If you build it, they will come:

Reducing car traffic in Copenhagen, by constructing alternatives

Edward Thomas Owen

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Cand.tech. M.sp. (Arealforvaltning og Planlægning)
Aalborg University**

Written by: Edward Thomas Owen
Student number: 20162007
Supervision by: Andres Felipe Valderrama Pineda

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Abstract

The Danish capital of Copenhagen is a good example of a city that has already gone some way to challenge the dominance of automobility and can be seen to exhibit a bicycle friendly culture. Despite this, there is evidence to show that the negative externalities of car traffic are particularly a problem for the inner city. The aim of this report is to investigate how both public and private companies in Copenhagen can help reduce car traffic, and to identify the challenges they face. Semi-structured interviews are carried out with representatives from four separate companies. Common themes are identified in the findings: 1) Automobility: Dominance and Deconstruction, 2) Ownership and Access, 3) Interaction, 4) Development and Adjustment of Regimes, 5) Infrastructure, 6) Space. The activities of the companies are found at different levels identified using the Multi-level Perspective, and it is suggested that more planning and cooperation can help achieve results where companies are otherwise working separately to the same ends.

Contents

1) Introduction

When cars first began appearing on roads, they presented a problem. They were not compatible with the existing dynamic, chiefly because of safety concerns for pedestrians or children playing in the street (Norton, 2008). In the battle that ensued, groups and alliances were formed based on differing interests regarding the presence of cars. Industry groups were able to purchase streets laid with rail - a competing form of mobility - and rip up the rails to optimise the space for cars. Combined with a free market principle, the automobile ultimately prevailed in the United States and much of the western world. The planning discipline born from this - traffic engineering - and planning aims generally became focused on how to accommodate motorists, and how to do this efficiently. This was detrimental to other modes of mobility, and allowed the private use of public space, due to the need for parking (Norton, 2008). Over the last century, the car has been invited into urban life via accommodating planning trends, to the extent where it is now widely acknowledged that more roads result in more traffic and congestion (Gehl 2010, 3-29).

Events in Copenhagen took a slightly different turn. In the post World War Two period, the *Finger Plan* was chosen as a development strategy for the city and suburban region. The intention being for urban growth to follow planned train lines coming in and out of the city, providing good proximity to stations for commuters. At this point there were relatively few cars on the road and such a plan made good sense. However, in the early 1950's faster than expected economic growth resulted in parts of the fingers being developed without sufficient proximity to a train station (Valderrama Pineda & Vogel, 2014). The unforeseen levels of prosperity meant that by the mid 1950's Danish car traffic had started to grow rapidly. It was not remarkable in any way that this growth coincided with a significant decline in bicycle traffic. Cycling infrastructure was widely removed to help accommodate automobility during these years (Cycling Embassy of Denmark, 2018). The growth and expansion of automobility infiltrated and began to influence spatial development planning, resulting in the relocation of public institutions to places not connected by public transport (Valderrama Pineda & Vogel, 2014).

Popular protests against these developments were reinforced by separate fuel crises in the 1970's. As car ownership in Copenhagen began to decline, planners reconsidered their priorities and bicycle infrastructure was revived (Valderrama Pineda & Vogel, 2014). This value has remained in the planning of Copenhagen ever since and led to the comparatively extended network we see today (Denmark.DK The Official Website of Denmark, 2018). So much so, that in 2016, 41% of all trips to study or work in Copenhagen were made using the bicycle (City of Copenhagen [b], 2017).

1.1) A Sustainable Situation?

If Copenhagen has developed in a different way to the typical major city, what might the priorities and issues be in the present day? Is car traffic a problem in Copenhagen? The following text referring to *car traffic* and *the environment* is offered as an introduction to the idea that there is perhaps an issue. These brief identifications of negative externalities coupled with a trend in *population growth* would seem to indicate an unsustainable combination.

Car Traffic

In contrast to the picture of success, it has recently been reported that car traffic on Danish roads has increased by almost a fifth since the turn of the millennium (McGhie, Steffen. "Biltrafikken Vokser Massivt." *Ingeniøren [a],* 02/02/2018). This is a national increase, but in just the Capital Region, commuters travelling by car will spend approximately 130,000 hours queuing in traffic. This equates to a significant loss of time, as well as the socio-economic value of these hours (The Capital Region of Denmark [a], 2016). Despite investment in large scale projects such as the Metro in Copenhagen, this does not necessarily translate directly into a reduction in car traffic in central municipalities; a result which is rather influenced by fuel prices for cars as opposed to the cost of a Metro ticket (McGhie, Steffen. "Eksplosivt Voksende Biltrafik Efterlader Togene i Støvet" *Ingeniøren [b],* 02/02/2018).

The result of this is congestion on Copenhagen's inner-city roads, and journey speeds of as little as 8km/h with automobiles covering only 1km in 7.1 minutes at peak times, which is essentially a walking speed (McGhie, Steffen. "Tæt Trængsel: Bilister i København Kører én Kilometer På Syv Minutter" *Ingeniøren [c],* 02/01/2018).

In the long term, this could be viewed as an unsustainable paradigm in terms of effective and efficient movement around the city.

The Environment

Environmental impacts are some of the most talked about and obvious negative externalities of automobility. Given the large number of vehicles on the roads that remain to be powered by an internal combustion engine, emissions of gas such as CO_2 are made. This is of course not the sole responsibility of automobility - for example, with diesel and electric trains also contributing - but it does account for most of the CO_2 emitted from forms of transport. In 2010, Copenhagen's transport sector accounted for 544,000 tons of CO_2 emitted and this represented 22% of the total for the year. Most significantly, 70% of this was the result of road traffic, with cars being the biggest polluters per passenger kilometre, more than double the next mode of transport (City of Copenhagen [c], 2012).

This can be explained due to the passenger capacity of cars as well as the probability that many journeys will involve the driver and nobody else.

The city of Copenhagen developed the CPH 2025 Climate Plan, which aimed to reduce CO_2 emissions significantly, by 20% between 2009 and 2015, continuing to then make the city of Copenhagen, carbon neutral by 2025 (City of Copenhagen [c], 2012).

The current regional growth and development strategy also includes plans to make the Capital Region of Copenhagen independent from fossil fuels by the year 2050, as part of a larger framework to achieve more efficient and sustainable mobility (The Capital Region of Denmark [b], 2018). To implement such framework, the environmental drawbacks of automobility will certainly need to be addressed and appear to be a well-established part of the justification for change.

Population Growth

Urbanisation is a global trend that has resulted in a significant increase in the amount of the world's population living in cities, over the last 120 years. In 1900, 10% of the global population was living in a city, 50% by 2007, and this is projected to be 75% by the year 2050 (Gehl 2010, 214). Copenhagen has experienced a small but steady population growth since the mid 1990's (World Population Review 2017). This arguably is a natural side effect from the status of the city within Denmark – in terms of being the nation's capital – as well as internationally through the city's reputation for business, education and generally high level of liveability (City of Copenhagen [a], 2018).

1.2) Alternatives

Thus far, automobility has established itself as the dominant form of mobility, becoming a part of planning and space. If more efficient and sustainable mobility is to be achieved, then it is useful for policy makers, planners and public or private entities to be able to classify what is desirable in the form of a hierarchy.

The reverse traffic pyramid (figure 1), is a useful way of doing so. This provides a visualisation of what is considered more desirable - at the top - and what is less desirable - at the bottom (Bicycle Innovation Lab, 2018). The pyramid is arranged against social and environmental benefit or detriment associated with the traffic type. In other words, a suitable hierarchy, if the primary concern is the common good (Freudendal-Pedersen, 2015).

Regardless, the sentiment is clear. People should think about their choices when making journeys, not just in terms of the mode of transport, but also what they really need or is necessary for a particular journey. If hypothetically we assumed for a moment that all of society agree with this in principle, the next question might be, why *wouldn't* people behave the same way? If such a model were to be achieved, we must consider what is needed to facilitate the more desirable behaviours. Getting people to think, requires a message.
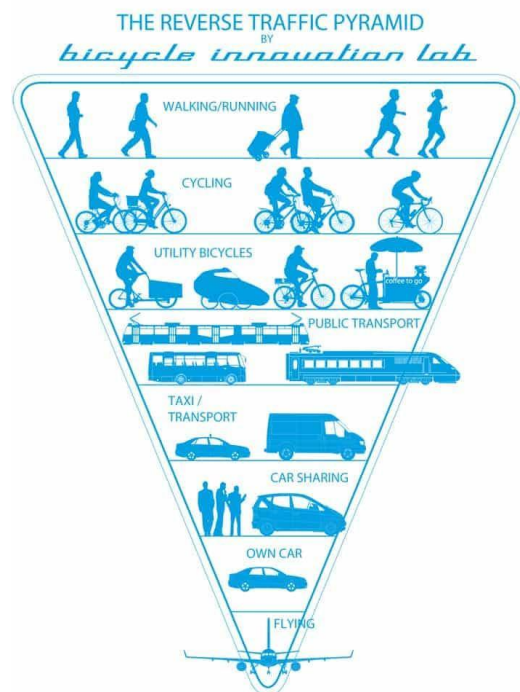

Figure 1: The Reverse Traffic Pyramid (Bicycle Innovation Lab, 2018)

Sharing instead of private use, means people need access.
Cycling instead of using public transport, means people need reasons to choose the former.

1.3) Automobility

Some of the historic development of automobility has been introduced in this chapter.
Before arriving at the research question, it is important to set out and define a basic understanding
of what automobility consists of. What are its components? This can be illustrated through the
components identified by Urry (2004).

1) A manufactured object
Representing the car. An object which the development of, holds enough historical significance to
be definitive with regards to social science i.e. Fordism or Post Fordism.

2) Individual consumption
As an item of individual consumption, the car or automobility as a concept is one of the major items
to provide status to the owner. This status will depend on the value attached to a car for example,
career success.

3) Complex
Automobility is made up of interconnected socio-technical linkages. It is not only the car, but also
any other separate parts that are required to facilitate and allow its practical and somehow useful
existence. This includes industry and manufacturing (oil, car production), infrastructure and
facilities (roads, parking, services), urban planning (creation of suburbs) and so forth.

4) Mobility
Globally the superior and dominant form of personal mobility with ability to change people's
behaviour and perception of opportunity.

5) Culture
Automobility is not just part of culture but is the dominant culture regarding what is desirable in
life.

6) Use of resources
One of the biggest causes of resource use and consumption. This spans from sourcing of materials
for manufacture to negative environmental externalities during and after the lifetime of a vehicle,
through to the demand and consumption of space by the vehicles themselves and the infrastructure
they require.
(Urry, 2004)

The complexity of Urry's (2004) automobility means that the effects are far reaching; it is not just a
car on a road. It is ideas, culture, perceptions, jobs, resources and infrastructure, and consumption.
Even if automobility is less culturally dominant in the urban environment of Copenhagen, this does

not necessarily correlate to the amount of public space that remains to be dedicated to its infrastructure. As such, we can still say that automobility is the dominant form of mobility. Whilst some of these components are not tangible - such as the perception of status provided by a car, the superiority of automobility, and desirability of it as a means to live the good life - many components are physical, as highlighted by point number 6, in Urry's explanation. Socio-technical linkages influence the way we use technology, to tackle problems or issues requires examining how a change process may look.

1.4) Research Question

At the beginning of this chapter the historic development of automobility was introduced. Industry groups and profit-making companies successfully maneuvered so that the car became the default planning concern. Interestingly, this planning concern became an obligation of the public domain, with the task of redesigning many cities and providing infrastructure being given to local authority and government. Despite Copenhagen's not so typical story, it can be illustrated that automobility poses a problem in the core urban region. This report aims to investigate the present-day dynamic of public and private companies addressing the issue of car traffic. The research question is as follows:

How do public and private companies seek to reduce car traffic in Copenhagen, and what are the associated challenges?

- What is the justification for their chosen course of action?

To address this question a selection of public and private companies will be included in the study. A pragmatic standpoint is taken, and further explanation of the research questions and methods of investigation are provided in chapter 3) Methods.

