Title

Transition towards Sustainable Urban Mobility in Stockholm

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Abstract

Rapidly rising population generates an increase of private vehicles. Respectively, during the recent past the growth in transport has risen remarkably. It is known that transport brings numerous benefits not only to individual users but businesses as well. However, it provokes many side effects that are beginning to surpass overall benefits. These advantages are formed with a significantly high cost, which comes in a form of substantial externalities through accidents, congestion, inequality in accessing motorized transport, pollution, landscape destruction and many others. It is clear that the current situation is unsustainable and there is an urgent need of fundamental changes in the realm of mobility. Videlicet, the transition towards sustainable urban mobility is required.

This Master Thesis focuses on transition to sustainable urban mobility. The report analysis the case study of Stockholm, by investigating the contribution of different planning practices - two developments of the Trendsetter project (clean vehicles and fuels, and the congestion tax) and the Urban Mobility Strategy of Stockholm to sustainable urban mobility transition. In this project the dynamics of implementing these practices that are radically different from current car-based regime are explored. In order to understand how diverse planning practices contribute to transition to sustainable mobility, a combination of transition theories and sustainable mobility paradigm is applied to analyse the case.

The conclusions in the report are deduced by applying above mentioned theories to the analytical part of the project. The research characterizes how diverse planning practices can influence the transition to more sustainable mobility in Stockholm and become a part of the existing car-based regime, as well as how this regime is trying to oppose these innovations.

Keywords: *transition, sustainable mobility paradigm, transition to sustainable urban mobility, Trendsetter, the Urban Mobility Strategy of Stockholm*

Preface

This Master thesis report was written during the 4th semester of the Master Programme of Urban Planning and Management at the Department of Development and Planning of Aalborg University during the period of time from 2nd of February 2015 to the 3rd of June 2015.

The theme of this thesis has been a transition to sustainable urban mobility which created a contextual starting point for the project. The goal of this report is to investigate how different planning practices: the Trendsetter project (particularly developments of clean vehicles and fuels, and the congestion tax) and the Urban Mobility Strategy 2012 of Stockholm contribute to the transition towards sustainable urban mobility in the City of Stockholm.

The supervisor of the Master thesis was Enza Lissandrello, who provided guidance and significant support over the semester as well as helped to develop the research. Special gratitude is given to persons interviewed during this project for providing valuable and vital information:

- Eva Sunnerstedt, who is leading the Clean Vehicle program in Stockholm, from the Environment and Health Administration of Stockholm, for helping with the general overview of clean vehicles and fuels development as well as the Trendsetter project;
- Daniel Firth, who is the Chief Strategy Officer of the Traffic Administration in Stockholm, for providing valuable information about the situation of sustainable urban mobility in Stockholm, and in particular about the Urban Mobility Strategy 2012 of Stockholm;
- Karolina Isaksson, who is the senior research leader in the Swedish National Road and Research Institute, for helping to understand urban mobility in Stockholm and the transition towards sustainable urban mobility from a critical point of view.

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1. Introduction

1.1 Problem Formulation

Cities are growing rapidly around the world and it is projected that almost 70% of the world`s population will live in urban areas by 2050 (United Nations, 2014). Due to this fast growth, cities are challenged and their development not always can keep up with the pace of population increase, leading to numerous problems. One of them is related to sustainable urban mobility challenge. Together with the population growth, the number of private vehicles increases as well.

Nowadays, many cities in the world are already significantly big in accordance with the population as well as area, and one of the reasons of that is the suburbanization. Suburban areas have been designed for the automobile, letting cities to spread. This indicates that people have to travel longer distances, and most probably for this they use a car (Banister, 2008).

Mobility is essential for international and national economies as well as it is remarkably beneficial for businesses and individual users (Banister, 2005), but at the same time it creates externalities through congestion, accidents, noise, health issues, solid waste, greenhouse gas emissions, landscape destruction and many other (Stead, et al., 2000). For example greenhouse gases causes temperature rise and creates instability of many natural phenomena such as flooding. Also it is known that the energy used for the transport sector occupies almost one third (31.7%) of the final energy consumption in the European Union and, in particular, about three quarters (71.7%) of the transport greenhouse gas emissions emerge from road transportation (European Union, 2012). It is clear that urgent actions must be taken to drastically reduce the negative effects of the transport system and to create more sustainable environment. In other words, the transition towards sustainable urban mobility is needed.

More and more cities throughout Europe are seeking to minimise the consequences of the transport system by sustainable solutions and to meet the goal set by the European Commission to reduce emission in the EU by 20% by 2020. The European Union comprehends that urban transport plays an essential role in sustainable growth, and it is supporting local governments in tackling mobility issues (European Union, 2013). Different initiatives have been created, in order to move towards sustainable urban mobility and to challenge the dominant car-based regime. The CIVITAS initiative, created in the EU framework, is an example of how research on urban transport can contribute to meet policy objectives towards sustainable urban transport (European Union, 2013). Moreover, the EU initiated the Sustainable Urban Mobility Plan which is *"a strategic plan designed to satisfy the mobility needs of people and businesses in cities and their surroundings for a better quality of life*." (Rupprecht Consult, 2013:8). This concept intends to help local authorities to create their own sustainable urban

mobility plans by providing various help such as guidelines for developing and implementing such plans, consultations, workshops, etc.

However, even with diverse initiatives assisting to reach sustainable urban mobility, some cities are more advanced than others, and the car-based regime is still relatively steady and dominant. That is why it is interesting to see how various planning practices can contribute to the transition to sustainable urban mobility.

The City of Stockholm is an interesting case in this respect. For a long time now Stockholm has been trying to create a sustainable city, and was awarded as the first European Green Capital 2010 for its input into sustainable development. That is why the city, and particularly its achievements relating sustainable development within a realm of mobility, are chosen here as a subject for the analysis of transition towards sustainable urban mobility. For comprehending how the city contributes to this change and what actions help to go towards sustainable transport, the Trendsetter project and the Urban Mobility Strategy 2012 of Stockholm are investigated, and their attempts to challenge the dominant car-based regime are discussed in relation to transition theories as well as sustainable mobility theories.

1.2 Research Questions

For the purposes stated above, this report investigates the transition towards sustainable urban mobility in Stockholm and attempts to answer the following research question:

How different planning practices contribute to the transition towards sustainable urban mobility in Stockholm?

In order to answer the main research question, the report is divided into different sections which tackle the following sub-questions:

1. What is a transition and sustainable mobility transition? How can different tools help to move towards sustainable urban mobility?
2. How has the role of the car changed in Sweden, and how does Stockholm try to move towards sustainable urban mobility?
3. How did the Trendsetter project, particularly two of its developments - clean vehicles and fuels, and the congestion tax contribute to change the dominant car-based regime into more sustainable one? What barriers had to be faced by these niche developments in order to become a part of the regime?
4. In which way does the Urban Mobility Strategy direct Stockholm`s mobility, and how does it challenge the car-based regime?

1.3 Research Structure

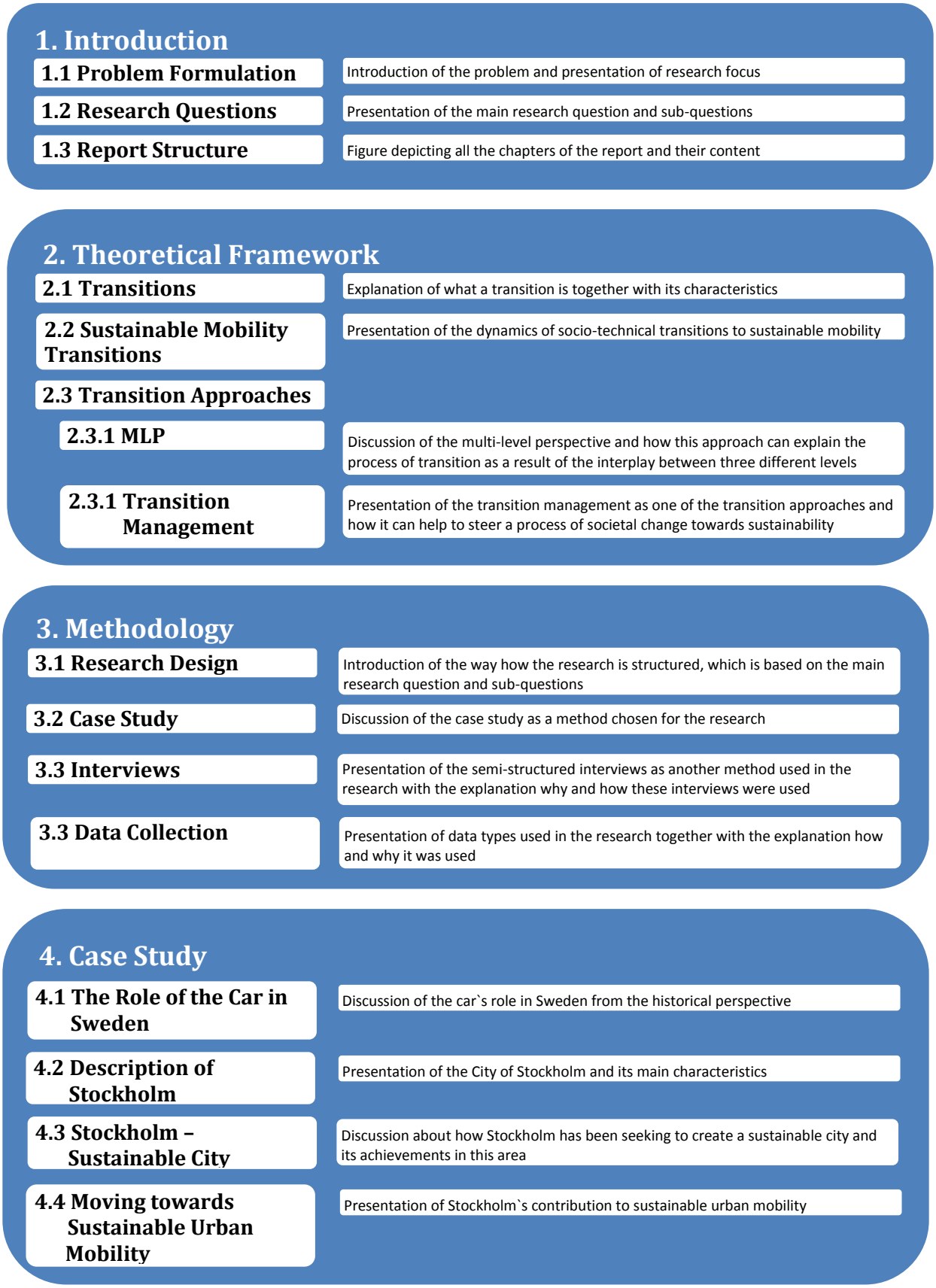
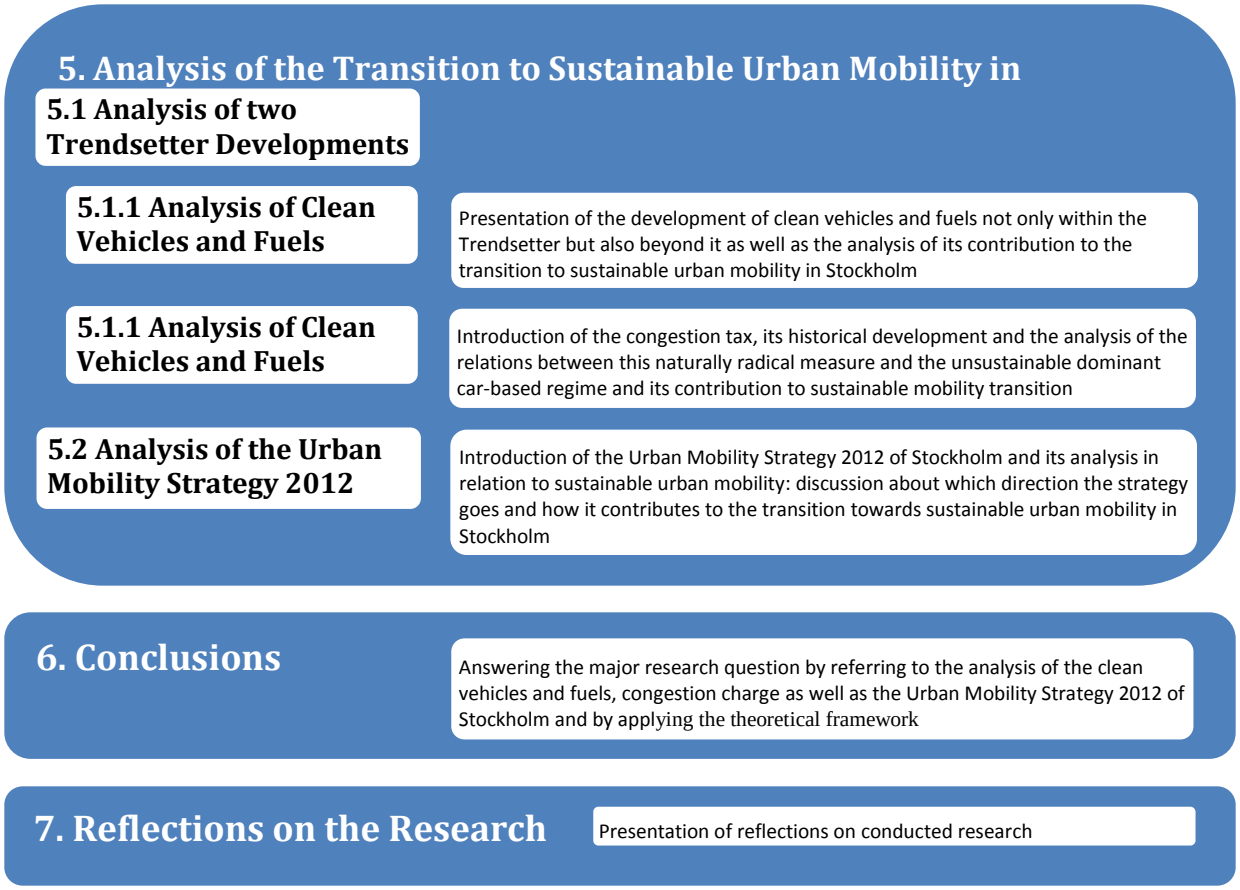


Figure 1.1 The structure of the report.



Continuation of Figure 1.1 The structure of the report.

2. Theoretical Framework

The theoretical chapter forms the fundaments for comprehending the dynamics of transitions towards sustainable urban mobility. Due to this issue, the focus is on the transition process from a theoretical point of view. At first, a general overview of transition theories (containing the definition and major characteristics) is presented. Afterwards, transition theory is interpreted in the specific field of sustainable mobility framing the main characteristics and complexity. In the following part two transition approaches (the multi-level perspective and transition management) are shortly discussed. Later, the sustainable mobility paradigm is presented, together with its goals and the ways on how is it possible to move towards sustainable urban mobility.

2.1 Transitions

A transition can be understood as a gradual, long-term, continuous process of radical change. It is a period of transformation from one state to another, where society`s structural character changes or when society transforms in a fundamental way (Shove, Walker, 2007; Rotman, Kemp, van Asselt, 2001; Farla, Alhemade, Suurs, 2009; Vergragd, 2004; Geels, 2011; Coenen, Benneworth, Truffer, 2012). The notion provided by Rotmans et al. (2001:16) underlines that:

"*A transition is the result of developments in different domains. In other words, a transition can be described as a set of connected changes, which reinforce each other but take place in several different areas, such as technology, the economy, institutions, behaviour, culture, ecology and belief systems. A transition can be seen as a spiral that reinforces itself; there is multiple causality and co-evolution caused by independent developments*.".

Transition theory covers different but similar theoretical approaches which study the development of socio-technical transitions (Geels, 2005). Shove and Walker (2010) outline that social processes shape innovations. Accordingly, the socio-technical notion addresses social and technical connections or reciprocal evolution, whilst transition addresses the dynamics which induce the emergence of fundamental change in these relationships (Geels, 2005). The label 'socio-technical' accentuates that transitions are not only caused by technological changes, but also transformations in policies, markets, consumer practices, cultural meaning, infrastructure and scientific knowledge (Geels, 2004, 2010, 2011; Geels, Kemp, 2012; Smith et al., 2005; Shove, 2010; Coenen, Benneworth, Truffer, 2012; Kemp, Geels, Dudley, 2012). These societal systems are reproduced, transformed and maintained by different actors such as policy makers and politicians, consumers, engineers and researchers, firms and industries, and civil society. This consideration underlines that transitions are not simple but complex and entails long-term processes involving multiple actors (Geels, 2011; Geels, Kemp, 2012; Coenen, Benneworth, Truffer, 2012).

Certain actors play a role as drivers of transitions to sustainability (Geels, 2010, 2011). They "*are the engine of a coevolutionary process of change: through action and learning, they replicate the structure of the ST* [socio-technical] *system; at the same time, they generate— directly or indirectly, intentionally or unintentionally— the variation and selection of structural variables*." (Marletto, 2013:2). Each actor, who intervene in radical change, features a vector of tangible and intangible endowments, such as knowledge, social capital and legitimacy, financial and physical resources, skills, etc., and is reasoned by one`s visions, interests and ideas. The power of every actor to influence the dynamics of socio-technical systems is seen as a function of the abovementioned vector (Marletto, 2013).

Civil society and public authorities are important drivers for addressing public goods and internalize undesirable externalities, to transform economic frame conditions, and to support niches of sustainability innovations. Because sustainability is a concept contested and ambiguous in itself, there is an on-going debate about how sustainability transitions can be achieved, managed and planned. Respectively, disagreement about sustainability transitions` directionality, the most suitable policy instruments or packages, and the disadvantages and advantages of certain solutions appears as well (Geels, 2011).

Furthermore, even though transition goals are ultimately selected by society, national and local governments play an important role in bringing about structural change; more often this occurs in an incremental manner. However, national and local governments should include the aim to overcome the conflict among long-term aspiration and short-term concerns to current dynamics and ordinary adjustment (Rotman, Kemp, van Asselt, 2001).

Furthermore, in particular, technology is not the main driver of a radical change, but only a structural element in the society`s functioning. More than the technology itself, the issue is therefore how technology interacts with other economic and institutional constituents. Marletto (2013) indicates that the socio-technical approach has a focus on action of individuals and groups rather than on functions - this purposeful action is at the heart of the analysis: "*All relevant attributes of action stay at the center of the analytical scene: power, interests, conflicts, agendas, policies, intentional pressure for —and resistance to—change, etc*." (Marletto, 2013:2). This outlines that there is no novelty without human action (Marletto, 2013).

From historical studies on transitions, such as the shift from horse-drawn carriages to motorized vehicles (lasted from 1860 till 1930) (Geels, 2005; Geels, Kemp, 2012; Nykvist, Whitmarsh, 2008) or the change from sailing boats to steam ships which occurred in the 19th century (Kemp, Avelino, Bressers, 2011, Geels, 2004, 2005, 2011; Geels, Kemp, 2012) or the shift from coal to natural gas in the Netherlands (1960s) (Kemp, van Lente, 2011), we also learned that transitions in socio-technical systems last over a generation or even more than one, and thus span across numerous political cycles (Geels, 2005, 2010, 2011; Kemp, Loorbach, Rotmans, 2009; Rotman, Kemp, van Asselt, 2001; Geels, Kemp, 2012; Kemp, Geels, Dudley,

2012; Coenen, Benneworth, Truffer, 2012). The study of socio-technical transitions therefore requires a clear progression from historical socio-technical transition pathways.

2.2 Sustainable Mobility Transitions

In this section, transition theory is narrowed down to sustainable mobility transitions. Firstly, due to the fact that transition is a complex long-term change, the section introduces the need of urgent transformation in mobility sector. This is followed by the identification of dynamics and characteristics of transitions towards sustainable mobility.

The Need for Change

Automobility has become a topic variously discussed in literature not only in relation to its benefits, but disadvantages too. The reason for this is that a continuous growth of mobility and car ownership has increased remarkably over the last 50 years and this growth seems to continue to rise throughout the world (Banister, 1997, 2005; Urry, 2011; Cohen, 2012; Hickman, 2007; Isaksson, 2014). So far, around the world, the majority of people still see the car as the most attractive transport mode. The car is the dominant form of personal transport (Vergragd, 2004) which creates an opportunity to combine various tasks (e.g. bringing kids to school, going to work and afterwards shopping) (Kemp, Avelino, Bressers, 2011). This indicates that private vehicles are deeply embedded in peoples` lifestyles, supported by cultural discourses around individuality, freedom, adventure, etc., and stabilized trough positive emotions and feelings (Kemp, Geels, Dudley, 2012). Accordingly, the use of car co-evolved with changes in lifestyle and was facilitated by motor associations and government policies (Kemp, Avelino, Bressers, 2011). As Sheller (2004:236) underlines:

"*Cars will not easily be given up just (!) because they are dangerous to health and life, environmentally destructive, based on unsustainable energy consumption, and damaging to public life and civic space. Too many people find them too comfortable, enjoyable, exciting, even enthralling. They are deeply embedded in ways of life, networks of friends and sociality, and moral commitments to family and care for others.*"

For the majority of people, the car remains a strong status symbol which helps to determine personal identity and forms social behaviour (Kemp, Geels, Dudley, 2012). It also provides an opportunity to gain benefits such as door-to-door transportation, flexibility, personal freedom and autonomy, comfort and convenience, speed, security, perceived social status, satisfaction in driving and so on (Urry, 2011; Vergragd, 2004; Cohen, 2012; Banister, 2005). Transportation is not only essential to individual consumers but also for all society (Geerlings, Shifran, Stead, 2012) and national and international economies benefiting individuals and businesses (Banister, 2005). Mass production of cars significantly contributed to growth of economy and improvement in living standards (Cohen, 2012).

