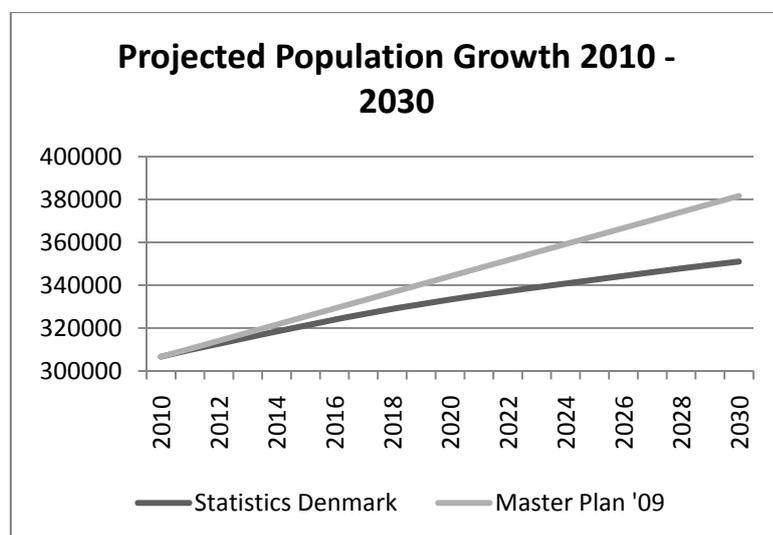


Figure 6: Projected population growth in the municipality of Aarhus from 2010 to 2030. The projected growth in the Master Plan '09 is evenly dispersed over the full time period.

of Aarhus projects additionally 31.000 inhabitants over 20 years. The difference equates to an app. 8.7 % overrun.

There is arguably a profound urbanization tendency in Denmark, which could support a high population growth, but the difference in the two projections is too significant to clear the Master Plan '09 for being optimistic. The population growth is of course very dependent on the general economic growth and hence the growth in jobs. The Master Plan '09 states that it is the goal to accommodate up to 50.000 new jobs and it bases its projection on occupation growth on the job growth during the last decade (Aarhus Kommune, 2009, p. 7). However, the last decade has mainly been characterized by economic growth and in the light of the current recession that seems to linger on for awhile it is hard to expect a continued growth in the same scale.

***It is necessary to locate the majority of the new residential areas outside the existing city to satisfy the desire to live in proximity to nature.*** There are actually two sides to this discourse. Are parks and other green areas in the high-density inner parts of Aarhus sufficient enough to satisfy the desire and more importantly will people living in dense inner city areas compensate for the lack of access to green areas by travelling out of the city to a larger extent than people residing in the low-density outer areas?

It was found in Næss' study in Copenhagen Metropolitan Area that only a limited share of the respondents in high-density inner city areas traveled frequently to larger nature areas and in general there was no tendency among inner city residents to travel more frequently to forests and shores. It was actually discovered that the central location of their dwelling had distance decay on the frequency of visits to recreational and natural areas. Residents in the inner parts of the city have although a considerable longer avg. transport distance to the nature areas outside the city than those living in the outer areas, but the extra transport distance is outweighed by the outer area residents' substantially longer travel distance for other leisure activities (Næss, 2006, pp. 150-151, 215-216).

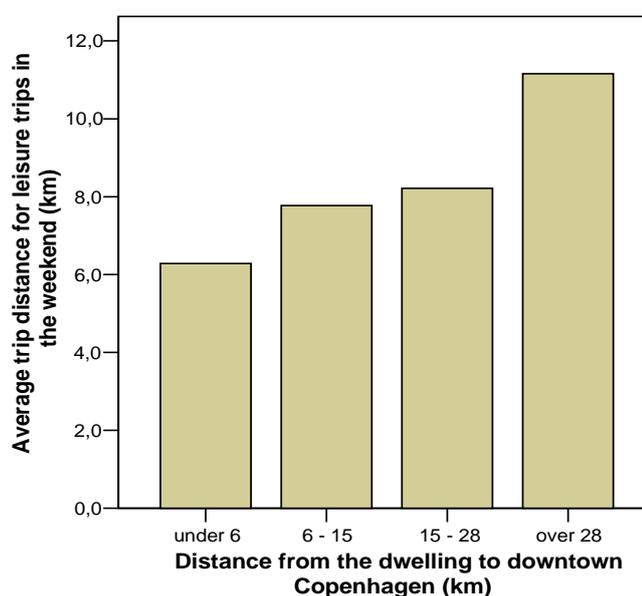


Figure 7: Avg. trip distance for leisure trips in weekends in relation to the dwelling's distance to downtown Copenhagen (Næss, 2006).

The overall density is arguably higher in Copenhagen than in Aarhus, which makes the avg. travelling distance from the high-density inner city residences to larger nature areas in Aarhus significantly lower. The "green structure" in the Master Plan '09 operates with an inner - and an outer green belt, and the finger-structure draws in large continues nature areas from the south and west (Aarhus Kommune, 2009, p. 88). So, there are nature areas in relative short distance of the dense inner city dwellings and in accordance with the findings in Næss' study it would make sense to locate residences in the central parts of the city, if the intention is to have access to green areas and minimize car transportation.

***A strict compact urban development approach cannot accommodate the projected growth and offer the preferred types of dwellings.*** It is stated in the Master Plan '09 that the appointed brownfield development possibilities only have a potential for app. 15.000 residences and 35.0000 workplaces within a total area of app. 375 hectare. This corresponds to app. 35 % of the residential development and 70 % of the business development. Additionally, there can be built app. 5.000 residences in densification of the existing city (Aarhus Kommune, 2009).

In a study from 1999 Peter Hartoft-Nielsen and a group of urban planning students from DTU made a proposal for a future spatial planning strategy for Aarhus. This project was undertaken on the request of the municipality of Aarhus who wanted ideas on how to orchestrate spatial planning in the future. The DTU-group's proposal operated with a time perspective until 2030. They assume a population growth of 40.000 inhabitants (30.000 new dwellings) and 30.000 jobs (4.5 mill. square meter floor space). The proposal advocates a strict compact city approach structured around a light rail network and green areas. This approach is based on that a compact city limits the energy- and resource consumption and as well minimizes the amount of transport and hence mitigates the environmental impacts from transportation. The proposal suggests that the majority of the urban development should take place in 4 new residential areas, which consists of 2 brownfield development areas in the inner city and 2 areas in the periphery of the existing city. The latter two areas are intermediate areas that can tie the existing together with suburbs in the finger-structure. These 4 areas can together with several densification possibilities on the light rail network accommodate 2/3 of the required residential development and more than the required business development. Furthermore, the densification possibilities will secure a better operating economy for the light rail. The new urban areas will have a mixed-use and a high density on at least 75 dwellings per hectare and 150 workplaces per hectare. Although, the proposal operates with a considerably higher density than in the past there will not be a radical shift in the types of dwellings. Compact types of dwellings represents 56 % of the future residential development compared to 47 % in the previous 10 years. The proposal argues that the amount of transport will be reduced by 25 % just from the compact city approach and if the combination of a light rail and transport reducing means (taxation, road pricing and parking restrictions) moves every other car trip from residents in the light rail's catchment area and every fourth car trip from residents outside the catchment area over to light rail network then the total effect of the proposal be a 53 % reduction of car transport.

The study shows that it is possible to accommodate a relatively higher number of dwellings and workspaces within the existing city. However, it does not meet the stated demands in the Master Plan '09 for growth in inhabitants or jobs, but it is relevant to point out that the study accommodated 20.0000 dwellings in only 4 new urban areas. In comparison the Master Plan '09 operates with 34 brownfield development areas of various sizes that are projected to accommodate 15.000 residences and 35.000 jobs (Aarhus Kommune, 2009, pp. 30-31). Furthermore, the Master Plan '09 does not operate with gap fill-ins in the finger-structure due to a stated lack of space due to infrastructure and natural areas (Mohr, 2010; Aarhus Kommune, 2009). If the guidelines in regards to dwelling density (75 dwellings per hectare) from DTU's study are transferred to the Master Plan '09 the relative spaciousness in the 34 appointed brownfield development areas would be increased to app. 28.000 residences. Furthermore, if the Master Plan '09 to a higher degree focused on creating a continuous urban space in the finger-structure the relative spaciousness within the existing city limits would arguably be considerable higher and as a bonus this development would strengthen the light rail network's customer basis. The crux of the matter seems to be the willingness to increase the overall density within the existing city instead of leapfrog developing. The Master Plan 09's intentions in regarding to building new urban areas with mixed-use, diverse types of dwellings, proximity to mass transit and nature can arguably be fulfilled within the existing urban space.

***The location and the lay-out of the new settlements coupled with the light rail network will influence the modal split in favor of mass transit and non-motorized means of transport.*** This is a loaded discourse that has multiple sub-discourses so to say. It is relevant to revisit the residential and business location's influence on travel behavior and the inherent trip generating mechanisms, and also in which way this influences the modal split.