1.5) Copenhagen

The focus of this report is the Danish capital, Copenhagen. Reference to *Copenhagen* is made in the general sense to mean the city as a whole, including its suburbs. This approximation is necessary for an issue such as automobility, as the flow of car traffic causing the perceived problem is difficult to delimit, and distinctions will be made where necessary if referring a specific part of the city. However, the *core urban region* will frequently be referred to. This is in specific reference to the inner-city. For the purpose of this report, this is considered the area illustrated (see figure 2), with the core urban region being contained within the boundary created in a semi-circular fashion by the E47 highway, running from the North underneath Dyrehaven, anticlockwise to the E20 highway cutting across Amager.
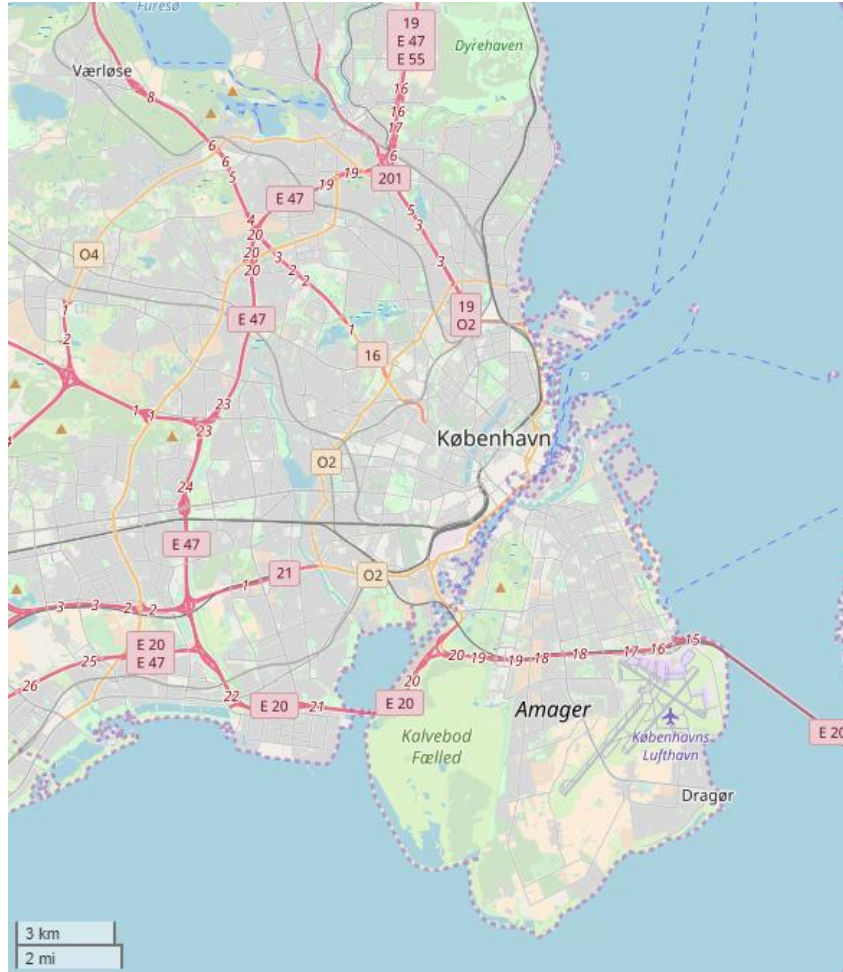

Figure 2: Copenhagen (Open Street Map, 2018)

2) Theoretical Considerations

The previous chapter has set out and established an overview of automobility and some of its current issues or negative externalities, and an alternative reasoning for how and why this might be changed to more sustainable behaviours. In order to develop an understanding of the front-line challenges that any solutions might face in trying to change the system, it is useful to take a theoretical perspective of our relationship with the different factors at play. This means considering what the purpose of automobility or any mobility might be, and the different forms it takes in society.

2.1) Travel

To begin with, we must break down and understand what is happening for car traffic to become a problem. A simple answer might be to blame the roads or lack of. But it is commonly understood that more roads provide more traffic. Therefore, we need to consider the issue in a literal sense. What is it that people are doing? An *activity-based* approach can help frame people's choices.

Urry (2002) outlines four different kinds of travel. These include the physical movement of *objects*, *imaginative* travel, *virtual* travel, and the real or physical travel of people, phrased as *corporeal* travel. The latter - corporeal travel - is most relevant, in that it relates to the physical movement and travel of the individual, that will manifest as the real and tangible creation of traffic. People travel and make journeys because there exists a desire or need to be in certain physical proximity to other people or places. Be it between home and work, or any other activity, *corporeal* travel is an essential part of social and economic life. As such, we cannot deem any journeys as necessary or unnecessary, and any attempts to reduce the demand for driving should not affect people's ability to go from A to B (Urry, 2002).

The *activity-based* approach subscribes to the idea that nearly all travel takes place because there is a real or perceived need to be somewhere, and carry out other activities (Næss, 2006).

These activities are subject to time and/or geographical constraints, as is travel itself. These are:
1) Capability constraints
2) Coupling constraints
3) Authority/Steering constraints

Capability constraints apply to individuals and their abilities, or ability of the tools they have. For example, if a person has a bike, how fast can *they* ride it from A to B? How good is the bike?
Coupling constraints refer to a situation where the individual and another element must be brought together, for example to be at work to carry out your job.
Authority/Steering constraints involve space and time; where and when. For example, a train schedule is a restriction over where and when a journey can take place.
(Hagerstrand, 1970 (cited in Næss, 2006)).

If a trip or journey has a definite combination of time and geographical location being fixed, then this is a *bounded* trip. If time and location are flexible and varied, then this is a *non-bounded* trip. (Vilhelmson, 1999 (cited in Næss, 2006)).

In contrast to the *activity-based* approach, it is acknowledged that the apparent flexibility of a *non-bounded* trip could be interpreted as less purposeful, meaning there is perhaps no activity basis for the trip other than the trip itself.

Different modes of transport provide people with very different experiences. Whether the characteristics of this experience are best described as done for pleasure, speed, sociability and so forth, it cannot then be assumed that this feature is not what is being sought after, and is secondary to the following activity (Urry, 2002).

2.1.1) Influence on Choice

Further to defining what travel is, it is worth considering additional factors that may influence modal choice for a journey. Maintaining the *activity-based* approach, we can then assume that people would aim to minimise journey time, as this is time lost in between activities. Development of new public transport systems is often based on this assumption (Kaufmann, 2000). Other influences on *"[...] travel behaviour also include personal characteristics such as age, gender, affluence level, and employment as well as norms, values, lifestyles, acquaintances, and social obligations"* (Næss, 2012, p.22), and it is these things that feed into creating a transport pattern, for example the frequency or mode (Næss, 2012).

However, these characteristics would not give a consistent pattern if also considering urban form, so the choice of an individual with any of these characteristics, will not show a predetermined behaviour on that basis alone. The higher density of the core urban region (the inner city), means that places and activities within are closer together, therefore providing an environment more conducive to non-motorised travel, with more frequent and shorter trips being possible by walking or cycling (Næss, 2012).

In contrast, residents from outside of the core urban region will most likely need to take longer trips to places of activity, due to the lower urban density. As such, these people may seek to reduce travel time by using an automobile. This is where the attractiveness of alternatives must be sufficient; that is to say that in lower urban densities alternatives require a high level of availability. People living outside the core urban region could be more likely to structure their lives around the car. A European study found that even when public transport offered a faster journey, those people with access to a car would often continue using it. As such, the minimising of the journey time needs to be significant in order to recruit users (Kaufmann, 2000).

2.2) Ownership and Access

One possibility for the evolution of automobility is de-privatised use (Urry, 2004). This throws light on an interesting topic for theoretical consideration; that of whether people have ownership of the objects that allow mobility, or if they simply gain access for the time required.
Ownership and access will later be shown to be a key aspect of solution-based companies, as they appear to build their entire business around changing which of these people choose. Just as importantly, the author aims to create an understanding and agreement on what it means to own or access forms of mobility.

2.2.1) Ownership

The object of mobility in this report is essentially the car. As per Urry (2004), it is understood that automobility consists of individual consumption, and so it is fair to speculate that the common understanding of car ownership is exactly that; one where an individual has made a purchase of some kind in exchange for possession of a vehicle. However, the meaning of this is not straightforward.
Differing concepts of ownership exist. On the one hand, it could be said that ownership means to have absolute control over something. This means that the owner holds possession, use, right to sell or transfer, maintain and benefit from that which is owned. In contrast, it can be argued that there is no such thing as absolute control, but simply a set of rights are received when assuming ownership (Christman, 1994). In addition to this, there is the concept of relation, or *relationship*, that exists between the owner, the set of rights (regardless of extent), and other people. This is illustrated in figure 3.

Figure 3: Ownership (adapted from Christman (1994), p.23)

Figure 3 (above) can be used as a frame to view elements of ownership within the automobility regime. When referring to ownership in the automobility regime, it is in fact *private* ownership that is the issue. Considering how one would own something, is represented by B. This addresses areas such as the extent of ownership, legal structures and regulations that might reinforce ownership, and is what characterises and defines the relationship between the owner and other people (C) (Christman, 1994). In this case, part D is of course the car, vehicle or bicycle with which the whole dynamic is in regard to, and so would be a tangible object.

This can be further summarised in that the *"[...] sole ownership enables freedom and responsibility toward the object with clear boundaries between self and others."* (Bardhi, 2012, p882).

2.2.2) Access

A common understanding of ownership has been set out and this stipulates that ownership results from purchase. As such, ownership is the result of market activity. However, over the last decade a new trend has emerged; one where transactions take place but do not result in the transfer of ownership (Bardhi, 2012).

This represents a complete redefinition of the relationships between people and objects that they consume with regard to the responsibility and boundaries that ownership would have set out.

As explained by Rifkin (2000, p.5): *"Where the market used to boast sellers and buyers, now that talk is more of suppliers and users."* In this paradigm of access, property remains to be important but rather than being exchanged in the transaction it is held on to by the *suppliers*, who then permit short-term use or access to the *users* (Rifkin, 2000).

The growth of this approach to consuming has come about for many reasons. Modern information and communication technologies have vastly increased the rate at which business can take place. The connectedness of cyberspace networks and smartphone apps acts as an essential enabler for this new form of economic life (Rifkin, 2000). Furthermore, the classically perceived advantages of ownership as a means of accumulating wealth and status have been diminished by economic uncertainties and the fact that in a fast-moving society, attachment becomes undesirable and problematic for many people (Bardhi, 2012).

It is worth noting that car sharing, is a bona fide example of an emerging access market. It is also important to clarify that the term *sharing* is often used as a general reference to access-based consumption as opposed to actually sharing an object (Bardhi, 2012). In other words, *car sharing* in the context of this report does not refer to some kind of joint ownership or use, which would otherwise be implied by the word. It refers to gaining access - and access only - on an individual basis with none of the associated ownership responsibilities (Bardhi, 2012). This will now be further clarified through explaining the dimensions of access.

The following six dimensions are identifiable with regards to access (Bardhi, 2012).
Temporality is concerned with how time relates to both access and use of the object. There are differences between whether access to the object is granted as a one-off consumption, or if the access takes place through a membership of registration of some kind. In automobility, an example of this would be a traditional leasing or rental of a car versus registering with a car sharing company. Using the same example, the temporality of use is variable along a scale of longer periods down to hourly rates (Bardhi, 2012).

Anonymity depends on the context of use with regards to the aforementioned relationships to other people. This essentially depends on whether the object is consumed exclusively, or if there is social and simultaneous access granted to others. For example, car sharing where one individual gains access to a vehicle, in contrast to ride sharing, where a ride from one place to another is provided but will include real time sharing with an owner and perhaps other users.

Market mediation shows itself through whether the service is provided for an economic gain. For profit business will invariable mean that access is granted as a paid-for service. Other peer to peer access services may have a fee, but this is not necessarily for profit, and public or socially consumed access may fit into either category (Bardhi, 2012).

The *consumer involvement* dimension is significant in the amount of interaction the user or customer has with the supplier. More modern business models of car sharing place basic maintenance tasks on the user (cleaning, fuelling up), and this is what makes the more flexible operation possible, as opposed to returning a vehicle to be checked (Bardhi, 2012).

The *type of accessed object* can be made clear by the method with which it is accessed. For example, is it something we simply observe and take in, like an artwork, or do we put it to a practical use to fulfil a task? This could also be related to the physical existence of the object, such as that of a digital file, a painting, a car (Bardhi, 2012).

Finally, *political consumerism* manifests itself through people's choices and beliefs. It may be that having access rather than ownership of an object works as an identifier of one's values i.e. sustainable consumption (Bardhi, 2012).

Figure 4 below summarises the dimensions of access, how they manifest and the scales that can be used to measure.

Dimension	Manifestation	Scale
Temporality	Time	Short-Term Vs Longitudinal Limited or Long-term
Anonymity	Context - Public/Private Spatial	Social Vs Exclusive Proximity (Object, Consumer)
Market Mediation	Profit Not for Profit	Paid for Paid for/Not paid for Public/Social Peer to Peer
Consumer Involvement	Experience/Involvement	High Involvement - Flexible Low Involvement - Traditional
Type of Accessed Object	Nature of Access	Experiential Vs Functional Tangible Vs Intangible
Political Consumerism	Choice Political Beliefs and Actions	Access Vs Ownership

Figure 4: Summarising the dimensions of access (own summary of Bardhi, 2012).

2.3) Infrastructure as a System

To some extent, automobility seems not to be operating well in the core urban region of Copenhagen, due to issues identified so far. The road network is a system, and problems such as congestion develop because of the way in which people interact with the technology the system is designed for (Kaijser, 2003). Therefore, it is useful to understand the infrastructure as a system, and how it is developed, so that we might learn and adapt new systems differently. If alternatives such as cycling require infrastructure, then these too can be understood as systems.

Kaijser (2003) explains that an infrastructure system - or infrasystem - can exist in various forms, for example as waterways, electricity networks, and transport networks. Transport is a system of two-way flows, and as such can somewhat metaphorically be termed as *communicative.* The following characteristics and dynamics are identified.

Firstly, an infrasystem will allow for *movement* and be *reliable*. In the context of this report, the movement is generally that of people in various forms of mobility, such as the car or the bicycle. Reliability, as a qualifier in the meaning of the word is then stipulating that an infrasystem such as the highways and roads are consistently and freely available across the area in question (Kaijser, 2003). Regarding the core urban region, this can be said to be true. On the other hand, its reliability related to different times in the day, due to peak traffic, is an issue.

Secondly, the infrasystems for transport are characterised with *specific* networks, in so much as they are built for the exclusive use of a regime. Roads for automobility, rails for trains, bike lanes for cyclists (Kaijser, 2003). Issues can arise in infrasystems with negative externalities, and these are such as the ones we see developing from automobility mentioned in the introduction, of traffic congestion and environmental impacts.

The dynamics of infrasystems relate to their development over time. Kaijser (2003) identifies a phase of *establishment* being necessary, where the early difficulties such as investment and uncertainty must be overcome. The involvement of public authority may vary between construction and regulation and have an affect on success, but powerful actors are needed at this stage, just as Norton (2008) explained the way in which automobility became established (see 1 Introduction).

The *expansion* of a system can depend on economic returns and benefits, but in the case of transport infrasystems will most likely depend on the extended reach or range achieved and the usefulness of this. For example, being connected to more people and places is convenient and can help drive the economy (Kaijser, 2003). In other forms such as cycling, health benefits can also be achieved.