However, all the benefits created by transport come at high price. It is known that the existing mobility paradigm, which focuses on motorized transportation based on fossil energy (Urry, 2007; Isaksson, 2014) causes fundamental externalities through air pollution, congestion, greenhouse gas emissions (transport sector produces about one third of greenhouse gas emissions (Urry, 2011)), noise, accidents, landscape destructions, use of space, solid waste, urban sprawl, social exclusion etc. (Vergragd, 2004, Banister et al., 2000; van Wee, 2011; Farla, Alhemade, Suurs, 2009; Kemp, Geels, Dudley, 2012; Isaksson, 2014; Nykvist, Whitmash, 2008; Geels, Kemp, 2012; Kemp, Avelino, Bressers, 2011). The undesirable effects of the existing transport system are frequently unequally divided, with most negative influence usually burdening other groups of residents than those who use motorized vehicles causing most of the trouble (Isaksson, 2014).

Moreover, many suburban areas have been designed in 1960s-1970s as being accessible primarily by the car (Pel, 2008). It resulted in sprawl of urban areas and substantial increase in the number of trips, travelled distances and speeds, even though travel time remained fixed (Geurs, Krizek, Reggiani, 2012; Banister, 1997, 2008). This led to a decentralisation within urban areas and between cities, often showing urbanised patterns, which cannot be easily served by public transport (Urry, 2011). The greater use of the car was also caused by decrease in attractiveness of local public transport and non-motorized means such as walking and cycling (Banister, 2008). Accordingly, "*The new mega cities of the world are emerging, not as the models of sustainable development, but as replicas of the car dependent cities of the West*." (Banister, 2011:1543).

Nonetheless, some of the problems caused by transport can, and have been, diminished over the past decades (e.g. the fatalities has fallen steadily in the EU (Kemp, Geels, Dudley, 2012)), it is clear that the current situation is unsustainable (Banister et al., 2000; Banister, 1997; Farla, Alhemade, Suurs, 2009, Shove, 2010; Nykvist, Whitmasrh, 2008) and there is a need for large-scale, major, deep-structural changes in the realm of mobility (Geels, 2010, 2011; Pel, 2008; Isaksson, 2014). This therefore shows that the system of transport has to be rethought in relation to other systems (Kemp, van Lente, 2011) or in other words there is an urgent need for a transition to more sustainable urban mobility.

Characteristics

Over the past decade, sustainability transitions literature has made a significant contribution to comprehending the multi-dimensional and complex changes considered necessary for adapting societies and economies to more sustainable modes of consumption and production in fields like agriculture and food, energy, health-care and communication, housing, and transport (Geels, 2005; Smith et al., 2005; Coenen, Benneworth, Truffer, 2012). What is more, recently, scholars have employed a perspective of socio-technical transitions for studying diverse facets of the modern transportation system and particular features of the dominant automobile regime (Nykvist and Whitmarsh 2008; Cohen, 2012). Geels (2011) highlights that socio-technical

transitions towards sustainability are an extraordinary research topic due to the fact that these transitions are relatively rare, only emerging now and then and require long-term macro-changes.

Geels (2011) identifies three characteristics of sustainability transitions. Firstly, sustainability transitions are in some respect different from the majority of historical transitions (Geels, 2011). As Smith et al. (2005) noted transitions towards sustainable development are 'purposive' or goal-oriented in a manner of coping with persistent environmental problems, while many historical shifts were 'emergent', for example entrepreneurs discovering and exploring commercial opportunities linked with new technologies.

Another characteristic that makes transitions towards sustainability unique and special is that most sustainable solutions do not provide evident benefits for users by the reason of sustainability being a collective good. That is why it often scores lower on dimensions of performance and price than established technologies. Respectively, it is doubtful that environmental innovations will be capable of replacing current systems without shifts in economic frame conditions such as taxes, regulatory framework, etc. As Geels (2011) points out these changes will require changes in policies, which entail power struggles and politics due to the fact that vested interests will attempt to resist such shifts.

The last characteristic is related to the empirical fields where is a great need of sustainability transitions, such as energy, transport and agri-food. Large firms (e.g. oil companies, car manufacturers, supermarkets) which have "'*complementary assets' such as specialized manufacturing capability, experience with largescale test trials, access to distribution channels, service networks, and complementary technologies*" (Geels, 2011:25) characterizes these domains.

Therefore, the increasing interest for sustainable transitions brings to light also an increasing interest in transitions towards sustainable transport systems (Kemp, Geels, Dudley, 2012). In most of the cases of historical transitions, the transition involved a change to different, but as well as more, consumption of resources and technical innovation. A transition to sustainability inside the domain of transport – as well in other fields - is likely to be a shift to less consumption (Urry, 2011; Whitmarsh, 2012).

The transport system is viewed as "*consisting of a semi-coherent configuration of mutually aligned elements, which include technology, industry, markets, consumer behavior, policy, infrastructure, spatial arrangements and cultural meaning*" (Kemp, Geels, Dudley, 2012:16). Even though the configuration is semi-coherent, misalignments and transitions for the moment might occur between elements which might lead to the creation of windows of opportunity for a bigger change. This indicates that the systemic transition towards sustainability is not only caused by a single factor such as high oil price, but also involves coevolution between multiple developments (e.g. infrastructure, regulations, knowledge base, etc.) (Farla, Alhemade, Suurs, 2009; Kemp, Geels, Dudley, 2012). Respectively, the way forward includes not only solutions in

technology, but as well as the development of new perspectives which propose innovative ways of comprehending how society itself can engage actively in fundamental change in mobility behaviour, and consequential on traffic management, spatial and urban planning and infrastructure (Kemp, Geels, Dudley, 2012). Although it is important to mention that radical changes do not necessarily happen at the same time in all the domains (Rotman, Kemp, van Asselt, 2001).

Automobility transitions come about over the interactions and interdependencies between stability and change. The transition perspective gives an approach based on systemic change and the actors who intervene shaping new mental models, shifting values and assumptions that reinforce change and stability in policy, culture, behaviour, firm strategies, and infrastructure (Geels, Kemp, 2012).

Many of existing systems which are unsustainable are stabilized through various lock-in mechanism (e.g. sunk investments, scale economies, infrastructure). The existing systems are also stabilized by other factors such as shared beliefs and discourses, political lobbying by incumbents, power relations, and institutional commitments. Moreover, user preferences and lifestyles might have become adjusted to present systems. As a result, all of these lock-in mechanisms build up path dependence and made it hard to break and displace existing systems. Therefore, it is important to comprehend how environmental innovations emerge and how they can dislodge, transform or reconfigure present transport system. (Geels, 2011; Kemp, Geels, Dudley, 2012)

For example, the dominant "*mobility paradigm constitutes a regime locked in to a stable state of oil- and car- dependence, dominated by the practice of personal mobility*." (Nykvist, Whitmarsh, 2008:1377). Infrastructure, manufacturing as well as consumer behaviour execute this regime when mobility demand continue to increase. Moreover, regarding the infrastructure, the built environment has co-evolved next to personal motorized transport modes as basic zoning of functions such as for example workplaces, leisure activities to be often only accessible by car. Also manufacture of vehicles has developed next to 'technological trajectories' that restrict vehicles and fuel technologies development to core competences development, in particular in internal combustion engine. The resistance to change in relation to persistent societal behaviour towards more sustainable one is considerably huge within society too. As it was mentioned before, traveling by car is still seen to be the most convenient and attractive way as well as it is often the cheapest way of transport which is tied to identity, social values and norms. As Nykvist and Whitmarsh (2008:1377) argue "*Much of the inertia in the transport system may be attributed to deeply entrenched habits of car use*.". It can be seen that the widespread resistance to radical change emerge because of these institutional, technological and psychological dependencies.

What is more, it is known that the transport system faces a necessity for change in order to solve persistent problems (e.g. traffic congestions, pollution), although the car is deeply

embedded in Western lifestyles and also stabilized through different lock-in mechanism. Even though during the last two decades there were many attempts to present radical innovation with greater sustainability performance, the dominant car regime still looks relatively stable (Kemp, Geels, Dudley, 2012). Nevertheless, since solutions that exist within current systems are insufficient to cope with problems caused by transport, academics, policy makers and civil society organizations more and more argue that more fundamental changes and transitions to novel systems are required (e.g. to reach an 80% decrease in CO2 emissions till 2050) (Geels, Kemp, 2012). This indicates that "*under the surface, cracks may be appearing that create opportunities for wider system change and transition to sustainability*" (Kemp, Geels, Dudley, 2012:3). Respectively, for overcoming path-dependence and various lock-in mechanisms created by the current 'individual car' system, policies supporting alternative transport systems must follow these guidelines: work on all socio-technical change dimensions in order to ensure the step-by-step alignment of all relevant market, technological and institutional variables; work on enactors in order to support the networking, legitimacy and empowerment of new supporting coalition; attain a critical mass for transformation in order to implement tremendously funded and enduring interventions (Marletto, 2014).

2.3 Transition Approaches

There are different approaches in order to understand, analyse or steer transitions. Some of them will be discussed in this section.

2.3.1 Multi-level Perspective

The multi-level perspective (MLP) is a significant conceptual lens for working on socio-technical transitions (Geels, 2005; Geels, Schot, 2007; Cohen, 2012). From the experience with the MLP it can be seen that it is a useful analytical framework for comprehending transitions, which underlines the dynamics, precursors and complexity of radical and incremental innovation (Whitmarsh, 2012).

Originally Rip and Kemp (1998) developed the concept of MLP and it was theoretically elaborated by Geels and other scholars (Geels, 2005; Smith et al., 2005; Rotmans et al., 2001; Whitmarsh, 2012). The MLP indicates approaches for understanding transitions through comprehension of the interplay between three different levels within societal systems (e.g. transportation system): landscape, regime and niche (Jorgensen, 2012; Vergragd, 2004, Cohen, 2012; Whitmarsh, 2012). These levels shows the distinction and link between macro-level, meso-level and micro-level theories, which are well known in sociology and economic domains and permanently determine a hierarchy (Jorgensen, 2012; Cohen, 2012). The top level (socio-technical landscape) "*includes infrastructure and other physical aspects (such as houses and cities), political ideologies, societal values, beliefs, concerns, the media landscape and macro-*

economic trends" (Geels, Kemp, 2012:57-58) and it only changes slowly (Foxon et al., 2009). The level in the middle or socio-technical regime reflects the predominant package of practices that are utilized by actors who develop, strengthen, and build a specific technological system, including "*engineering practices, production process technologies, product characteristics, skills and procedures all of them embedded in institutions and infrastructures*" (Foxon et al., 2009:3). The bottom level or micro-level consists of niches which are special places, partly isolated from regular market selection at the meso-level (regime), for radical innovations to emerge (Foxon et al., 2009; Whitmarsh, 2012; Geels and Schot, 2007).

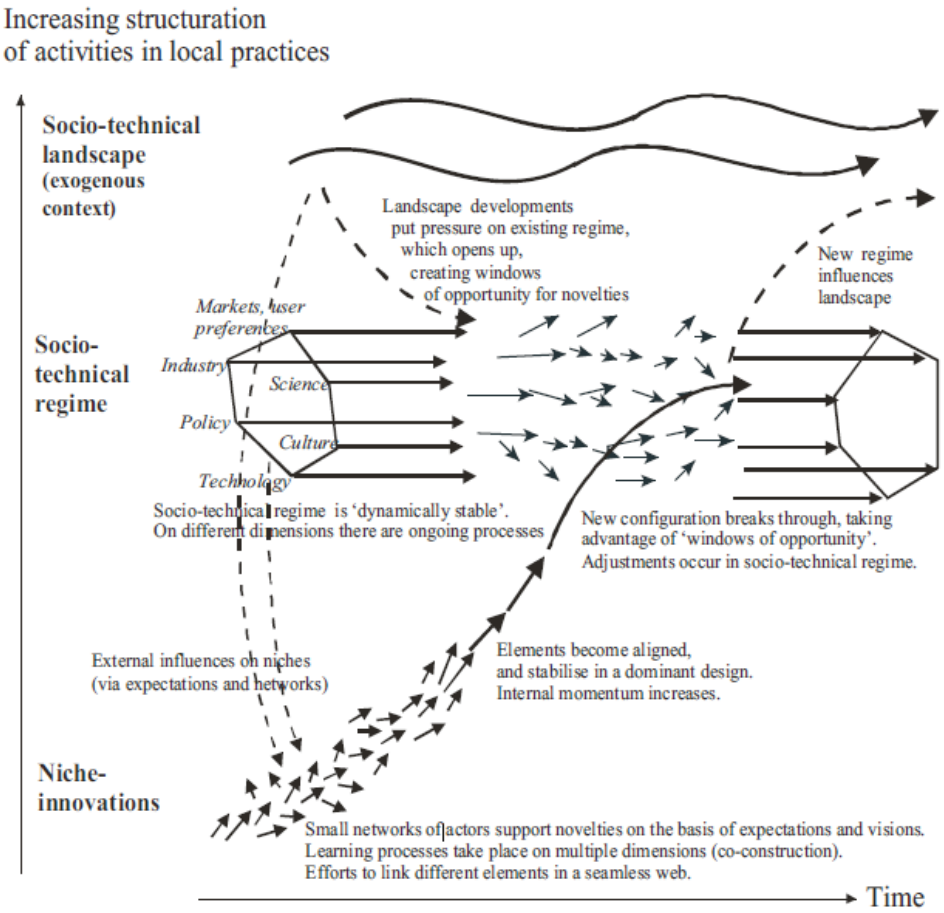


Figure 2.1 A dynamic multi-level perspective on transitions (Geels, 2011:28).

In figure 2.1 it can be seen an ideal-typical representation of dynamic interaction of the three levels in the unfolding of socio-technical transitions. Despite the fact that every transition is unique, the general dynamics pattern is defined by transitions which result from the interplay among processes at diverse levels: "*(a) niche-innovations build up internal momentum, (b) changes at the landscape level create pressure on the regime, and (c) destabilisation of the regime creates windows of opportunity for niche innovations*." (Geels, 2011:29). The unfolding

interplay can be further sub-divided into some phases, for example appearance, take-off, acceleration and stabilization (Rotmans et al., 2001; Geels, 2011).

The notion behind transitions is that they take place "*through processes of co-evolution and mutual adaptation*" (Shove, Walker, 2007:2) between and inside all these levels. The MLP can be used to describe how new technologies emerge inside niches as well as how they get working configurations that form and reform the regimes and landscapes they support and that are in turn supported by them (Shove, Walker, 2007).

Interestingly, it can be noticed from transition literature that the niche and regime might exist in a symbiotic or competitive relationship. For instance, actors from the regime level may draw on niche novelties in response to the pressure from the landscape level if they are incapable to appropriately respond with their own resources. Other niche technologies and various practices are said to be less compatible with those who are in the incumbent regime, leading them to be resisted or opposed by regime actors (Shove, Walker, 2007).

Furthermore, the main task of the MLP is to provide a framework to perceive how currently dominant socio-technical regimes could be broken up and superseded by new systems or in other words how novel configurations might become dominant (Shove, Walker, 2007).

2.3.2 Transition management

Transition management (TM) is another approach of transition theory. It has resulted from system dynamics together with evolutionary economics (Rotmans et al., 2001; Farla, Alhemade, Suurs, 2009). The approach is not only descriptive but also prescriptive in the sense that it can be applied for analyzing and influencing transitions (Kemp, Loorbach, Rotmans, 2009).

TM is the approach where long-term societal aims are used to drive shorter-term developments and experiments (Farla, Alhemade, Suurs, 2009). Respectively, it is a process of governance aiming to affect the speed and way of dynamics of societal change towards sustainability (Roorda et al., 2012). TM forms processes of co-evolution through creation of visions and objectives by using cycles of learning and adaptation (Kemp et al., 2007; Kemp, Loorbach, Rotmans, 2009)).

The approach can be treated as a specific multi-level governance form by which state and non-state actors are gathered together to coordinate and co-produce policies in a multiple and evolutionary manner on diverse policy levels, "*adhering to the aforementioned principles*" (Kemp, Loorbach, Rotmans, 2009:82). In general, TM is a concept of co-evolutionary steering which includes a cyclical process of ideas, mechanisms and instruments, and notions that co-evolve: shared perception of problem, vision of sustainability, agenda, experiments, tools and monitoring by a process of social learning relating to radical systemic change which offers sustainability benefits without user benefits (Kemp, Loorbach, Rotmans, 2009).

2.4 Sustainable Mobility

As it was mentioned before, the existing transport system based on fossil fuels is economically, environmentally and socially unsustainable (Banister, 2011; Kemp, Geels, Dudley, 2012) and transport is currently expected to play its part in forming more inclusive and sustainable society (Lyons, 2012).

The European Commission presented the concept of sustainable mobility in 1992 Green Paper on Transport. Sustainable mobility, referring to Brundtland Report, underlines the broad subject of transport that is sustainable with regard to climate, social and environmental impacts. Respectively it indicates that inter-generational and intra-generational equity has to be fostered, the basic human needs have to be satisfied and long-term ecological sustainability has to be safeguarded (Holden, 2007).

Probably, the most popular definition is made by professor David Banister (2008) where he outlines that sustainable mobility requires a shift from traditional transport policy paradigm, which has made automobiles the dominant travel mode, to more sustainable transport (Banister, 2008; Isaksson, 2014). The main idea of sustainable urban mobility paradigm is to reduce the need to travel and trip lengths, encourage modal shift and fewer trips (Banister, 2008, 2011; Isaksson, 2014), accordingly, "*A sustainable transport system means that we will travel less*." (Banister, 2011: 1541).

Also reasonable travel time rather than time reduction, improving the quality of spaces and places, viewing transport as a valued activity, not as a derived demand, more efficient infrastructure use, lower level of noise and pollution caused by transport, and greater energy efficiency are the elements of the sustainable mobility paradigm (Banister, 2008; Kemp, Geels, Dudley, 2012; Isaksson, 2014). In the paradigm it is as well stressed that there is a need to distinguish between mobility and accessibility by prioritizing the later, to not any more concentrate on motorized means of transport but on environmentally friendly modes such as cycling, walking and public transport, to stop forecasting and start working strategically with scenarios and long-term visions (Banister, 2008, Isaksson, 2014). Another important feature of sustainable mobility paradigm which Banister (2008) emphasizes is broad stakeholders` and residents` involvement into the process from its beginning till the end. By combining clear planning strategies, cities will be planned and designed at the personal scale for allowing not only high-quality accessibility, but a high-quality environment as well (Banister, 2008). The goal is to design cities of high quality and at an appropriate scale that people would not need to have an automobile, rather than to forbid car use which would be hard to achieve and it would be seen as the opposite to the notions of choice and freedom (Banister, 2008; 2011)

Banister (2008) underlines four principles which are necessary in order to move towards sustainable mobility:

1. Make the best use of technology, containing investment in technology, in information systems, in transport modes and in transport system per se;
2. The use of regulation, taxation and pricing (e.g. higher fuel prices);
3. Integrate land-use development combining planning and regulations;
4. Plainly targeted personal information, including awareness rising, social pressure, individual marketing, persuasion and demonstration is essential as well.

Additionally, demand management, which addresses and influences when, where and how people travel in an effort to greater match transport demand and supply, has gained increasing attention. Basically, demand management is about sticks (e.g. road pricing) and carrots (e.g. better public transport services) which aims to change individual behaviour (Lyons, 2012). As examples of policy tools for transport demand management, vehicle and fuel taxation, information campaigns and marketing, congestion charging and road tolls, and energy labelling of vehicles can be taken (Nykvist, Whitmarsh, 2008). For instance road pricing is a novelty of traffic management which is regime-preserving during the short-term but may have a huge impact in the long-term. On the one hand, currently it makes car use easier by offering benefits to users of car and giving them an opportunity to use the roads more efficiently. On another hand, in the long-term road pricing could contribute to multi-modal and intermodal travel by encouraging a modal split and more selective car use (Geels, Kemp, 2012).

Land-use Planning

Sustainable mobility intends to strengthen the links among land-use and transport (Banister, 2008; Holden, 2007; Miciukiewicz, Vigar, 2012; Isaksson, 2014). The idea of using land-use planning as a measure in order to move towards sustainable urban mobility is to address the physical separation of the means and activities by which distance can be decreased. The purpose is to build sustainable mobility into the arrangements of urban forms and layouts that can lead to switching from the car to environmentally friendly modes of transport (Banister, 2008, 2011).

Land-use planning is considered to be a great tool for reducing the energy use in transport in urban areas, through regeneration of existing areas and planning of new developments (Banister, 2011). Accordingly, it can address the real sources of the issues of congestion and pollution instead of their symptoms or consequences (Banister, 1997). Sustainable development can be accomplished by higher density locations which can reduce not only trip lengths, but also the proportion of car trips. As the density of urban area increases, the car use, travelled distance and the average trip lengths are reduced (Banister, 1997, 2011). In high-density locations it is also easier to provide public transport services and to create high quality local environments (with close proximity to the main functions such as work, recreation, home, etc. (Vergragd, 2004)) which are able to provide safety and security. Nonetheless, high-densities create significant social dilemma: usually people want to live in urban areas with low-density,

that is why increasing density can cause reduction in the attractiveness of cities and lead to out-migration (Banister, 1997, 2008, 2011).

Use of Technology

Technology can greatly contribute to sustainable mobility. Firstly, technological innovations can increase transport efficiency and reduce the impact of vehicles directly by guaranteeing that the best accessible technology is being used regarding engine design, the use of renewable sources of energy and alternative fuels (Banister, 2008, 2011; Nykvist, Whitmarsh, 2008). For example the technology of city car is probably to be based on a small highly efficiency internal combustion engine or an electric vehicle or plugin hybrid vehicle. Also there are significant opportunities for new public transport forms such as personal rapid transit or demand responsive transport (Banister, 2011). Transport system as a whole and road use efficiency can be improved by intelligent transport systems as well (Isaksson, 2014). Standards for reducing noise and emissions at source levels can be also introduced, and measures which ensure that access to specific parts of the urban area are limited to more environmentally cleaner vehicles than others (Banister, 2008, 2011). Even though technology (e.g. electric cars, alternatively fuelled vehicles) can help to cope with environmental problems, but it would do nothing about issues of road accidents and casualties, geographical and spatial problems and congestion (Kemp, Geels, Dudley, 2012; Banister, 1997; Kemp, van Lente, 2011).