As it was presented through Næss' and Hartoft-Nielsen's studies of urban structures' impact on travel behavior in respectively Copenhagen Metropolitan Area and Aarhus residential and business location affects travel behavior even when various socioeconomic and attitudinal differences among the inhabitants are taken into consideration as it was documented in Næss' study (Næss, 2006; Hartoft-Nielsen, 2001 A; Hartoft-Nielsen, 2001 B). It was found that respondents emphasize the possibility to choose among the best facilities rather than minimizing the travel distance for most travel purposes, which means that the amount of travel is highly influenced by the dwelling's distance to the city center and to a lesser degree to a second order center. This relationship is most prominent among people with high income, specialized job skills, specialized

leisure interests, and high mobility resources. The relationship is less prominent among people with non-specialized job skills, non-participants of the workforce, and people with little spare time or low mobility resources. Furthermore, it was found that residences in dense urban areas in the city center travel less, have a lower share of car travel, and carry out more trips by foot or on bicycle (Næss, 2006).

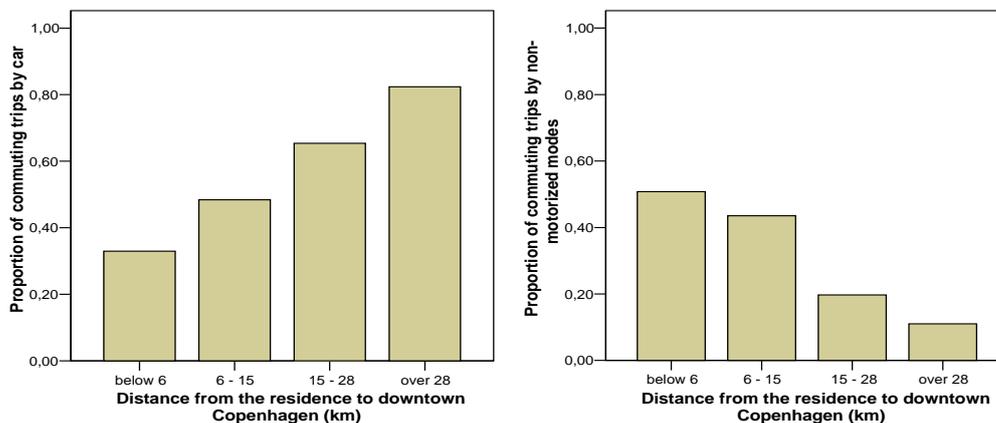


Figure 8 (to the left): Share of car commuters in relation to the dwelling's distance to downtown Copenhagen (Næss, 2006).

Figure 9 (to the right): Share of commuters with non-motorized means of transport in relation to the dwelling's distance to downtown Copenhagen (Næss, 2006).

There was found a similar relationship between business location and travel behavior in Aarhus. Employees in businesses located in the periphery of the city generally had a longer avg. travel distance per day than employees in businesses located in the city center. Moreover, employees in downtown businesses generally carried out a higher proportion of the trips by bicycle and on foot than employees in businesses in the outskirts of the city, although there were deviations from this relationship. There was also found a weaker relationship between the share of mass transit commuters and business location, because some of the public institutions in the peripheral parts of the city had a high share of mass transit commuters. However, the businesses in the city center generally had a higher share of mass transit commuters than businesses in other parts of the city. It was generally found that most employees travelled by car even in the city center where the share of car commuters were 50-56 %. The shares of mass transit commuters and employees bicycling/walking were generally low (Hartoft-Nielsen, 2001 B). Moreover, knowledge about the relationship between the share of car divers and business location has been implemented in the Dutch planning system through the guidelines in the so-called "ABC-concept". This approach is based on the observed difference in car transportation among different business types and locations, and also that car accessibility has a higher influence on travel behavior than mass transit accessibility. This knowledge has led to a location strategy for differ-

ent types of businesses in order to secure that the highest possible share of employees and visitors uses mass transit, bicycle or walks. However, this approach has been most successfully coupled with a mix of various restrictions on car traffic and incentives to use mass transit (Engebretsen & Hanssen, 1994; Strømme, 2001).

So, what does this mean for the validity for the stated discourse? The location of the 6 new settlements are between 9 and 24 km from the city center (central railway station), which does not promise well for the intention to minimize the amount of transport. In light of the previous discussion in chapter 4.4.2 about “new urbanism’s” effect on travel behavior compared to metropolitan-level centralization it is dubious whether initiatives as densification, mixed-use, proximity to mass transit stations etc. in the suburbs or in satellite settlements outside the city will have the desired effect on the amount of transport and the modal split compared to a similar development within the existing city (Næss, 2010). Furthermore, the strategy to minimize the amount of transport by locating businesses, institutions, and other activities in the new settlement will only have the desired effect, if it is businesses with a very local catchment area and non-specialized workforce. If, there on the other hand will be built specialized stores, cultural offers, and other specialized leisure activities to the same extent as in the city center then there will be a large catchment area and hence a lot of commuting across the urban landscape. The Master Plan '09 clearly states that the goal is to keep the young bright minds in the city and to attract more knowledge-base businesses to the city, which are respectively a type of workforce that is highly mobile and a business type with a large catchment area. It is also very unlikely to expect the same extent of specialized offers as in the city center both because of the difference in customers within the local area and because of the common practice to locate specialized offers in the city center. If, the new settlements takes form as a 2<sup>nd</sup> order center the distance to the city center will still be the major driving force in the relationship. Moreover it is very much needed to restrict car accessibility to the businesses in order to encourage commutes by mass transit or non-motorized means of transport.

***Restrictions on car transportation are not needed to affect the modal split in favor of mass transit.*** This discourse is not directly stated in the Master Plan '09 or by either of the two planners I interviewed. It is however emphasized in the Master Plan '09 to expand and strengthen the road infrastructure in order to accommodate traffic growth and enhance car accessibility. This encompasses upgrading main radial and orbital roads and as well establishing a new orbital motorway that connects two other motorways (Aarhus Kommune, 2009). Furthermore, both of

the planners expressed the need to increase the road capacity in order to minimize congestion and that there generally was a political unwillingness to restrict car traffic. On the other hand, they stated that there is an increasing political willingness to restrict parking in especially the brownfield development areas by banning surface area parking (Mohr, 2010; Iversen, 2010). However, the traffic planner stated that there have been problems complying with the formulated guiding regulations for parking, since developers are willing to pay for additional parking spaces, which they sometimes are allowed to (Iversen, 2010). The municipality's lack of emphasis on restrictions on car traffic means that the light rail needs to be competitive on its own in order to affect the modal shift. The light rail network has a clear competitive advantage compared to bus transit, because the fixed physical presence of the rail has a sustained presence that encourages residential and commercial development along the rail and especially in the vicinity of stations compared to a bus network that has more route flexibility, longer range and are better at bringing people to the place of activity. Moreover, light rail has a considerable more attractive perception among consumers than busses, which influences a much higher patronage (Newmann, Kenworthy, & Robinson, 1992). However, the extensive road capacity upgrades and the lack of other measures to restrict car traffic can arguably work against the light rail's competitive advantages and attract passengers from bike riders/pedestrians instead of car drivers. The EIA-report on the first leg of the light rail network actually forecasts that 50 % of the light rail's passengers will be former bike riders/pedestrians and 25 % will be former car drivers (COWI A/S, 2010, p. 107).

The local government's reflects a clear "predict and provide" approach to car transportation, which is not beneficial if the intention is to minimize the amount of transport and influence the modal split in favor of mass transit and non-motorized means of transport. The experiences with the ABC-concept in the Netherlands clearly showed that it was necessary to not only locate businesses with a high workplace intensity and/or visitor intensity in central areas with high accessibility to high class mass transit, but also to restrict car accessibility, if a high share of the employees and visitors were to travel by mass transit or non-motorized means of transport (Engebretsen & Hanssen, 1994). It is necessary to discriminate between the two different locations the Master Plan '09 appoints as business (including public institutions) development areas; the brownfield development areas in the existing city and the new settlements. Although both locations in strict terms can be considered B-locations then there will arguably be higher car accessibility to the new settlements than the brownfield development areas. If they succeed to locate 70 % of the businesses in the brownfield development areas, secure proximity to the light rail network, and at least comply with the already formulated norms for parking then they have

taken a considerable step in the right direction. It is however pivotal to focus on setting up barriers to car transport at both types of locations, but especially in the new settlements. Improving and expanding roads is detrimental to the CO<sub>2</sub>-neutrality goal in itself, because the construction of the roads entail a high CO<sub>2</sub>-emission from materials and machinery and furthermore the improvements will lead to a increase in traffic by 3-5 % in the short term and 5-10 % in the long perspective, which means a higher amount of car transport and a higher share of car commuters, and also that the increased capacity will be used up in time (Strand, Næss, Tennøy, & Steinsland, 2009, pp. 18-37).

***The desired urban development can be obtained without strict local government control through order-of-development plans.*** The Master Plan '09 does state time perspectives for the various brownfield and greenfield development areas and there has been made order-of-development plans for development within individual areas, but Mohr (2010) states that there actually is no timetable for when the development of the different areas can be started. He argues that it is up to the market to decide which location that is most attractive and that the local government does not want to force a specific type of development, but tries to tempt developers by offering a wide range of different locations and types of development. Iversen (2010) argues that one of the reasons for the extensive greenfield development is the fear of losing competitiveness due to not being able to offer an exhaustive range of development areas and locations.