However, the expansion could again depend on the involvement of public authority and other social forces and values. For example, a bicycle network, well established in an urban area, needs sufficient force for expansion. If it cannot be an economic force, then this must come from elsewhere, such as social benefit (Kaijser, 2003).

Kaijser (2003) explains how eventually an infrasystem will reach a stage of *stagnation* in growth. Regarding automobility it can be speculated that this would stem from the aforementioned issues such as car traffic and congestion, lack of space in the urban area, and the general realisation of induced demand between roads and cars.

Finally, Kaijser (2003) identifies the dynamic of *interplay,* which accounts for the fact that infrasystems will both compete and coordinate with one another. This aligns with the apparent situation of there being a dominant regime of automobility. The interplay occurs with the dominant regime providing structure which then influences new and developing infrasystems. For example, a new bike network will likely follow existing roads.

2.4) Multi-level Perspective

Given the overview that has been set out in relation to automobility in Greater Copenhagen, it can be said that a change or transition is required in order for the negative aspects to be reduced or even completely overcome. The Multi-Level Perspective is a sustainable transition model and is therefore an appropriate framing of the problem area, in order to illustrate how the system of automobility can be perceived scientifically, and consider its structure in relation to other systems or actors.

The multi-level perspective (MLP) is made up of three analytical levels; niches, regimes, and landscape. These are set in a hierarchy of stability depending on how well established they become, or dependent on other levels. For example, a niche may exist inside or outside of a regime, whilst a regime will exist within landscape. A transition or change is something that occurs as a result of the interplay between these levels over time, and as such does not come about from a linear process. Structuration and time are the two basic scales of this perspective (Geels & Kemp, 2012).

From hereinafter, the multi-level perspective will be referred to as MLP**.**

Niches

A niche could be a new idea, innovation or novelty. Such things may or may not relate to an existing regime. They will tend to develop in research environments - outside of regimes or landscape - where they can be tested and improved. Within any niche there are the processes of vision, networking and learning (Geels & Kemp, 2012). Respectively, this would mean explaining the idea-phase, recruiting initial users or actors to gain momentum, and then using feedback and knowledge gained to improve or add in new or existing aspects.

The car was once of course a niche, a new technology, innovation, a novelty, breaking through and destabilising conceptions of what streets are and what they are for (Geels & Kemp, 2012).

Regimes

Regimes are established practices of various disciplines, that sit within the overall landscape (Geels, 2012). Being more established means that regimes are more stable than niches. A socio-technical regime is made up via an alignment of other regimes which share common ground. For example, we can consider automobility as a whole to be a regime, but it does not exist without the manufacturing, planning and policy, and user regimes (Geels & Kemp 2012). This alignment with other regimes is essential.

Some of these regimes will have counterparts that also align to help form other transport regimes, such as the train, bus or bicycle. However, there is a notable difference between these regimes and automobility, as they do not account for the same amount of mobility or benefit from the same level of allowances that are made for automobility. As such, they should be termed differently as *subaltern* regimes, to reflect their position in relation to the *dominant* regime of automobility (Geels & Kemp, 2012).

Landscape

The landscape is the physical and/or metaphorical setting in which regimes exist, be it physical infrastructure and characteristics of land, or a political ideology, societal values or trends (Geels & Kemp, 2012).   In either sense, this means that changes in the landscape can either stabilise or destabilise regimes (Geels, 2012). Destabilising factors stemming from landscape changes could be political, for example a policy that in some way makes using or owning a car significantly less viable for the majority of a population. In contrast, the landscape could help stabilise said regime via investments committed to existing infrastructure, or economic leverage of industry stakeholders providing jobs, and herein sits an aspect of 'lock-in' (Geels, 2012). This would make regimes seem impossible to escape from, as society proceeds so far with one approach, alternatives seem difficult and risky. What is more, there are many sources of lock-in that can occur in such complex systems: Technological, Organisational, Industrial, Societal, Institutional (Unruh, 2002).
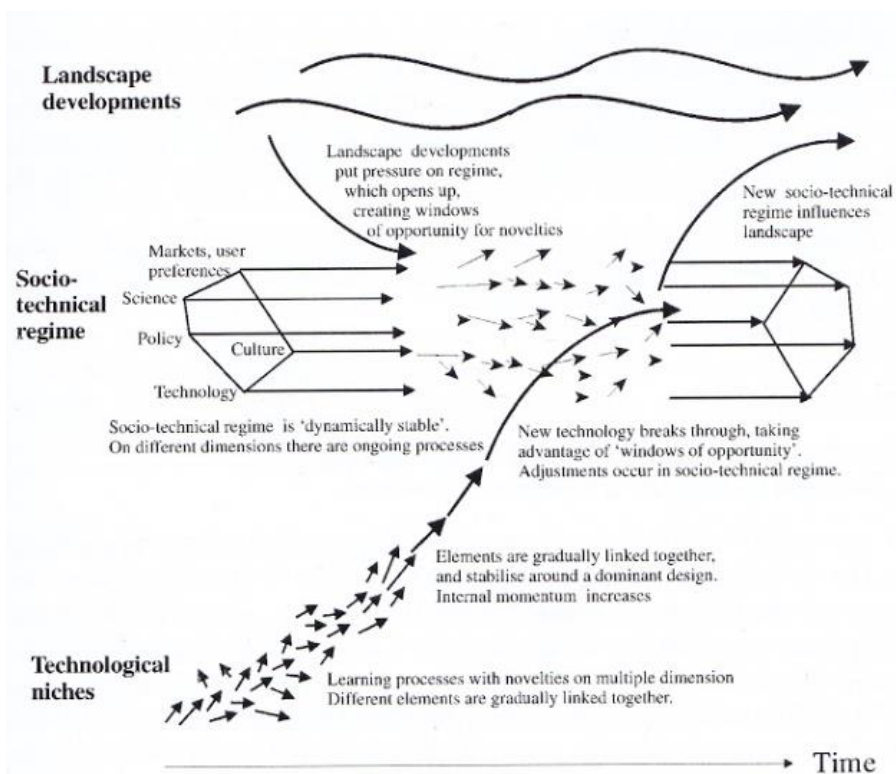

Figure 5: Multi-level Perspective on system innovations (Geels & Kemp, 2012. P. 57)

2.4.1) Automobility and Transition

According to the MLP, transition needs to be co-evolutionary between the three levels described above. Complex interactions must take place between actors in a nonlinear fashion (Geels, 2012). As such, it is not necessarily the case that a *failed* niche or innovation could not work or was not a good solution, but perhaps the additionally required interactions from other levels (regime, landscape) did not occur. Timing would be a key element to success and transition.

Urry (2004) acknowledges the multi-dimensional requirement for socio-technical change when proposing technical-economic, policy and social transformations are all necessary in order to *disrupt* the car system. Interestingly, some transitions are what could be interpreted as developmental, in that they do not result in a complete paradigm change (i.e. the car does not become subordinate), but rather its role is changed. When combining new fuel systems such as those of electric cars, new design using lightweight materials, smart technology (perhaps the use of smartphone apps), de-privatised use and different culture and more Intelligent Transport Systems (communication between infrastructure and vehicles), it is possible to imagine a much different car paradigm. Urry (2004) uses the term 'post-car.' A post-car era could in fact mean post-ownership, where the shift is towards an emphasis on access (Urry, 2004).

The elements that go in to and make up the above perspective are diverse. Political ideology resides at the landscape level of the MLP (Geels & Kemp, 2012). It is logical then to assume that influence at this level will be woven into public bodies and their function, i.e. the agenda of public organisations. Niches and innovations are not exclusive to the public realm. These of course are often the result of private business or organisations. Innovation can provide adaptation, new solutions, public influence and funding, and essentially interact with any political will that exists. Therefore, it is interesting to investigate what role different companies may play and at which levels perceived by the MLP.

3) Methods

The following chapter will present the methodology used to answer the research question.

3.1) Elements

The research question can be broken down into several key elements. These are as follows:

***How** do public and private companies seek to reduce car traffic in Copenhagen, and what are the associated **challenges**?*

- *What is the **justification** for their chosen course of action?*

A) How - This is concerned with the aims and goals of the specific companies. The way in which they go about their business, the solutions they provide, the tools they employ, their beliefs or advocacy is investigate via this part of the research question.

B) Challenges - These will include any problems, needs or difficulties resulting from part A) of the question, which then hinder or prevent the realisation of the companies aims and goals.

C) Justification - The final part of the analysis addresses the reasoning for why the companies approach is desirable. How is it better?

The guiding aspects of the question are as follows:

Public and ***Private*** companies - this aspect of the question is used to differentiate between types of company i.e. whether they are a private interest or publicly funded. The term *company*, is used freely in the sense that a public body may not identify as a company per se.

The above is investigated under the proviso that the activities of the company can be adjudged to help reduce car traffic in Copenhagen, whether that is the explicit aim of the company or not.

3.2) Identifying the Companies

The identification of public and private companies involved in activity that seeks to reduce car traffic in Copenhagen, is a task of finding actors playing a current role. An initial internet search led to the discovery of State of Green, a self-described entry point for exploring green solutions and information and profiles of numerous relevant organisations (State of Green [a], 2018).
Using the State of Green profile search, the criteria were selected as: Sustainable Transportation; Urban Mobility; Business & Public Sector (State of Green [b], 2018). This led to the discovery of the companies used in the remainder of this report: Copenhagenize Design Company, Green Mobility, Donkey Republic, and The Capital Region of Denmark, referred to as Region Hovedstaden, or Region H. Initial research on each of these companies - and others - was recorded and summarised

in a spreadsheet of key information such as public/private status, aims, tools, challenges and so forth (see Appendix D: Companies List). Contact was made by the author to the final selection of companies with regards to an interview with an appropriate member of staff.

It is important to keep in mind the Reverse Traffic Pyramid, identified in the introduction, as this is somewhat used as a screening tool for the companies.

3.2.1) Copenhagenize Design Company

Copenhagenize Design Company is a private consultancy working with the main aim of creating bicycle friendly cities and reducing the automobility presence. Although their projects are not exclusively set in Copenhagen, the company is based in the Danish capital. Its very name represents a particular image and set of planning principles and can be seen as a characterisation of a city that provides an environment conducive to bicycle friendly practices.

Copenhagenize Design Company provides analyses on consumption of space, cyclists behaviour, and an overall index ranking cities across the world in terms of bicycle friendliness.

The work of the company is built upon an emphasis and importance being placed on the provision of bicycle infrastructure, which itself should possess certain qualities, namely that it be a reliable, dedicated and connected network (Thoem, James. Interview by author. Audio recording. Copenhagen, March 22, 2018; Copenhagenize Design Co, 2018).

The inclusion of Copenhagenize Design Company is based on their activities appearing to align with the promotion of a common good, further to that outlined in the introduction, and to be taking action that counteracts the problems with traffic, the environment, and population. The emphasis on infrastructure as well as a single-minded bicycle strategy means that they attempt to deconstruct the dominant regime of the automobile from two different angles. The first of these is to develop the landscape and space we move through with physical infrastructure. The second aspect of this is the promotion and nurturing of a so called subaltern regime as defined in the MLP (see 2.4 Multi-level Perspective).

The interviewee - James Thoem - has a role as Urban Planner and partner in the company. It is anticipated that in the capacity of his role that useful and valuable insight can be obtained regarding the research question, not just for the advocacy of their own methods, but a general state of play in Copenhagen.

3.2.2) Green Mobility

Green Mobility is a car sharing company operating in Copenhagen, which uses a fleet of electric cars (e-car). Further to the clarification on car sharing made earlier (see 2.2.2 Access), this is exactly such a model where individual access to the car is gained, rather than simultaneous sharing.

As a private interest, aside from offering a mobility solution, the company is operated for profit. The business model functions as a free-float in the approximate physical space of the core urban region. Cars can be reserved or accessed spontaneously, all through the use of a smartphone app. Whilst the cars can be taken out of the delimited free-float zone, the rental must end somewhere within the zone. This can be anywhere on a street where parking is permitted, at a charging station in Copenhagen (not Frederiksberg) or at a designated hot-spot where charging facilities are also

available (Andersen, Torben. Interview by author. Audio recording. Copenhagen, March 27, 2018; Green Mobility, 2018).

Green Mobility offered an interesting example of a company and solution towards the narrow end of the Reverse Traffic Pyramid (see 1.2 Alternatives). The aim of adjusting the role of the car could be seen to maintain the dominant socio-technical regime of automobility, but at the same time this could genuinely reduce car traffic in Copenhagen. The model under which it operates is different to the norm, and so it is not completely clear as to whether the company is a niche, or already part of the regime. The interviewee - Torben Andersen - has a role as Chief Executive Officer (CEO) and of the company. In speaking with him, it is perhaps possible to clarify this and obtain valuable information to answer the research question.

3.2.3) Donkey Republic

Donkey Republic is a bike sharing solution available in Copenhagen and many other European cities. Here, the term *sharing*, also refers to exclusive access to the bike(s). As well as providing a mobility solution, the company operates for profit. The system employed is that of a series of geographical locations set as virtual hubs, where bikes can be collected and dropped off; this is known as the *hub-centric* model. Whilst the bikes can technically be taken anywhere during a rental, the rental can only be ended correctly by dropping the bike off at an available drop-off location or hub. The important aspect here is that the hub-centric model does not involve the use of exclusive docking stations, therefore the hubs all make use of everyday-regular bike racks. In Copenhagen, these locations are generally concentrated in the core urban region, and can change over time due to limits on the number of bikes permitted (e.g. a maximum of 5). All of this is carried out using a smartphone app (Ovacik, Erdem. Interview by author. Audio recording. Copenhagen, April 6, 2018; Donkey Republic, 2018).