Secondly, with the help of technology travel can be substituted with the use of internet by doing more 'at home' activities (e.g. shopping, conferencing, working) (Banister, 2008; Vergragd, 2004) and information and communication technologies (Nykvist, Whitmarsh, 2008; Isaksson, 2014). While some activities can be substituted, others are generated. For example shopping via the internet still generates trips in order to deliver ordered goods to buyers home. Also technological communications can substitute travel, but as Banister (2011:1545) stresses out "*in many cases there is no substitute for face to face communication, and we want to see the world and to meet people*." This illustrates a conflicting case among individual choices and preferences, as opposed to the broader society needs for protecting the environment as well as future generations (Banister, 2011).

Modal Shift and Inter-modality

Another approach is shifting personal mobility to other transport modes such as cycling, walking and public transport (Vergragd, 2004; Nykvist, Whitmarsh, 2008; Isaksson, 2014; Banister, 2008, 2011). The level of car use can be reduced by promoting these environmentally friendly modes of transport and creating new transport hierarchies where pedestrians and cyclists are at the top and users of car - at the bottom. This can constitute a kind of mental map that can be accomplished by making urban traffic slower and reallocating space to public transport by road pricing and parking controls. Measures for encouraging modal shift have to be combined with strategies for creating the best use of the 'released space', therefore "*that*

there is a net reduction in traffic" (Banister, 2011:1541). As Banister (2008, 2011) underlines it does not indicate that there is a need to build more road capacity, but that better flexibility in its use is demanded as well as a greater part allocated to non-motorized modes of transport – walking, cycling, and public transport.

Moreover, the establishment of car clubs can also be as an alternative to private vehicle ownership. It encourages people to join a club which provides them access to a number of cars in their neighbourhood that can be used for a certain amount of money if needed. Another alternative – car sharing schemes or car-pooling, encourages people to share their private cars for certain trips (Cairns et al, 2008).

Improved Health

Sustainable mobility also provides improvements in individual health, better, healthier and cleaner environment because emissions caused by transport are linked to decreasing public health. Non-motorized means of transport such as walking and cycling, and public transport – all are way healthier than using the car. Healthy transport expresses strong action on separating citizens from traffic and creating exclusive routes for cyclists and pedestrians. It also means the encouragement of travel plans for all activities and businesses which are central traffic generators. (Banister, 2008)

Change the Notion of the Street

Sustainable mobility approach changes the perception of the street to broader view. It is no longer viewed simply as a road only for cars, but as a space for people, green modes of transport (walking, cycling) and public transport (Banister, 2008). Also innovative "*use of that space at different times of the day or day of the week means also that new uses can be encouraged (e.g. street markets or play zones*)." (Banister, 2011: 1541). For example there are an increasing number of governments in the USA, Europe and elsewhere which takes apart current roadways and reallocates public space for new purposes such as pedestrian districts, cycling lanes and other non-motorised activities (Cohen, 2012).

Cross-sectoral Decision-making

One of the factors of achieving sustainable development in mobility is cooperation and coordination between different governmental levels and sectors which will lead to emergence of cross-sectoral decision-making (Banister, 2005). This indicates that resources and responsibilities need to be divided and reallocated among diverse departments for facilitating action. The inter-sectoral cooperation and production of knowledge and dialogue has to be created (Miciukiewicz & Vigar, 2012). Therefore, if real changes and effective decision-making is about to happen, the clear leadership, direction, cooperation and coordination is necessary at all government levels (vertically) and between sectors (horizontally) (Banister, 2005).

Packages of Policy Measures

Pull (carrots) and push (sticks) policy measures have to be combined in mutually supporting packages (Banister, 2008), since single policy measures are considered to be limited in their scope, and in order to have a successful implementation *"creative packages of complementary measures* [are required] *to be introduced consistently over a period of time"* (Banister, 2005:7). This indicates that policies work in a better way when they are packed together, rather than being left as separate, 'stand-alone' policies (Banister, 2005)

Stakeholder Involvement

The future of sustainable cities is highly dependent on sustainable mobility, but it is only through the acceptance and comprehension by the citizens that it will succeed (Banister, 2008). Respectively, in order to implement a radical change in transport sector there is a need of strong support by the public and the politicians, or in other words all stakeholders have to be involved into the process of discussion, decision-making and implementation (Banister, 1997, 2005, 2008, 2011; Vigar, 2006; Miciukievicz, Vigar, 2012) so that they can comprehend the reasoning behind diverse policy initiatives and support their establishment (Banister, 2008). Involving all kinds of stakeholders requires a partnership between public and private sectors (Urry, 2011) or it demands "*developing new connections between groups of people, between citizens and the state, between citizens and economic groups, and within different segments of government activity*" (Healey, 2012:338).

When engaging all stakeholder there is an increased likelihood that change in behaviour will follow (Banister, 2008, 2011) and this "*involvement would help match expectations of behavioural change with actual outcomes, and this in turn may lead to permanent change with limited possibilities for rebound effects*." (Banister, 2011: 1542). As a result, the active and widely open involvement of all actors would have a way better effect than the means of persuasion which are conventional and passive.

It is known that many historical and contemporary grand schemes failed due to the lack of social support. For example while London congestion charging (introduced in 2003) has been relatively successful in mitigating inner city traffic and congestion, proposition to implement congestion charging in Edinburgh and Manchester have been strongly defeated in referendums. The problems in bringing about the significance of public acceptance and system innovation were illustrated by the social and political difficulties inherent at the beginning of urban congestion charging (Kemp, Geels, Dudley, 2012). This clearly shows that even if technology exists (Kemp, Geels, Dudley, 2012) without sufficient public support for a radical change, the action will not happen (Banister, 2008).

Individual Marketing

The shift towards sustainable development can also be achieved by using information and education measures. For instance one of these measures is individual marketing – an approach

which provides information to people about the available alternatives and also helps them to choose the most suitable one. It is indicated that instead of expecting that people will find necessary information by themselves, information needs to be taken to the client. This approach also includes “selling” the idea of sustainable mobility to individuals and groups as well as localities by explaining the necessity for changes in their behaviour and persuading them of the significance of their contribution. Individual marketing is considered a great example of technique, which is based on dialogue, to promote the use of alternatives to the car such as cycling, walking and public transport. (Banister, 2008)

Overall, in this chapter the theoretical framework, consisting of transition and sustainable mobility theories, for analysing transition towards sustainable urban mobility in Stockholm was presented. Respectively, the theoretical framework helped to understand dynamics of radical innovations and possible tools which can contribute to the transition towards sustainable urban mobility. When theoretical chapter is presented, the next step in this report is to form methodological framework in order to outline how the research is designed and which methods were used for it.

3. Methodology

The aim of this chapter is to describe the scientific approach together with the methods that are applied in this research. Firstly, the research design is presented which shows the steps taken in the report. Later, the chosen methods – single case study and semi-structured interviews are discussed, and in the end of this chapter the different types of data analysed are presented together with the explanation why and how these sources of data are used.

3.1 Research Design

In this part of the report, the approach to address the problem, introduced by the research question is explained. The goal of this section is to describe the process of research across both theories utilised in relation to the main research question and the sub-questions, as well as the empirical material. The research process is reflected by the following figure:

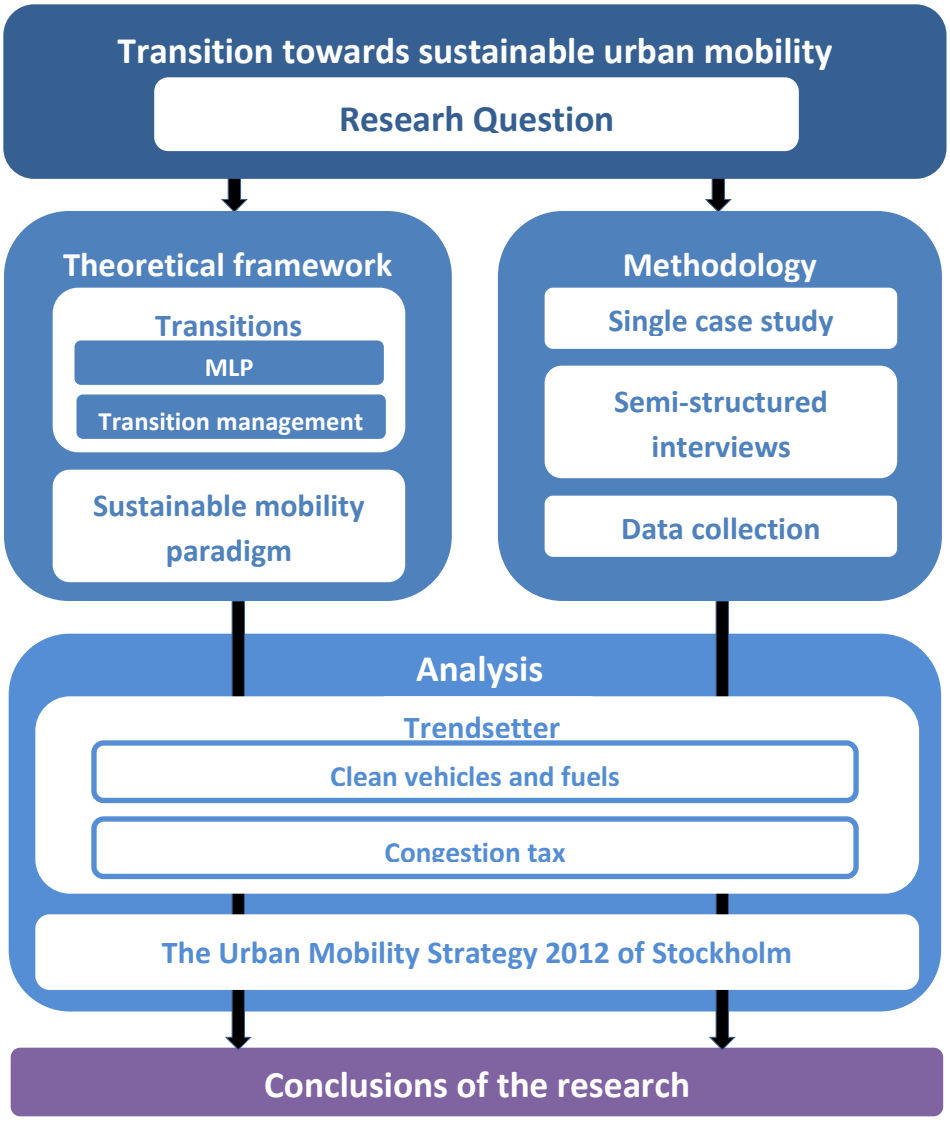


Figure 3.1 Research design.

The report starts with the presentation of the investigated problem that current mobility is unsustainable causing various problems and externalities; therefore there is an urgent need for a transition to more sustainable urban mobility in order to create better environment and improve quality of life. Later, the problem is narrowed down to the main research question:

How different planning practices contribute to the transition towards sustainable urban mobility in Stockholm?

This question defines the clear objective for the report and is answered with the help of additional sub-questions, which focus on diverse aspects of the problem in a gradual manner.

The next step is the formation of the theoretical framework, which aims to answer the first sub-question. As the approach of the report is to analyse the contribution of different planning practices to the transition towards sustainable urban mobility in Stockholm through the combination of transition and sustainable mobility theories, the theoretical part of the report focuses on combining transition studies with sustainable urban mobility paradigm. Due to the focus of the research being put specifically on the sustainable urban mobility transition, after the presentation of general dynamics of transitions, the discussion about sustainable mobility transitions is taking place. Afterwards, the different approaches (the multi-level perspective and transition management) as tools for comprehending, analysing or steering transitions are shortly presented. The formulated main research question emphasizes that the focus is put on certain type of transitions – sustainable mobility transitions. For this reason, later, the sustainable mobility paradigm with its goals, characteristics and possible ways on how to move towards sustainable mobility are presented. The combination of above mentioned theories helps to create a theoretical framework for the report as well as it serves as a tool for analysing the case study.

The third step aims to develop the methodological framework which can be applied to the empirical case. In this part of the report the single case study as a method is explained. Also in this section, the interviews as a method and their contribution to the research is presented. In the end of this section the types of data used in the research as information sources, in order to create theoretical framework and for the analytical part of the report, is discussed. It describes why and how diverse data sources were used.

Another step is the presentation of the case study. In this section of the report the goal is to answer the second sub-question. The intention of this part is to present the case study, firstly, from the broader point of view starting with the discussion of the role of the car in Sweden. Then, the focus moves on to the presentation of Stockholm as being a sustainable city and its various achievements in relation to sustainable development. Later, the focus is narrowed down to the topic of sustainable mobility and the presentation of different planning practices by which Stockholm has been trying to move towards sustainable urban mobility. This section

of the report creates a base for the case and enables the researcher to go deeper in it in the next chapter.

The fifth step in the report is the analysis. At this part the focus is put on the investigation of the contribution of different planning practices to the transition towards sustainable urban mobility in Stockholm with the help of transition and sustainable mobility theories. For the analysis, specifically the two developments of the Trendsetter project and the Urban Mobility Strategy were selected. That is why the analysis is divided into two parts. In the first part the Trendsetter project is shortly presented and then the focus is scaled down to only two sections of the project: the clean vehicles and fuels, and the congestion tax. The analysis of these two parts not only focuses on what has happened within the Trendsetter project, but also from a broader perspective, which lets to see the development of them before and after the project as well as their influence on the transition to sustainable urban mobility. At this point, the third sub-question is answered. In the second part of this chapter the analysis of the Urban Mobility Strategy 2012 of Stockholm is presented, which seeks to investigate the direction that the strategy set for the city`s current and short-time future mobility, and its efforts to challenge the dominant car-based regime. Afterwards, the last sub-question is answered.

After the analysis, in the next step the conclusions are drawn about the contribution of different planning practices to the transition towards sustainable urban mobility in Stockholm by taking into account theoretical framework and the results from the case. It indicates that the main research question is answered.

As the last step of the report, the reflections of the carried research are presented. After the introduction and explanation of the research design of this report, further on, the case study as a method is discussed.

3.2 Case Study

The single case study was chosen to be used as a method for the research. It is defined "*as an intensive study of a single unit or a small number of units for the purpose of understanding a larger class of (similar) units* […]" (Gerring, 2004:342). This method lets the researcher to explore and comprehend complex issues as well as it helps to enrich the research with qualitative and quantitative data. The case study is significantly useful, especially when studying behavioural and social problems, due to the fact that it provides in-depth and holistic explanation of questioned issues (Zainal, 2007).

According to Yin (2014) if one`s research question seeks to explain some existing circumstance (e.g. "why" or "how" some social phenomena works) the case study research is suitable. As it was already mentioned, the distinctive demand for case study research comes from the aspiration to comprehend complex social phenomena. Shortly, a case study gives the

opportunity to the investigator to focus on a case and keep the real-world and holistic perspective (Yin, 2014).

Yin (2014) also argues that there are three types of case studies: descriptive, exploratory and explanatory. From this it can be seen that the chosen case study in this research can be comprehended as an exploratory case study, due to the fact that it seeks to explore a phenomenon of transition to sustainable urban mobility.

The reason of choosing this type of case study is that it enables a researcher to investigate the contribution of different planning practices (particularly two developments as a part of the Trendsetter project and the Urban Mobility Strategy 2012 of Stockholm) to transition towards sustainable urban mobility in Stockholm. Also it helps to comprehend various complex issues and dynamics of these practices in relation to this transition. Furthermore, in order to strengthen the exploratory case study as a method, it was complemented by other methods (e.g. semi-structured interviews).

3.3 Interviews

Three interviews, 50 - 60 min long, were conducted with three experts from the Environment and Health Administration of Stockholm, the Traffic Administration of Stockholm and the Swedish National Road and Research Institute about sustainable urban mobility in Stockholm and the transition towards it. These interviews were the main sources of first-hand information about the case study, specifically in relation to various planning practices regarding Stockholm`s sustainable urban mobility. The goal of these interviews was to gather information about previously mentioned topic and to use them to analyse the case. The complete transcripts of these three interviews can be found in Appendix A, Appendix B as well as Appendix C, and the audio recordings are available in Appendix D (in the CD).

The conducted interviews were semi-structured. This type of the interview is a qualitative data collection method and it allows the researcher to ask a series of predetermined, open ended questions to the interviewee. For the semi-structured interview a written guide is prepared in advanced. The guide can include specific and carefully prepared questions or it can be a list of topics to be covered within the interview (Given, 2008).

The interview guides were created specifically for each of the interviewees in order to gather more information about the topic and to better comprehend it. The interviews were a significantly helpful tool to reveal issues, opinions, things which are ‘left behind the scene’, the situation of sustainable urban mobility in Stockholm and transition towards it. As it was already mentioned, three interviews were conducted as a part of the research.

The first interview was conducted with Eva Sunnerstedt, who is leading the Clean Vehicle program in Stockholm, from the Environment and Health Administration of Stockholm. This interview gave a broader view about the Clean Vehicles program, the Trendsetter project and

Stockholm`s sustainable urban mobility in general. The second interview with Daniel Firth, who is the Chief Strategy Officer of the Traffic Administration in Stockholm, also provided valuable information about the situation of sustainable urban mobility in Stockholm, and in particular about the Urban Mobility Strategy 2012 of Stockholm, which was analysed in the report. The last interview was conducted with the senior research leader in the Swedish National Road and Research Institute, Karolina Isaksson. The interviewee provided information about the transition towards sustainable urban mobility from a critical point of view.
All the interviewees were given the opportunity to express their view on the development of sustainable urban mobility in Stockholm and various measures for achieving it. The information collected during these interviews was crucial for comprehending the case better as well as for its analysis.

3.4 Data Collection

For conducting the research and tackling the problems, which are formulated in the research questions, a variety of data sources and information were used. Accordingly, the range of different sources ranges from scientific literature, including articles and books, to public documents. In the following section all sources used in the report are summed up and their significance as well as relevance for the research is explained in detail.

Literature

The research design as well as the research problem, that involve the topic of transitions to sustainable urban mobility, needed the collection of theoretical data in order to get a deeper insight of both topics - transitions and sustainable urban mobility paradigm, and theories built around them. A literature review, including a selection of scientific articles and books, was conducted for getting a better comprehension of the topics. These sources of data were used to get a knowledge about what a transition towards sustainable urban mobility is, how it is understood by theorists, as well as what are the foundations of logic behind it.
As it was already mentioned, the goal was to get a sufficient knowledge about the transitions towards sustainable urban mobility, which enabled me to understand both theories involved in the topic separately and as a combination, and use this knowledge in the report for analysing this transition in Stockholm. In particular, it gave the ability to investigate the Trendsetter project as well as the Urban Mobility Strategy 2012 of Stockholm in regard to transitions and sustainable mobility paradigm.
All sources of data used for the report were selected by taking into account the criteria of information quality and validity. Respectively, in this work only official scientific articles and books written by professionals in relevant domains were used.

Public Documents

Public documents were another data source applied to the research. The data from this category were mainly used for getting information about the sustainable development of Stockholm, especially in relation to sustainable transport and its contribution to the transition towards sustainable urban mobility in Stockholm. For instance, the document on Urban Mobility Strategy 2012 of Stockholm was used for getting an insight about the direction Stockholm is currently facing regarding this transition, and how it contributes to it. Besides this, other public documents such as Sustainable Urban Transport: Final report from the European project Trendsetter, Clean vehicles in Stockholm: Historic retrospect 1994 – 2010, the Walkable City: Stockholm City Plan, Stockholm a sustainable growing city, BioEthanol for Sustainable Transport: Results and recommendations from the European BEST project, etc., were used for getting an insight about various projects, initiatives, planning documents etc. concerning sustainable urban mobility topic in Stockholm. All kinds of public documents were applied to the case study not only for comprehending the sustainable development of mobility in the city, but also for analysing how various developments contribute to the sustainable mobility transition in Stockholm.

In this chapter, the methodological framework of the research was presented. Firstly, the research design was introduced and followed by the presentation of the case study and semi-structured interview as methods. Subsequently, the types of data that were used in the report were discussed as well.

After the theoretical and methodological frameworks are presented, it is possible to move on to the case study.

4. Case Study

The purpose of this chapter is to introduce the case study – Stockholm, in relation to the sustainable development, especially in the realm of mobility. Firstly, the role of the car in Sweden is presented from a historical perspective in order to understand the broader view. Later on, the focus is narrowed down to the introduction of Stockholm and its general characteristics, which is followed by city`s achievements and attempts to create a sustainable city. Lastly, the discussion of different ways which the city has been adopted for making mobility more sustainable and for dealing with environmental problems generated by transport, is taking place.

4.1 The Role of the Car in Sweden

Already in 1906 the first Swedish regulation on usage of automobile was established. Few decades after, in the 1930s, the significance of the national railway was in constant decline and that helped to introduce mass motorization in the country. At the same time, economists perceived a car as a tool for bringing economic prosperity as well as supporting democratization process in Sweden. (Thynell, et al., 2010)

During the 1940s in Swedish transport policy documents the need to connect Sweden was significantly stressed out. This indicated that the state was responsible for creating better accessibility in the country. It is argued that since the 19th century, the state has been extremely active in stimulating national systems for network industries, involving communication and transport infrastructure (Lindgren E., Lindgren U. & Pettersson, 2010).

The number of cars started to grow significantly after the Second World War, due to economic growth (Thynell, et al., 2010) and the fact that Sweden became one of the most car-friendly European countries after the same war (Lindgren E., Lindgren U. & Pettersson, 2010). At that time, the Social Democrats governed Sweden and this resulted in private car use being regulated and appropriated in accordance with local traditional political and social principles and values (Thynell, et al., 2010). Both national road network construction and car ownership were assumed as political tools of democracy as well as national integration, however, ensuring economic growth was the core goal (Lindgren E., Lindgren U. & Pettersson, 2010). As it can be seen more discourses were formed in favour of car-based regime in order to foster it.