If the municipality of Aarhus wants to promote a specific kind of development it is often necessary to establish an incentive structure coupled with a regulative structure (do's and don'ts). As it was previously discussed, compact development has been promoted in Oslo, because of National and local planning acts that was based on topographic conditions and the wish to save arable and natural land (Næss, Næss, & Strand, 2010). Hartoft-Nielsen stated that after several years of dispute between the Agency for Spatial and Environmental Planning and the 34 municipalities within Copenhagen Metropolitan Area about continued greenfield development they have finally agreed on complying with the disposal plan in accordance with the Fingerplan 2007. He argued that it is hard to control 34 municipalities that all compete for growth and that it is needed to have top-down control through strict regulations - order-of-development plans (Hartoft-Nielsen, 2010). The ABC-concept was also infused through governmental control although in the beginning there was a lot of opposition from the Ministry of Finance, since they wanted a more flexible regulation in order to stimulate growth in a time of economic recession,

but the businesses and developers actually showed to be primarily interested in locations in proximity to mass transit (Engebretsen & Hanssen, 1994).

If you primarily have one type of development areas, e.g. brownfield development, it is not as necessary to enforce strict regulations to promote this development as in Aarhus' case where there are two kinds of development areas. Developing greenfield areas is arguably less expensive than developing brownfield areas due to supply and demand and to some degree higher requirements for the building quality in central locations. Hence, the risk is that there will be an extensive greenfield development on the expense on brownfield development – especially in a time of economic recession. For the sake of the argument, it has been extremely difficult to keep the development of the City Harbor in Aarhus on schedule, because several of the developers have had serious financial problems since the start of the financial crisis.

The peculiar thing is that they have made rather detailed order-of-development plans in the local development plans, e.g. Lisbjerg and the City Harbor, but will not make a general disposal plan for all development areas. If the goal is to have an equal development of greenfield and brownfield areas it arguably is necessary to enforce top-down controlled regulations on a larger scale, which has been somewhat confirmed in the other cases. It is also noteworthy that the municipality is willing to enforce strict energy-saving measures (energy-class 1) for new residential and business development (Aarhus Kommune, 2009).

A compact development in Copenhagen Metropolitan Area is benefitted by a strict National Planning Act, but on the other hand it is disadvantaged by the institutional structure within the Metropolitan area. The urban development in Aarhus does not receive the same interest from the National Planning authorities, but they do have an institutional structure that is beneficial in regards to deciding the direction of the planning (Hartoft-Nielsen, 2010).

### 5.2.2 Recapitulation

The overall story-line advocates a planning direction that not only promises growth and prosperity, but also an urban development that is beneficial to a sustainable lifestyle, the local environment, and the global climate. The story-line is so diverse that it encompasses a multitude of different perceptions of reality and it can be interpreted in multiple ways. The dominating discourses leans on several discursive affinities, such as the structurization of terms from the “Compact City strategy” and the institutionalization of terms from “New Urbanism”. However, when looking at the various counter-arguments the urban planning strategy is far from the “Compact City strategy” and the knowledge-claims in the Master Plan '09 are prevailingly contradicting to state-of-the-art knowledge. On the other hand, the knowledge-claims have a similar discursive structure as the “New Urbanism” discourse.

Looking at how the municipality of Aarhus discursively constructs knowledge about urban structures' impact on travel behavior makes you wonder why the discourse is so different in the case of Oslo. Hoftun (2002) has investigated the emergence of a hegemonic compact city strategy in the Norwegian sustainable city debate and compared it to the debate in Denmark. Her findings in the Norwegian debate points towards some of the similar story-lines as found in this case study:

- Save land: Saving natural areas and arable land are very prominent discourses in the Norwegian debate, because of recreational interest among the public and the scarcity of arable land in Norway.
- The precautionary principle: This story-line is built on the concepts of sustainable development – *“we cannot predict the future, but we must do what is in our power to be prepared for whatever challenges may arise”*.
- Effectiveness: In relation to time (mass transit frequency), space (shorter distances), money (optimal use of mass transit) and public/private investments (build more on less land).
- Density with quality: Integration of green structures into the compact city strategy. The story-line originates in the lack of support from various actors, if there are no green structures within the city.

Aarhus' contribution to the debate about the compact city strategy can be found within these story-lines however with moderations. Hoftun (2002) discovered that there are several factors that have made the compact city strategy a much more controversial debate in Denmark than in Norway. She found that Norway's rugged topography and lack of arable land favors a compact

city strategy, but the same urgency is not found in Denmark, because of the flat topography and vast amount of arable land. There is tradition for a bottom-up approach and a general focus on small-scale innovation and change in Denmark. She also found that many municipalities in Denmark are opposed to the compact city strategy, because they argue that it is in conflict with the ideas of local governance (bottom-up) and that it is a hindrance to flexibility and growth. It was found that sustainable city strategies often focus on small-scale changes (place) instead of city-structures (space). Hoftun's findings in the Danish debate are very similar to my findings in the Aarhus case. The Master Plan '09 generally focuses on local-scale innovations in regards to urban planning and does not focus on the larger urban structures beyond the finger-structure, which arguably serves the purpose of bringing nature into the city and not a transport minimizing purpose. Furthermore, the "save land" story-line is only important in Aarhus when it comes to natural areas and areas with drinking water, but it is of less importance in regards to arable land, since they continue make inroads into the farmland outside Aarhus. Lastly, the conception of the compact city strategy as being in conflict with economic growth and competitiveness is also very pronounced in this case.

## 5.3 Knowledge-filtering

After having gone through the various story-lines and dominating discourses that emerged from the decision-making process in regards to the Master Plan '09 and having presented a range of different counter-arguments I will investigate further how and why these specific discourses have gained dominance. It is relevant to look at how the relevant actors have gained discursive hegemony and by which mechanisms of power they have filtered knowledge through the decision-making process.

### 5.3.1 Knowledge-filtering through discourse

I will argue that there are two all-encompassing story-lines that have gained discursive hegemony due to the local governance approach to the decision-making process and the overall goal of securing public support. The two story-lines are:

- Growth, flexibility and competitiveness
- Accommodating freedom of choice

The first story-line has been highly prevalent in the Master Plan '09 and it has been conspicuous in almost every formulated strategy on urban and infrastructure development. It is evident that the fairly optimistic growth projection has influenced the urban growth strategy towards extensive greenfield development. The goal of strengthening competitiveness has also influenced the spatial planning strategy in a direction that accommodates all conceivable location preferences in regards to both dwellings and businesses. Moreover, the growth and competitiveness goals have influenced the infrastructure development. The projected growth in traffic has been accommodated with an increase in road capacity and a considerable investment in a light rail network. The mass transit network serves several purposes, as it is supposed to move some of the road users into mass transit and hence serves an environmental purpose and the purpose of freedom of choice. Furthermore, it serves a psychological purpose, since it associates the growth and grandeur of a metropolis – Aarhus the capital of West Denmark.

The second story-line has been just as conspicuous as the first. The goal to provide the public with an almost exhaustible freedom of choice in regards to the location of the dwelling, the type of dwelling and the preferred means of transport have been consistent requirements in the dominating discourses. The same can be said for the freedom of choice for business location, although a higher share of business development is intended within the existing city (70 %) than residential development (35 %). The extensive residential development in the outskirts of the city has been emphasized because of a biased perception of this type of development as the

only way of accommodating a preconceived preference for proximity to nature and certain types of dwellings. This approach might signal freedom of choice, but it is skewed towards a biased conception of people's dwelling preferences, since the dwelling preferences are constantly developing along with the demographic composition, the economy, urbanization, and emerging trends. For instance, there has been a considerable increase in the share of dwellings with only 1 person, especially in the large cities, over the last decade, which means that there arguably will be a lower demand for low-density types of dwellings and a higher demand for high-density dwellings in the central parts of the city in the vicinity of cultural activities and cafés, where single-people can socialize with each other (Scherg, Gram-Hanssen, & Christensen, 2010). Moreover, the increasing value of centrally located dwellings can be seen as an effect of a low supply and a high demand.

The other type of freedom that is emphasized in the dominating discourses is the freedom to be free from health detrimental effects of living in a city, freedom from social destabilized environments, freedom from inroads into natural areas, and to some degree freedom from global climate changes. On the other hand the public's health is promoted through better conditions for bicycling and mass transit and as well proximity to nature, but on the other hand the unwillingness to restrict car traffic is detrimental to the public's health in regards to safety and pollution. Diversity in dwellings and residents have been emphasized in the new settlements in order to avoid enclaves of people from the same socioeconomic group, which arguably can be seen as a way of strengthening the social mobility in order to avoid ghettoization. The goal of saving natural areas can be seen as an effort to save land that is perceived as valuable by the general public. The CO<sub>2</sub>-neutrality policy has been highly touted by the municipality, but their endeavors seems to be more focused on mitigating CO<sub>2</sub>-emissions through energy-savings in dwellings and businesses rather than curbing emission from car traffic, which ultimately makes them reliable on technological advances or increased costs on car traffic.

It is clear that both positive and negative liberties<sup>3</sup> for the civil society and the market are emphasized in this decision-making process, although the negative liberties are more prominent. This liberal approach to planning is arguably rooted in the local governance approach. It is unclear to which extent the developers, or other non-disclosed market actors, have influenced the direction of the planning strategy in the Master Plan '09 steering group, but it is peculiar that a planning document is so liberal in its approach. However, a similar approach to urban spatial planning has been found in the case of Aarhus Harbor expansion (Driscoll & Mikkelsen, 2009).

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<sup>3</sup> The concept of positive and negative liberty is taken from Isaiah Berlin – Four Essays on Liberty (1969).

The local government's liberal approach to the location strategy for businesses is rooted in the goal of competitiveness and the same can also be said for the approach to securing people's autonomy and security, but the latter can arguably also be rooted in what can be regarded as wish for non-confrontation. However, the latter condition is difficult to demonstrate in the gathered information about the decision-making process.