Donkey Republic is in some structural ways very similar to Green Mobility, but with a different solution. They seem to more clearly belong at the niche level of the MLP. It is interesting that they can be seen to attempt to develop the subaltern regime of the bicycle through a sharing model. In an environment that is already somewhat bicycle friendly, it is interesting to see if this can be achieved, as in principle the challenge is to adapt the characteristics of the subordinate regime. The interviewee - Erdem Ovacik - has a role as Chief Executive Officer (CEO) and co-founder of the company. Having developed the company from the ground up, it is likely that useful knowledge can be obtained regarding the impact of the company and the challenges it faces in the context of the research question.

3.2.4) Region Hovedstaden

Region Hovedstaden (Region H) is an administrative body for the Capital Region of Denmark. Broadly speaking, the Region has various areas of responsibility related to health and hospitals. However, given the subject matter of this report, the focus will be on the department/office of *Mobility and Technology*, and their focus areas of cycling and green mobility. This all resides under the umbrella of Regional Growth and Development.

Region H has particular involvement with regards to the Cycle Superhighways project, through funding, coordination and certification of the highways, and this project will take the role of main practical example for how Region Hovedstaden seeks to reduce car traffic in Copenhagen. Cycle Superhighways is an extensive infrastructure project for the modification and creation of a high-quality bike lane network. It involves 23 municipalities across the Region, with the main aim of increasing the number of people commuting over 5km using a bicycle (Lundgaard, Helen. Interview by author. Audio recording. Copenhagen, April 17, 2018; Region Hovedstaden, 2018).

Thus far, each company introduced into the report has satisfied the private company element of the research question. One reason for the inclusion of Region Hovedstaden is to obtain a public interest into the report. Furthermore, it is hoped that the inclusion of a public company can provide an alternative perspective as to how to go about tackling the issue and discover what challenges this brings.
The interviewee - Helen Lundgaard - is a Senior Consultant within the Mobility & Technology cluster, and has responsibilities relating to cycling and green mobility (not to be confused with the company). By speaking with Helen, it is interesting to see if the activities of Region Hovedstaden occur at a macro level or otherwise, if their aims align with any of the other companies, and in which ways they seek to counteract the issues that have been introduced.

3.3) Research Process/Strategy

The approach of this paper is pragmatic, because there is no philosophy or ideology driving the research. The aim is to create knowledge that can be applied in practice and reflect a life-word situation. The question begins with asking *how* public and private companies seek to reduce car traffic in Copenhagen. Therefore, the logical step is to identify companies whose activities appear to fit this description and enquire directly to them. The data generated from the interviews is a representation of the world according to these people and their companies. Knowledge has been gained of a small part in a much broader area, and so it cannot be said in a positivist manner that truth has been gained. Rather, something truth-like is obtained with regards to the four companies (Boisvert, 1998). Despite initial research questions i.e. those categories and questions used in interview, it is the collection and interpretation of the data the drives theoretical considerations for discussion; this is therefore an inductive process (Bryman, 2008), with the researcher is not necessarily neutral, by being active in the research process and identifying meaningfulness (Boisvert, 1998).

3.4) Data Collection: Semi-Structured Interviews

The interviewees for each company are as follows:

- ❖ Copenhagenize Design Company - James Thoem (Partner/Urban Planner)
- ❖ Green Mobility - Torben Andersen (CEO)
- ❖ Donkey Republic - Erdem Ovacik (Founder and CEO)
- ❖ Region Hovedstaden - Helen Lundgaard (Senior Consultant (Cycling, Green Mobility)

Semi-structured qualitative research is deemed to have the key components of, purpose, descriptions, life-world, and interpretation of meaning (Brinkmann, 2013).
The purpose of the interviews is to produce and obtain knowledge from relevant sources, in regard to the research question. The interviewees' insights are provided through their description regarding the world, in this case Copenhagen and automobility.
The companies in this report are doing something to deconstruct automobility in some way, the goal therefore is to obtain a description of their experiences of doing this.
These descriptions must be interpreted, and the implications of this are will be discussed more (see 3.5 Analysis).

Once each interview was set and agreed, an interview guide was produced and sent to the interviewee in advance (see Appendix A: Interview Guides). The interview guide was made up of general themes and company specific questions derived from the information collected in the companies list (see Appendix D: Companies List) and the picture established in Chapter 2) Theoretical Considerations.

At each interview an audio recording was taken. This minimised the need to take written notes and allowed the interviewee to speak naturally. The audio recording was subsequently transcribed (see Appendix B: Interview Transcripts). All interviews generally followed the interview guide, however the approach was semi-structured, allowing for a relative amount of divergence in the exact wording used to ask the questions, as well as the order in which they were asked depending on the topics arising (Brinkmann, 2013).

The interviews were carried out face to face, on an individual basis, yielding qualitative data. In comparison to more structured interviews - a strict question and answering process - this form allows much more leeway with regards to what the interviewee deems important. Whilst this can uncover interesting and relevant material, it still allows for the interviewer to focus on issues seen as relevant or important to the project (Brinkmann, 2013).
The challenge is to remain in control and avoid the conversation taking irrelevant tangents. Given the positions held by each interviewee within their respective companies, the interviewer was willing to allow their knowledge of the subject to somewhat guide proceedings.
Achieving this balance is made easier by the choice of individual interviews. A one-on-one conversation is easier to lead and return to relevant topics if there is too much divergence.

Furthermore, a rapport can more easily be developed helping to gain good honest answers (Brinkmann, 2013).

One of the drawbacks of this type of interview, is that despite returning qualitative data, many non-verbal signs or gestures that may show emphasis on a certain point, are lost and not recorded in the transcription process (Brinkmann, 2013). This is not seen as a significant problem with regards to the data's value in answering the research question.

Qualitative interviews can generate vast amounts of data in the form of long transcripts. This can be a challenge with interpretation becoming a time-consuming process, and difficult to rationalise into analysis (Brinkmann, 2013). The analysis method employed attempts to counteract this.

3.5) Analysis

The interview data was analysed using a thematic analysis method, inspired by the steps identified by Braun & Clarke (2006). The full interview transcripts were carefully read through and any meaningful sentence was coded, using a few short words or a phrase. As much as possible, the wording used for the code was the wording used by the interviewee in the sentence.

Once all the coding was complete, they were kept in groups of the respective company and split to the main elements of the research question for context (how, challenges, justifications), and to provide the author with a manageable data set. The codes were reviewed in search of potential themes, whilst referring back to the transcript when necessary. A theme would be a sufficiently reoccurring aspect within the coding and data.

The writing process for the analysis began, during which the themes became more clearly defined and were found to be those present across all of the interviews. Within the themes of the analysis, segues in content are identified to the reader.
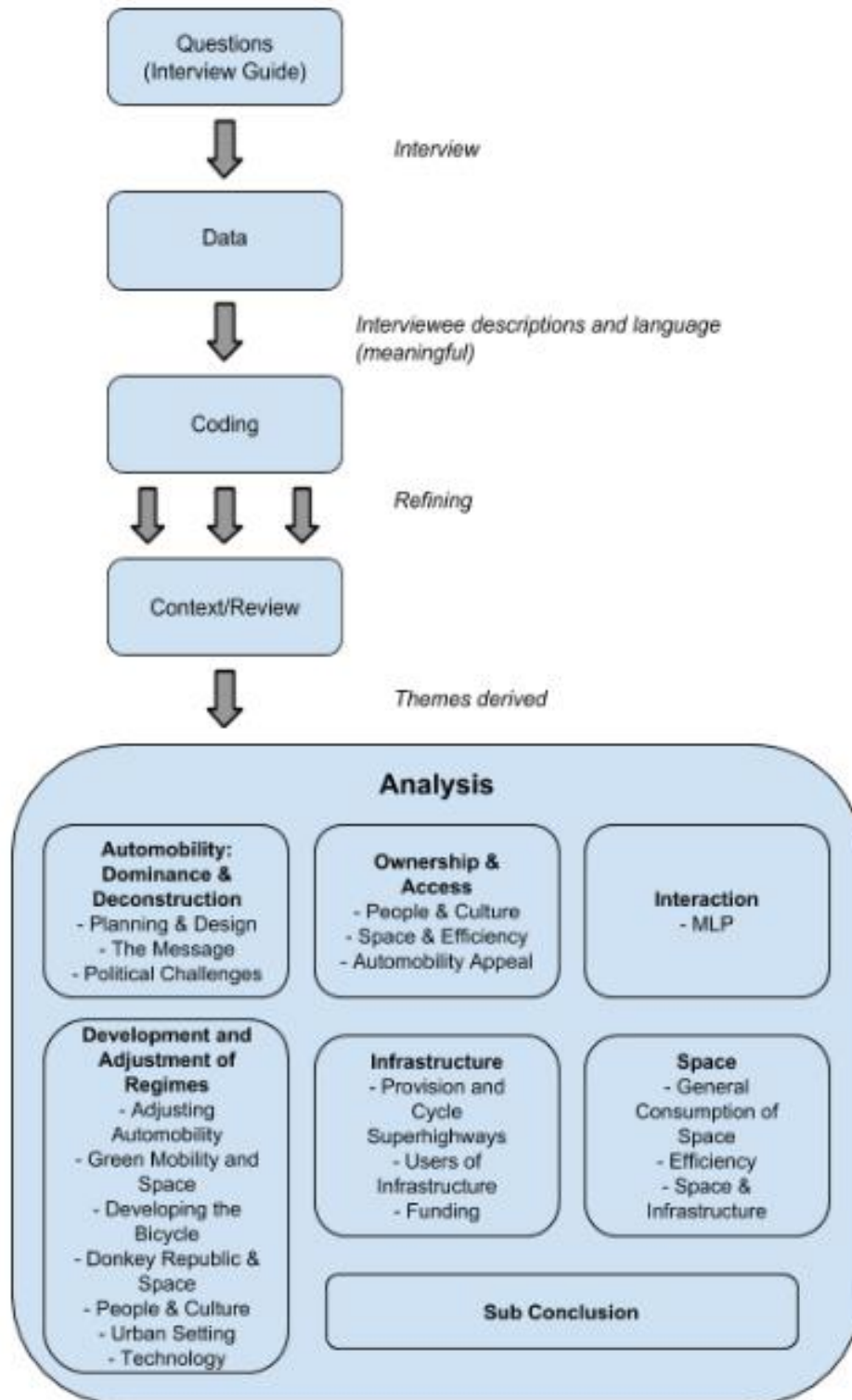
Figure 6:Analysis Process (own creation).

As explained previously, qualitative interviews can result in vast amounts of data, in the form of long transcripts. One of the key benefits to conducting the analysis this way is that it provides the author with a systematic way of rationalising the content.

This is an inductive approach where the data - or more importantly, the *language* of the interviewee - is used to generate the codes, which in turn make up the themes. The result, is themes that are closely related to the data set, as opposed to being derived from a particular theory.

On the other hand, it is somewhat debatable as to whether the researcher can completely remove them self from wider aims and goals of a report, as well as considering prior knowledge. The questions for the interviews were born from somewhere. The refining process of the data being coded and thematised on the value of the interviewees words can go some way towards removing bias, but this is difficult when part of the interpretation is to decide what is meaningful (Braun & Clarke, 2006).

3.6) Trustworthiness

With regards to validity and reliability, it is perhaps more appropriate to discuss *trustworthiness* with regards to qualitative research (Bryman, 2008; Brink, 1993).

Trustworthiness consists of the following criteria: credibility, transferability, dependability, confirmability (Bryman, 2008). The issue of credibility is concerned with the best practice of the research, in so much as to a harmony between the observations and concepts. This is essentially concerned with whether or not the research question has been answered.

From an external perspective, the question is whether or not findings can be generalised across the field. Bryman (2008) correctly states that qualitative research often involves intensive study of a small group, and this feels true of this paper. If the field is that of public and private companies in Copenhagen, in some capacity seeking to reduce car traffic, then it is perhaps not possible to say that it can be generalised across. Further to the pragmatic standpoint of the paper, further study and inclusion of a greater number of companies would arguably achieve a more credible truth as opposed to truth-like.

The dependency and confirmability relate to how repeatable the research is, or the extent to which it can be replicated. As explained, a systematic method was employed in order interpret the data. Therefore, whilst the procedures such as coding of data can show that the results are not completely accidental or unfounded, there will always remain the interpretation of meaning - which is subjective - and so is perhaps less repeatable in terms of analysis and outcome (Bryman, 2008).

4) Qualitative Analysis

The following analysis identifies the key findings revealed by the interview data. Having initially coded the interview transcripts, the following themes are identified across the data:

- ❖ Automobility: Dominance and Deconstruction
- ❖ Ownership and Access
- ❖ Interaction
- ❖ Development and Adjustment of Regimes
- ❖ Infrastructure
- ❖ Space

The analysis is structured according to these themes, and they are multidimensional in nature.

4.1) Automobility: Dominance and Deconstruction

Planning & Design

There is a clear emergence in the interview data, that automobility retains a level of dominance due to a number of supporting factors. One of the biggest challenges presented in reducing car traffic and advocating for alternatives like the bicycle, is the historic embeddedness of the automobility regime. When first introduced, the car was often perceived negatively. However, by establishing itself as the default planning concern this influenced how cities including Copenhagen developed, therefore resulting in a self-preserving path:

"Yes, they're seen as speed demons [in the beginning] and they're really the public enemy and then through a series of - on many fronts - through communication and then also through engineering, [...] the regime changed in way, and how the car become the de facto thing that was planned for."
Thoem, J. (2018). Personal interview.

Part of the problem with this is continued investment in automobility provides the regime with further stability and is counterproductive to the pursuit of a maintaining a bicycle friendly city:

"Investing in more automobile infrastructure is antithetical to the city that Copenhagen is aspiring to be."
Thoem, J. (2018). Personal interview.

In the view of the MLP, this can be seen as a stabilising factor at the landscape level. The vast amounts of planning and money already invested into a system, traps future development and decisions making.