Later, in the 1950s, the role of the car did not change significantly. In the beginning of 1950s Sweden began its transformation into a car society (Lindgren E., Lindgren U. & Pettersson, 2010). Politicians believed that increasing physical mobility by the use of modern cars should not only improve democracy and stimulate growth of economy, but also accelerate the advancement of modernisation. The welfare state establishment gained high priority and spreading mass motorisation became a significant part of that vision. Motorisation was supported by all basic political parties, when there were only few voices against it. In 1956

politicians understood the car as both a toy and a helpful tool which can hardly be replaced. They also stated that some decades before only the few had the privilege to own a car, but that it is now longer the case: "*Now* [in 1956] *there are car owners in all layers of society, and we shall soon eliminate the remaining barriers. It is reasonable to say that the development of motorisation is the most manifest aspect of democratisation of our time*." (Thynell, et al., 2010:423).

In 1958 the design and construction of the national road network was established for the next 20 years and played the main role in the national policy. Although, another road plan was created in 1969, due to the fact that construction could not keep up with the fast motor traffic expansion. Moreover, Sweden turned into the most motorised European country in 1960 (Lindgren E., Lindgren U. & Pettersson, 2010).

Later, in the end of the 1980s, the Swedish Prime Minister Mr. Ingvar Carlsson, who was a Social Democrat, moved even further in determining the importance of the car. He indicated that the car should be understood as a human right, underlining that everywhere, everyone should have the ability to own it (Thynell, et al., 2010).

However, in 1987 the concept of sustainability was enshrined in the Brundtland Report on Our Common Future. Inter-generational sustainability involved the idea *"that developments around the world in the present should not hinder the ability of future generations to meet their likely needs and requirements."* (Urry, 2011:26). New discourses started to be formulated around the consequences of modernity and the need to plan cities in a different way, in order to create more liveable and better environment, for example in terms of air quality. This resulted in some shifts on the landscape level and influenced the view of the position of the car which started to change slowly. Therefore, in 1991, the Swedish Prime Minster Mr. Carl Bildt, who was a Conservative leader, indicated that he believed that technical development can solve the problems caused by global car use and he was more sceptical about including driving into human rights charter (Thynell, et al., 2010).

This section shows how the motorization has been evolving and how its importance has been growing during the years. In order to the car-based mobility become stronger and dominant, numerous discourses were formed around automobility, its benefits and the need to expand road infrastructure. The motorization has been strongly supported by the politicians over the time and only in the beginning of the 90s different opinions about the automobility started to slowly appear in the landscape. Afterwards, the discussion moves to smaller scope and presents the City of Stockholm.

4.2 Description of Stockholm

Stockholm is the capital of Sweden and some say that it is also the capital of Scandinavia (Erman, 2012). The city is Sweden's center of culture, economy, media and politics. Stockholm is a contemporary and planned city (Thynell, et al., 2010), which is situated on south-central east cost of Sweden. It is built on 14 islands and it is a connection between the Baltic see and Lake Mälaren (Stockholms stad, 2013).

In Stockholm more than 10% of surface area is water. Over the time, the city has successfully developed the accessibility of the shores. Also more than 40% of the city is occupied by parks and green spaces which are open to everyone (Stockholms stad, 2013).

The city is the biggest of the municipalities inside Stockholm County, consisting of 26 municipalities with a population of more than 2.1 million (Tools of Change, n.d). In 2014 the city's population was estimated at 897,000 with a population density of 4.700 *people/km*^{2}. In Stockholm lives 22% of Sweden's total population (World Population Review, 2014).

Figure 4.1 Stockholm`s green spaces (Stockholms stad, 2013:9).

The city together with Oslo is the fastest growing in Europe (News: Nordic, n.d.). As it can be seen from Figure 4.2 the population in Stockholm municipality increased dramatically from the second half of the 1800s.

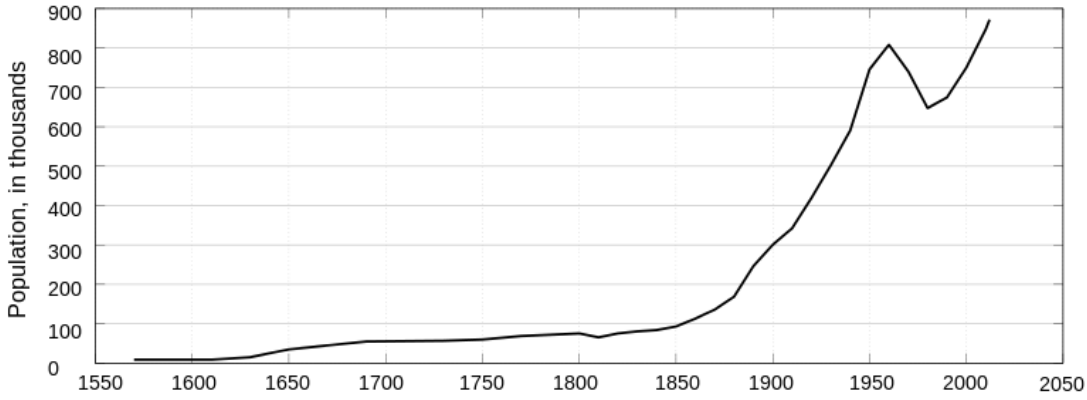


Figure 4.2 Stockholm Municipality`s population growth 1570-2012 (Wikiwand, n.d.).

Furthermore, the population of Stockholm has also risen significantly in the recent years, increasing by more than 10.000 people per year. According to the forecasts, the population should reach one million till the mid-2020 (The City Planning Administration, 2010). This indicates that there is a need to address this growth and try to develop and keep the city in a sustainable way.

The population increase creates a lot of challenges for the city and generates problems such as lack of housing, increased traffic congestion and so on. The city has to adjust to these changes and try to create the best conditions as possible for people to work, study and live. However, the population growth has been really rapid and it is not always easy for Stockholm to keep up with it. Over the years, the city has been trying to address this increase in a sustainable way, and its achievements will be discussed in the next section.

4.3 Stockholm - Sustainable City

Stockholm is considered as one of the cleanest capitals not only in Europe but also elsewhere. The city has strong green credentials and is ranked number two in Europe on the Siemens index and is willing to reach carbon neutrality by 2050 (Smart Eco City, 2014). Stockholm is also considered to be the best city in terms of freedom from pollution, according to the European Cities Monitor 2010 (Cushman and Wakefield, 2010).

From the 1960s the national legislation was introduced for protecting the environment. Later, in the 1970s, the environmental program for Stockholm was created. From that time since now the city had five of these programs. Another wave of policies, that strongly affected Stockholm`s sustainable urban development, occurred in the late 1990s and in the beginning of 2000s, together with plans for new sustainable urban district design. The most known example of sustainable urban development in the city of Stockholm is Hammarby Sjöstad (Hult, Metzger, & Olsson, 2013) which has long been a future symbol of Stockholm (Stockholms stad, 2013). It is the most extensive and ambitious development in the city, that inspired many other worldwide projects such as the Tangshan Bay development in China (Hult, Metzger, & Olsson, 2013). Stockholm Royal Seaport is the next major environmental profile district whose development has just begun. It will be a district where innovative solutions for sustainable city life and green building working together with trade and industry (Stockholms stad, 2013).

Stockholm has been working ambitiously on urban environment problems for a long time. Investments were initiated in new efficient solutions for creating a contemporary city environment with a metro system and Essingeleden – a road circuit directing traffic in order to avoid passing through the city. Stockholm`s determinedly work for improving and upgrading public sector housing energy efficiency from the 1960s and 1970s is also creating interest (Stockholms stad, 2013).

Since 1995 Stockholm has been a member of Eurocities which enabled the city to influence work in the EU and to place the capital as a model city in Europe. In 2008 the city also joined the Covenant of Mayors (Covenant of Mayors, 2014) by which European cities pledge to work in order to reduce greenhouse gas emissions more than decisions made by EU dictate (Stockholms stad, 2013). Now Stockholm has been presenting the way to the energy transition for many years (Covenant of Mayors, 2014).

Another strategic collaboration is also happening within the framework of C40 – Climate Leadership Group. This group has a commitment to implement sustainable and significant climate-related actions locally which will help to address climate change globally. The focus is to underline best practice models and exchange experiences as well as to be a role model for other cities, which have not advanced far in their work. (Stockholms stad, 2013)

In 2010 Stockholm was announced the first European Green Capital (see Figure 4.3) by the European Commission for its successful work on sustainable urban development as well as for its ambitious goals for the future. Stockholm won this award by competing with seven other finalists. The city got top marks for its contribution in coping with the climate change, keeping low noise levels and green spaces open to the people, sustainable land use and waste management. (City of Stockholm Executive Office, 2011)

Since 1994, Stockholm managed to reduce its total carbon dioxide equivalents emissions by 25%, which is even more than the EU set target for 2020. In 1990 the city diminished emissions from 5.3 tons of carbon dioxide equivalents per inhabitant to around 3.4 tons in 2010. It shows that it is a decrease of over 35%. Moreover, all buses in the inner city are run on renewable fuels and the trains are run by green electricity. The quality of the air also got much better and the congestion tax on vehicles in the inner city is partly responsible for that. In Stockholm all the benefits of a better urban environment such as cleaner water, air and land, expanded green spaces and improved urban transport can be felt and seen. (City of Stockholm Executive Office, 2011)

Figure 4.3 Stockholm – European Green Capital 2010 (Stockholms stad, 2013:9).

The European Commission chose Stockholm as the European Green Capital to be as a role model for other cities in order to move towards sustainable urban development. This led to exchange of experiences and share of the city`s best practice with officials and politicians around the world to become a key task of Stockholm. (City of Stockholm Executive Office, 2011) What is more, the program Professional Study Visits was launched in Stockholm in the beginning of 2010 to share green best practices of Stockholm. The aim of the program was to give visitors a chance to learn how to cope with issues such as carbon dioxide emissions, urban planning, sustainable and efficient transport system and waste management (European Union, 2010).

Furthermore, Stockholm alongside Japan, Paris, Kitakyushu and Chicago participates in the Organisation`s for Economic Co-operation and Development (OECD) Green Cities Programme for green growth. This programme assesses and estimates how urban green growth together with environmental policies can improve economic results as well as environmental quality. Also the goal is to increase contribution of cities to national growth, competitiveness and quality of life (City Development, n.d.; Stockholms stad, 2013). The OECD is impressed by Stockholm`s ability to successfully manage combining the reduction of CO2 emissions with not only economic growth but also with fast population expansion (Stockholms stad, 2013).

As it can be seen Stockholm is trying hard in various ways to become more sustainable city and to keep it in this way. However, the main interest in this report is put on transport sector and how the city seeks to move towards sustainable urban mobility, which is presented below.

4.4 Moving towards Sustainable Urban Mobility

In Stockholm different ways of creating more sustainable transport system and coping with environmental problems caused by transport has been adopted. In different policy fields the city has implemented many ambitious measures in order to achieve more sustainable urban transportation system (Sunnerstedt, 2006).

In 1950 the metro system was built and Stockholm received its contemporary urban plan (Thynell, et al., 2010). Even though the underground system was arguably grossly over-dimensioned, it helped the capital to avoid urban sprawling which is common in many other major cities (Hult, Metzger, & Olsson, 2013). Later, the metro was also supplemented with another rail-bound transportation. Currently, eight out of 10 travellers use public transport in a rush hour (see Figure 4.4) (Stockholms stad, 2013).

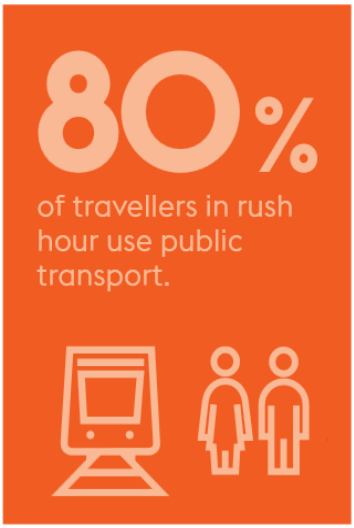


Figure 4.4 Public transport use (Stockholms stad, 2013:9).

Ambitious investments, such as congestion charging and traffic management, made by the city show that they create a huge difference (Sunnerstedt, 2006) and lead to lower emissions and less congestion in the inner city (Stockholms stad, 2013), however, the city also shows that inexpensive and small measures, like bus priority systems, are able to make significant contributions as well (Sunnerstedt, 2006).

Stockholm is said to be a leading city in Europe in relation to clean vehicles and fuels (Sunnerstedt, 2006).In the mid-1990s Stockholm already initiated a long-term investment in eco-friendly fuels and green cars. Today, all city buses in the inner city run on ethanol or biogas, and the goal is for all public transportation to become fossil-fuel free by 2025 (Stockholms stad, 2013).

Stockholm city was built on a harbor, which was bordered on all sides by lakes. This meant that the majority of commuters in order to get to the city had to cross highly congested bridges. Stockholm has relatively good public transport system and small population, although, the city`s traffic congestion was the same like in significantly huge cities such as Paris or London (Tools of Change, n.d). Just from 2008 till 2014 the population of Stockholm has increased by 16%. The demographers in 2007 predicted that this growth will be reached only by 2030. The forecast of the population increase moved forward by a decade and left Stockholm to face a difficult challenge for retaining a high urban mobility level (Saven, 2014).

Stockholm has already implemented some progressive measures for reducing congestion, however, it is hardly enough for keeping up with the growth figures. As it was already mentioned, Stockholm implemented a congestion tax which continues to effectively decrease traffic and delays of commuters (Saven, 2014).

In figure 4.5 it can be seen some examples of various projects, initiatives and policy documents (and their duration) by which Stockholm has been seeking to move towards more sustainable urban mobility from the 1990s. The arrows indicate the continuation of planning practices.

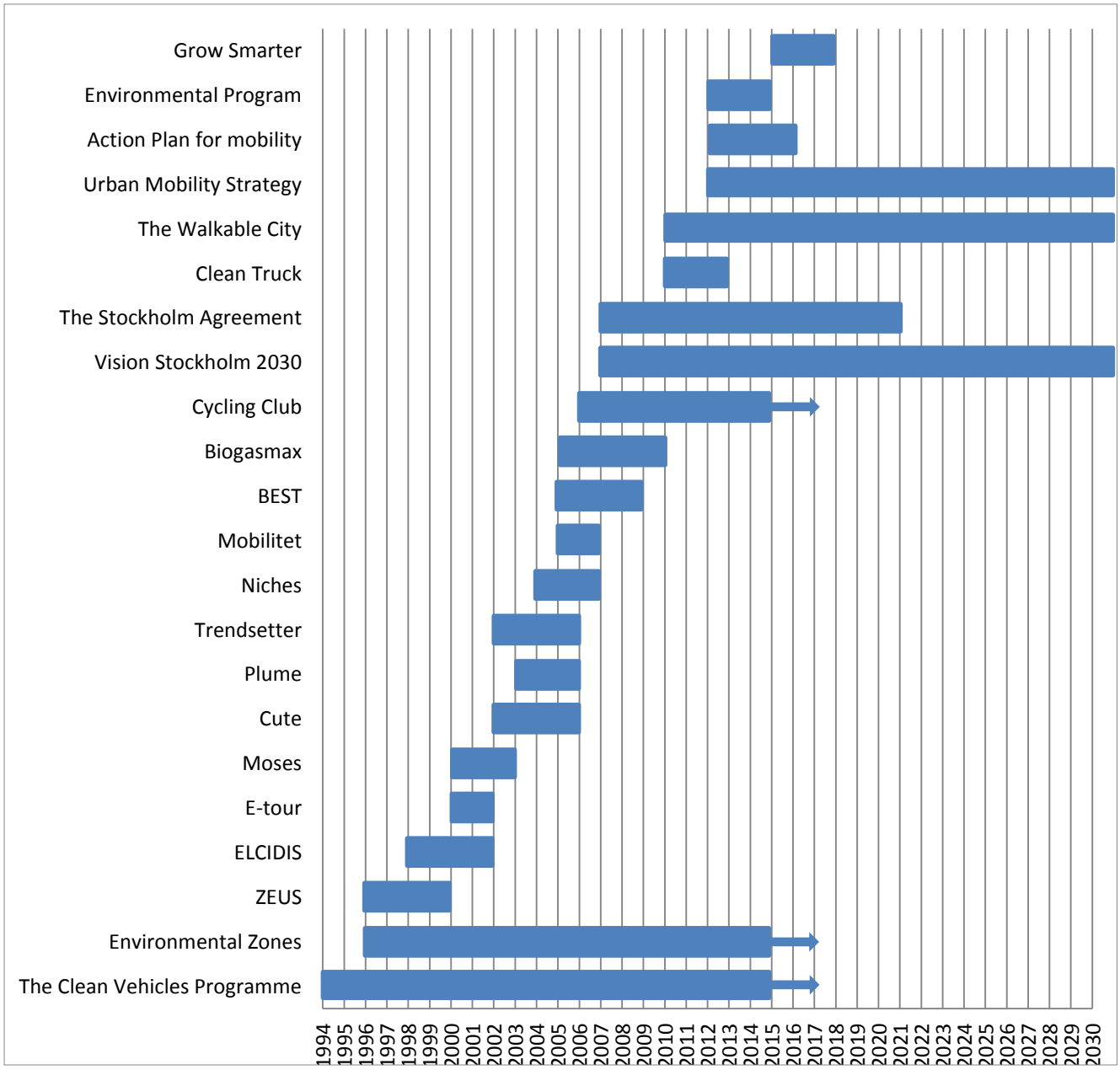


Figure 4.5 Various projects, planning documents, etc. initiated by the city of Stockholm and their duration.

From all these planning practices only two of them were chosen to explore further in the analysis. The Trendsetter project and the Urban Mobility Strategy 2012 of Stockholm were selected from these practices, due to their influence and significance in relation to their contribution to the transition towards sustainable urban mobility in Stockholm.

5. Analysis of the Transition to Sustainable Urban Mobility in Stockholm

In this chapter the analytical part of the report is presented. The main objective of the analysis is to investigate how some planning practices (e.g. projects, initiatives, planning documents, etc.) pursued in Stockholm contribute to the transition towards sustainable urban mobility. Two of these planning practices have been selected for this analysis: the Trendsetter project (particularly two developments) and the Urban Mobility Strategy 2012.

5.1. Analysis of Two Trendsetter Developments

Firstly, in this section the Trendsetter project is shorty introduced, and later, the analysis of its two developments are presented.

Trendsetter

The Trendsetter project was introduced in 2002 and developed until 2006. This project has been important because it focused on inspiring also other cities as an example of good practice on how sustainable urban mobility can be facilitated in various ways. The results achieved by five participating cities Lille, Prague, Pecs, Graz and Stockholm were intended not only to encourage other cities to start up new initiatives, but also to set trends for a sustainable transportation future in Europe more broadly. In other words, the purpose was to identify valuable lessons, that could be learnt during the project, to serve as a toolbox for any ambitious followers (Trendsetter, 2006), willing to move towards sustainable urban mobility goals.

Despite the fact that there were 5 participants in the Trendsetter, the focus in the analysis is put on Stockholm and what the city could achieve within this project. Stockholm has managed to successfully implement 19 measures in different fields (see Table 5.1) during the Trendsetter, even though, in the analytical part of the report the attention is paid only to the development of the congestion tax, and clean vehicles and fuels.

Table 5.1 Measures implemented during the Trendsetter in Stockholm (Trendsetter, 2006:71).

Measure Field	**Measure**
Access Restrictions	Widening of the Environmental Zone
	Congestion charging
Integrated Pricing Strategies	Smart Card systems and integrated ticketing
	Reduced parking fees to promote clean vehicles
Public Passenger Transport	Increased number of public transport passengers

Table 5.1 Continuation.

Measure Field	Measure
New Concepts for the Distribution of Goods	Material logistic centre – to optimize freight deliveries at construction site
	Logistic centre for Old Town of Stockholm
Innovative Soft Measures	Making cycling attractive (B&R information on the Internet)
	Creation of a visitors` web for optimal planning
Integration of Transport Management Systems	Traffic monitoring and supervision
	Accessible road network (street) data
	More adaptive signal control in a bus priority system
Clean Public and Private fleets	Clean and efficient heavy vehicles
	Waste collection with biogas-vehicles
	Clean municipal fleets
	Making clean vehicle use in private company fleets
	Increasing clean vehicle use in private company fleets
	Web portal for drivers of clean vehicles
	Improved biogas refuelling infrastructure

These two developments were chosen due to the fact that they started before the Trendsetter project and are still taking place. They also appeared to be highly influential and created a significant positive impact in terms of environmental quality. Analysis of clean vehicles and gules, and the Urban Mobility Strategy of Stockholm is presented below, starting with former.

5.1.1. Analysis of Clean Vehicles and Fuels

Sweden is regarded as a main pilot country for alternative fuel vehicles. It all started in the mid-1990s from the moment when some conventional cars from the municipal fleet were replaced by clean vehicles. In 2009 the introduction of clean vehicles was considered just as normal progression to car use and the result was that around 40% of new car sales were clean cars. Stockholm's contribution to the introduction of clean vehicles and fuels has been significant over the years. Participation in the European Commission`s project – Trendsetter also remarkably supported the development of alternative fuel vehicles and renewable fuels. The

project was just as a part of the general development and helped to accelerate it, that is why it is interesting also to look at both: what has been done before and during the Trendsetter.

Clean Vehicles - the Beginning

The first investigation of possibilities to introduce environmental friendly vehicle technology started in 1989, when the Stockholm Materials Supply Organisation conducted a survey of electric vehicle technology existing at that time (Birath, Padam, 2010). Although, the beginning of developing clean vehicles and fuels in Stockholm was in 1994. It was a political decision to form a working group (Appendix A) leading to the creation of Clean Vehicles in Stockholm program, which has been run by the Environment and Health Administration (Birath, Padam, 2010). According to Sunnerstedt (Appendix A), who is leading the Clean Vehicle program in Stockholm, the main reason why the program was created was mainly because of the need to improve the environment, especially air quality, as well as health. Also the program aimed to serve as a tool for speeding up the transition towards clean vehicles and renewable fuels (Birath, Padam, 2010).