All in all, the discursive hegemony is established through a local governance approach, where the local government and developers has decided on a common strategy that benefits both parties. The public has arguably silently verified the strategy oblivious to what is actually being decided, which has partly been verified by the total lack of objections against, or questions regarding, the overall strategic decisions in the Master Plan '09. Mohr (2010) states that there is absolute consensus about the Master Plan '09, but I will argue that the basis for consensus is established on an approach that severely impedes transparency.

These story-lines have created a powerful setting for what can and cannot be discussed in regards to the urban spatial strategy, because of the level of knowledge-filtering in the decision-making process. Mohr's and Iversen's (2010; 2010) acknowledgement of Hartoft-Nielsen's studies of residential and business location's influence on travel behavior in Aarhus imply that there has been filtered knowledge about urban structures' impact on travel behavior in the decision-making process, which entail that the dominating discourses are not just a product of ignorance.

### **5.3.2 Knowledge-filtering through different mechanisms of power**

It is clear that the dominating discourses in the Master Plan '09 are a product of a specific interpretative horizon. There is a conspicuous neo-liberal system of thought at play in the overall visions for how to accommodate growth in the Master Plan '09, which has had influence on the filtering of knowledge about urban structures' impact on travel behavior. A centralized development is perceived as an unbeneficial regulation of the market for business and residential locations, which will affect Aarhus' competitiveness and hence the conditions for growth. In prolongation hereof it is perceived to be necessary to accommodate growth in traffic and not restrict people from driving, even though it is detrimental to the municipality's goal of minimizing the amount of transport, since it is within people's right to drive. Apparently the urban spatial planning strategy is perceived to strengthen Aarhus' role as the Capital of West Denmark, but Aarhus is on the other hand still perceived as a provincial town, where people need to drive (Mohr, 2010). It is interesting that the goal is to strengthen Aarhus' role as the most important growth machine in Denmark next to Copenhagen and hence get all the benefits of being a large

city, but there is no acknowledgement of responsibility for doing something about the unbeneficial effects of being a large city – namely car traffic. One possible explanation for this is that high mobility is seen as a driving force for economic growth. The predict-and-provide system of thought is very much rooted in the market economy's system of thought.

Furthermore, the approach to influencing modal shift in favor of mass transit is also characterized by a market economy system of thought, since the light rail has to operate on the same conditions as other means of transport, which means that there is no effort in regulating other forms of traffic. However, the light rail network has been located on stretches with a current or future high population density and proximity to public institutions and businesses, but that is more or less an operational economic decision rather than an intended market advantage, since there is high car accessibility on the same stretches.

The other system of thought that has been very influential on the filtering of relevant knowledge about urban structures' impact on travel behavior is what I will call an incrementalistic system of thought. This planning approach is focused on small-scale changes and is rooted in the bottom-up approach to decision-making. The Master Plan '09 and the Spatial Planning Strategy '08 have devoted a considerable amount of attention to architecture, local sustainability, liveability and design of the new settlements. Moreover it is local parameters such as density, street-pattern design, mixed-use and proximity to mass transit and other local functions that is stressed as influential on travel behavior and not overall urban structures (Aarhus Kommune, 2009; Aarhus Kommune, 2008 A; Aarhus Kommune, 2008 B). The same small-scale perspective is evident in the Technical and Environment services committee's study trips to respectively Helsinki and Oslo and Stockholm, where the focus was on sustainable dwellings, architecture, mass transit service, and design of individual residential/business areas (Aarhus Kommune, 2007; Aarhus Kommune, 2008 C). The design and location of the new settlements were inspired by the experiences from Helsinki (Mohr, 2010). The municipality's incremental approach entails a confirm-structuring of knowledge-claims about local parameters' effects on travel behavior and to some degree de-structuring of knowledge-claims about urban structures' impact on travel behavior in a metropolitan-scale, although they are not mutually exclusive in a standard incremental planning approach. The inherent problems in taking an incremental approach to implementing knowledge about urban structures' impact on travel behavior in an urban spatial strategy is rooted in the fact that the knowledge-claims most often entail a major overhaul of the previous approaches to urban development, which arguably is not embedded in the incremental approach.

The confirm-structuring of small-scale urban structures' influence on travel behavior and the de-structuring of metropolitan-scale urban structures' influence on travel behavior are further reinforced by the systemic bias towards practices that confirm-structure small-scale change and innovation. This systemic bias was evident in the local government's evaluation of the presented ideas for a future spatial planning strategy for Aarhus. There were proposals for a future spatial planning strategy in Aarhus from the Aarhus School of Architecture (AARCH), the Royal Danish Academy of Fine Arts - School of Architecture (KARCH), the Faculty of Life Sciences (LIFE) and the Technical University of Denmark (DTU). The proposals generally recommended inward development instead of urban expansion, promoting mass transit instead of car traffic and large-scale concepts instead of small-scale adjustments, but the proposals incorporated different means of getting there: AARCH focused on densification in the city center and development around suburbs, KARCH focused their attention on densification in the river valley, and LIFE focused on establishing several green structures within and around the city (DTU's proposal has already been described). LIFE's proposal was seen as in concordance with the municipality's green structure apart from the controversial proposition to demolish a prominent residential area in order to make room for a coherent green structure. Moreover the proposal was applauded for the suggestion to plant trees along the motorway instead of businesses. KARCH's proposal was commended for its focus on a single development area and the concomitant illustrations, but on the other hand the spaciousness for dwellings and variation in types of dwellings and as well the local environment were questioned. DTU's proposal was praised for its attention on the necessity to coordinate infrastructure development and urban development within the compact city strategy, but on the hand the proposal was criticized for its lack of illustrations and it was questioned whether the proposal is a realistic alternative to the previous urban growth strategies or if it remains a theoretical calculation that illustrates some economic and environmental consequences of the previous approach to urban land-use development. AARCH's proposal was applauded for the propositions for the "new" city within the city center, in connection to suburbs and in regards to high-rise buildings. Moreover, the outlining of the proposal was applauded (Skou, 1999). The salient point in this evaluation is the confirm-structuring of practices that clearly demonstrates small-scale development on the principles of (preconceived) liveability and de-structuring of practices that do not meet this requirement. The de-structuring of DTU's proposal is especially conspicuous, since it was the only proposal that actually demonstrated how to accommodate land-use and transport planning in accordance with knowledge about urban structures' impact on travel behavior in a thorough manner and that the evaluation starts off by acknowledging that a compact city strategy is beneficial to minimizing the amount of transport

(Skou, 1999). Hence, the municipality has made the knowledge about urban structures' impact on travel behavior and the compact city strategy an area of non-decision, which means they are unable to confirm-structure any related knowledge-claims. This is clearly evident in Mohr's (2010) argument about the "new settlements" being a direct response to knowledge about urban structures' impact on travel behavior. He states this knowledge is no exact science due to not being able to account for attitudinal and socioeconomic factors.

The third mode of power that is in play in filtering knowledge about urban structures' impact on travel behavior is the fact that the public is unknowingly reifying the presented knowledge-claims in the Master Plan '09, since there has been no public debate or been submitted any questions or complaints about the overall strategic decisions. Mohr (2010) states that there is absolute consensus about the spatial development strategy, but that is only so, because the public has not been presented with the incentives to transform practical into discursive consciousness knowledge. This circumstance can be seen as due to the fact that the spatial planning strategy does not entail any significant encroachment on the publics' life and because there has been no evident counter-discourses in the public debate.

It can easily be argued that the presented urban spatial planning strategy can be interpreted as;"old wine in new bottles". There are not many radical changes from business as usual especially in regards to minimizing the amount of travel through spatial planning in accordance with knowledge about urban structures' impact on travel behavior.

*"We cannot predict the future, but we can and must do what is in our power to be prepared for whatever challenges that may arise, as long as it does not radically change our way of life"*

## 5.4 The Pitfalls of Mega-projects

Flybjerg (2007) has gathered his experiences from several years of research in policy and planning of large-infrastructure projects into a list of problems, causes, and cures. I intend to apply his synthesis of the 3 main causes for the failure of large-infrastructure projects into my study. This application will be twofold, since I intend to both analyze the causes for the failure of the Environmental Impact Assessment Report on Master Plan '09 and the causes for the error in relying solely on the light rail network to satisfy the goal of minimizing the amount of transport and mitigating CO<sub>2</sub>-emissions from transportation. I do so knowingly that I do not analyze the same aspects of planning as Flybjerg draws his experiences from, but there is arguably similarities in the problems and causes for planners and decision-makers misrepresenting information. Moreover, there is a price to be paid for a failed project in both cases, although there is a more imminent consequence of a failed infrastructure project (in a monetary sense) than a failed endeavor in mitigating CO<sub>2</sub>-emissions from transportation.

Hence, I will analyze the Master Plan '09 and the light rail network as a mega-project, although there are differences in the scope and economy compared to a large-infrastructure project. Flybjerg considers projects with a cost range from app. 100 million to several billion dollars. The first leg of the light rail network is estimated to 1.1 bn. DKK (app. 178 M dollars) in construction costs, so the light rail network can be considered a large-infrastructure project (COWI A/S, 2010, p. 355). It is harder to estimate the costs of the Master Plan '09, but there will arguably be considerable expenses to expropriation of land and site development. However, the costs of the Master Plan '09 is not important, since I intend to analyze the causes for the failure of the EIA-report in assessing the consequences of the land-use and transport planning strategy in the Master Plan '09.