Planning and design can change the physical landscape that we move through. As advocated for by Copenhagenize Design Company, this approach can reduce the presence of automobility through rules and restrictions and physical alterations in specific areas. A design approach could be preferable to financial disincentives or tactics that might temporarily reduce car traffic. Meaning, rather than allowing the regime of automobility to continue operating in the same way - but perhaps under harder financial constraints - the planning priority should change and affect the urban *landscape*. This has been done in places such as Nørrebrogade:

"So, if you look at streets like Nørrebrogade, there's one block where it's buses only, so just small little design interventions like that, urban acupuncture if you will, through design to reduce car traffic is one event that you can point to."
Thoem, J. (2018). Personal interview.

Rather than a congestion charge, design solutions are seen as more effective, and could simply prevent private car use all together in certain areas or streets. The benefit to this design approach is its permanence and influence:

"That's why the design solutions are useful because they're more permanent and concrete, and less easily absorbed by the economy."
Thoem, J. (2018). Personal interview.

Furthermore, in order to reduce car traffic, the focus and priority of urban planning and design must actually move away from the car and look to more efficient ways of moving people. Meaning, automobility should not be the first thing that is planned for, it should not be the default:

"How can you actually make the street and the city more efficient, and move more people; a nicer place to be in by turning to these other modes of transportation?"
"[...]rather than how many cars can you move down the street? They changed the question to, how many people can you move down the street?"
Thoem, J. (2018). Personal interview.

This typifies an approach that directly aims to deconstruct and lower the priority given to automobility. In changing the focus of urban planning and design - in this case to cycling - it must be accepted that automobility will be challenged or confronted, and therefore limited in some way:

"Something we've always embodied within our approach, but then is sometimes harder for our clients to stomach, is that planning for the bicycle also entails that by making the bicycle a more legitimate mode of transportation, you are also limiting car traffic in certain ways whether it's through speeds or access."
Thoem, J. (2018). Personal interview.

The Message

Also, at the landscape level in the realms of societal values and beliefs, both Copenhagenize Design Company and Region Hovedstaden, are involved with communicating a message. This message can be seen to put pressure on automobility. Communications are found to be a key aspect of how to go about this, by raising the profile of the alternatives. In the case of Copenhagenize Design Company, that would involve portraying cycling in a positive light, and by doing so attempting to change the narrative around how cities are used. By producing and publishing an index of cities around the world which ranks them for their 'bicycle friendliness' this helps to maintain the profile of Copenhagen as one of the highest ranked in this respect. In doing so, it could be perceived that this keeps pressure on key actors, to persist with further car traffic reducing measures. This also helps raise the profile of such planning philosophies for other cities:

"As you may know it's published every two years with wired magazine, we look at over 120 cities around the world, we research them, rank them and then publish the top 20 most bicycle friendly cities, with wired. This is a way for us to really drive the conversation internationally, around bicycle friendly cities, and even in a way driving competition and getting other cities to really step up their game and build better bicycle infrastructure, and also of rewarding the ones that are doing a really good."
Thoem, J. (2018). Personal interview.

Part of relaying a positive message is also about the perception of cycling within the general public. Through research and observation studies, companies like Copenhagenize Design Co, can provide counter arguments to typical negative stereotypes, such as that of the *rule breaking cyclist*:

"So, what we do, how we use that in a broader context is that through these studies we can see that, looking at the behaviour of hundreds or even thousands of cyclists at one particular intersection we can see that only a fraction of the users will actually be breaking that law. Whereas the perception out there in the public is often that cyclists are always breaking the law, so it gives a counter argument."
Thoem, J. (2018). Personal interview.

The message from Region Hovedstaden, is one of *priority,* in so much as they would encourage people to think about their mobility much like the Innovation Lab's Reverse Traffic Pyramid, presented in the Introduction (see 1.2 Alternatives).

"We don't say that everybody should cycle, we say that if possible it's a priority list, we would like people to walk and cycle because it's best for everything. It's the best thing for our health, for the climate, for pollution, for congestion and so on and so on and so on. But we recognise that not everybody can cycle every day, and walking is relatively small trips, then we recommend that people go by train or bus. If that is also not a possibility, well maybe not every day, some people have more things that they need to launch during the day, and maybe the train and the bicycle doesn't fit in to that programme. So maybe they do need to take a car - not every day - but some days. Then we say, if you do really need to take a car, try and see if it could be an electric car. In the end, if an electric car is not an option then take your fossil car. So, this is a way of thinking that should be changed also."
Lundgaard, H. (2018). Personal interview.

The message needs to be backed up by action, such as providing better bicycle infrastructure, and the two are combined in the approach to promoting cycling in favour of automobility:

"I think we always combine the actual building with the campaigns and behavioural measure that make people [use it]. Sometimes people just need to know that there is a bicycle lane; a new upgraded bicycle lane where they live or where they work. We always in the super cycle highways project work with both infrastructure - providing the infrastructure - but also campaigning and behavioural matters and measures."
Lundgaard, H. (2018). Personal interview.

Political Challenges
Political conflict is also an issue at the upper, landscape level. It could be argued that this acts as a stabilising factor - in the interim - as such conflict is conducive to status quo; a dominant automobile regime. For example, previous attempts to implement economic disincentives on automobile use in Copenhagen, with congestion charging had been approved at the municipal level. This was subsequently blocked by national government:

"I forget how long ago, I think it was 10 years ago or so - that the municipal government actually voted in favour of having congestion charging, much like you have in London, much like you have in Stockholm, but the national government blocked them on that. So, they went back to the drawing board and tried to figure out other ways to reduce automobile congestion in the city, rather than the financial approach."
Thoem, J. (2018). Personal interview.

The overturning of a measure that seeks to limit the automobile merely illustrates the strength of its position. The lack of a cohesive approach from different sides remains to be an issue in the present day, with some political parties advocating for a more car-friendly Denmark, as a part of their campaigning in national politics:

"For example, the party, the Liberal Alliance. They have posters up in Kongens Nytorv, rights now, that say, "Fighting for you to make cars cheaper and more affordable!" and then another billboard that says, 'A VW Passat now costs 100,000 crowns less thanks to us.'"
Thoem, J. (2018). Personal interview

This would not appear to align with encouraging a hierarchical thinking process of prioritising types of mobility, as it is a political endorsement of private car ownership, which will later be explained as problematic.

Furthermore, factors on the front line appear to be supporting automobility (or private car ownership), in the core urban region as pointed out in the interview with Torben Andersen. In particular this applies to the cost of parking; an unavoidable expense. However, the cost of a *residents* parking permit is determined by the environmental impact of the vehicle. As such, an electric or hybrid car would be the cheapest; it is correctly claimed in the interview that the cost of the permit can be as little as DKK100 per year. The issue emerging here is that the low cost of *residents* parking certainly does not discourage ownership with even the most expensive permit coming in a little over DKK1,000:

"You know, let's take the example today. If I want to own, if I buy a VW Up, it costs me 100kr to have it parked on the street on an annual basis if I am a citizen [resident], in the city. That is ridiculously cheap. Anyone else, if I don't live in Copenhagen; I live out in the suburbs, if I want to have [or] if I even want to have room on my land to park my car [...] you know I couldn't buy land at a price cheaper than this. So, right now they're renting out the streets to citizens at a fraction of its value. If they decided to make parking just nearly resemble the cost of the land that it's occupying, then we would have a completely different car ownership situation in the city."
Andersen, T. (2018). Personal interview

Whilst this potentially encourages *ownership* for residents, the e-car sharing business must operate at higher visitor costs and rates for parking like any other privately-owned car belonging to a non-resident.

Thus far, the Green Mobility niche has not been able to benefit from as many favourable conditions as it might, in order to challenge the dominance of the mainstream automobility. If parking availability away from charging stations is subject to the same rules and conditions as that of a privately-owned vehicle then this is a potential barrier to increasing the popularity of the model. For example, a time limited parking space in a street could allow unrestricted parking for the e-car sharing company, given the likelihood of the car being rented or moved in a reasonable time. In other cities such as Oslo, there are other favourable conditions such as allowing the use of bus lanes:

"They could say that if I park in a time restricted [area] - you know some places will only have 1-hour parking or something like that - I cannot allow people to park there now, because if they park I don't know if the car will be moved within 1 hour. But the question is whether it would be better for the city

to say well, 'shared cars generally move fast so we don't give them a ticket for being parked in a time limited space.' Several ways that they could make it more attractive. And you definitely, in Oslo, an electric car, regardless of whether it is shared or not, is allowed to drive in the bus lane. So, they can use that special lane to get an advantage compared to the gasoline cars. The list of ideas, of things they could do, is almost limitless right, but right now they're doing very little I would say."
Andersen, T. (2018). Personal interview.

The political dimension also poses an issue for Green Mobility due to continuity and this stems from working across three different municipalities, all of which have subtle differences in parking rules. This can be a hindrance if users are not aware of the differences, and this could result in a bad experience should any parking fines or penalties then have to be added on to their costs:

"Today I operate in three different municipalities and those three municipalities have slightly different parking rules, so it's difficult for people to understand exactly where they are allowed to park and where they're not allowed to park with my vehicles.
In Copenhagen, if you have an electric vehicle you can park outside of a charging station, and you're allowed to park there for as long as you like. In Frederiksberg you're only allowed to park outside a charging station for 4 hours, because you should make it available for someone else. So, I encourage people to park in front of a charging station in Copenhagen, but I cannot do it in Frederiksberg, and if you're not very familiar with where the municipal border is then you could end up with a ticket."

If such a solution is to become more widespread in use, then a political commitment is required to create a more favourable environment, conducive to e-car sharing rather than private car use.

4.2) Ownership and Access

One of the key ways in which some of the companies seek to reduce car traffic is by offering alternative models or paradigms with regards to how objects are used or consumed for mobility. This is true of both Green Mobility and Donkey Republic, with the shared electric car, and the shared bicycle, respectively. These *shared* options operate using *access* paradigms, as opposed to *ownership*. This is interesting, as it targets one particular aspect of each regime.

People & Culture
Part of the challenge to the success of a company such as Green Mobility is that its model goes against the embedded habits of people. Automobility has largely developed under a model of private ownership, and so to enforce the prohibition of this in any setting would be near impossible, but it must appeal enough to people to break their routines:

"Well, I think it's a little bit like...well, maybe I shouldn't say it this way. Maybe it's a little bit like cigarettes right? That you would probably not allow the privately-owned car today [...] if we hadn't invented it, you would not allow it the way it is. But, it's going to be extremely difficult to take away from people."

Ownership of a car can be perceived to bring a high level of convenience.
In comparison to a traditional car rental, it is this convenience that the *sharing* model looks to emulate, without the need for owning a bicycle or car. This is where the meaning of *sharing* is distorted (see 2.2.2 Access).

"My neighbour, my next-door neighbour and I, we both use our service on an almost daily basis, taking a car to the city centre and maybe some days we might be driving at the same time. Why is it that we are sitting in two cars instead of one?"
"The challenge with car sharing today is that, or ride sharing as I see it, is that I don't want to be dependent every morning on your behaviour, right? I just today wanted to get in early because I had an interview with a candidate at 08:30, so then I don't want you or I don't need you to come in early as well."
Andersen, T. (2018). Personal interview.

It is also proposed that the concerns of younger people are less focussed on car ownership providing some kind of status, whereas older generations are more likely to prefer having their own vehicle for these kind of reasons, as well as a greater awareness and consciousness among younger people regarding negative environmental externalities of automobility:

"Yeah, I mean the whole idea that you want to have your own BMW or whatever car it is, and it show your status and it's an image of who you are, I think it pays a lot less with young people than with my generation. That's of course also a cultural element, no doubt about it. But I also think that there is a consciousness among young people that they think more about their resource usage and there is no planet B."
Andersen, T. (2018). Personal interview.

This is also related to a wider trend of the development of sharing economy being seen as an acceptable way of conducting our daily lives, as with automobility alone it exists in subtly different forms. At the heart of this justification is the greater emphasis people now place on access as opposed to ownership:

"We also see that, sharing economy has come to a stage now of a maturity level where people feel comfortable with it and not just a small fraction of people that are keen on this for ideological reasons but everyone sees this as a way to do things. Access - at least for young people - has become so much more important than ownership. So, in that respect you can say sharing economy has moved to a completely new level."
Andersen, T. (2018). Personal interview.

It is also explained that as ideal as cycling may be, people do have different physical abilities and the need for a different solution is also being met by offering access to shared cars, as for some people to make a complete change away from using automobility would be dramatic:

"However, for many people, doing 7km on a bicycle [is just] that's a relatively far bike ride and they would either have allocate some more time for it, maybe also think about different clothing and things like that. But it would also be quite a dramatic change to their modality behaviour."

The behavioural element mentioned here is in this case linked to peoples real or perceived need for automobility. Given the extent to which this can be embedded in behaviour, it is argued that an access paradigm is preferable to ownership, given the justifications for space and efficiency:

"That's based on the fact that I do believe that people appreciate and for certain purposes need or at least believe they need automobility, and if you don't have access to that without owning your own car then car ownership becomes the only option for you."
Andersen, T. (2018). Personal interview.

Space & Efficiency
The justification therefore in terms of efficiency is made up of the idea that it is not efficient or logical to own such an object as the car, on an individual basis, when it will not be in use for significant periods of time. To have access to automobility only when needed makes more sense:

"I think that if you look at it overall, the whole idea of shared mobility, I don't think you need to do a lot of research to actually see that it makes sense, because we can just see how cars are parked and not used. The whole idea that you own something that is sitting outside and standing still for the vast majority of the time just doesn't really make sense."
Andersen, T. (2018). Personal interview.

The success of a model like this can then contribute to reducing car traffic in Copenhagen, particularly over time if new road users can access automobility without ever having to purchase a vehicle. Furthermore, those already owning a vehicle in the core urban region will have the option to postpone any future purchase given that their needs could well be met through shared mobility, and this forms the grounds of part of the justification for why this is a more desirable model:

"I actually believe that we help reduce the number of cars, because people will postpone their decision to buy themselves a new car or they might decide when they scrapping - if they have a car today - not to replace it or not to have the second car, because we actually make it possible for people to better use us, public transportation, or bicycle, other modes of modality in general, because we provide them with automobility."
Andersen, T. (2018). Personal interview.