In 1994 the focus of the program was mainly put on introducing electric cars, but also other environmentally adapted vehicle technology such as biofuels (Appendix A). At that time it was decided that the City of Stockholm have to adopt the long-term goal to replace conventional vehicles as much as possible by electric cars or/and vehicles, that run on renewable fuels, in the city fleet. The goal was set to replace 300 of these vehicles. There was also the need to designate a political reference group, including representatives from those boards and committees that were concerned. This group has no formal political mandate. Therefore, political decisions are taken as ordinary in the City Council and committees. The main aims of the project group of the Clean Vehicle program were to establish an implementation program for increasing the use of environmentally friendly vehicle technology in the city traffic, to track technological developments related to environmental issues caused by transport vehicles, energy carriers, off road vehicles and so on, to make a suggestion to the City`s boards and committees about the measures for introducing environmentally friendly vehicle technology, as well as renewable fuels in Stockholm (Birath, Padam, 2010)

However, at that time there was no market for clean vehicles and renewable fuels in Sweden (Appendix A), also dealers and manufacturers were significantly hesitant, so everything had to be created from a scratch. Due to the absence of the market, there were no clean cars too, and without having them it was impossible to create a demand. Birath and Padam (2010) named this situation as “chicken or egg” problem which is able to easily stop new initiatives. The Clean Vehicles in Stockholm program wanted to prove that it is possible to break through from the chicken-egg situation, by not only focusing on clean vehicles, but also on renewable fuels (Birath, Padam, 2010). This required a lot of support and the political reference group has made it easier to achieve political consensus in relation to clean vehicles. The large political support has been a significant factor since the beginning of the Clean Vehicles program.

Another issue was the funding. In 1994, in order to achieve the goal for replacing the municipal fleet with clean vehicles, the Environment and Health Administration had to make a proposal for financing of this replacement program. The idea was to receive funding from the European Union by participating in diverse projects, initiated by the European Commission. Nevertheless, the reason of being a part of these projects was not only for getting funds, but also to form networks with other European cities and stakeholders, and by this to strengthen the position of Stockholm as a leading environmental city (Birath, Padam, 2010).

The first big-scale EU project, where Stockholm participated in, was Zero and Low Emission Vehicles in Urban Society or just ZEUS. It started in 1996 and ended in 2000, and was funded by the EU. The aim of this project was to increase clean vehicles share in Stockholm city trough technology procurements of electric vehicles as well as production and distribution of upgraded biogas. The city was coordinator of ZEUS and during the project it cooperated with other seven cities: London, Athens, Helsinki, Luxembourg, Palermo, Copenhagen and Bremen. The project gave Stockholm scope for carrying out a range of vital measures in order to increase refueling stations and vehicles availability. The city gained position in Europe and was considered as a good practice example of how cities can work with clean vehicles (Birath, Padam, 2010). As Sunnerstedt (Appendix A) said it was a good decision to participate in this project, because the obligation was made not only to themselves (the Environment and Health Administration and in general the City of Stockholm) to implement it, but also to the European Commission. That was as a stimulus to put more effort into implementation of the project. Also the funding gave the opportunity to carry out ZEUS on the bigger scale than the city initially could have done (Appendix A).

After achieving good results from the first big-scale project, Stockholm did not stop there, and participated in many more such as ELCIDIS (1998 - 2002), Trendsetter (2002 – 2006), BEST (2006 – 2009), etc. The city has used projects, initiated by the EU, for facilitating the introduction of new technology and for demonstrating how it works. In other words, various projects were used to foster this niche development in order to bring it closer to the existing regime. Stockholm has used EU funding in order to implement existing action plans and has not accepted the EU proposals to steer the direction of the city`s work, because it was aware about the risk of jumping from one technology to another (Birath, Padam, 2010).

Participation in various EU projects during the years has provided Stockholm with a broad European network and enabled the capital of Sweden to work with clean vehicles and fuels to such a great extent. Through these projects more funding was received as well as more contacts, knowledge and ideas for the next projects not only related to clean vehicles or renewable fuels, but to a broader notion of sustainable transport development (Appendix A).

During the Trendsetter besides international cooperation between participating cities, new local collaboration was also created. The Traffic Administration (which before was not very keen on these cooperation projects) was involved into this one. Also Sunnerstedt (Appendix A)

highlighted that the Trendsetter has influenced another projects such as BEST. Accordingly, from participation in some project one generates a lot of ideas or thinks of next steps for further developments which are usually put into next projects or just continued to work with. Therefore, the work which is being done in a project was usually built up on something that the Environment and Health Administration of Stockholm has done previously (Appendix A).

Moreover, during the Trendsetter Stockholm has created a network for cities interested in clean vehicles and renewable fuels in Sweden in order to work together towards national level. As it was already mentioned, the city has a large network in Europe, and it has also been regularly exchanging experiences with Clean Cities program from the United States of America. Due to the fact that Stockholm was at the front in relation to clean vehicles, many cities showed interest in its work, and several study visits were taking place each week within the Trendsetter. Before and during the implementation of some measures from the project, Stockholm collaborated with other cities in the same action field. For example, there was an exchange with London and Singapore while preparing the congestion charge trial. This measure attracted a considerable attention from cities all around the world and many of them visited Stockholm when the trial was taking place (Sunnerstedt, 2006). Various experiences from the capital of Sweden has not only been shared with other cities, but also has inspired them (Birath, Padam, 2010).

Over the years since 1994 Stockholm proved that it is possible to integrate clean vehicles and fuels into the market. The work of the city with the alternative fuel vehicles has gained attention from all over Europe and received awards and prizes for its work, involving the Niches Award, Civitas Award and Green Fleet Europe. One of the reasons why Stockholm got the Civitas Award after the Trendsetter, according to the jury, was that the city managed to convert political goals into practice. Successful city`s work with clean vehicles was also an important factor for Stockholm to be chosen as the European Green Capital of 2010 (Birath, Padam, 2010).

Work within Trendsetter

As it was already mentioned before, the main focus is put on the Trendsetter, and particularly what has been achieved in the field of clean vehicles and renewable fuels during the project as well as how it contributed to the transition towards sustainable urban mobility in Stockholm. Within the Trendsetter there were implemented 19 measures in various fields in order to move towards sustainable development, but 7 of them were focused on clean vehicles and fuels (see Section 5.1 Figure 5.1)

One of the measures was to make heavy vehicles clean and more efficient in Stockholm. During the project 21 biogas buses have been introduced in the city and as a result of that Stockholm Transport bought 130 of these buses after the Trendsetter. The introduction of 21 biogas buses managed to reduce noise and CO2 emissions by 1.900 tons/year, and left more than 90% of biogas bus drivers very satisfied. However, the cost of maintenance was higher, but it was

balanced by low fuel prices. Also in Stockholm in 2002 the inner city bus fleet had 250 buses running on ethanol and this number increased by 123 in 2008. Within the project the goal was set to make all the buses clean by the year of 2030. (Trendsetter, 2006)

Other heavy vehicles - five trucks and nine waste collection vehicles - have also been operating in Stockholm as a part of the project. The use of waste freighters gave good results and significant driver satisfaction. This positive experience resulted in orders of 22 biogas refuse trucks additionally. (Trendsetter, 2006)

One of the goals of the City of Stockholm when the Clean Vehicle programme was created was to replace 300 vehicles from municipal fleet with clean vehicles. The city began the process already in 1996. The same objective was also formulated within the Trendsetter, and more than 200 vehicles from municipal fleet have been changed by clean ones. In 2006, when the project ended, there were 465 of these vehicles in running, from which 43% were of the city fleet. Operation of these vehicles in Stockholm led to reduction of CO2 emissions from 650 tons/year to 560 tons/year, decrease of NOX, HC and CO emissions, and diminution of total energy consumption by about 25%. The project also had an influence on biogas fuel costs. This resulted in 15% lower biogas fuel price. At that time 80% of clean vehicle drivers stated that they were very satisfied with their vehicles and would recommend them to others. There has been the disadvantage of the average maintenance cost of biogas vehicles being 5% higher, because these kinds of vehicles need more repair and maintenance. (Trendsetter, 2006)

The Trendsetter project also aimed to increase the use of clean vehicles in private company fleets. The idea was to offer firms to take alternative fuel vehicles for a week for a free test-driving (Appendix A), and in this way help to convince them that these vehicles are able to fulfil their requirements for operation, safety, performance, environmental and economic issues. After the test-driving the survey was carried out in 70 companies and it showed that these firms were 90% satisfied both with the function of the car and the performance. Later, 50 companies were asked if they had bought clean vehicles after free test-driving. The results showed that 34% of them actually had bought one or more clean cars and other 34% were thinking to purchase one or more clean vehicles. (Trendsetter, 2006)

During the Trendsetter alternative fuel vehicles were introduced both in private company and city fleets. It resulted in more than 320 new clean cars in the city fleet and more than 3000 of these vehicles in private company fleets. The project also inspired car manufacturers and citizens (Trendsetter, 2006).

Another measure for promoting clean vehicles within the Trendsetter was the creation of the web portal. Environmental arguments are said to be not enough for citizens and companies in order to buy a clean vehicle. There is always a need of financial arguments for becoming interested in these cars (Trendsetter, 2006). That is why the web site was established during the project, which shows all necessary information about the clean vehicles. For example, it is possible to see all clean vehicles that are on the Swedish market, do environmental as well as

economic calculations, read about renewable fuels and much more. The website is designed to be easy to use and if one types a Swedish word for clean vehicles the website always comes up as one of the first suggestions. According to Sunnerstedt (Appendix A) a lot of journalists in their articles, related to clean vehicles, refer to this particular website.

The last measure, implemented during the project, is more technical. Its goal was to improve biogas refuelling infrastructure. Within the Trendsetter 4 biogas fuelling stations were built. This had an influence on the gas company AGA Gas and led to the implementation of 7 additional biogas stations in Stockholm besides a contribution from the project. Also the number of ethanol fuelling stations has been growing during the Trendsetter. In 2005 there were already 26 of these stations, and more were open at the same year and in 2006. The increasing number of renewable fuels` stations were also influenced by the legislation, which indicated that the fuel companies have to offer minimum one kind of renewable fuel in their best-selling stations and over time at smaller stations (Trendsetter, 2006).

Incentives

It can be seen that a lot of measures related to clean vehicles and fuels were accomplished during the Trendsetter, but the question appears how did Stockholm manage to achieve so much in relatively short time (the project lasted from 2002 till 2006)? To make goals of the project real some incentives were created in order to make companies and citizens more interested in clean vehicles.

One of these incentives was the introduction of free parking for clean vehicles, which is known from a common experience to be very effective way of making people more interested in these cars. In 2005 the decision was made in Stockholm to offer free parking for clean vehicles (a special permit was needed). After the introduction, during 8 months, about 1350 permits have been issued for free parking (Trendsetter, 2006).

Moreover, another measure of the Trendsetter project was the congestion tax (see Section 5.1.2), and decision was made to exclude clean vehicles from this charge. Currently, the exemption is no longer there. The agreement was reached that clean vehicles registered after January 1st 2009 will be no longer exempt, when clean vehicles registered before this date were exempt till 2012 (Borjesson, et al., 2012; Birath, Padam, 2010). It was calculated that the exemption from the congestion tax could save the driver up to 1200 SEK per month, as well as has made these vehicles more desirable (Trendsetter, 2006). Borjesson et al. (2012) shows that the dismissal of alternative fuel vehicles from the congestion tax significantly increased the sales of clean vehicles.

In 2008 the sales of clean vehicles grew at a record pace comparing to other European countries. At that time one quarter of all cars sold in Sweden and one third of all cars sold in the City of Stockholm were alternative fuel vehicles. During the congestion charge trial, in the spring of 2006, it was noted that 2% of passages were clean vehicles and in December 2008 the percentage risen to 14%. As it can be seen from the Figure 5.2 in 2006 and 2008 the sales of

clean vehicles were higher in Stockholm than generally in Sweden. In 2007, after less than half of the year, when the congestion tax was made permanent, the rates of the sales were about the same in Stockholm and Sweden, showing that the local incentive of congestion tax exemption affected the sales of clean cars in Sweden`s capital (Borjesson, et al., 2012).

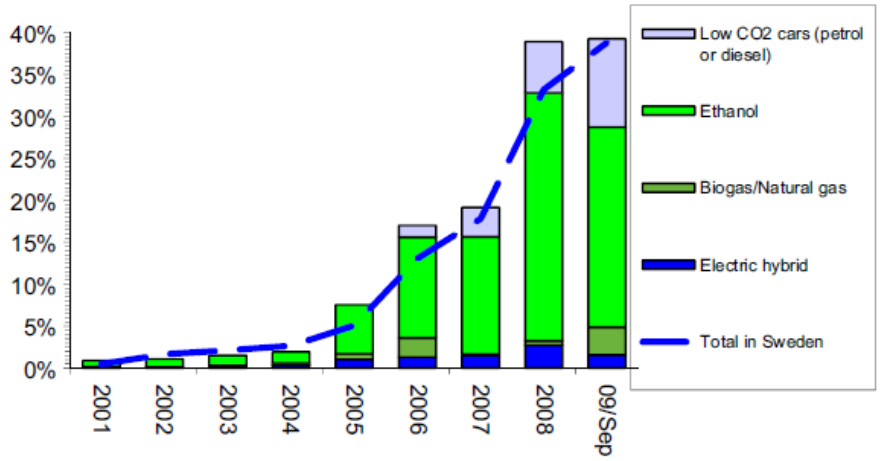


Figure 5.2 Share of clean vehicles sales relative to total sales of new vehicles from 2011 till 2009 (Borjesson et al, 2012:7).

The risen alternative fuel vehicles share has only contributed to a slight increase in traffic volumes throughout the cordon, due to the fact that clean vehicles` drivers are not as price-sensitive as the average drivers (regarding all the incentives in favour of clean vehicles). According to Borjesson et al. (2012) the clean vehicles crossing the cordon were mainly taxis, company vehicles in commercial traffic, and only a really small percentage of vehicles consisted of private motorists, that drive clean cars.

The exemption of clean vehicles from the congestion tax indicates how one measure from the Trendsetter project reinforced another. As it can be seen this led to a substantial increase in sales of alternative fuel vehicles in Stockholm. However, one of the ideas of the sustainable urban mobility paradigm is to reduce the need to travel and in this case creating some benefits for clean vehicles encouraged people to buy more of them. Nevertheless, the statistics showed that this did not result in a significant growth in traffic volume and most of clean vehicles were bought by various companies not for personal use.

Another effective way for spreading the clean vehicle concept in Stockholm was a provision of subsidies for covering a part of the extra cost. In the city companies have been able to get a subsidy part of additional vehicle price. Figure 5.3 shows that Stockholm and Trendsetter subsidised 17% of clean vehicles (which is equal to 422 vehicles) from 2002 till 2004. The total amount of these cars sold during the same period in the same region was a bit more than 4200.

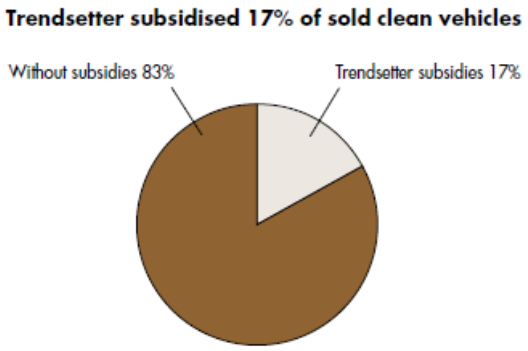


Figure 5.3 Subsidised clean vehicles during the Trendsetter (Trendsetter, 2006:64).

Although, the local incentives were not enough, and Stockholm together with a network of cities has put pressure on the national government in order to introduce national incentives. It was seen that local incentives` effects can be multiplied by national ones (e.g. discounts on fuels). It took more than 3 years of campaigning to get discounts on clean vehicles, tax exemption for biofuels (Trendsetter, 2006) and an obligation for each petrol station to provide at least one type of renewable fuel (Borjesson, et al., 2012).

Everything what Stockholm did in order to introduce clean vehicle was highly planned. The city reduced the cost of alternative fuel vehicles by purchasing large quantities of them, through gathering many buyers not only from Stockholm but from the rest of Sweden as well. In the beginning of the Trendsetter, a big nation-wide procurement was done, leading to a framework agreement to purchase 5000 vehicles during the project. The procurement resulted in lower prices by 4 – 15% (depending on vehicle model) (Trendsetter, 2006).

Some statistical analyses, made by the Environment and Health Administration of the City of Stockholm, showed that the exemption of clean vehicles from the congestion tax had the greatest effect on growth of these cars from all the incentives. The similar positive effect on sales was generated by the lower cost for alternative fuels, whereas the free parking for clean vehicle drivers had a lower impact on sales. The reduction of the purchase cost has mostly affected small city cars` with low CO2 emissions sales, but it is important to note that these vehicles were not exempt from the congestion charge (Borjesson, et al., 2012).

Many discounts for clean vehicles were created during the project in order to increase the interest in them. All the incentives mentioned above have quickly raised this interest between companies and residents and led to the successful implementation of set goals in relation to clean vehicles. Respectively, the local government, which is a part of the existing regime, provided some help to the development of clean vehicles and fuels.

Discussion

As it can be seen the Trendsetter project was a part of the Clean Vehicles program in Stockholm, which overall strategy has been to facilitate market introduction of alternative fuel vehicles and renewable fuels. Therefore, the guiding principle has been to constantly cooperate with various market players, and to look for ways on how to increase the demand for clean cars and fuels. During the years, the dialogue has been created with companies and municipalities that have an interest in clean vehicle initiatives, with fuel suppliers and vehicle manufacturers (Birath, Padam, 2010).

As it was presented earlier, the Clean Vehicles program started in order to improve the environment, particularly air quality, and people`s health. These reasons can be understood as a pressure from the landscape level in relation to the fact that the discussion about sustainable development began in the late 1980s and in the beginning of the 1990s. At that time new discourses were formed about the consequences of modernization (e.g. fossil fuelled vehicles) and the need to create more liveable environment in terms of air quality, etc., leading to the formation of "windows of opportunity" for clean vehicle and renewable fuel technologies to slip into the regime.

From analysing the Trendsetter project in relation to clean vehicles and fuels it can be seen that a lot of measures were implemented during the project, which generated positive effects and improved the environment. One can ask how the city did so much in relatively short time period. Political support is underlined as one of the greatest success factors of clean vehicles and fuels. Politicians have been actively trying to harmonise different actions of the city in order to support the introduction of alternative fuel vehicles and renewable fuels into the market. This is also emphasized by a number of incentives mentioned above, which purpose was to make clean vehicles more attractive, by creating better conditions and various discounts for owning this kind of a car. Having all this support from the politicians significantly contributed to the development of clean vehicles and fuels not only during the Trendsetter but from the beginning of the Clean Vehicle program. It also led to fewer barriers to be overcome during the process. It accentuates that the notion of transitions that actors (in this case politicians) are significantly important for transforming economic frame conditions and supporting the development of the niche of clean vehicles and fuels. It can be said that the support came from the regime and led to this niche innovation to be adapted and to become a part of the regime and slowly reform it.

What is more, the broad collaboration between different actors in relation to clean vehicles and fuels pushed the novelty further, showing that the technology by itself is not the main driver of innovation or in other words, as it is underlined by socio-technical transition theories, no innovation can appear without human action. Moreover, the socio-technical transition towards sustainable mobility cannot be caused by one factor only, for example high oil cost, but it can be generated by coevolution between multiple developments in infrastructure, knowledge

base, regulations, markets and so on, which is the case of the development of clean vehicles and fuels in Stockholm.

Furthermore, during the Trendsetter a lot of collaboration and practice exchange took place with different cities from around the world in relation to measures of the project. The measures implemented during the project has inspired other cities and resulted in continuing efforts. Participation in the Trendsetter also led to generate more ideas for further initiatives as well as thoughts for how to keep developing some measures after the project. This represents a co-evolution of clean vehicles and fuels through creation of visions and aims by cycles of learning and adaptation within different practices (e.g. various projects).

The analysis shows that the Trendsetter project constitutes a significant input into further development of clean vehicles and renewable fuels, as well as it contributed to incorporation of these technologies into the market. It can be seen that alternative fuel cars and renewable fuels are being more and more embedded in the regime in a step-by-step manner in order to cope with environmental issues caused by vehicular traffic. This technology can solve problems in relation to environment, however, there will always be the essential problem of congestion and risk of accidents. The clean vehicle is still a car and it also occupies space, requires parking and other car infrastructure. Also the idea of clean vehicles being more environmentally friendly than an ordinary fossil-fuel car can encourage people, who do not own a car, to buy one. In an environmental sense, it is definitely better to replace polluting cars with more environmentally friendly ones, but this would not challenge the car-based regime. As Banister (1997, 2008) argues in order to move towards sustainable urban mobility transition, firstly, there is a need to reduce the need to travel, travel shorter distances and encourage modal shift. Nonetheless, from the Clean Vehicle program and the Trendsetter it can be seen that the main idea is to change the municipal fleet and target mostly companies to replace their fleets. Accordingly, there are some necessary functions which have to be covered by motorized vehicles and while it cannot be substituted by some alternatives, at least clean vehicles and fuels can keep those functions operative with leaving smaller impact on the environment, the city and people`s health. In this sense, Stockholm`s work with clean vehicles and fuels is contributing to the transition towards sustainable urban mobility, but at the same time there is a risk to be in favour of the car-based regime if polluting vehicles are only changed by clean ones, but no additional actions are taken for changing people`s behaviour and attitudes towards the use of the car.

5.1.2. Analysis of the Congestion Charge

The congestion tax is a measure for reducing congestion levels, pollution and improving the environment as well as bringing changes in behaviour and attitudes (Isaksson & Richardson, 2009). Its implementation in Stockholm has drawn huge attention worldwide. Clearly, the chance to gauge the impact of congestion tax on traffic, travel behaviour and congestion levels have attracted significant interest (Borjesson, et al. 2012; Eliasson, 2008). This measure is considered as a radical policy or unpopular policy, which is not wanted by the public (Isaksson & Richardson, 2009), that is why it is even more interesting that the congestion tax survived extremely complicated political and legal process, involving a forced referendum by opponents to the charges. The congestion charges in Stockholm went from being considered as ''*the most expensive way ever devised to commit political suicide*'' (Borjesson, et al. 2012:1) to something that was eventually recognized by hostile media as a success story with broad political and public support (Borjesson, et al. 2012; Eliasson, 2008).