Flybjerg (2007) argues that the problems regarding large-infrastructure projects, and planning for the projects, generally are prompted by: the inherent risk in long planning horizons and complex interfaces, technology not being standard, multi-actor decision-making processes with conflicting interests, considerable changes in scope and ambition-level over time, and unplanned events are often unaccounted for, which makes misinformation about costs, benefits, and risks the norm and the results are cost overruns and/or benefit shortfalls for the majority of the projects. Flybjerg sums up the causes for these problems into 3 categories:

- Technical errors based on imperfect forecasting, inadequate data, mistakes, inherent problems in predicting the future, and lack of experience.
- Psychological errors based on planning fallacy and optimism bias, delusional optimism rather than rational weighting of gains, losses, and probabilities, intentional spin of scenarios of success, and overlooking the potential for mistakes and miscalculations.
- Political-economic errors based on deliberate and strategic overestimation of benefits and underestimation of costs, and also political and organizational pressure for scarce funds or jockeying for position.

I will utilize these 3 categories in order to analyze the underlying causes for the errors in the EIA-report and the light rail network project. However, I will primarily focus on the misrepresentation of relevant knowledge and alternative scenarios that is surrounding the planning of the light rail network and in the EIA-report, and how this has influenced the validity and accountability of the Master Plan '09 in relation to the overall goals of minimizing the amount of transport and mitigating CO<sub>2</sub>-emissions from transportation. Hence, I will not put much emphasis on the possible economic problems following the municipality's land-use and transport planning strategy.

#### **5.4.1 The errors in the light rail network project**

As previously described the light rail project relies solely on the competitive advantages it provides on its own, especially compared to the bus network it replaces. There are no significant efforts in relation to establishing competitive advantages by restricting car transportation, which arguably makes it harder to attract passengers from car drivers. Moreover, it is highly questionable whether the spatial planning strategy sufficiently supports the light rail by facilitating compact urban development and hence minimizing the need for travelling. I will argue that all 3 causes are influential on this strategy. There is a significant planning fallacy in the total disregard of the relation between the dwelling's location in relation to the city center and travel behavior. There is also a delusional optimism in regards to the light rails influence on the modal split in regards to the projected number of passengers it can attract without looking at the gains and possibilities in restricting other means of transport and implementing travel reducing urban structural conditions. The set-up in regards to the light rail network is heavily influenced by unwillingness to restrict any means of transport which is a result of the (political/market actor) pressure to accommodate growth by being competitive (through a neoliberal economic system-of-thought) and a psychological error derived from the misrepresentation of knowledge about urban structures' impact on travel behavior. The delusional optimism in regards to the light rail

network's influence on the modal split is somewhat repeated in the EIA-report on the first leg of the light rail network, where it is stated that experiences from other projects abroad points towards a 25-40 % increase in mass transit passengers when traditional bus services is replaced with light rail and on that basis the EIA-report operates with a precautionary estimate of 25 % increase in passengers (COWI A/S, 2010, pp. 105-107). In light of Flyvbjerg's (2007) investigation of the inaccuracy of traffic forecasts, where it was found that there is an avg. shortfall of 47.8 % passenger in urban rail projects, then it is appropriate of the EIA-report to choose a precautionary forecast. However, the precautionary forecast is still a result of imperfect forecasting and optimism bias, since there is no visible control for the casual mechanisms that has influenced the travel behavior in the cases they draw their forecast from and how this relates to Aarhus. Furthermore, Flyvbjerg (2007) has found that the avg. cost overrun for urban rail projects is 40.3 %, which further raises the question whether relying solely on a light rail network to minimize the amount of transport and mitigate CO<sub>2</sub>-emissions from transport, when there are less risky measures that can both minimize the amount of transport and support the light rail network's patronage.

#### **5.4.2 The errors in the EIA-report on the Master Plan '09**

I went through the general conclusions and most importantly the conspicuous set-up of the base alternative in chapter 1.3.4, where I found that, contradictory to state-of-the-art knowledge about urban structures' influence on travel behavior, it was concluded that the main alternative (the urban spatial planning strategy in the Master Plan '09) contributes more to minimizing of the amount transport even though the residential development areas are located further away from the city centre than in the base alternative. Moreover, there was no mention of the increase in road capacity or the lack of parking space regulation as influential on the amount or transport. This must be categorized as a technical error, since COWI A/S has no visible interest in promoting one strategy rather than another unless they are trying to position themselves favorable, so they can continue carrying out task for the municipality in the future. This can by no means be proven from the data I have gathered. They have not only failed by evaluating on inadequate data, but they have also failed in establishing an alternative scenario that provides a scientifically justifiable basis for comparison. I will try to interpret the intentions in the bill on environmental impact assessment of plans and programs (Act no. 936 of September 24<sup>th</sup> 2009) in regards to generating scenarios in order to assess whether the technical error stems from a misinterpretation of the bill, an unclear definition in the bill or a lack in the requirements for base alternatives. It is stated in §7 that the EIA must determine, describe and evaluate the most

probable and significant impacts on the environment from the implementation of the plan or program and reasonable alternatives in consideration of the plan's or program's goal(s) and geographic field of application. It is elaborated in subsection 2 and appendix 1 that the EIA must contain (among other things) relevant aspects of the current environmental status and the probable development if the plan is not carried out, a short outlining of the reason for choosing the alternative(s), and a description of how the assessment has been carried out including possible difficulties in gathering the demanded information. Furthermore, it is stated that the EIA only has to contain the information that reasonably can be demanded in consideration of relevant knowledge and prevailing methods of evaluation in regards to the level of detail in the plan.

The constructed base alternative in the EIA-report meets the basic requirements for what can be demanded, but I will argue that it does not meet the requirements as being a reasonable alternative in consideration of the plan's goals and it does not provide the information that reasonably can be demanded in consideration of relevant knowledge about urban structures' impact on travel behavior and the level of detail in the plan. This is probable contingent on how you interpret the bill, but I will argue that it would have been more transparent and justifiable, if they had compared the main alternative to two radically different cases; a case with extensive sprawl and a case with compact city development. Comparing the main alternative to two extreme cases instead of a typical business-as-usual case draws out more information, because the extreme conditions draws out more actors, conflicting interests, and the casual mechanisms stand more out (Flyvbjerg, 2006). Hence, the contrast between extremity 1 and 2 makes urban structures' impact on travel behavior more accessible and transparent and as a bonus for the interpreter the various discourses and counter-discourses surrounding the field of interests are perceptible.

## 5.5 Who Gains and Who Loses?

The only real winners in this case is the market actors, who has economic interest in the land appointed for development. The municipality can possibly be considered a winner in the future in regards to the increase in income and business taxes, if the growth and competitiveness strategy succeeds, and possible also a winner in regards to creating a more diverse city. However, it is very questionable whether the municipality's goals in regards to minimizing the amount of transport and mitigating CO<sub>2</sub>-emissions from transport will be successful in light of the chosen land-use and transport planning strategies, which means that the CO<sub>2</sub>-neutrality goal is contingent on mitigation of CO<sub>2</sub>-emission within other sectors (e.g. electrical and heat supply/consumption) and/or technological advances in car fuels that can be considered CO<sub>2</sub>-emission free. This means that the global climate, the local environment and the general public remain losers with regards to the continued pollution and loss of land to infrastructure and urban development. With the increased awareness about encroachments on the global and local environment a public uproar could be expected and the same could be expected in regards to the encroachments on the health and safety. However, these detrimental effects are the ones that the municipality actually promises to mitigate, which makes it even less transparent. And it certainly adds to the opaqueness that a well-renowned advisory company sanctions the chosen strategies as beneficial for the municipality's goals and that the Agency for Spatial and Environment Planning/ Ministry of the Environment on one hand advocates suburban densification and on the other regulates compact urban development in Copenhagen Metropolitan Area.

## 6 Discussion

So, what can be done about it? There are numerous focus areas that probably can rectify the planning fallacies I have encountered in this study. It is crucial to secure a more transparent and scientifically justifiable strategy development within coordinated land-use and transport planning and an assessment of the environmental impacts through methods that entail a comparison that takes relevant knowledge and the level of detail into account. This is the 3 focus areas I will argue can work against the biased filtering of relevant knowledge about urban structures' influence on travel behavior and the biased conception of the compact city strategy. The 3 focus areas involves 4 levels of society; the national government, the local government, the private sector, and the civil society. The overall theme in these 3 focus areas is to improve and secure transparency and accountability in urban planning.

- Expansion of the Agency for Spatial and Environmental Planning's National Planning Directive to involve Aarhus and the East Jutland Metropolitan Area.
- Implementation of mandatory benchmarking to various relevant cases in urban spatial planning strategies and Environmental Impact Assessments; which should be made public.
- Promoting public awareness about knowledge about urban structures' influence on travel behavior and the benefits of compact urban development.

The "easy" solution is to enforce national regulation on urban spatial planning in Aarhus and the East Jutland Metropolitan Area in order to secure a compact urban development in the whole region, so the widescale urban sprawl and massive car commuting within the region can be minimized. If the intention is to minimize the amount of travel on a larger scale, as the East Jutland Metropolitan Area, then strict control and advocacy for compact urban development is needed, because of the multitude of conflicting interests and actors, as it was ascertained in the Copenhagen Metropolitan Area (Hartoft-Nielsen, 2010). This approach will of course work against the bottom-up tradition and the local governance ideals, but governmental regulation is preferable in order to incite compact urban development, as it was ascertained in Oslo and the Netherlands.