The displacement effect of access to a shared vehicle against privately owned cars has been an observable phenomenon in different studies in North America and Germany. Whilst this cannot be directly transferred as an assumption for Copenhagen, it does prove an effect of providing access markets:

"However, if you can get access to automobility without owning a car, then I believe we are actually reducing the number of people who actually needs to own their own car. [...] Car2Go made a North American study, that showed replacement of one shared car, replacing up to 10 privately owned cars and there's also a study from Munich city that also shows private car displacement. Although they say that they believe that data is very specific for Munich; it cannot be used elsewhere."
Andersen, T. (2018). Personal interview.

Automobility Appeal
But with the mention of a 7km journey, this is where private car ownership becomes a real challenge, as the traffic coming from *outside* the core urban region is most likely made up of this branch of automobility and a significant percentage of the traffic:

"Because this strategy says that congestion is bad, health problems, we have climate issues, we have all sorts of different societal challenges, and if you want to solve these problems we need to do something about the private cars."
[...]
"Not only for small trips on the cycle but also for longer distances, and if you look at the core city and Copenhagen, Frederiksberg, then they know that they can't solve their problems alone, because a lot of the traffic in Copenhagen each day comes from the outside."
Lundgaard, H. (2018). Personal interview.

For example, those people with a daily commute in the lower end of the alternatives catchment area could be deterred from abandoning their private car due to the glass ceiling or journey time for commuting versus comfort factor, or perhaps the number of changes required on public transport:

"I think I actually heard it is 1 hour is the turning point [preferred commuting limit], and also how many shifts [changes] you have. When I go to work in Hillerød, I need to go to the station here, then I need to get to Hillerød and then I need to change to a bus or I need to go by bicycle the rest of the way. So, I think they say people don't want more than 1 hour of travel. Maybe it's half an hour, half an hour would be even better, but also it's a matter of shifts [changes]; how many times are you going to shift [change] between modes of transportation, and how long you are waiting for the next mode to arrive."
Lundgaard, H. (2018). Personal interview.

A big part of the challenge in getting people to switch from using a car to a bike or otherwise is due to the general appeal and comfort of automobility. If the perceived positives, for example journey time, are not sufficiently better with the alternative then people are likely to remain with the car:

"You have more cultural behaviour and lifestyle things, we talked a lot about that also, the thing that you need to change your software, the way of thinking. There's also something about comfort, a lot of people, they don't care about spending time in their car because it's so comfortable to be in the car, so they would never do anything else than take the car, for that reason."

As much as technology can enable the sharing alternatives covered in this analysis (Green Mobility, Donkey Republic) it can also enhance automobility in its appeal as something that is desirable to own, by making driving a nice experience:

"*I think technology - not just apps but technology - they both reduce and enhance automobility. Because you all the time also have more new solutions that will make it easier to go by car, so you don't only see [...] we use apps to connect people, when they need to carpool, or Green Mobility or Drive Now, it's a central thing in their business model.*
Also Donkey Republic and Bycyklen, use apps and technology. Of course, it is in that way crucial to their development, but you can also find a lot of examples of technology making cars more attractive."

4.3) Interaction

Region Hovedstaden has a general mandate related to regional growth and development and this is centred around becoming:

"*[...] a green and innovative metropolis with high growth and high quality of life.*"
 Lundgaard, H. (2018). Personal interview.

There is however a connection between their public goals and private companies such as those discussed already in this analysis. The Region's framework of efficient and sustainable mobility, contains a growth area of smart growth which aims to have sharing economy as a driver.
As such, the Region can work with such companies in seeking to reduce car traffic.
This is an illustration of potentially creating a window of opportunity for the new socio-technical regimes, as explained in the MLP. To that end, private companies can be viewed as the talent that brings new ideas and innovations to the fore:

"*They play a role, especially when it comes to new solutions, new technology and so on.*
Firms can work with their own workforce, or firms can be drivers for change because they create and come up with new solutions. Smart solutions, soft solutions, new technology and so on."
[...]
"*So, they are innovators, the innovators of green development and technology, and so they are also important.*"
Lundgaard, H. (2018). Personal interview.

However, there is not necessarily a direct interaction between Region Hovedstaden at the landscape level, and companies at the niche innovation level of the MLP. A transition is co-evolutionary between the levels, so whilst the door can be opened by Region Hovedstaden - for example with the project of Cycle Superhighways - it is up to the innovators to walk through it, and also dependent on the stability of the dominant socio-technical regime of automobility:

"No, it's difficult to help them directly, because there are different rules; procurement rules, competition rules and so on, that means that we are not allowed to support a company directly. We also have some economic constraints in the public sector, we need to cut all the time on expenses, so we can't necessarily afford to help start-ups and innovative firms because they are typically more expensive."

[…]

"We can help them in that development phase. We can help with tests and demonstration, but anything that is normal running of the business or the operations of the company, we are not supposed to dig into; we can't."

Lundgaard, H. (2018). Personal interview.

This is unfortunate, as it could mean potentially ideal solutions being delayed in implementation, or not coming to fruition whatsoever, due to the overall timing of events. This compatibility issue can be related to the speed at which the private sector innovations emerge, with the more cumbersome public organisations perhaps being unable to keep up. For example, in developing smartphone apps for use with bicycles:

"[…] we will never be able to run as fast as google and the private planners."

[…]

"We can't support them directly, we are simply not allowed to do that. We can buy their solutions, for example we have bought a few places the bike share system of Copenhagen, the white bicycles [Bycyklen]."

Lundgaard, H. (2018). Personal interview.

4.4) Development and Adjustment of Regimes

A significant aspect of the two solution-based companies (Green Mobility, Donkey Republic), is that they look to either adjust or develop their respective form of mobility, in some kind of evolutionary process, as a way of deconstructing automobility in its traditional form.

Adjusting Automobility

By providing *access* to automobility, Green Mobility play a role in evolving the way in which cars are perceived and used. The cars are shared and also run on electricity as opposed to traditional petroleum. This is a developmental approach to change:

"I think that we are [developmental], if you look at us compared to the connected autonomous vehicle, then we are evolution more than revolution, right?
But if you compare us to the privately-owned car and just say well, the fact that there are just cars available in principle everywhere, just take one and drive your trip and then leave the car, it does represent quite a dramatic change. Because, we've always been used to cars as something we owned ourselves […], if you took it somewhere you had to take it back etc. So, in that respect it's quite a big change, I would say."

Andersen, T. (2018). Personal interview.

In this sense, the use of a sharing economy model is being adopted to reduce car traffic. However, whilst it is presented in the interview data that a change is occurring, it is seen as an *adjustment* as opposed to a complete paradigm shift due to the similar characteristics of the cars and relatively mainstream technology, whereas current developments in driverless technology are perhaps on the cusp of becoming more mainstream and making a bigger change to the regime:

"But of course [a big change, but], not as big as the self-driving car or the autonomous vehicle there. I guess [...] making it a complete paradigm shift is taking the mouth a little bit too full."
Andersen, T. (2018). Personal interview.

Green Mobility and Space
Automobility is also adjusted in the way in which it uses and consumes space with Green Mobility. The strategic use of space is built into the operation of the solution, as a general operation zone is set at the approximate boundary of the core urban region of Copenhagen. This includes hot-spots throughout the city (optional pick up/drop off hub) and satellite zones that sit outside of the core urban region or main operation zone but are of enough significance to be included e.g. Copenhagen Airport. It may seem somewhat paradoxical, in that by operating within a confined urban space, it could be suggested that a greater density of automobiles and congestion will be the result. However, in order for the alternative of car sharing to be efficient and flexible, a close proximity of desirable locations and activity is required:

"Free float car sharing requires a density of people, in order to operate. Whether that density requires a capital kind of density or whether it can be a smaller city [...] where we are right now where it is still a somewhat limited percentage of the users that are ready for these type of solutions, I think we need to be in a quite urban setting."
Andersen, T. (2018). Personal interview.

In times of increasing population and urbanisation, and fast-moving society, it is proposed that by providing another option for mobility, this can help spread the workload by providing people with another choice of modality for moving around the city; not necessarily the only solution, but part of a holistic approach:

"In the cities where urbanisation and our desire to have individual mobility is driving a lot of congestion and challenges with pollution, and air quality etc etc. We like to see ourselves as part of the solution to that problem."
Andersen, T. (2018). Personal interview.

The aim therefore is to specifically reduce the individual use of privately owned cars, or longer term traditional rentals in the core urban region, in favour of e-car sharing as a way of reducing overall car traffic and making automobility more environmentally friendly, but also aiming for a more efficient and equitable use of space and place:

"I think that many streets in the inner Copenhagen area would be a lot more pleasant if we told people that they could be quite sure there'd be a shared vehicle down there so they didn't have to park, have

their own cars parked there [...]. But, a combination of different solutions there would definitely make it possible for us to have a lot nicer streets because we would have space to use for something else."
Andersen, T. (2018). Personal interview.

Regardless, the overall justification for the solution provided by Green Mobility, it is claimed that the shared e-cars spend more of their time in actual use than the average privately owned car. If a car is spending more of its time on the road in motion, this means there is a less of a likelihood of it being parked in a street or elsewhere consuming space:

"There's no doubt that our cars are driving 2 or 3 times more than the average car out there. So, in that perspective it's more, moving in the street than parked in the street compared to the average car."
Andersen, T. (2018). Personal interview.

Those that are parked, and stationary are not necessarily parked in a typical street parking situation. Due to the requirement for recharging, many will be returned to designated 'hot-spots' or other charging points, which are for the exclusive use of electric vehicles or Green Mobility cars. As such, the spatial impact of the cars is more controlled:

"But, if you look at the space we occupy you could say the combination of us actually renting our own private parking spaces and the fact that the cars are driving more, I generally think that we are consuming a lot less space than any other cars."
Andersen, T. (2018). Personal interview.

Developing the Bicycle
Just as their car-based counterpart, Donkey Republic looks to develop their form of transit, the bicycle. Part of the approach and strategy is to increase the role of the bicycle in the city. This can be done by improving availability in a similar access model offering the bicycle on demand:

"We have the motto now, after long discussions. 'Making life and cities better for everyone.'
The bicycle is just a small component of that maybe, but we do think that making cities more sustainable, bikes have a big role to play. Switching people from cars to bikes and making cycling more convenient because you have bikes available when you need them."
Ovacik, E. (2018). Personal interview.

This includes capturing different types of users making different types of journey, with a convenient and accessible service. For example, taking multiple trips in one rental, or a simple one journey-one rental situation. Users are defined as visitors, occasional or frequent, and the service meets different and overlapping needs:

"Both the occasional and frequent users are most likely to use it in the city, and they have two types of needs. 1) I want to keep the bike the whole day. You take it in the morning, you take it to work, the bike might be sitting while you're at work and then you go back home on that bike. Sometimes you'll take a meeting outside of your work, you go on that bike to the meeting, back to work and then back to

the station, or you go by shopping or somewhere like that. But you'll take on average 2.5, 3 trips in the whole day, while you go to work and back with that bike and your trips will be under 10 minutes each; just around 10 minutes. That's one need they have, the occasionally and frequent. 2) The other need they have is the single trip just A to B, one trip, that's typically 10-15 minutes.
[...]
Then you have the visitors who use the bike 7-10 times during the day, 7-10 trips."
Ovacik, E. (2018). Personal interview.

So, there is a distinction between users, rental and trip type in the service that is available. This allows people to either retain a bike for a certain period of time - whilst making numerous journeys - or only renting the bicycle for the period of the single journey i.e. just to go from A to B.

Essentially, the bicycle can play a role in providing mobility whatever the individual needs during the day. By providing quick and easy access the bicycle can become the default or preferred mode of inner city transit. This develops the role of the bicycle as ownership is no longer necessary.

Donkey Republic and Space
Developing the role of the bicycle is enabled by a specific spatial model. Donkey Republic employs a 'Hub-Centric' model with regards to the distribution and collection points of the bikes. This entails the presence of a hub, every 200-300 metres. The hub is a shared location within public space, and key to this is the fact that the hub is not a physical structure but a geo-location with a designated radius:

"I'm not sure which one you are referring to, but you could take multiple trips in one rental and you can end at any other of drop off locations in Copenhagen. We have about 300 drop off locations which are almost equivalent to physical stations, except there's no physical station, it's just a geolocation on a map."
Ovacik, E. (2018). Personal interview.

It is within these hubs that bikes can be picked up and returned. However, hubs carry a limit as to how many bikes can be located there at the same time (for example, five) to avoid clustering and any other negative impacts this may have visually:

"We also are limiting the number of bikes that can be left in a geolocation. So, with the city we coordinate, the city tells us that on average or in general they don't want more than 5 bikes."
Ovacik, E. (2018). Personal interview.

The hubs involve the use of everyday/regular bike racks and facilities, and so given all of these characteristics they provide a high level of flexibility whilst maintaining control over public space and avoiding the need further consumption of public space from exclusive facilities:

"We don't think that there should be exclusive or designated locations that only bike shares can use, like the Bycyklen the white bikes system, they have their own designated stations."

[...]
"So, we believe that we should be putting a lot of racks out there which can be used by both private people and a bike sharing systems like us."
Ovacik, E. (2018). Personal interview.

Furthermore, this model provides flexibility depending on the size of the town or urban setting, whereby smaller places can host fewer centralised hubs, and larger towns or cities like Copenhagen, a more dispersed pattern.