It is interesting to look how this measure has been developed and what kind of an impact it has been having on the city and its citizens. It is known that the congestion tax had to go a long and hard way to become accepted, so it is also important to understand what barriers had to be overcome in order to introduce the congestion tax (which was considered as a quite radical measure) in Stockholm and make it permanent. Accordingly, the main focus is put on the analysis of how the congestion charge has been contributing to the transition towards sustainable urban mobility in Stockholm.

Historical Development of Congestion Charge

Socio-technical transition is a long-term change, so it is crucial to comprehend how some possible part of this process (in this case the congestion charge) evolved during the time. In this section the historical development of the congestion tax in Stockholm and the most important decisions taken will be presented.

The congestion charge in the capital of Sweden has a long history (see Figure 5.4). It has been a debate issue since 1970s, because traffic has been a problem for a long time in Stockholm and the city was inspired by Singapore (Appendix C), which was the first city in the world that introduced the digital congestion charging system in 1975 (Sustainable Cities, n.d.). In 1977 already "*a county bill was laid for economical steering of the car traffic*" (Hiselius, Brundell-Freij, 2007:5). Later in 1992 road tolls were included in the "Denis Agreement", which was an agreement on environment and infrastructure. Although, the Dennis package collapsed, because of the increasing political difficulties, generated by the agreement, after the national government withdraw its support in 1997 despite the fact that the agreement was initiated by it (Hiselius, Brundell-Freij, 2007).

Only in 2002, the process leading to the introduction of the congestion charge started (Thynell, et al., 2010). After the national as well as local elections in September, the Green Party, the Social Democrats and the Left Party on a national level agreed that a trial of congestion scheme

would be taking place in Stockholm during the election period together with an evaluation of the trial in the end of 2005 and in the beginning of 2006. However, it is important to mention that at the local level before the elections, it was promised by the Social Democrats to not introduce congestion charges in case they will be elected (Hiselius, Brundell-Freij, 2007).

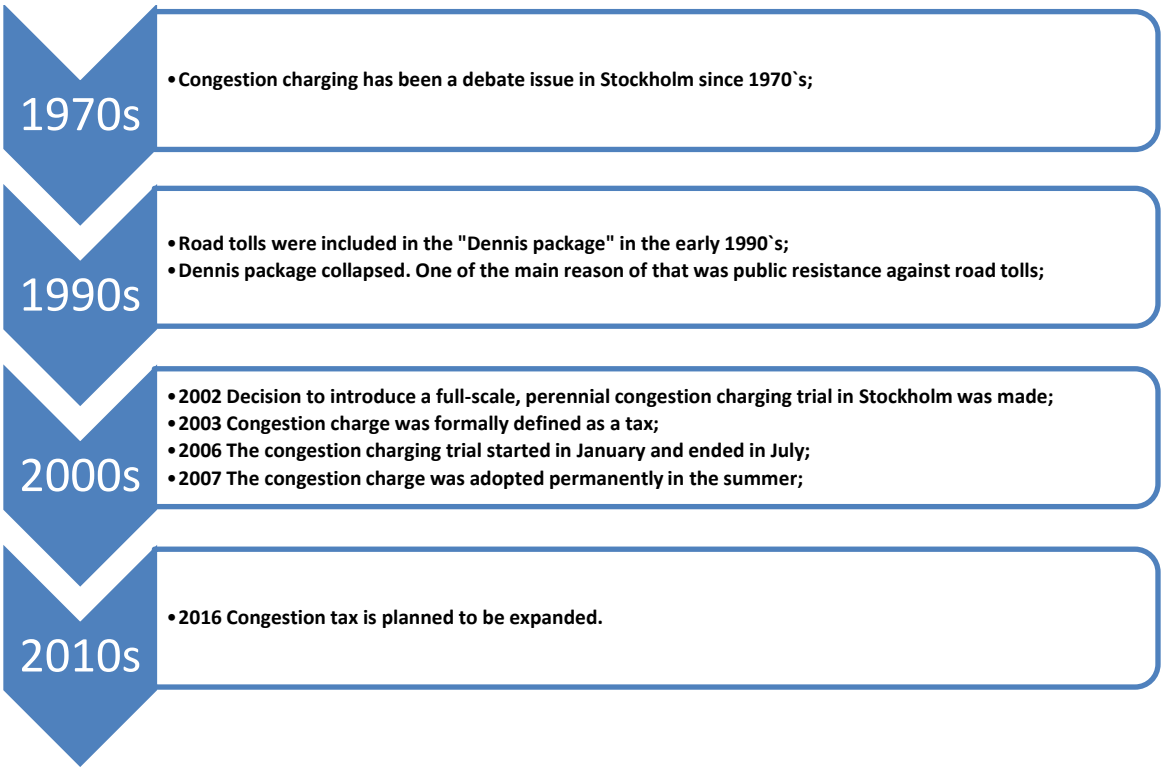


Figure 5.4 Historical development of the congestion charge.

In 2003 the Stockholm City Council made a decision that a referendum regarding the trial will be taken in the fall of 2006, when the general election is held. In the same year the charge was formally defined as a tax and was not in control of the municipality (Hiselius, Brundell-Freij, 2007).

In June 2004 the formal decision on implementation of the congestion tax trial was made by the Swedish Parliament (Trendsetter, 2006). The trial started in January 2006 and ended in July 2006, despite the fact that it supposed to last for 14 months. It could not begin earlier, due to requirement of new legislation for making the Stockholm congestion tax trial legal (Hiselius, Brundell-Freij, 2007; Isaksson & Richardson, 2009; Eliasson, 2008). This trial not only included the congestion charge but also an increase of public transport capacity. Initially, the trial supposed to consist only of a congestion tax scheme, but later, the decision was made that the charging scheme has to be complemented by enlargement of public transport capacity. This expansion started in August 2005 and continued till the end of December 2006, despite the fact that the charges were postponed (Isaksson & Richardson, 2009; Eliasson, 2008).

The budget of the trial was SEK 3.8 billion (Trendsetter, 2006), which was paid by the natioal government as a part of the agreement, which was set between the national government and the City of Stockholm (Hiselius, Brundell-Freij, 2007). The revenues were given back to the Stockholm region not only by investments in the infrastructure needed for the trial but also for the public transport system. However, the reuse of the revenues to the region was often seen as a question of fairness and equity (Hiselius, Brundell-Freij, 2007).

A referendum took place in September 2006 (Trendsetter, 2006) in Stockholm and 14 out of 25 neighbouring municipalities. The results were 53% in favour of keeping the charge (Tools of Change, n.d.) and it resulted in reintroduction of the permanent congestion tax in August 2007 (Stockholms stad, 2013; Eliasson, 2008; Borjesson, et al., 2012).

After the short introduction of the historical development of the charge since the 1970s, more detailed characteristics of it will be introduced below.

Goals

As it was presented before, the congestion tax first was introduced in 2006 as a trial, which was followed by a referendum, and finally, was reintroduced permanently from 2007. The main goals of the congestion tax were to increase accessibility, improve the environment (Trendsetter, 2006; Isaksson & Richardson, 2009; Tools of Change, n.d.; Hiselius, Brundell-Freij, 2007) and "*to reduce congestion on the most congested road—improve speed through the bottlenecks*" (Eliasson, 2008:396), as well as to test if traffic system`s efficiency in Stockholm can be enhanced by congestion tax (Tools of Change, n.d.; Hiselius, Brundell-Freij, 2007; Trendsetter, 2006).

The Design of the System

In Stockholm the congestion charging system consists of a toll cordon around the inner city (see Figure 5.5) (Borjesson, et al., 2012; Eliasson, 2008), including 18 unmanned electronic control points at all entrances to the cordon. The tax was applied on the entry of the area as well as the exit (Tools of Change, n.d.). The area inside the cordon occupies 30 km² (Eliasson, 2008).

From 06:30 till 18:29 motorists have to pay for driving in or out the inner city on weekdays (Trendsetter, 2006; Stockholms stad, 2013). The fee varies from 10 SEK to 20 SEK, depending on the time of day (see Figure 5.6), with the maximum charge of 60 SEK per day (Hiselius, Brundell-Freij, 2007; Eliasson, 2008).

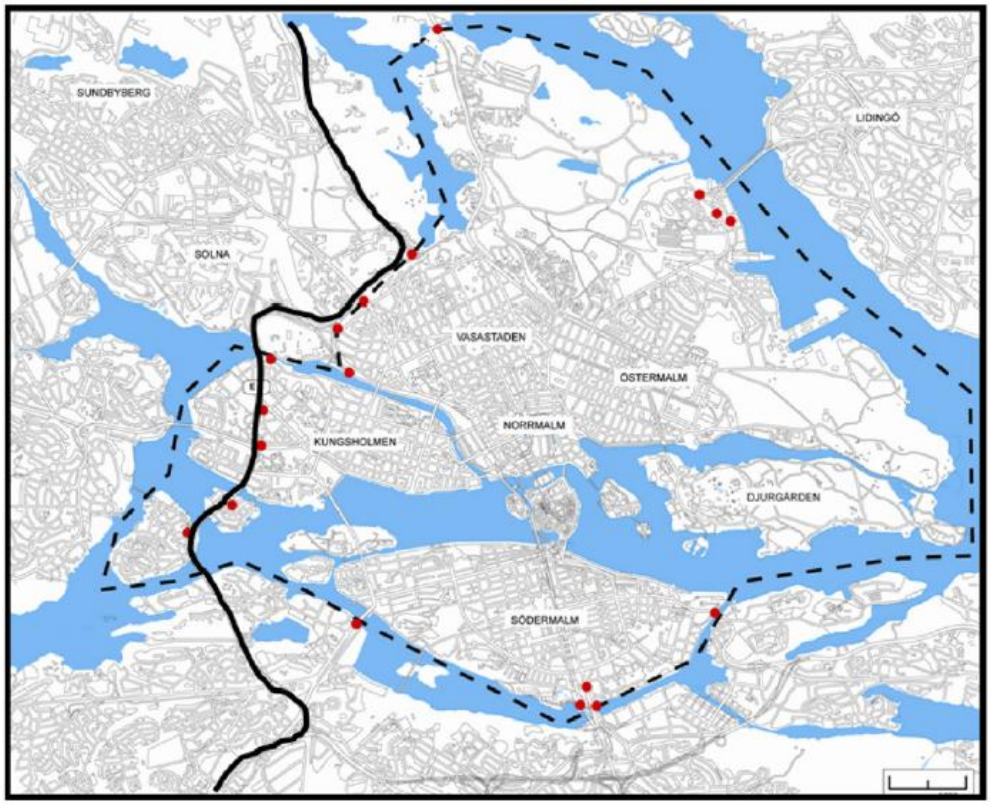


Figure 5.5 The charged area. The dashed line shows the charging cordon, red dots – charging points and the solid line – non-charged Essinge bypass (Eliasson, 2008:396).

Nights, weekends or holidays are not charged as well as transit, emergency, other kind of govenmental vehicles and those with disabled parking permits (Tools of Change, n.d.). Also at some point the clean vehicles were exempt from the tax too (see Section 5.1.1). Only one passage between the north and south part of the country is free of charge. It is the Essinge bypass (see Figure 5.5), which used to be heavily congested even before the congestion charges were introduced. Accordingly, there was a strong argument to also charge this road, however, the opposition from the neighbouring municipalities was strong and that led to the decision of not charging the Essinge bypass made by the politicians of Stockholm (Eliasson, 2008).

06:30 – 06:59	10 SEK
07:00 – 07:29	15 SEK
07:30 – 08:29	20 SEK
08:30 – 08:59	15 SEK
09:00 – 15:29	10 SEK
15:30 – 15:59	15 SEK
16:00 – 17:29	20 SEK
17:30 – 17:59	15 SEK
18:00 – 18:29	10 SEK

Figure 5.6 Congestion prices.

Results of the Trial

Despite the fact that the congestion charging trial lasted less time than it was planned in the beginning, all the goals were reached. The trial resulted in substantial traffic reductions, leading

to congestion reductions as well as travel time variability, and public acceptance (Borjesson, et al., 2012).

The traffic was reduced by around 22% across the toll cordon (see Figure 5.7) during the charging time (06:30 – 18:29) (Isaksson & Richardson, 2009), and congestion decreased significantly by 30% – 50% (Tools of Change, n.d.). The decline in vehicle kilometres travelled indicated that emissions of carbon dioxide and particles from traffic were also diminished. The reduction in the inner city was the largest, between 10 % and 15% (it varied across diverse types of emissions) (Eliasson, 2008). Due to the fact that the inner city of Stockholm is a densely populated area, the decrease of emissions created a significant health benefit. According to Thynell et al. (2010:424) "*The health benefit is about three times higher than the benefit that would have been gained had the reduction occurred through an increase in fuel prices*.". However, the trial only had a marginal impact on noise levels (Thynell, et al., 2010).

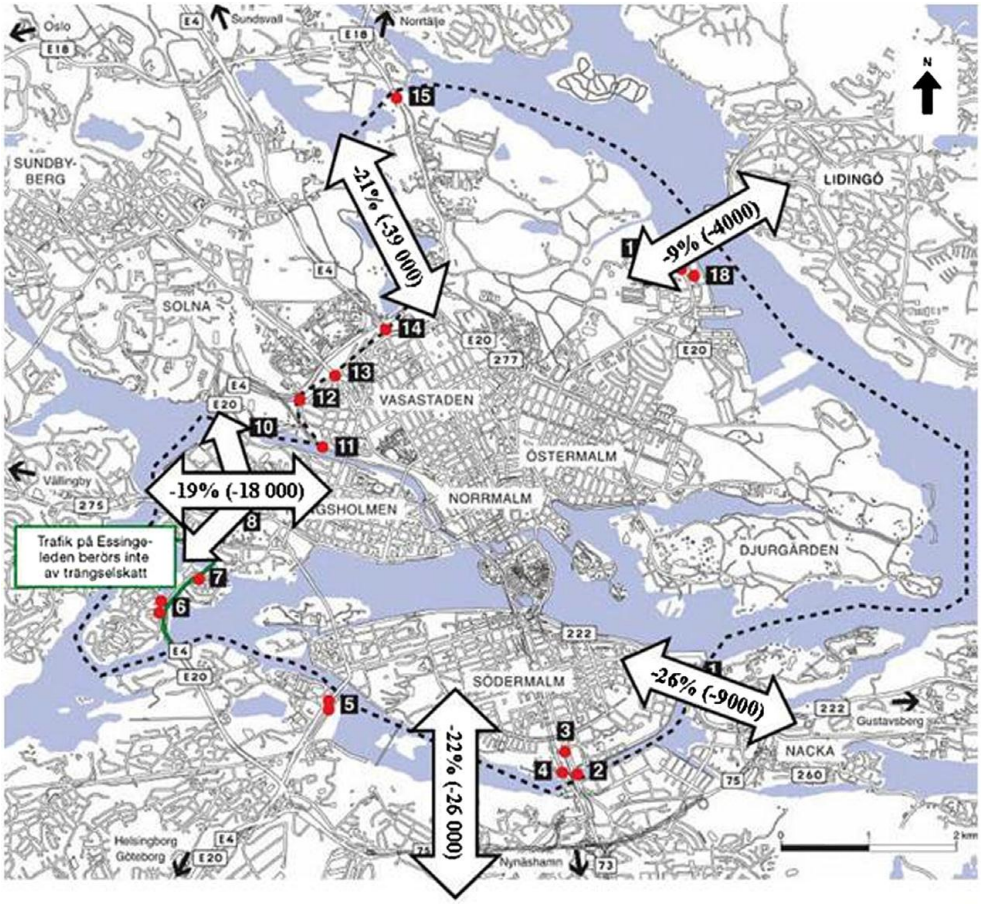


Figure 5.7 Reduction in traffic flow at the charging points during paying hours (6:30–18:29) (Thynell, et al., 2010: 425).

As it was mentioned above, one of the main goals of the congestion charge was to improve urban environment. Citizens of the inner city claimed that air quality, traffic flow and

accessibility for car drivers, cyclists and pedestrian were improved (Thynell, et al., 2010; Eliasson, 2008; Hiselius, Brundell-Freij, 2007).

Moreover, it was underlined that during the congestion tax trial traffic levels decreased immediately, but once the pricing was abolished it returned towards initial levels (Tools of Change, n.d.; Borjesson, et al., 2012). Later, when the charge was reintroduced, the traffic has not increased since 2007, in spite of that the population has grown and charges stayed unchanged (Stockholms stad, 2013).

Eliasson (2008) noticed that also the media image changed greatly "*from "Congestion charging: even more chaos for road pricing" to "Stockholmers love congestion charging—People have realised the advantages—The dirge has turned into hymns of praise*"" (Eliasson, 2008:403). The proportion of newspaper articles representing a positive view on the congestion charge trial increased from only 3% in the autumn of 2005 to 42% after one year, whilst the proportion of articles that expressed a negative opinion were decreased from 39% during the autumn of 2005 to 22% after one year (Eliasson, 2008).

Public Acceptance

The process of the implementation of the congestion tax was complicated and its trial resulted in significantly strong reactions. There was significant public resistance against the charge and it became even fiercer when before the elections in 2002 the Social Democrats leader in Stockholm, Annika Billstrom, made a promise that in the city would not be road pricing during the next election period from 2002 till 2006. Nonetheless, after the national and local elections, the Green Party demanded that in Stockholm there has to be a full-scale congestion tax trial as a condition to support a Social-Democratic national government (Borjesson, et al., 2012; Eliasson, 2008). It can be seen that by this requirement actors supporting the development of the tax tried to push it into car-based regime because they gained power after the elections.

Then, there was the demand for a public referendum before the implementation of the tax by the Liberal Party, Moderate Party and motorist organizations (Isaksson & Richardson, 2009), that were against the implementation of the congestion tax. This indicates the resistance from the regime to the congestion tax to be incorporated into the dominant car-based regime and challenge it. In other words, the proponents of the existing regime felt a threat from this innovation, so it was tried to filter the congestion tax implementation out by the referendum.

Before the referendum, in the spring of both 2004 and 2005, 40% of Stockholm residents said that they would "most likely" vote yes for making the congestion tax permanent. However, the support felt at the beginning of the trial to 36% (Borjesson, et al., 2012). The referendum took place in September 2006 in the City of Stockholm and other 14 neighbouring municipalities (Hiselius, Brundell-Freij, 2007). In the capital of Sweden it resulted in 51% for and 45% against the congestion charge. In other municipalities the average result was 40% for and 60% against (Isaksson & Richardson, 2009). Even if the referendum in Stockholm resulted in favour of the tax, based on the total number of votes in all municipalities which voted the majority of the

voters were not in favour of the congestion charge (Borjesson, et al., 2012). Despite this fact, the congestion tax was reintroduced permanently in 2007. It can be seen that there was no clear attempt for convincing the whole region about the benefits of the tax. The focus was mainly put on Stockholm as the heart of the region, whose residents benefited mostly from the system (Isaksson & Richardson, 2009). Nevertheless, it is important to mention that the rest of the municipalities of the county, where the polls indicated greater support for the tax, did not hold a referendum at all and many of these municipalities expressed their opinion that it was up to the Stockholm Municipality to make a decision regarding the congestion charges (Eliasson, 2008). Later in December 2007 a poll showed that the support for the tax rose till 66% and in 2010 it reached 70% (Borjesson, et al., 2012).

In the case of the Stockholm congestion charge it can be seen that public support for it was the lowest at the beginning of the trial, then the support increased significantly during the trial and has remained consistently great at about 70% thereafter. This indicates the pattern which has also been observed in other cities that implemented the road pricing such as London, Singapore, Oslo, Rome and Milan (Tools of Change, n.d.). The opinion about the congestion charge has changed dramatically after the citizens gained their own experience and saw the benefits and advantages of the system (Isaksson & Richardson, 2009; Hiselius, Brundell-Freij, 2007). As Thynell et al. (2010) indicates that before one has experienced something by oneself, one sees expenses and obstacles, but after one has gained experiences, one starts to see the benefits and advantages that one is getting for money.

Congestion Tax Revenues

The trial also included increased capacity in the public transportation system, for example a number of extra bus lines and more subway-trains. This expansion began on 22 of August 2005 and continued until the end of December 2006. During the trial, tax revenues were earmarked for investments in public transportation (Isaksson & Richardson, 2009).

Public transport was extended with 16 new bus lines and 197 new buses (Thynell, et al., 2010), additional capacity on trains and subways, and a bigger number of Park & Ride facilities (Eliasson, 2008; Trendsetter, 2006). The purpose of the extended public transport service was to meet increased demand for public transport during the congestion charge trial and also partly by politicians to show both “carrots” and “sticks” (see Section 2.4). As it was already mentioned, the trial had to be postponed, however, it was too late to postpone the extension of public transport, so it started as planned in August 2005. Eliasson (2008) argues that this turned out to be fortunate from a pure evaluation perspective, because it let to separate the effects of the public transport enlargement from those of the congestion charges much easier.

The official evaluation showed that the provision of additional capacity of public transport system was negligible on the aggregate level: about 14000 trips were made every day by buses at its peak, compared to over 1 million trips made by public transport across the cordon every day. Although, in the certain corridors that were served by buses, these vehicles probably

contributed to ensuring that the crowding on commuter trains would not be increased. Moreover, the transit extension purpose was also to serve as a tool to increase the effect of the congestion tax by creating better options to switch from private car to public transport. Unfortunately, surveys made on board on the new buses showed that only very few former car drivers were using these buses. Only 0.1% of total 22% of vehicle traffic reduction over the toll cordon can be ascribed to the expanded bus services (Eliasson, 2008). Nevertheless, the public transport passengers turned out to be very satisfied with the extension of bus lines (Thynell, et al., 2010).

As it can be seen during the trial tax revenues were appointed to investments in the extension of public transport system, but what were the plans for these revenues after the congestion tax was made permanent?