In order to promote an unbiased approach to the field of urban planning and also improve and secure the decision-making process' transparency and the planners' and decision-makers' accountability I will suggest implementing an outside view into urban spatial planning strategies and EIAs, which is inspired by Flevbjerg's (2007) suggestion to implement reference-class forecasting large infrastructure projects. This entails a benchmarking of the preferred spatial strate-

gy in relation to cases with a similar point of departure but another course of action. This entails extreme cases, maximum variation cases and/or critical cases (Flyvbjerg, 2006, p. 230). This method is especially relevant in cases where planners are embarking on a planning strategy that differs from business-as-usual - a paradigm shift. This approach forces the planners to expand their professional knowledge basis instead of relying on biased perceptions and tacit knowledge. Moreover, it should be mandatory to pass this process on into the public participation process in order to make the future decision on a preferred strategy transparent and the decision-makers accountable for the chosen strategy. This will also empower the public in regards to the knowledge they gain about the problem at hand and the insight they gain in the decision-making process.

The 3rd focus area follows in the footsteps of the latter part of the 2<sup>nd</sup> focus area. It is necessary to provide the public with more than insight into what is being decided upon the decision-making process in order to promote compact urban development. It is therefore necessary to communicate knowledge about urban structures' impact on travel behavior and the benefits of compact development to the public in order to provide the public with the discursive knowledge that there are other measures to mitigate CO<sub>2</sub>-emissions than technological "fixes". The global climate/sustainable development discourse is gaining ground in the public awareness, so it would arguably be fruitful to promote the opportunities within compact urban development and the associated benefits. Minimizing car dependency through coordinated land-use and transport planning will hypothetically appeal to the public's rational and economic sense and to some degree our normative sense, but the decisive factor is how reluctant the public is to relinquish some of their attachment to the car. However, it can be argued that this is contingent of when, and not if, the tipping point is reached ...

## 7 Conclusion

This project has aimed at studying the problematization of compact urban development in the municipality of Aarhus. In the beginning of this project I stated 2 research questions that established the analytical frame for how I intended to investigate this problematization in the municipality of Aarhus' Master Plan '09. The analytical frame entailed a benchmarking of the land-use and transport planning strategies in Master Plan '09 to state-of-the-art knowledge about urban structures' influence on travel behavior. Moreover, the analytical frame entailed an investigation of how knowledge about urban structures' impact on travel behavior was discursively constructed and by which mechanisms of power this knowledge has been filtered through the decision-making process. Lastly the analytical frame entailed an evaluation of how this process relate to the formulated goals of minimizing the amount of transport and the mitigation of CO<sub>2</sub>-emissions from transport.

*How does the municipality of Aarhus discursively construct knowledge about urban structures' impact on travel behavior?*

The municipality of Aarhus discursively constructs knowledge about urban structures' influence on travel behavior in a manner that both guarantee growth, prosperity and sustainable development. They give the impression that the spatial planning strategy is in agreement with state-of-the-art knowledge about urban structures' impact on travel behavior and that the strategy will protect the local environment, minimize the amount of transport, and mitigate CO<sub>2</sub>-emissions from transport. However, it was evident that the knowledge-claims in the dominating discourses in the Master Plan '09 were prevailingly contradicting to state-of-the-art knowledge about urban structures' impact on travel behavior. Moreover, it was evident that dominating discourses relied on several discursive affinities from the compact city strategy and "New Urbanism", but that the urban spatial planning strategy in Master Plan '09 was far from a compact city strategy. It was shown that accommodating growth and competitiveness is the prevailing goal and this entails an almost absolute freedom of choice in regards to business and residential location, types of dwellings, and means of transport. This goal has led to a spatial strategy that apparently emphasized both greenfield and brownfield development, but actually promotes extensive greenfield development on the basis of a biased conception of dwelling location preferences. It was also evident that the discursive construction of the need to save land was only relevant for natural areas outside the city and green areas within the existing city. Furthermore, it was revealed that the dominating discourses and the local governance approach played a significant role in the filtering of knowledge about urban structures' impact on travel behavior.

*By which mechanisms of power has knowledge about urban structures' impact on travel behavior been filtered in the decision-making process?*

It was found that knowledge about urban structures' impact on travel behavior has been filtered through a market economic and neo-liberal system-of-thought. This has influenced the spatial planning strategy in Master Plan '09 in the direction of emphasizing extensive greenfield development outside the city, because of a desire to have a vast supply of different business and residential development areas in order to accommodate growth and secure competitiveness. Moreover, it has influenced the infrastructure development in a direction that emphasizes all means of transport and hence freedom of choice. It was perceived to be necessary to increase road capacity in order to accommodate traffic growth and detrimental to restrict car accessibility through parking restrictions.

It was also found that knowledge about urban structures' impact on travel behavior has been filtered through a kind of incrementalistic system-of-thought, which is rooted in small-scale change and a bottom-up approach to planning. This incrementalistic system-of-thought entailed that the municipality confirm-structured knowledge-claims about small-scale parameters' effect on travel behavior; such as street-pattern, proximity to mass transit, proximity to activities, stores, cafés etc., and local density, and de-structured Metropolitan-scale parameters'; such as overall density and the influence of the residence and business location's distance to the city center. This filtering was further enforced through a systemic bias towards professions demonstrating small-scale change through an architectural and urban design approach and a focus on local liveability. On the contrary, professions that demonstrated a more comprehensive approach to coordinated land-use and transport planning was de-structured on the basis of its lack of focus on small-scale change.

Lastly, it was found that knowledge about urban structures' impact on travel behavior has been filtered through reification, although it can be argued that the general public has been unaware of what knowledge-claim they were confirm-structuring and what knowledge-claim they were de-structuring. This condition has been established because of a lack of transparency in the decision-making process due to planning fallacies in the local government and technical errors in the EIA.

*How does this process relate to the strategies regarding minimizing the amount of car traffic and ultimately mitigating CO<sub>2</sub>-emissions from transport?*

It is questionable whether the chosen strategies will have any significant affect on the amount of transport. The extensive greenfield development will contribute to an average longer distance from the residential and business areas to the city center, which will entail an increase in transportation. Whether they will be successful in influencing the modal split in favor of mass transit and non-motorized means of transport is questionable, because of the avg. longer distance from the dwelling location to the city center and because of the lack of restrictions on car accessibility.

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## Appendix 1 - Urban Development Map

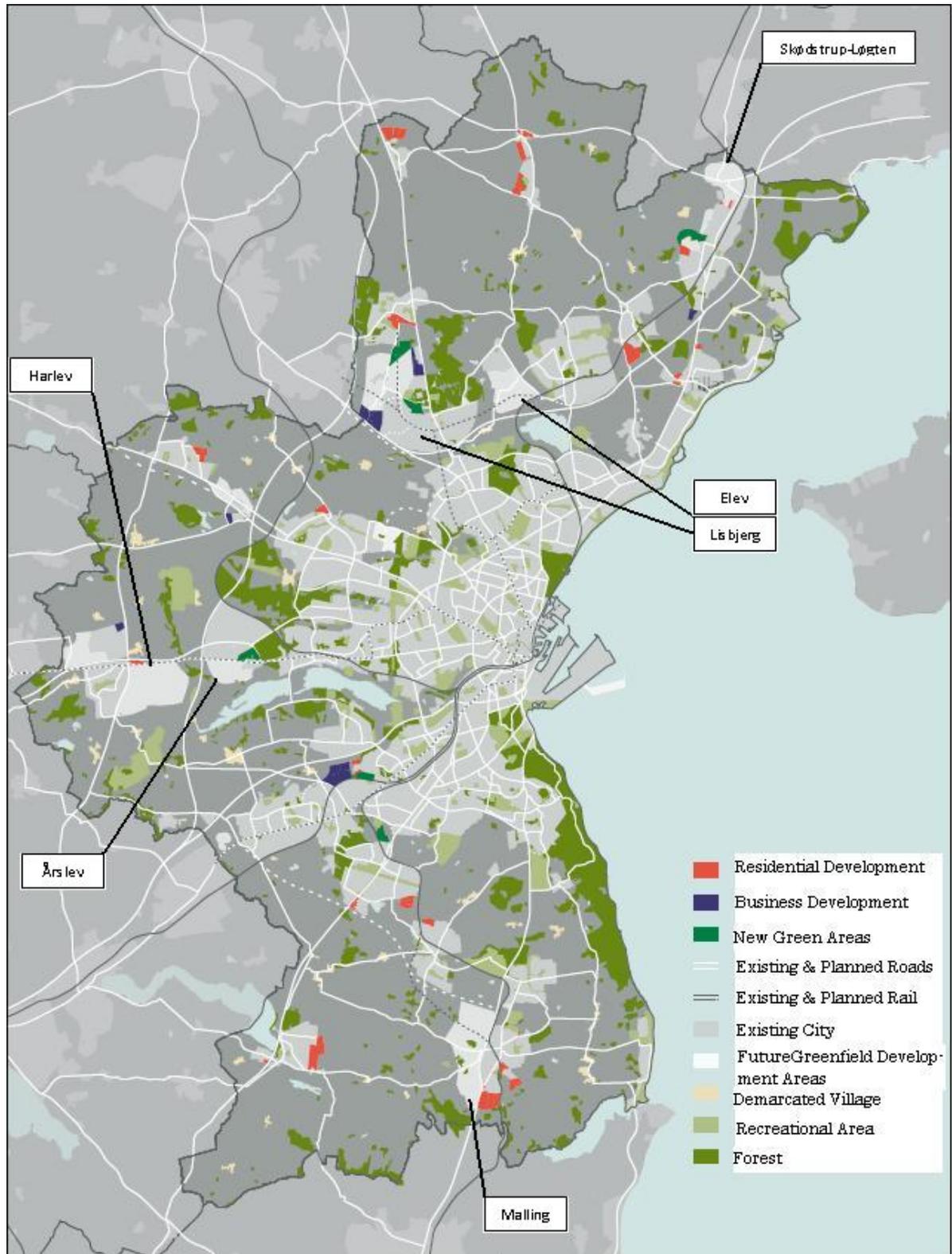


Figure 10: Edited map from Master Plan 2009 (Aarhus Kommune, 2009).