"So, as a rider you can take the bike out from a hub, you can lock and unlock away from the hub, wherever you want, but then you have to finish it or bring the rent bike back when you end your rental at a hub. These hubs can be quite centralised so when we have operations let's say in a small town like Roskilde or Hillerød then we put maybe 5-10 hubs central and then people who take the bike away to visit their parents then come back to the station and leave the bike there, that means we don't need that many bikes to offer a pretty good service in a rather small town."
Ovacik, E. (2018). Personal interview.

Overall this is presented as a better use of city space stemming from the characteristics of the company:

"Maintenance level, bike quality, a hub-centric operation, not a free-float to make better use of the city space."
Ovacik, E. (2018). Personal interview.

This takes care of physical and practical aspects of developing the bicycle (Donkey Republic) even further than it stands today in Copenhagen, but there are other issues and challenges.

People & Culture
The way in which we perceive cycling in general, both as a society and from the perspective of the cyclists themselves can hinder development. The challenge lies in refraining from a subculture identity within cycling, as this is not typical of an established mode of transport:

"To be honest, part of the barrier is what you see in many cities, many countries, of bicycle culture. [...] But the sort of sub-culture of cyclists. The middle-aged guys in lycra, they have their expensive bikes, go out for rides at the weekend, or the people that self-identify as a cyclist, and they name their bike and they do all these things, you know. They nerd out over the weekend about changing their bearings and all these things, that is a sub-culture mentality within cycling that is not indicative of an everyday mode of transportation."
Thoem, J. (2018). Personal interview.

In contrast, the perception needs to be that of the bike as a *tool*, no different from the vacuum cleaner. Something that we use, but do not identify with en masse:

*"We say, you may as well be talking about vacuum cleaner culture - you've heard that one before -
everybody in Copenhagen has a vacuum cleaner in their closet, but they don't say, 'Yeah, I'm a
vacuumist!'"*
Thoem, J. (2018). Personal interview.

Urban Setting
The adjustments to the paradigm being made by Green Mobility, also face limitations or difficulties.
The need for an urban setting would appear to be a prerequisite for the sharing operation to work.
Whilst the company operates as free-float in terms of where cars can be picked up and left, this
takes place generally within the confines of the core urban region.
As pointed out in the interview, this relates to the need for a density of people to allow for a free-
float system to work:

*"Free-float car sharing requires a density of people, in order to operate. Whether that density requires
a capital kind of density or whether it can be a smaller city [is debatable]. Where we are right now
where it is still a somewhat limited percentage of the users [people] that are ready for these type of
solutions, I think we need to be in a quite urban setting."*
Andersen, T. (2018). Personal interview.

Therefore, part of the challenge presented in reducing car traffic in the city is that the solution is
confined to it, whilst private automobility is not.

Technology
Regarding technology, it has been seen how this enables both niche innovations discussed, to exist
at all. They both operate and rely on the diffusion of the smartphone, and apps. However,
technology can also be a challenge to developing or adjusting regimes. For example, part of the
appeal with Donkey Republic, is the potentials for a multimodal journey. Until more fully
integrated aggregators are available, it is somewhat less likely that a multimodal journey - including
the use of a Donkey bicycle - would be made spontaneously, as the single integrated presentation of
this is not available when looking to go from A to B:

*"I think it's very important to have better and better aggregators, when you want to go from A to B, to
give you all the alternatives, also payment mechanisms so you can rely on it. I think google maps have
in the last 10 years become much more reliable in terms of how many minutes you can count to be
there, but it doesn't include a lot of different mobility alternatives, like Green Mobility or Donkeys are
not on google maps right now."*
Ovacik, E. (2018). Personal interview.

Thus far, despite notable improvements in prediction of travel times with Google Maps for example,
but the issue lies in the fact that the majority of options operate on independent platforms,
including Donkey Republic:

"There's a lot of work with integration across platforms. Rejsekort platform for instance is a closed platform and if you could pay with your Rejsekort card or your Rejsekort account to which we could make an API integration, through our app, [...] it's all going to be through an app [it would be a lot easier]. We need to really open up the micro mobility space to, from the few people who sit controlling those platforms."
Ovacik, E. (2018). Personal interview.

Improvements to hardware and physical technological components of the solution could somewhat improve recruitment of users but do not represent a significant challenge through their absence:

"I think that a lot of the technology in the bike share space was about smart-lock. I think you'll see another big improvement with e-bikes becoming more and more a part of the mix. Of course, Bycyklen is an e-bike but it's really heavy and bulky and very expensive to operate right now. When that becomes more of a standard and you see more e-bikes but also other e-scooters or other types."

4.5) Infrastructure

As it resides within the physical space we move through, infrastructure makes up the socio-technical landscape.

Provision and Cycle Superhighways
From the interview data and coding, it is clear that infrastructure is viewed as one of the most important aspects of implementing the cycling alternative across the city, and therefore reducing car traffic and the dominance of automobility. In order to be successful, the characteristics of the infrastructure are crucial. These are that it be a network of: reliable, dedicated and connected infrastructure:

"That's one of the main approaches to our work, is that it's infrastructure. You can do everything you want to promote cycling, but people aren't going to get on a bike until they have a reliable, dedicated, connected network of bicycle infrastructure."
Thoem, J. (2018). Personal interview.

This is part of making the alternative appealing to use, and the provision of infrastructure with such characteristics forms the basis of treating the alternative as a legitimate mode of transport:

"That's incredibly important, because we approach cycling as a legitimate mode of transportation, you have to treat it as a legitimate mode of transportation."
[...]
"It's wide enough, it's comfortable, it's separated from pedestrians, it's separated from cars, and is throughout the city."
Thoem, J. (2018). Personal interview.

The main point, above all else is *provision*. If the commitment is made to provide best-practice infrastructure, significant results can be achieved, as this will go a long towards making cycling the quickest and easiest way around the city. This is exactly the kind of landscape pressure that can create windows of opportunity for niches.

This is being exemplified by Region Hovedstaden. The infrastructure project of Cycle Superhighways is a new way of prioritising cycling and is aimed at encouraging people to make bicycle journeys of distances over 5km. These are known as the *regional distances* and are crucial to reducing car traffic in the core urban region by extending the *range* of cycling:

"But sometimes the behavioural thing is not just a soft cultural communication thing, so you actually need to change something, some infrastructure, some hard things [physical], because that's also a framework condition for making a different transportation choice, next time you need to go somewhere. So, for example the super cycle highway infrastructure is meant to make it easy for people to choose a sustainable and healthy alternative, to make competition for the cars and public transportation, to make it attractive to go by cycle instead of those [other forms]."
Lundgaard, H. (2018). Personal interview.

With the target of 28 routes across the region by the year 2045, this can provide an extensive cycling network. The provision of infrastructure can stimulate change by offering a real alternative that can actually compete with automobility, or give the opportunity to niches like Donkey Republic to appeal to people making journeys over 5km:

"We usually say that the total network of super cycle highways - we now have 8, we are supposed to have 28 routes in maybe 10 years and before 2045 I think we have 48 routes we would like to realise - the cost of the total network of super cycle highways is between DKK 1 and 2 billion."
Lundgaard, H. (2018). Personal interview.

This is sought out by ensuring certain characteristics are built into the alternative infrastructure of Cycle Superhighways, in order to make cycling conditions better and the quickest way from A to B:

"We have four main criteria that are guiding the realisation of the network of Cycle Superhighways. It is the quickest way from A to B. It's Accessibility and Connectivity, so a route should be connected and be accessible for a lot of people. Security is an issue, you should feel secure when you bike there, and also comfort, it should be comfortable."
Lundgaard, H. (2018). Personal interview.

The Cycle Superhighways are scored and confirmed as superhighways using various parameters and measures in a points-based system:

"When you make a super cycle highway and you approve of them in the steering group, we look at the different parameters, and they get rated/scored, on the basis of a points system that we have created

for super cycle highways. Then it says that you should at least have a minimum of points - certain points in different categories - in order to be certified as a supercycle highway."
Lundgaard, H. (2018). Personal interview.

Users of Infrastructure

Whilst some of the companies then are providers of infrastructure, other have needs and are users of infrastructure and facilities. Obviously, Green Mobility somewhat benefits from the established traditional automobility, and uses the road network provided in and around the core urban region. However, given that Green Mobility operates exclusively with the use of electric cars, there is also of course the requirement for charging infrastructure or facilities to keep the cars running. One issue identified here is related to whether or not the charging points are provided by publicly or at the cost of the company. Public provision is at good level in Copenhagen but an increase in popularity over time can present a challenge with regards to obtaining a suitable balance of the number of electric cars on the road against the number of available charging stations.
This is sited in the interview with the example of Amsterdam:

"You could also argue that even if you have a large infrastructure in a city - Amsterdam for example I believe there are 1,200 charge points - but they also have quite a large population of electric vehicles already, so you know, at least as far as I understand it is difficult to find charging in Amsterdam, at the public charging points because they are already occupied with other cars that are charging."
[…]
"We have around 50 [of our] own sockets and access to around 700 public sockets from e.on with our zone."
Andersen, T. (2018). Personal communication.

There is then a question surrounding infrastructure and facilities as to how it is provided, and who is using it. Considering the approximate ratio in Copenhagen, there is a general reliance on infrastructure and facilities being provided:

"So, from that point of view it's not so straight forward. We are relying on a few things, we are relying on a parking regime, which allows street parking or otherwise offers parking facilities that we can get access to and hopefully pay by the hour electronically."
Andersen, T. (2018). Personal interview.

Donkey Republic on the other hand may seem to require and use relatively basic infrastructure and facility, but this should not belittle the scale. For example, Cycle Superhighways could be of extensive benefit, not to mention the already existing network of bike lanes in the core urban region.
Of the additional facility required by the bike sharing company, it is mainly that of bike parking racks. However, the challenge lies in whether these exist at a steady supply or if the number is increased to create an environment conducive for success of the bike sharing model:

"We like that bikes are parked at bike racks because it keeps them orderly - otherwise they can tilt and people can step on them - so it's just having enough bike stations for private [bikes] and our bikes in a city. So, Copenhagen suffers from not having enough bike racks for private people, [...] 40-50% of all bikes parked in public spaces are not parked at a rack because there are not enough racks."
Ovacik, E. (2018). Personal interview.

Given the problem with the percentage of bikes at public spaces not being parked in racks, this is a clear challenge with regards to avoiding adding to the problem:

"We don't again want designated bike parking zones for shared bikes. We just want enough bike racks for everyone, which is also part of our mission."
Ovacik, E. (2018). Personal interview.

Part of this challenge stems from people owning secondary bikes that remain locked up in public spaces for the majority of the time. Shared bike access can combat people's reasons and perceived needs for doing this:

"There is a lot of spare bikes in the city that citizens have locked in stations like Nørreport, Hovedbanegården, different places around their buildings, which they only use if their other bike has a flat [tyre] or if they have a guest. So, there's many, most people have a second bike. Those second bikes to start with can be replaced with a shared bike."

Therefore, to conclude the theme, it is observable that an overall investment in bike riding infrastructure and facilities is needed to help justify this company's model and help reduce car traffic in Copenhagen. This it would seem needs to be in the very least publicly provided:

"We want other people with their private bikes to have a good time with parking their bike. We are not fighting against them, we want a better bike infrastructure for everyone. Then we also want cities to invest more in the bike riding infrastructure; both bike parking and bike riding infrastructure."

This lack of bike racks can be a difficult need to meet. If infrastructure can create windows of opportunity for niches, then this means more is needed in the view of Donkey Republic. But if a situation exists already where some spaces appear cluttered and saturated with bikes, the addition more racks could be practically difficult.

Funding
To conclude with infrastructure, it is necessary to zoom out somewhat and consider the political aspects revealed. The political challenges of reducing car traffic in Copenhagen are presented in this theme of the interview data in three ways. These are *financial*, *coordinative*, and pertaining to a *consensus*.

Financially, funding for the Cycle Superhighways project is a challenge, as the costs of the final infrastructure will vary greatly depending on the standard to which the project is delivered:

"1 billion Kr, if you just follow the lowest requirement, maybe 2 billion Kr if you want to go for the high level, but we don't see anyone going for the high level, because it's too expensive."
[...]
"I think there are so many great things you could do to make a cycle path, to upgrade it to a high class like super cycle highway. We have so many good ideas and so many solutions, we know them, they are well known, but we can't afford the best solutions."
Lundgaard, H. (2018). Personal interview.

This of course is related to the question of what is affordable across the 23 municipalities involved. At this point the *coordination* aspect becomes a challenge due to the involvement of so many municipalities. Achieving a network with a continuity in of standard becomes problematic:

"This is a cooperation between at the moment 23 municipalities, and the super cycle highways will always cross more than 2 or 3 or 4 municipalities, maybe more."
[...]
"One of the hard things about creating a super Cycle Highway is to make the municipalities cooperate, and have the same guiding principles, the same standards, the same quality. So, when you are a user and you cycle on the superhighway, you should not feel the difference. This in itself is an issue."
Lundgaard, H. (2018). Personal interview.

Furthermore, the lowest requirement in the previously mentioned parameters and measures that qualify the route as a Cycle Superhighway, has become typical of the infrastructure:

"Each municipality on the line needs to have a certain score in order to be allowed to call it a super cycle highway. We have not seen yet a super cycle highway that scored much higher than the lowest requirement."
Lundgaard, H. (2018). Personal interview.

More generally, achieving a *consensus* in that such a project is the correct course of action is a difficulty. Political differences mean contradictory agendas exist as well as the layered nature of public authority (local/regional/state) resulting in a potential lack of clarity with regards to responsibility for the provision of funding and infrastructure:

"We directly elected the politicians in the regional council, and of course you have different opinions there, and you would have politicians thinking that we should do everything to make it easier to go by car. You have politicians of a different opinion that would do anything to reduce people's freedom to just go by car anywhere."
[...]
"Whose role is it to make sure that the trains run every day, that the roads are fixed and that employees can get easily and quickly to work every day? Private firms look at that as a public-sector role, something that the public sector has to provide, this is the responsibility of the public sector."