Already in 2006 the new Liberal-Conservative government underlined that the congestion tax revenues can be possibly allocated for financing a new bypass road. In other words, the surplus from the congestion charge revenues would be used for building a new 20km long highway – the Stockholm Bypass (Thynell, et al., 2010). Accordingly, it was decided that the revenues of the permanent congestion tax will be earmarked for road investments, but as a part of more comprehensive transport investment package (the Stockholm Agreement 2007), including both road and transit investments, partially funded by the government (Borjesson, et al., 2012; Eliasson, 2008). It is important to mention that the package contained major rail investments as well, but they were said to be financed by other funding sources. After the decision to involve the charges in an investment package was made, there were no propositions from any political parties to abolish the tax anymore (Borjesson, et al., 2012). Probably this can explain political acceptability of the charges: the inclusion of revenues was a necessity for congestion tax to be accepted on the national and local levels (Appendix C). The naturally radical measure had to adapt to the car-based regime in order to become a part of it.

Public transport extension was in line with political parties such as the Green Party, the Left Party and the Social Democrats Party, which were behind the congestion trial, agenda, despite the fact that the Social Democrats in Stockholm are also quite car-friendly. This can explain why the money collected from the congestion charge was appointed for public transport: to convince key voter groups of political parties responsible for the trial. However, when the referendum was held, there were also national and local elections happening at the same time. After these elections, there was a shift in the political majority not only at the national level but also at the local (Appendix C). This indicates that the decision to reallocate money, collected from the congestion tax, into new road infrastructure was made, in order to keep new government`s key voters groups satisfied.

It can be seen that the congestion tax was adjusted by those political parties that were in power at certain time for not losing the votes from their key voters and convincing them that the congestion tax can be useful. Firstly, there was a need to convince people about the tax with

providing more public transport service in order to create better possibilities to switch from a private car to public transport. When the government changed, after the referendum in 2006, there was no need any more to satisfy the needs of anti-car voters. This led to the inclusion of the revenues of the congestion charging into the broader infrastructure investment package and this was a rational thing to do from the new government`s perspective, which was in favour of the car-based regime. This situation perfectly reflects Hiselius and Brundell-Freij (2007:2) idea that "*In a decision-making process, all actors are guided by their own values and preferences*.".

Furthermore, investment in the new road infrastructure can probably improve the short-term traffic system efficiency, but it surely will not contribute to its long-term sustainability. The sustainable mobility paradigm argues that there are different tools for solving traffic related problems instead of building more road infrastructure (see Section 3.4).

Future of Congestion Tax

From the beginning of the congestion tax the fares has been the same (Appendix A). However, it is planned to raise the fares and start charging the Essinge bypass in 2016. But what is the possible future of this transport policy measure? One of the interviewees, the Chief Strategy Officer of the Traffic Administration in Stockholm, Daniel Firth, argues that the level of the charges will be continued to review and probably there is a need to think about the time when roads are charged, and to analyse what is the situation on weekends (because now weekends are free of charge). Another possible task for the future is to look at other possible charging locations in the region (Appendix B). However, another interviewee, the senior research leader in the Swedish National Road and Research Institute, Karolina Isaksson, has a different opinion in relation to the congestion tax future. According to her the congestion tax will be used for funding new infrastructure and public transport or in other words it will be used more as a "money machine" than a steering tool, in order to move to sustainable mobility, if nothing is changed. This measure has a potential to support more sustainable ways of travel by making private car use costly, although, there is always a temptation for the politicians to use this policy as an instrument to basically raise funds leading to week interest in reducing traffic, because then there is a need to keep the traffic level high enough for collecting the desired amount of money (Appendix C).

Discussion

The congestion charge can be a powerful tool in order to cope with traffic related problems and challenge car-based mobility. During the trial period of the congestion tax in Stockholm the aims were to increase accessibility, improve the environment and to reduce traffic, when the revenues were appointed for the public transport extension. However, when the tax was made permanent, it became a part of a larger infrastructure plan (the Stockholm Agreement 2007), which involves large-scale investments in the new road bypass, the Stockholm Bypass.

According to Richardson et al. (2010) this plan is highly similar to some parts of the old plans from the 1950s, 1960s as well as 1990s, and underlines that the congestion tax and the Stockholm Bypass are closely linked in the multimodal development strategy for Stockholm region. Respectively, it can be seen that the permanent congestion tax this time is not about changing mobility patterns, but it is more about effective mobility management that in turn should have positive impact on the environment and accessibility, as well as about funding new road infrastructure in itself.

One can ask how radical this policy is. Isaksson and Richardson (2009) underline that the car to some extend was challenged only when the decision was made to implement the congestion tax trial in 2002, unfortunately, in the end, the congestion charge trial was not designed with the purpose to radically confront car-based mobility (dominant regime). The congestion tax in Stockholm is a proper example for showing that radical policies of this type can really well perpetuate a mobility frame of car-based automobility instead of confronting it (Richardson, et al., 2010).

The congestion tax can be a tool for making a turn towards the transition to sustainable urban mobility, as well as it can strengthen an unsustainable mobility frame. The purpose and the outcome of this policy depend "*on how local power relations engage with the underlying frame of mobility*." (Richardson, et al., 2010:65). In Stockholm case it is clear that the congestion charge drifted away from sustainable urban mobility, in a sense that it was converted to a "money making machine" to fund new road infrastructure, even if it aims to reduce congestion and improve the environment. In other words, it can be said that the regime "consumed" naturally radical measure and adapted it to itself: the congestion tax reduced the congestion significantly, which meant that better conditions were created to those drivers who can afford to pay the charges, and the tax rate was kept at relatively low level, because the intention was not to challenge the car-based regime remarkably in order to collect desired revenues. Respectively, the regime converted the purpose of the congestion tax from serving as a tool to move towards sustainable mobility transition to a tool which still reduces environmental impact but also favours the existing regime by creating better conditions for those who want and can use the car, also directed the revenues to strengthen it by building more road infrastructure.

A successful development of niches of sustainability innovation, such as the congestion tax, requires support from a civil society and public authorities. From transition theories it is known that as a result of sustainability being an ambiguous and contested concept, the debates and disagreements about directionality of sustainability transitions, the most suitable policy instruments or packages, and the pros and cons of particular solutions will take place. This can be seen in the case of Stockholm congestion tax. The introduction of this measure was not easy and was met with broad public and political opposition which led to changes and transformed radical measure to one in favour of the dominant regime through process of mutual adaptation. However, it emphasizes that transitions do not take place as smooth transformations but over a

series of disagreements and conflicts that shift over time the elements included in visions, goal and means which are pivotal for actors' engagement throughout the process (Jorgensen, 2012).
Another questionable decision is the exemption of clean vehicles, which shows the ambivalence towards the private car use. At the same time the goal is to reduce congestion by the congestion tax, but this exemption encouraged driving, since clean vehicles had the privilege not to pay the tax. In addition, the charge is not very high, the maximum amount of money to be paid is 20 SEK during the peak hours, which according to Richardson et al. (2010) is less than a fifth of the charge if one ones to enter the charging zone in London. Thus, putting a price on something that used to be free creates equity problems. The congestion charge mainly benefits to the drivers, who can afford to spend money for their car-based mobility, as well as those citizens, who live in the inner city and can feel reduced congestion and the improvements in urban environment. However, it is emphasized in transition theories that most sustainable solutions do not give evident benefits for single users, because sustainability is perceived as a collective good. The congestion tax currently makes the use of the car easier by offering benefits to car users and providing them the opportunity to use the roads more efficiently. On the other hand, this transport policy in the long-term can contribute to multi-modal travel by encouraging a modal split. As Urry (2011) indicated transitions towards sustainable mobility is likely to be a shift to less consumption. Therefore, the congestion tax could be a great tool to contribute to this change if used in a right way, because it aims to reduce the use of private vehicles.
From the Stockholm case it can be seen that substantial focus was put on the period of elections. For managing to conduct the trial during the election period the whole process has been hurried, leading to the trial period being shorten twice (from 14 months to only 7). Often there is a myopia among the politicians, which can be viewed as a difficult political problem for democratic governments, due to the fact that politics tends to create short time horizons, which are frequently "*extending only until the next election, if not just up to the next public opinion poll"* (Hiselius, Brundell-Freij, 2007:2). The future might be systematically short-changed by the politicians when they weigh short-term costs against long-term benefits.
The main strategy for implementing the congestion charge can be summarized as 'trial + referendum' or the logic which let to overcome public resistance and avoid conflict. Politicians gave a considerable power to the residents through the referendum and it shows that there was a clear attempt to prepare citizens for voting in favour of the congestion tax through thoughtful system design. The general strategy for creating legitimacy was kind of an experiment, where the policymakers decided on the basic approach, which residents were then forced to test. Therefore, in return the public were given the power over the final decision about the congestion tax future. However, the increased public acceptance has been essential in order to implement this measure (Borjesson, et al., 2012). Isaksson and Richardson (2009) indicates that this approach can be seen as an alternative for directing confrontation with an

unwilling public, as well as an approach that is well in line with the consensual traffic policy and planning tradition not only in Stockholm, but generally in Sweden.

Moreover, the strategy also had an effect on the content of the policy itself. It was formed in the way to be conflict free among different political parties, but in the end it also got content free, in a manner "*that a policy with the explicit intention of managing urban mobility was adopted without deliberation on how it could or should impact on the future of mobility in Stockholm, and which consequently was prone to being remoulded – in this case into a package that facilitated significant investment in new roads, at the expense of the development of public transport*." (Isaksson & Richardson, 2009:256). It can be seen that the aim was to make every political coalition satisfied and be in line with their goals, as it was discussed above. After all, the question of future urban mobility was suppressed and stayed fundamentally untouched in deliberations of the policy.

The analysis of the congestion tax showed that the discussion about introducing it already started in 1970s, but the real action took place only from 2002, when Stockholm participated in the Trendsetter project. However, from analysing the congestion charge it can be seen that in various scientific articles in relation to this policy the project is not mentioned. Accordingly, it can be said that the Trendsetter was not the main driver of the development of this measure, but it helped to accelerate it and create better conditions for this niche development to evolve.

The congestion tax in Stockholm has survived a complicated political process and lost his radical nature in order to become a part of the existing regime. This analysis shows that transitions are significantly complex processes and existing regimes tries to oppose radical innovations or filter some of them and then adapt them.

The niche development of the congestion tax has happened on the edge of the existing car-based regime and actors with power encouraged and pushed this novelty towards the regime. For example, politicians, in favour of this measure, in order to stimulate its development used their political and financial capital and also contributed to overcome opposition from diverse social groups.

Also, actors who were against the congestion tax and had power when this measure was under development tried to supress it, for example by demanding to have a referendum. Shift in power caused by general elections led to changes of the congestion tax. In this case, in the end the regime did not filtered out the congestion tax as a novelty, even if it tried to do so, but included it into itself as a more worthy innovation. Although, in spite the tax was kept, it had to change its radical nature and adapt to the regime, in order to stay inside it.

Nowadays, the congestion tax brings significant benefits from the environmental point of view, but does not remarkably challenge the car-based regime. In 2016 the tax will be raised and expanded. It indicates that this transport policy measure shows the potential to contribute more to the transition towards sustainable urban mobility in the future if it is used properly.

5.2 Analysis of the Mobility Strategy 2012 of Stockholm

In this section the Urban Mobility Strategy 2012 of Stockholm is analysed and discussed in relation to sustainable urban mobility transition.

At the beginning of 2013, the Urban Mobility Strategy 2012 was presented by the City of Stockholm, in order how to deal with the increased need for efficient and sustainable transport, due to the rapid population growth (Stockholms stad, 2013). The strategy is an agreement between the City of Stockholm, the Swedish government, the county council as well as the other municipalities in the county (City Ranking: Stockholm, n.d.). It seeks to move away from a traditional transport planning system, focusing on automotive transport, to a system that considers environmentally friendly modes of transport such as cycling, walking and public transport (Saven, 2014). According to Firth (Appendix B) it is also not so long-term vision of the strategy for what has to be done with the transport system in Stockholm in order to achieve the goals set by the City Council.

The Urban Mobility Strategy, first of all, focuses on promotion of efficient use of limited and shared resource – street space. It is underlined that how one plan and use this resource plays a crucial role in the Stockholm`s ability to achieve its targets for sustainable development in social, environmental and economic fields. The document outlines the negative sides of car-based regime, such as automobility being a source of pollution and noise, which has an impact on people`s health. Also that the road traffic includes a danger in itself, as well as how one chooses to transport oneself impacts one's health, and people`s access to a diversity of travel options affects their social life. The contribution made by traffic to global climate change and the substantial efforts that will be demanded for achieving the ambitious goal to become a fossil-fuel free city till 2050 is outlined in the strategy as the biggest challenge for the transport system (Firth, 2012).

A lot of attention in the Urban Mobility Strategy is paid to accessibility. It is emphasized that travelling should be about reaching the destination, but not about the trip itself. This implies that "*Flows and mobility are not goals in themselves*." (Firth, 2012:5), and the core element is accessibility, or in other words, the ability to reach one`s destination without difficulty.

Another principle of the strategy indicates that Stockholm ought to change focus from moving vehicles to transporting people and goods for achieving efficient and sustainable traffic flows (Firth, 2012). Respectively, the strategy has changed the political discussion (Appendix B). This underlines the new direction of transport planning that goes towards the idea to plan for people, not cars.

The need to promote public transport, walking and cycling is significantly highlighted in the strategy as well. According to Firth (Appendix B) substantial focus is put on improving the infrastructure and promoting the movement of people and goods instead of vehicles, but not much is done to change people`s behaviour. There are a lot of people coming and moving in to

Stockholm, and there is a need to engage with them and provide information about alternative modes of travel and what are the consequences of car travel (e.g. high parking fees, lost time, etc.) and so on. However, the strategy only emphasizes the need, but does not necessarily provide tools for fulfilling it. Moreover, as Firth (Appendix B) stressed out it is hard for public authorities to deal with this, because they just cannot give orders for people what to do and physically stop them. That is why the Traffic Administration is trying to make other travel options more attractive by making easier to bike, walk and use public transport.

Moreover, the need to reduce trips made by car in Stockholm is expressed in the strategy. It is said to be a necessity and indicates that decreasing the car traffic is not seen as a barrier to have well-functioning and satisfactory car traffic, distribution traffic as well as other commercial traffic. The notion is to have a city with cars, but not a city for them. It matches the idea of sustainable mobility paradigm that it is important to design the city with high quality where people would not need to use private vehicles, rather than forbidding the use of them.

Also it highlights that in various contexts the car has an essential function, but in order to make car travel efficient in Stockholm it is required to make the majority of trips by other means of transport. More people have to choose to use public transport, walking and cycling. For achieving this aim there is a need of the step-by-step transition of the street environment for making more dedicated lanes for public transport, creating more bicycle lanes, an enhanced street environment for pedestrians and having less parking spaces (Firth, 2012). It shows the intention of changing the street from being a space where, the most attention is paid to vehicular traffic, to one, where more space is given for environmentally friendly modes of transport.

It can be seen that the Urban Mobility Strategy as a framework has helped to facilitate the political public discussion by moving the debate from only one certain transport mode to the more general questions of mobility (Saven, 2014). Accordingly, the strategy gives the priority to more efficient and environmentally friendly modes of transport (see Figure 5.8), or in other words, it creates a hierarchy of all transport means with cyclists and pedestrians on top and car users on the bottom, and also reflects one of the ideas of the sustainable mobility paradigm.

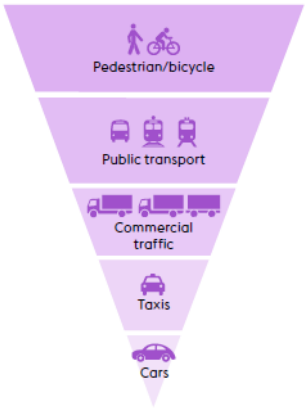


Figure 5.8 Prioritization of transport modes (Firth, 2012:17).

Furthermore, the strategy indicates that one of its major elements is focusing on cycling and that Stockholm has a large potential to become a world-class city for biking, where cycling is viewed as a natural activity and a part of the transportation system. However, there is congestion not only for car traffic but also on the cycling path network, particularly in the city centre. For developing this network the new cycling plan was created, which focuses on the infrastructure, information and

communication not only with travellers, but also with other relevant actors such as companies, schools and authorities (Stockholms stad, 2013).

Three Focus Areas

The strategy consists of three focus areas: city planning, infrastructure planning and transport planning (Stockholms stad, 2013). It is claimed that these interacting cornerstones will help to sustainably manage the increasing need for transport, due to the rapid population growth (Firth, 2012).

The purpose of urban planning is to create a dense and varied urban environment that diminishes the need to travel (Stockholms stad, 2013). By the formation of changing urban environment, where a bigger and more mixed range of shops, schools, workplaces, leisure activities and so on are easily accessible by walking or cycling, an accessibility level is created, which is not only built on mobility. Furthermore, in a denser city it is easier to have better public transport system that is frequent and high-capacity (Firth, 2012).

Infrastructure planning is said to be used for a substantial public transport and a road network, leading heavy traffic out of Stockholm, expansion (Stockholms stad, 2013). To reach this, there are many infrastructures planned to be buil, which comes from the Stockholm Agreement. The Stockholm Agreement was reached in 2007 between the Swedish government and various stakeholders of the region on a number of priority transport projects for ten years (The City Planning Administration, 2011), and how they will be funded (Firth, 2012). All the projects from this agreement became an integral part of city`s comprehensive plan – the Walkable City (The City Planning Administration, 2011). The agreement funds 100 SEK billion of new roads and rail lines, involving Norra länken – a new road tunnel, a new branch and an extension of the light rail, Citybanan – a tunnel for commuter trains, a new E18 motorway section, a new road link - the Stockholm Bypass and other projects in the county (Firth, 2012).

The aim of the traffic planning is to optimize the use of current infrastructure (Stockholms stad, 2013). According to the Urban Mobility Strategy all these major investments in building more roads and rail lines will not be sufficient, and substantial capacity deficiencies will stay in some transport system parts even after these expansions, due to the immense population growth not only in the city but also in the region. That is why there is a need to add capacity for enabling more people and goods to be moved in the same space. The strategy underlines that this is nothing new in itself, because Stockholm has been working constantly in order to optimize the use of the limited space, but the pace of change indicates that there is a growing need for this work to be directed and coordinated to shared goals. At the same time, there is also a considerable requirement need for providing more travel alternatives, information and demand management tools (Firth, 2012).

Planning Aims for the Road and Street Network

As a part of the Urban Mobility Strategy four planning goals for the road and street network have been developed. The first planning aim highlights that "*An increasing number of people and amount of goods need to be moved, through greater use of high capacity transportation means; that is, public transport, bicycles and walking as well as goods vehicles with a high load factor*." (Firth, 2012:22). The strategy suggests three methods of how to mitigate the reoccurring congestion effects. Little increases in the capacity for moving vehicles can be reached in certain cases by optimising traffic lights, removing left turns, moving kerbs or converting parking to traffic lanes. However, if these measures work individually, their effect is limited, but when a number of little gains are combined, they are able to have a more significant impact. Another method indicates that the space which is limited can be use more efficiently through dedication of more space to transport modes that can move most people at those times when many people want to travel. Also smart measures are other method for creating space. These kinds of measures help people to identify other ways of how to perform the same journey or by just not travelling. Financial incentives are also part of smart measures. For example, parking charges or the congestion tax are said to be effective measures, which prioritise trip, regarding to the person`s own valuation of the benefits of the travel (Firth, 2012). Another goal focuses on enhancing accessibility in the road network by increasing speeds for high-capacity transport means and increasing travel-time reliability for every road users. The strategy underlines that the city can enhance accessibility by permitting higher speeds for public transport, walking and cycling. Furthermore, it is outlined that more equal conditions for all transport modes will make them attractive, as well as increase freedom of travel option. Better accessibility for more sustainable modes of travel such as walking, cycling and public transport will indicate that vehicular traffic gets lower priority in particular situations and at particular times. Nonetheless, this is inevitable in a city, although the effect is diminished through offering reliable journey times (Firth, 2012).

The third aim is to strengthen the role of streets and roads as attractive spaces by improving walkability in the "walkable city". The idea of this goal is to make city`s streets and roads to encourage interplay, as well as to provide a public meeting place instead of just a space for moving people and goods. In order to achieve this, physical planning has to enable all types of walking: from walking to work/school or to the bus stop, to walking the dog. It is underlined in the strategy that: "*A serious approach to pedestrian traffic also involves acknowledgement of pedestrian traffic as a separate mode of transport*." (Firth, 2012:41) because planning of a combination of bicycle and pedestrian traffic has no possibility to identify or account for the unique and special terms and conditions to each of these transport modes.

The fourth goal is to minimise the negative effects of traffic, by promoting car use for trips, generating the most public good. The City of Stockholm according to the Urban Mobility Strategy has diverse strategies for minimising traffic impact. Although, these strategies

sometimes contradict with each other and reaching some objective might compromise other objectives. A joint objective that shows positive effects is for limiting the total traffic volume in those areas which are the most sensitive. The congestion charge has the potential to achieve lower levels not only of air pollution but also of other effects through traffic reduction. Moreover, road safety measures have the ability to create safer and secured environment and help to avoid accidents. If these measures are implemented correctly, they might have an influence on creating a better urban environment and the public realm. It is said that a higher road safety level will enable better mobility to more groups of people. Also noise levels can be reduced by measures for decreasing speed, and air quality can be improved as well, because of diminished fuel consumption, and consequently, lower carbon emissions. As another measure for mitigating negative effects of traffic - a car club is mentioned as well in the strategy.

The Next Step

The Urban Mobility Strategy presents the set goals, but they require action plans, which specify the types of initiatives in more detail, for reaching the aims during the shorter time span. Apparently, the strategy describes a general direction which Stockholm should move, and which goals are desired to be achieved. However, it is not a plan, where a defined number of measures for reaching specific targets are stated, and where the fundamental conditions are to some extend more stable, but a strategic document. In a plan if too many factors changes, then there is a need of a new plan, while a strategy is more flexible and can adapt to a shifting operating environment. It is stated in the Urban Mobility Strategy that the most significant element of it is that goals are reached, instead of how one achieves them. Also a strategy is needed for ensuring that all plans, tactics and programs are aimed at the same objectives, as well as to control any possible conflicts which can arise among the different priorities (Firth, 2012). Only in the action plans concrete measures are described.