## Appendix 2 – Infrastructure Map



Figure 11: Map of the municipality of Aarhus that shows the existing and planned infrastructure, and as well the planned and existing city (Aarhus Kommune, 2009).

### Appendix 3 – Interview-guide

The following interview-guide was used in the interviews with Niels-Peter Mohr (see appendix 4) and Anton Iversen (see appendix 5).

Themes	
Practice	<ul style="list-style-type: none"> <li>• Cooperation between the traffic-, urban-, and environment planning department in regards to the spatial planning strategy in Master Plan '09               <ul style="list-style-type: none"> <li>○ Areas of responsibility</li> <li>○ Common responsibilities</li> <li>○ Influence on other responsibilities</li> </ul> </li> <li>• Political influence</li> <li>• Retrieving and assessing new knowledge (which media?)</li> </ul>
Knowledge	<ul style="list-style-type: none"> <li>• What knowledge is the "paradigm shift" in the spatial planning strategy based on?</li> <li>• On what basis is that knowledge chosen?</li> <li>• Is there any external influence on the knowledge the spatial planning strategy is based on?</li> </ul>
Residential and business location	<ul style="list-style-type: none"> <li>• The shift from urban development that rounds off the city to new independent settlements outside the existing city</li> <li>• The basis for the extensive greenfield development rather than compact urban development</li> <li>• The basis for the change in urban design compared to other suburbs</li> <li>• Pro's and con's for decentralized urban development rather than centralized urban development</li> <li>• Types of businesses in the new settlement</li> <li>• Types of dwellings in the new settlements</li> </ul>
Infrastructure	<ul style="list-style-type: none"> <li>• Connection between increasing road capacity and emphasizing mass transit</li> <li>• Connection between emphasizing car accessibility and mass transit accessibility</li> <li>• Focus on high mobility and less transportation</li> <li>• Restrictions on car traffic</li> <li>• What shall make people deselect the car as the preferred mean of transport?</li> </ul>
Transport behavior	<ul style="list-style-type: none"> <li>• How do you expect people to travel in the future and why?</li> <li>• What is the importance of proximity to activities and various functions?</li> <li>• Parkering restrictions</li> <li>• Other incentives?</li> </ul>
Connection to other plans	<ul style="list-style-type: none"> <li>• What is the expectations in regards to the CO<sub>2</sub>-emission mitigation potential in coordinated land-use and transport planning in Aarhus</li> <li>• Connection to National Planning</li> <li>• Connection to the cooperation among the municipalities in East Jutland</li> </ul>

## **Appendix 4 – Summary of Interview with Niels-Peter Mohr**

*This interview can be found in its full length in appendix 7 as a sound file. The interview guide used in the interview can be found in appendix 3. The interview will be referenced to in the main rapport as (Mohr, 2010). The interview is recounted here as a comprehensive summary of the interviewee's experiences with working with Master Plan 2009 and his stance on spatial planning, infrastructure, and travel behavior.*

Niels-Peter Mohr is the Head of Department of Master Planning in the municipality of Aarhus.

### **Formulating the plan in practice**

The Interviewee explains that the process of formulating the Master Plan 2009 (MP) has been taken on in a steering group constituted by the head of department from Urban Planning & Construction, Nature & Environment, and Traffic & Roads, and as well attorneys and developers. The steering group is supervised by the Chief Financial Officer from the Mayor's office. Contrary to the organization in the Spatial Planning Strategy 2008 (SPS) there has not been any external advisors connected to formulating the planning strategies in the MP. However, for the Environmental Impact Assessment (EIA) of the MP was outsourced to COWI. Additionally, the operation of the busses and the light rail project is outsourced to *Midttrafik*, but planning of the light rail and the EIA remains the steering group's responsibility.

### **Urban Development**

The interviewee argues that the so-called "paradigm shift" in the spatial planning strategy is based on several factors. He explains that it is not only due to the focus on mitigating CO<sub>2</sub>-emissions, but also due to a desire to secure groundwater resources, minimize land consumption, and to have nature in proximity to the city. They wanted to break with the planning tradition of building successive residential quarters with mostly open-low houses that consumed a large amount of land per house. He argues that there is nothing new to the focus on urban renewal, which has been an on-going process for a long time. The interviewee explains that they have identified a lot of urban renewal areas that they are willing to talk about, if someone desires to develop the area. However, he argues that urban renewal is a complicated and lengthy process and hence the greenfield development is a lot less complicated.

The idea about building new settlements outside the existing city arose in 2000, when the municipality bought the land, where the Lisbjerg-settlement is planned. They subsequently launched a contest on ideas for the future design of a settlement with accommodation for 10.000 inhabitants mixed with businesses. They have now raised the number of inhabitants to 25.000, be-

cause they came up with the idea about creating independent and dense cities with a mix of residences and businesses outside the existing cities. This idea has been inspired by a trip to Finland, where there are similar cities outside of Helsinki. The interviewee argues that the location and design of the new settlements are a direct response to the knowledge about residential and business location on travel behavior, since the new settlements are located in relative proximity to the city center, there is proximity to mass transit stations, high density building, and multi-functional set-up. However, the interviewee argues that the knowledge about urban structures' impact on travel behavior is no exact science, because there are several attitudinal and sociological factors that cannot be accounted for in such a set-up.

The interviewee states that although the greenfield development areas from Master Plan '01 and two of the new settlements (Lisbjerg and Elev) are first on the order of realization, then there is no actual prioritized timetable for the realization of the urban renewal/densification projects and the new settlements. He argues that the municipality has a broad spectrum of different types of locations and projects and it is up to the market to decide which location is most attractive. The municipality does not want to force a specific type of development, but tries to entice developers by having a wide range of possibilities. It is most important to the municipality to find interested developers and attain a good economy in the projects, and at last to secure a high degree of diversity in the residential areas. Furthermore, he argues that the market demands development projects in the city center, so the densification and urban renewal project will be realized accordingly with the demand.

In continuation hereof the interviewee states that they accept businesses that want to locate in proximity to the freeway

### **Mass Transit, Road Building & Parking**

The interviewee states that the light rail project is an important enlargement of the mass transit network that should increase the share of mass transit users considerably. The new settlements are a key part in creating a sound customer base for the light rail. On the other hand, the settlements have partly been located in order to spread car traffic over several main roads in order to minimize congestion. He further argues that the car traffic will continue to rise and it is hence critical to increase the road capacity and the overall car accessibility in the municipality. In continuation hereof the interviewee argues that the pivotal factors in minimizing CO<sub>2</sub>-emissions from car traffic are clean-energy and bringing down the amount of transport per citizen. It is however not on the agenda to incorporate measures that limits car traffic, because the politicians do not want to force car drivers to choose another mean of transportation. The interviewee

wee states that Aarhus is still a provincial town, where people need to drive. Furthermore, it is in his opinion impossible to outmatch the car, because of its practical nature, but it is crucial to find alternative fuels.

In line with the political unwillingness to restrict car traffic parking restrictions are not high on the agenda. Although, they have accepted business development in the city center without any parking, i.e. parking spaces need to be within the construction or dug down. They plan to restrict parking to within the construction in the new settlements where the building density is above 70 %.

### **Closing Remarks**

The interviewee argues that there is absolute consensus about the direction of the Master Plan '09 from all sides; politicians, public, planners/civil servants, and developers. Although he thinks that the EIA as a basis of evaluation is flimsy and uninteresting, since he believes no one even has read it, it is important to acknowledge that it could have pointed out mistakes in their planning efforts, but it fortunately did not. He states that there are so many other priorities than minimizing CO<sub>2</sub>-emissions from transport, e.g. economy, finding developers, and obtaining a high degree of diversity in people in the city, so the CO<sub>2</sub>-mitigating efforts are mainly directed at residence heating, but also transportation.

*“There are many other qualities in life than driving CO<sub>2</sub>-friendly to work” (own translation)*

### **Interviewer's Reflections on the Interviewee's Demeanor**

The interviewee was very defensive from the start of the interview. He seemed to dislike theoretical discussions and especially other perspectives (than theirs) on coordinating land-use and transport planning in accordance with knowledge about urban structures' impact on travel behavior. He evaded questions about whether a compact development could contain the assumed growth in population and jobs and started talking about the innovative design of the new settlements.