4.6) Space

The final theme emerging from the analysis is, space. This appears as a common justification for why automobility should be dismantled from its current form, and alternatives nurtured and developed.

General Consumption of Space
Through the in-house analyses developed by Copenhagenize Design Company, it is clearly illustrated that automobility is an intensive consumer of space and infrastructure:

"So, the arrogance of space analysis, is where we take an aerial photo of a site, or an area of the city, maybe an intersection, maybe it's a street segment, and we overlay a grid and then categorise how each square in that grid is used. So, what you see then is obviously the automobile has a disproportionate amount of space in our cities."
Thoem, J. (2018). Personal interview.

This means that a preference for cars results in fewer people using a greater amount of space, and this is space that could be put to alternative use, or more efficient use. Part of the justification for changing the paradigm completely is the view that minor changes to other aspects, such as ownership or fuel source, do not sufficiently address the spatial consumption of automobility:

"For me as an urban planner, as a geographer, the issue with cars for me is that they're incredibly spatially inefficient. That they - of course resources as well - are spatially, resource inefficient. Changes in fuel source and ownership models don't really tackle either of those issues."
[…]
"If you look at - how should I best phrase this - a highway in L.A. chock-full of cars, is still going to be as inefficient and…as inefficient whether it was cars that run on gasoline or hydrogen or whatever, it's still a massive waste of space."
Thoem, J. (2018). Personal interview.

It was further highlighted within this theme that if the dominant regime is not challenged and remains to be continually planned for, the consumption of space will merely intensify, as the more accommodating planning is for automobility the greater the increases in car traffic and congestion will be:

"What that led us to [this point] and what we've learned 80 years later, is that the more space for cars you build, the more cars you're going to get, this whole concept of induced demand that you may have read about."
Thoem, J. (2018). Personal interview.

Bicycle sharing is undoubtedly beneficial in the spatial and sustainable sense and this solution can help improve cycling in general. The previously mentioned challenge regarding people owning secondary bikes and cluttering parking areas can be addressed through sharing. Rather than two in

three bikes remaining stationary and consuming varied amounts of space - depending on the ownership or access model - these could be replaced by a shared bike. The spatial drawback of a fixed physical hub or docking station can be avoided if the preferred hub-centric model is used:

"For every bike [fixed hub/docking stations] you need multiple designated spots, so there's flexibility in the system, so you can go from A to B and leave it there. The industry average is 1 to 3, so for each bike you need 3 spots, so that when you go to another station, the chances are quite high that there will be space, otherwise they will fill up. If it was 1 to 1 you could never find a new space because you have the exact same number of racks as bikes, and you couldn't go somewhere else. But if there's 1 to 2 and half, 1 to 3 then you start to have flexibility, so you can go and leave it at another rack. But, if you don't let private people use those empty racks, then you're designating a lot of space that cannot be used, which is also sad."
Ovacik, E. (2018). Personal interview.

Efficiency
Coupled with space, is efficiency. Specifically, this relates to the reasoning that planning for automobility, and how many cars can be moved along a street, is therefore an inefficient practice; one which emerges from the street being treated as a system rather than a public space:

"As a vehicle, as mode of transportation, the car is incredibly inefficient, and we need to re-democratise how we use our space, how we use our urban spaces, so that there are plenty of options that are equally as appealing and equally as successful as the automobile is these days."
Thoem, J. (2018). Personal interview.

In particular, what is most often private use of public space is inherently inefficient, as it fails to return a decent level of mobility in comparison to that which is consumed in the urban setting. If something is inefficient but still growing then the question is raised as to whether it is sustainable, when movement around the city is required on a daily basis:

"Whether people own their cars or if they are taking shared cars, people need to move in and out of their homes to their workplaces. In Copenhagen we have 250,000 daily DSB users, and something like 150 - 180,000 are 'pendler,' with cards, monthly cards. The rest are taking daily trips. So those regular users are living in the suburbs and going to work, or [living] in the city and going to the suburbs, but either way there's a big traffic of people coming in and out, and that's [...] 20% of the greater Copenhagen population doing that. A bunch of them are commuting by car, so is the current level sustainable? I would say it's too much."
Ovacik, E. (2018). Personal interview.

Given the amount of personal travelling taking place in the city, and the apparent advantage cycling would appear to have over automobility when it comes to sustainability, the justification leads back to a wider question about what is desirable:

"If you take as a total of the people have to commute for work, and there's a lot of personal travelling happening every day in the city. What is sustainable? What is desirable, for a city [that] in terms of the total car modality?"
Ovacik, E. (2018). Personal interview.

Space and Infrastructure
The justifications for the pursuit of Cycle Superhighways and cycling as an efficient and sustainable form of mobility can partly be attributed to the better use of space in comparison to the car. Considering the amount of space required for each form of transport, there is a fairly obvious proportional issue in the core urban region. This is one of automobility consuming a large amount of space in order to move a small number of people, with cycling consuming little space to move many people:

"I think about it, many times when I'm out on the cycling lane and waiting for a green light, and how many cycles can line up, how many people can be in [the space] as you've seen, these comparisons between how much space the cars take up versus the cycles or the people in a bus or something."
[...]
"[...] but it's just a fact that cars take up a lot of room and there's [often] one person in each car."
Lundgaard, H. (2018). Personal interview.

This does not mean that the space that could be liberated from automobility should immediately be put to use for cycling infrastructure, as a default. Rather, space could also be redistributed as for other public benefit e.g. broader pavements, recreational space. In addition, traffic reductions from better use of space could assist priority traffic such as ambulances:

"Of course, if you ask my personal opinion, of course urban space could be used much better. It could be used for recreation, it could be used for super cycle highways infrastructure, it could be used to broaden pedestrian streets and so on and so on."
[...]
"Also, maybe there is a thing that we don't talk about so often, and that is to liberate space from private cars, shouldn't just make more room for recreational activities [like] cycling and you know, healthy transportation and so on. But also, it should make more room and better conditions for the necessary transport in our city. For example, you have freight and private firms that need to deliver goods. It's a big problem for them that there is so little space. We all need a city full of goods and services, and maybe if we reduce the number of cars in the city, it would be easier for the necessary transportation; ambulances. So, it's not only to make it easier for people that want to walk or cycle, green parks and so on."
Lundgaard, H. (2018). Personal interview.

Although car sharing business models and electric cars can go some way towards nullifying the negative externalities of ownership and pollution (respectively), there will always exist the disproportionate use of space issue with automobility:

"Of course, what we are trying to say is that automobility is not necessarily bad, we would just like to switch over to fossil free cars. In terms of becoming fossil free in 2050, also cars are part of the solution, because we need cars. We just need these cars to be driven by electricity, or maybe gas [...]. That would solve the climate problem and also a lot of problems with pollution and air pollution and so on, but it would not solve the problem with congestion, because if you have a Green Mobility car [shared car] or you have any kind of car, it takes up the same room in the public space. So, cars are not the only solution."
Lundgaard, H. (2018). Personal interview.

4.7) Sub Conclusion

Throughout the interview data, it is revealed that automobility is perceived as a dominant socio-technical regime. All of the companies involved in the research are carrying out activities that seek to reduce this dominance. This is pursued in a number of different ways.
Firstly, the companies operate at different levels as perceived by the MLP. Some are providers of infrastructure for alternatives to the dominant regime, and this falls into the category of a *landscape development.* In doing this, they are also seeking to deconstruct automobility, by changing the default of what is planned for in the urban environment i.e. changing the planning question.
Other companies offer technological niches as solutions or alternatives to the dominant regime, as more efficient forms of mobility. These are enabled by modern technology such as the smartphone and apps, allowing the introduction of new processes in a backdrop of changing ownership and access models. These niches either attempt to adapt automobility into to a new regime, or look to develop the status and standing of subaltern regimes to become more prominent, but they require appropriate activity at the macro level to create a suitable opportunity.
Further meaning and significance of the findings will be covered in the following chapter.

5) Discussion

The following section aims to interpret and describe the meaning of the key findings in relation to how the companies might seek to reduce car traffic in Copenhagen, and the challenges that come with doing so. To reiterate, the key findings are identified within the following six themes: Automobility: Dominance and Deconstruction, Ownership & Access, Interaction, Development and Adjustment of Regimes, Infrastructure, Space.

Before exploring the significance of the findings, it necessary to consider the potential limitations of this report. Firstly, the expansion of the report to include more companies could help provide more weight to the findings. To begin with this could be done by seeking similar companies offering solutions or planning. Furthermore, the report reflects a situation in Copenhagen, and therefore cannot be generalised to make assumptions elsewhere. The interviewees and companies in the report all have an interest in activities that can be seen to go against traditional automobility. As such, it is important to consider that there are many other ways in which different companies might also seek to reduce car traffic, but not be considered attempting to unmake automobility. For example, the use Intelligent Transportation Systems on roads, or Corporate Social Responsibility schemes from large employers.

From the beginning of this report it has been proposed that automobility has established itself as a dominant regime of mobility. The findings suggest that there is indeed an extensive amount of embeddedness at work with regards to this dominance.
This occurs at various levels perceived by the MLP. Even *niche* innovations such as Green Mobility are potentially supporting the dominant regime, and from the *landscape* level it is maintained through developments such as the *establishment* and *expansion* of a large scale infrasystem in the form of a road network. With urban structures being shaped around the infrasystem used by cars, this provides a high level of stability. Deconstructing this is not only difficult because it resides in the physical landscape, but also because it becomes embedded in people's behaviours and habits, as shown through influence on choice (see 2.1.1 Influence on Choice).

However, new solutions do attempt to change our relationships with technology. This has been found in the form of companies offering *access* to mobility without the burden or responsibility of *ownership*. The access models preferred by the solution based private companies in this report (Green Mobility, Donkey Republic), can be seen to avoid many of the *constraints* associated with travelling from A to B, particularly the *authority/steering* constraints associated with public transport. Furthermore, both of the solution based private companies bear all the characteristics of the dimensions of access explained by Bardhi (2012). The *market mediation* of these companies is one of *profit*, and it remains to be seen if their paradigm can reduce car traffic in Copenhagen in comparison to the level introduced at the beginning of this report, but it may well be a side effect of their business.

It is also found that there is a process of development and adaptation taking place with regards to the regimes identified in the report. Automobility and cycling are made up of a coordination of other regimes (see 2.4 Multi-level Perspective) and it is the influence of technology and user preference that is helping the respective niches break through. Given the uniqueness of Copenhagen, having somewhat already established a bicycle culture, the norms and structures of society are well placed to allow for the development of niches such as bicycle sharing.
The interplay found in the analysis in the form of innovations, adaptations and developments offers good support for the MLP as a model to view transition.

The setting of the core urban region appears to be a natural home for the *sharing* model, and this can be explained by the need for a proximity of activities and people (see 2.1.1 Influence on Choice) to be concentrated yet far enough apart that it supports a reliable distribution of the solution (cars, bikes) and a consistent geographical spread of a hub or hot-spot that users can quickly and easily get to. The lack of activity and connection to other forms of mobility in suburban areas means that the incoming *regional* car traffic will prove difficult to reduce with these solutions. It is therefore more appropriate that efforts to reduce car traffic in the *core urban region* be made by focussing on encouraging a situation where the dominant regime becomes and remains cycling, followed by any other *access* paradigms. The significance of this for the core urban region will be a re-democratisation of the city space, as forms of mobility take on a more discreet but efficient presence. Outside of the city, it is automobility that will remain dominant but the approximate boundary for the divide in dominant regimes is still to be decided. Based on average journey distances covered by both e-car and bicycle sharing solutions, as well as the regional distances targeted by the Cycle Superhighways, it would seem that the battleground will be the 5-7 kilometre journey. Further study and analysis could be focussed on this area.

The findings consistently identify infrastructure as crucial with regards to the success of the niche companies. The desirable properties of bicycle infrastructure identified by Region Hovedstaden and Copenhagenize Design Company, essentially describe the characteristics of infrasystems as identified (see 2.3 Infrastructure As a System). Bicycle lanes in Copenhagen are already *established*, so it is the development of projects such as the Cycle Superhighways that represent the *expansion* phase of an infrasystem. This is a landscape development of physical infrastructure and the delivery of a high-quality network can assist companies like Donkey Republic to convince more users to switch to their product. The same concept can be applied to Green Mobility, for example with the provision of charging points, or introducing permission to drive in bus lanes.
This means that the provision of infrastructure should be considered a priority as a key driver for change, and this requires political commitment and leadership.

In summary, public authority has been caught up in planning around automobility. Whilst there are things happening at the landscape level, more can be done to nurture niches whose activities align with wider public aims. This can mean public authority engaging with private companies in two ways. Firstly, on the policy level, where a change to policy not only fits with wider public aims but also nurtures niche company activity that is of the same ethics. Secondly, by engaging with planning and design companies like Copenhagenize Design Company, expert knowledge on how to

make improvements can be gained. Public and private companies are not necessarily looking to reduce car traffic in Copenhagen, at least not explicitly. However, there is a common ethos for better solutions that comes with health benefits, environmental benefits, better use of space and fewer of the negative externalities associated with traditional automobility.

6) Conclusion

This report set out to investigate; How do public and private companies seek to reduce car traffic in Copenhagen, and what are the associated challenges?
It has been found and illustrated that this is done through a variety of means and activity at different levels. Representatives from the companies were interviewed and it was established that the way in which they carry out their work, and the challenges arising from it, shared common ground in the form of: Automobility - Dominance & Deconstruction, Ownership and Access, Interaction, Development and Adjustment of Regimes, Infrastructure, and Space. The companies can hold very different positions with regards to this common ground, for example the difference between aiming to provide and implement major infrastructure versus needing and using infrastructure that is provided. There is an alignment of ethics between companies, and this is where greater planning and cooperation can achieve change and traffic reduction.

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