## **Appendix 5 - Summary of interview with Anton Iversen**

*This interview can be found in its full length in appendix 7 as a sound file. The interview guide used in the interview can be found in appendix 3. The interview will be referenced to in the main rapport as (Iversen, 2010). The interview is recounted here as a comprehensive summary of the interviewee's experiences with working with the Master Land-use Plan 2009 and his stance on spatial planning, infrastructure, and travel behavior.*

Anton Iversen is the Head of Department of Traffic Planning in the Municipality of Aarhus.

### **Formulating the plan in practice**

The interviewee tells that the principal ideas behind the Master Land-use Plan 2009 (MP) was founded in the Spatial Planning Strategy 2008 (SPS), which means that a great deal of the work with the MP has been more in the line of finding technical solutions to the principal strategies. The MP has primarily been undertaken in a steering group across the departments for Urban Planning & Construction, Nature & Environment, and Traffic & Roads, although there has been consultants attached to the steering group going back to the SPS. The interviewee stressed that there by no means has been a territorial approach to forming the principal ideas in the SPS and MP, but they have worked interdisciplinary throughout the process, although each department had a special responsibility for the sections in the SPS and MP concerning their expertise. The light rail project, which is one of the most prominent parts of the MP, is a joint municipal project in Eastern Jutland, since the light rail network should in time be expanded across several municipalities. The planning process is controlled by a specially appointed secretariat, which is appointed to *Midttrafik*.

### **Urban Development**

The interviewee argues that the basis for the "paradigm shift" in regards to spatial planning and the massive investment in mass transit is due to a sporadic trough several years, which to some degree is rooted in Hartoft-Nielsen's studies of residential and business location's effect on travel behavior. They (the planning department) were aware of the problem with an increasing auto-dependency and decreasing number of mass transit users. The overall goal of CO<sub>2</sub>-neutrality in 2030 spurred them on.

He further argues that the decision to locate most of the urban development outside the existing city in new enclaves was driven by several factors. The interviewee believes that it would almost impossible to locate all urban development within the existing urban structure, because of 1) previous and forecasted population growth rates and 2) other priorities, such as loss of

competiveness due to not being able to offer all possible types of settlements and a wide range of locations for settlements and business'. The latter explanation is mostly a political opinion that in the interviewee's mind is under transformation. He argues that politicians are increasingly more open to strict management of spatial planning, because of the political desire to mitigate CO<sub>2</sub> emissions. He further argues that the new settlements outside the city differs from the "business-as-usual" approach, because they are from the "garden city ideal", since they plan to build dense cores with mixed housing and business' that is centered around light rail stations. He has however a "wait and see" approach to the first of the new settlements (Lisbjerg), because it is difficult to foresee, how the market reacts in regards to how conservative peoples preferences are, when it comes to type and location of the settlement.

### **Mass Transit & Road Building**

The relative short distance from the residential areas to mass transit stations (< 700 meters) and an effective high-frequency mass transit system will most likely, according to the interviewee, have a favorable effect on the share of mass transit users. Although, the interviewee acknowledges that the mass transit network may not be able to sufficiently accommodate commuting across town, if the network is solely based on a radial structure, but on the other hand, he argues, that this type of commuting is not very widespread, because of Aarhus' size.

The interviewee argues that in general even very large investments in mass transit options yields a relative small modal shift in a short timeframe, but in the long perspective the share of mass transit commuters increases. The immediate goal is to test the outcomes of the implementation of the light rail project and to gradually get people accustomed to its presence.

He further argues that in a professional view there should be directed much more attention to downgrading road capacity, if they should maximize the yield of their investment in mass transit, but he argues that this is a problematic viewpoint among politicians, because they do not want to de-emphasize any mode of transport.

The interviewee tells that many of the planned road capacity increases are old decisions that should relieve the pressure on the existing roads. He further explains that there is no plans for large investments in increased road capacity on the long term, but the southern part of the Municipality is in need for new roads, because of a historically lack of investment in the area. He further explains that the traffic situation should be viewed in a larger perspective, since the increase in settlers and jobs in the Eastern Jutland corridor prompt an increase in traffic. The municipalities are working on a solution that is different from the "business-as-usual" approach, but as he argues they have not come to more than some limited reflections on possible mass transit

solutions. The interviewee calls for a serious discussion on the topic on both the municipal and general level.

### **Parking Restrictions**

The interviewee says that there to some degree have been signs of a stronger political will to implement a more strict parking policy in order to regulate the amount of traffic in the city. They have enforced stricter parking norms for urban renewal, but there is no general norm, but a guiding norm that is reviewed from case to case. They generally prioritize parking for residents and short term visitors and deemphasize long term parking. They typically operate with a norm of 1 parking space per 100 m<sup>2</sup> for business' and a ½ parking place per residence in the inner city and twice the norm outside the inner city. They will avoid large surface area parking spaces in the new settlements and they are currently contemplating parking norms that shift accordingly to the denseness of the urban area and the level of mass transit service. The interviewee argues that parking restrictions are a controversial subject in the political arena, but he acknowledges that from a professional viewpoint parking restrictions are an important mean to restrict car traffic and enhance mass transit. He argues that it has been difficult to enforce strict parking restrictions in the urban renewal project – “the City Harbor”, because the investors are willing to pay more for more parking places, which they sometimes are allowed to by the Municipality (landowner).

### **Closing Remarks**

The interviewee argues that the Master Plan '09 is a step in the right direction in regards to integrating urban development with infrastructure. Although, he calls for knowledge about what the expected outcomes specific can be of such a strategy especially when the municipalities have to formulate climate plans and invest in mass transit. He sums up the difficulties they have been faced with in regards to arguing for an alternate spatial planning strategy:

*“It is difficult for us to tell our decision-makers that, if You pass this Mater Plan and moreover are prepared henceforth to comply with the urban development principals, then everything is lovely in the garden in 20 years, because we have mitigated this many kilometers from individual transport. You cannot calculate it, so it is of no use to pretend so, but it is always an exciting process to see, if you can argue; if this is the conditions, then it might indicate a successful outcome.”*

(Own translation)

### **Interviewer's Reflections on the Interviewee's Demeanor**

The interviewee most often speaks as a civil servant and argues for the key decisions in the Master Land-use Plan '09. On occasions he argues from an individual and professional viewpoint, where he starts the argument with *"in my eyes"* or *"in a professional setting"*. The latter arguments were mostly spurred by questions regarding theoretical viewpoints and references to similar cases. When the interviewee argued as a civil servant he often took a pragmatic stance on the key-decisions in the Master Land-use Plan '09 and generally argued for an incremental planning process. He was a bit more normative in his personal/professional arguments, but often diverted back to a pragmatic stance on the subject often because of outside interests.

## **Appendix 6 – Summary of interview with Peter Hartoft-Nielsen**

*The interview will be referenced to in the main rapport as (Hartoft-Nielsen, 2010). The interview is recounted here as a comprehensive summary of the interviewee's experiences with working with coordinated land-use and transport planning in the Copenhagen Metropolitan Area and DTU's proposal for a future urban spatial planning strategy in Aarhus, and as well and his take on Master Plan '09 and the government's role in promoting compact urban development.*

Peter Hartoft-Nielsen is an urban planner at the Agency for Spatial and Environment Planning.

### **Experiences from Copenhagen Metropolitan Area**

The interviewee argues that it has been a long and complicated process of promoting coordinated land-use and transport planning and compact development in Copenhagen Metropolitan Area, because the 34 municipalities within the metropolitan area all fight for growth and it has been difficult convincing the municipalities to bring the appointment of new greenfield development areas to an end, but they have recently succeeded. He further argues that it is crucial for the intentions in the Fingerplan 2007 to comply with the order of development plans in order to secure a beneficial urban development that supports the mass transit network and the finger-structure. He argues that the principle effects of proximity to mass transit stations only are relevant in Copenhagen Metropolitan Area, because of the density and the high accessibility to high-frequency mass transit.

### **Experiences from the DTU proposal**

The interviewee argues that their proposal for a compact urban development in Aarhus was met with astonishment and especially the proposal to revoke the harbor for urban development was highly controversial. He further argued that there was a special relationship between the municipality and the Aarhus School of Architecture, since their proposal for compact urban development was received with a more positive attitude.

### **The municipality of Aarhus' Master Plan 2009**

The interviewee acknowledges that he does not have a lot of insight in the Master Plan '09, but he argues that he is a proponent for the light rail network, which they also proposed in the DTU-project. However, he argues that it is doubtful whether there will be a sufficient patronage for the light rail network, if the spatial planning strategy does not accommodate a high-density urban development around the light rail network. He argues that they cannot secure this type of urban development, if they do not enforce order of development plans. Moreover, he argues that locating businesses in the new settlements will increase the amount of transport and that it

is optimistic to think that the proximity principle will have any significant effect on the travel behavior. Furthermore, he argues that it is a problem if there are no efforts to minimize car transport through transport behavior regulations. He stresses that it should be easier for the municipality of Aarhus to control land-use, since they have the advantage of being a cohesive unit and hence does not have to fight with other interests, as in Copenhagen Metropolitan Area

### **The Government's role**

The interviewee argues that there has been shifting political will to promote compact urban development. The Fingerplan 2007 was enacted under the former Minister of the Environment Connie Hedegaard (C), who according to the interviewee was a proponent for compact urban Development. However, the interviewee argues that the political will has vanished. He further argues that the white paper on the modern sustainable city that was issued under former Minister of the Environment Troels Lund Poulsen (V) was a shift away from the compact city strategy and an attempt to start a debate about the suburbs' role.