2012-2016 Action Plan for Mobility

The Urban Mobility Strategy also contains a general Action Plan for 2012-2016. It describes a number of proposed measures, contributing to fulfil the strategy's objectives in the short-term. It also does not include those projects that were ready to implement at the time when the strategy was prepared (Firth, 2012). The general action plan specifies what is needed to be done in order to detail such specific alternatives or other policy decisions that has been taken.
This action plan consists of 21 measures for:

- high-capacity and attractive public transport;
- world-class bicycle traffic;
- pedestrian traffic;
- efficient and reliable freight traffic;
- car traffic;
- robust and sustainable accessibility.

The general action plan is going to the end, and it is interesting to see in what stages these measures currently are. The status of proposed measures can be seen in Table 5.9.

Table 5.9 Current status of proposed measures of the general Action Plan 2012-2016 (Appendix B).

Proposed Measure	Current Status
Commence work with the main network	Implemented
Enhanced monitoring of dedicated lanes for public transport	In process
Connecting journeys to public transport	In process
A bicycle plan for commuting to work	Implemented
Winter maintenance of cycle paths	Implemented
Bicycle parking plan	Implemented
Expansion of the shared bicycle system	Implemented
Action plan for bicycles	Implemented
A pedestrian traffic plan that identifies key thoroughfares	Needs to be accepted
Better understanding of pedestrian traffic`s needs	Under development
Coordination of operation and maintenance, road safety and accessibility	Implemented
An action plan for freight traffic	Adopted
Study consolidation centres	Implemented
Parking in the inner city	Implemented
Parking in the suburbs	Under development
And action plan for car traffic	Not developed
Enhanced coordination of disruptive road works	Implemented
Communication with city travellers and residents	Not much is done
Smart-choice measures	In process
Congestion tax development	Starts in 2016
One plan for the environment and traffic	Under development

Relation with other Urban Planning Documents

The figure below (see Figure 5.10) shows the relation between the Urban Mobility Strategy and other planning documents. The overall document is the City`s Vision 2030 that depicts how it will not only be to live in and work, but also to visit the City of Stockholm. The detailed description of how the city will grow exactly is given in the City Plan – the Walkable City. One of the key elements of this plan is to use urban planning for reducing the need to travel. The Urban Mobility Strategy gives the guiding policies for priorities in small and big decisions, related to the city`s roads and streets, for promoting a more safe, efficient, environmentally friendly, attractive and healthy city in line with the City`s Vision 2030 and the City Plan (Firth, 2012).

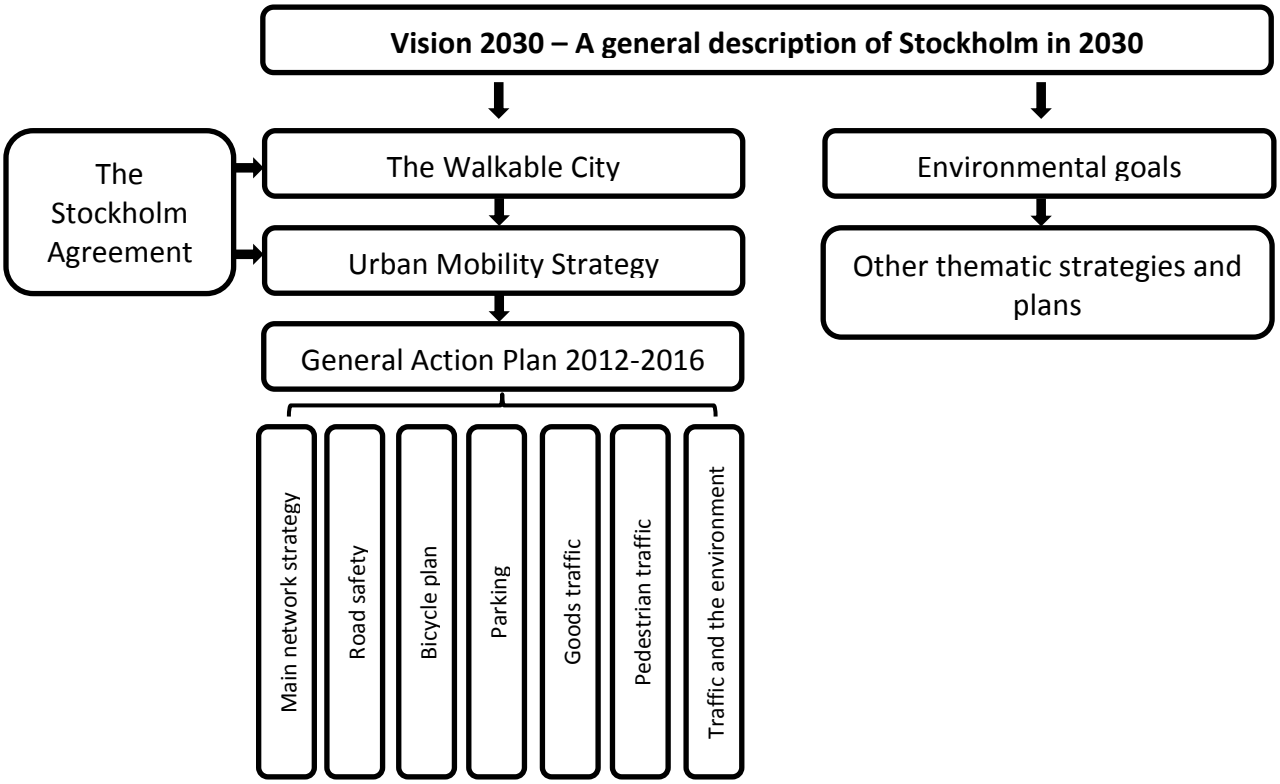


Figure 5.10 The Urban Mobility Strategy relations to other planning documents (elaborated from Firth, 2012).

The City Plan presents a concept of the walkable city and determines the direction for a contemporary transport system as well as sustainable travel, based on City`s Vision 2030. In the plan three strategies for the city are indicated:

• "*Plan for the efficient implementation of the infrastructure projects included in the Stockholm Agreement.*

• *Work to ensure a long-term focus on public transport.*

• *Focus planning on increased mobility for pedestrians and cyclists*." (Firth, 2012:17-18)

The first strategy implies that initiatives from the Stockholm Agreement have to be fully implemented and that all the projects have been included in the City Plan (The City Planning Administration, 2011). It is important to note that these projects have been also incorporated into the Urban Mobility Strategy.

Another planning aim of the City`s Plan emphasizes that Stockholm has to play an active role in the cooperation between stakeholders of the region aimed at keeping a long-term focus on public transport. Together with the projects from the Stockholm Agreement, the City Plan covers a number of public transport routes and links that have to be developed for securing sustainable growth (The City Planning Administration, 2011).

The last strategy underlines the need for creating good conditions for cyclists and pedestrians in Stockholm. This approach is said to be an essential consideration when planning transport routes and links that are outlined in the City`s Plan (The City Planning Administration, 2011).
However, Isaksson (Appendix C) indicates that the strategy is ambiguous in itself and it can clearly be seen from the relations between the strategy and other planning document. The analysis shows that the Urban Mobility Strategy has a lot of ideas, in line with the sustainable mobility paradigm (see Section 2.4), such as prioritizing of transport modes, enhancing accessibility, make city denser and so on, but at the same time it also contains numerous road infrastructure projects. This ambiguity exists because the Urban Mobility Strategy is a political document, where big infrastructure projects such as the Stockholm Bypass are incorporated into it. From the interview with the Chief Strategy Officer of the Traffic Administration in Stockholm, Daniel Firth, (see Appendix B) it is clear that the Traffic Administration has a sufficient knowledge about sustainable urban mobility. Although, politicians have the higher power, and how it was mentioned before, the strategy`s purpose was to outline what has to be done for achieving political goals in relations to the transport system. Due to this reason, the Urban Mobility Strategy was made in line with bigger plans that are not completely challenging the car-based regime, but are in favour of it, indicating the strategy still being highly influenced by the dominant regime.
Furthermore, in the interview Isaksson (see Appendix C) underlined that it is urgent to deal with the private car issues and change private vehicle role in the city. Also she stated that continuing building infrastructure, supporting an unsustainable transport system, is a significant problem. This kind of infrastructure requires huge investments, and currently everything is put into the Stockholm Bypass, which is considered as a top priority for the City Council, led by the Liberal and Moderate parties, that has car-friendly political goals. The researcher also stressed out that politicians do not realize that there is a limited amount of money for all the projects that have been agreed on, when it is obvious that this amount of money is not enough for supporting all of them. So it can be seen that pro-car politicians with the great power put the whole focus on road infrastructure and that results in limitation of the development of more environmentally friendly modes of transport such as walking, cycling and public transport. Isaksson (Appendix C) also highlighted that due to this unsustainable prioritising, public transport has to suffer: the city cannot afford to keep the system operating at the same level, so they are forced to reduce the capacity, even if the system is already crowded. This again shows the ambiguity of the Urban Mobility Strategy when the implementation of unsustainable political goals in favour of dominant car-based regime in practice has much higher position and priority.

Discussion

The Urban Mobility Strategy has played a significant role in Stockholm and has changed the political discussion from how to move vehicles to how to move people and goods. From the analysis it can be seen that the Urban Mobility Strategy is ambiguous in itself, due to the

combination of ideas of sustainable mobility paradigm and unsustainable pro-car political goals, incorporated into the document. This also indicates that the strategy is not so radical, in a sense of mobility paradigm. According to Firth (Appendix B) the perception of how radical the measures from the strategy are depends on individual comprehension and preferences. For example, a lot of people consider some measures, such as removing parking or increasing the price of parking, to be quite radical. However, Firth (Appendix B) believes that there is a need to be more radical in relation to transport policy measures, and that there are other cities like New York or London that are taking more radical actions (e.g. in expanding cycling infrastructure), in order to move towards sustainable urban mobility at the moment. Although, at the same time there are numerous politicians, public servants, residents, etc. with the same opinion, but also there many of those who think the opposite. This shows that there is some kind of a balance between these two opinions. Furthermore, the level of acceptance indicates how people see various policy measures being more or less radical. That is why there is a need of constant discussions and negotiations in order to implement some measures, which will be accepted by the politicians and the public (Appendix B). As Banister (2008) underlines (see Section 2.4) public acceptability generates political acceptability, and without it no radical change can take place.

The Urban Mobility Strategy is about how road users should use streets and roads of the city, the vehicles they travel in, as well as the parking areas for keeping the vehicles, for ensuring the system is as efficient as possible (Firth, 2012). It shows that the discussion has become more about the distribution of capacity instead of the particular advantages of one transport mode over another (Saven, 2014). The attention put on efficiency and efficient use of space emphasizes creating economic and environmental sustainability. However, the notion of sustainable mobility paradigm comprises three dimensions, while in this case taking into account the social dimension is missing. Social benefits in the strategy are barely touched upon. Firth (Appendix B), who was the project manager of the development and implementation of the Urban Mobility Strategy, explains that the social sustainability is absence from the strategy, due to the political reasons and goals, therefore, it is a need to review the document and to consider the social aspect`s part in it. Although, he emphasizes that it is important not to magnify transport system`s role in coping with social problems. Accordingly, transport system does not fix social issues and sometimes it can even exacerbate existing problems. For example, the city is growing very rapidly and there is segregation issue in Stockholm. In the inner city of Stockholm to live in is incredibly expensive and this forces people to move to less desirable places in the city, where the transport system is not well developed. This leads to restriction of peoples` accessibility to necessary facilities (e.g. work, school, health care, etc.). As Firth (Appendix B) highlights transport system can fix some of the social issues, but also it can hinder them. That is why it is crucial to better comprehend the existing situation and to see what can be done in order not to make these problems worse.

The ambiguity of the strategy again indicates how the dominant car-based regime influenced the document, but together the pressure from the landscape level is also reflected in it. Various lock-in mechanism (e.g. infrastructure, sunk investments, etc.) make it difficult to displace and break the current system.

Furthermore, the urban mobility strategy is a set of goals which are not so concrete. The strategic document only shows the direction in which the transport system`s development should move. Certain measures which have to be applied are described in different action plans. Then, how this strategy can contribute to the transition towards sustainable urban development? The fact that the strategy must be in line with the Stockholm Agreement, consisting of numerous infrastructure projects, shows that this steering document was still highly influenced by the dominant car regime and that private vehicles are still deeply embedded in some people`s lives, values and norms. However, the strategy contains numerous ideas from the sustainable mobility paradigm and that shows that Stockholm is slowly changing and moving towards the transitions to sustainable urban mobility.

6. Conclusions

In this chapter the conclusions of this research will be deduced. At first, the purpose of the research will be reiterated, and followed by the answer of the research question introduced in Section 1.2.

The aim of this research was to analyse how different planning practices contribute to the transition towards sustainable urban mobility in Stockholm, by investigating how did these practices develop in relation to the persistent car-based regime.

The theoretical framework created a fundament to analyse this contribution. As it was discussed in Chapter 2, the transition to sustainable development such as sustainable mobility is complex and fundamental long-term process of radical change. It includes socio-technical systems such as the built environment, rules, ideas, beliefs, regulations as well as habits in relation to current life style and practices. The goal of the research was to investigate how two planning practices: the Trendsetter project (particularly two of its developments in relation to clean vehicles and fuels, and the congestion tax) and the Urban Mobility Strategy 2012 of Stockholm can influence some elements of these systems.

From the analysis, it became clear that the transition towards sustainable urban mobility in Stockholm is happening only in some segments of the transport system, such as the development of clean vehicles and alternatives fuels, and therefore the overall transition is not that visible yet. Still what appears evident is that the persistent discourses around car-based regime make it significantly difficult to flee from this lock-in situation. This indicates that the current regime is locked-in to steady state of both oil and car dependence, dominated and influenced by the practice of personal mobility (Nykvist, Whitmarsh, 2008).

The transition towards sustainable urban mobility as any other sustainability transition is a gradual and long-term change from one state to another, which happens through processes of coevolution and mutual adaptation. In the case of Stockholm, this research contributes to make it visible that the regime is gradually adapting to some novelties. The example of the introduction of the congestion tax shows that the intention behind the congestion charge was to introduce a radical measure in the realm of urban mobility. However, due to public and political opposition it became a tool of the regime in the sense that, despite the fact that local government (which is a part of the regime level) tried to filter this novelty out as a threat, it was adapted by the regime and modified in accordance to it (see Figure 6.1). The purpose of this radical measure changed to serve as a mean to collect money for reinforcing the current regime, of building more road infrastructures.

Various difficulties met by niche innovations emphasize that transitions do not take place as smooth transformations but over a series of disagreements and conflicts that shift over time the elements included in visions, goal and means which are pivotal for actors' engagement throughout the process (Jorgensen, 2012).

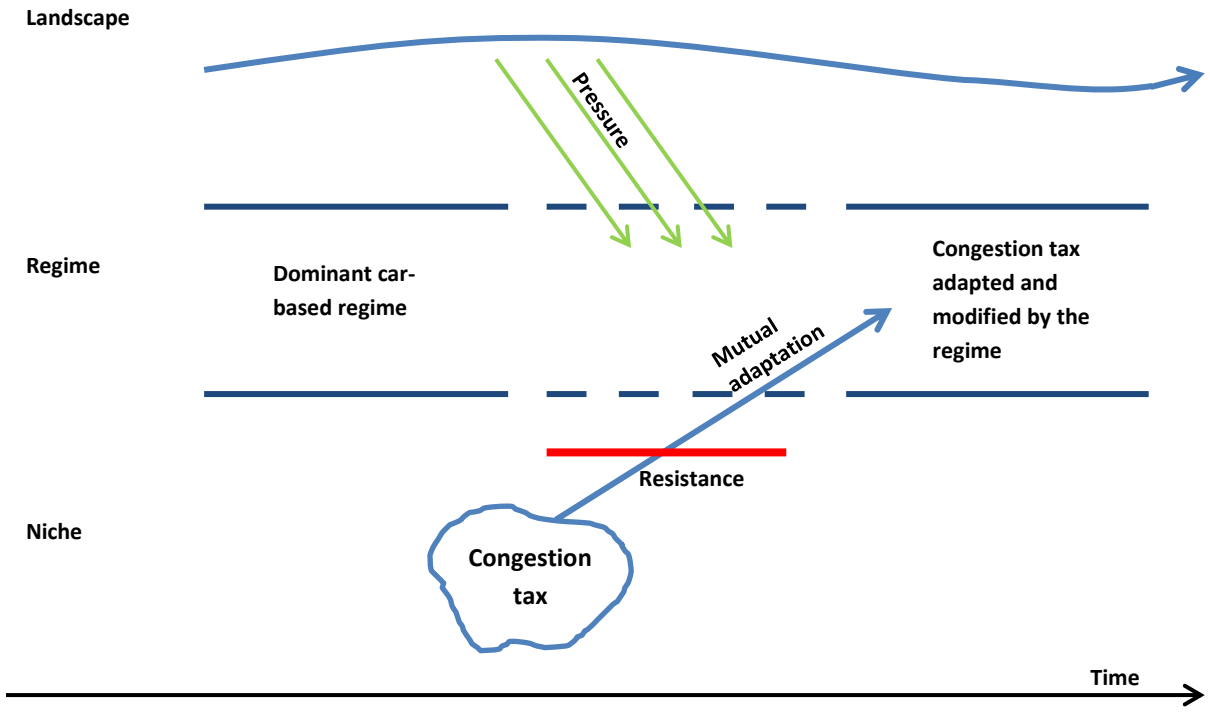


Figure 6.1 The congestion tax development in relation to three socio-technical levels (based on Geels, 2011).

The development of clean vehicles and fuels is another example to report here. From transition literature it is known that the niche and regime can exist in a competitive or symbiotic relationship. The later type of relation was noticed between clean vehicles and fuels development and the current regime of automobility. This development was initiated first by the local politicians (who are a part of the regime level) after the pressure was felt in relation to environmental awareness (the landscape level). The pressure led to the opportunity for niche innovations to appear. This chance was taken and the Clean Vehicle program was formed in order to foster the development of clean vehicles and fuels niches. After the analysis, it can be said that alternative clean vehicles and fuels have been developing on the edge of the existing regime and were guided towards it. However, it is important to mention that as one of the success factors of these developments was broad political support. From the beginning of the program as well as during the Trendsetter project, politicians have been actively trying to harmonise diverse city actions to support the introduction of clean vehicles and fuels into the market and slowly incorporating them into the regime (see Figure 6.2). This underlines the idea that "[…] *processes in socio-technical regimes and systems are outcomes of perceptions and (inter)actions of actors and social groups. These social groups try to navigate a transition, find their way through searching and leaning, interact in power struggles, controversies and debates*" (Geels, 2005:453).

It is known that transitions involve multiple actors who play a role as its drivers. These two examples show that in order to implement some radical changes there is a need of strong political support for creating a chance to niche innovations to develop and influence the existing regime. The case study indicates that the dynamics of transitions are carried by the interplay of social groups.

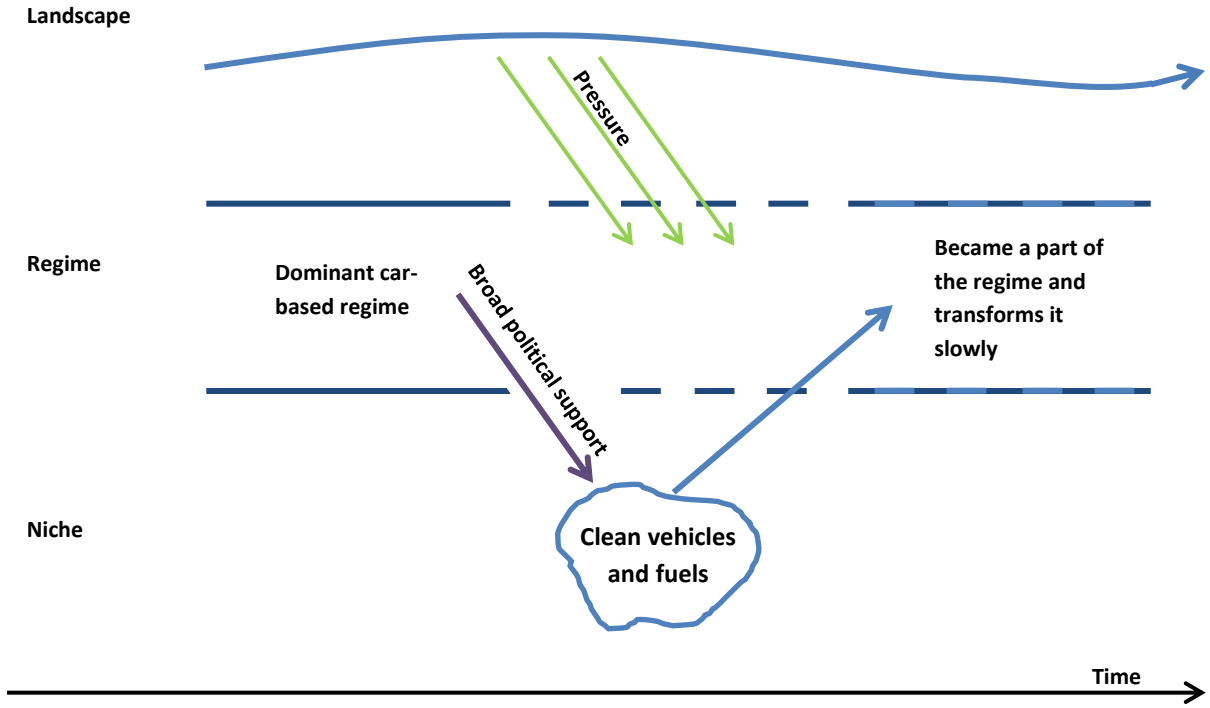


Figure 6.2 Clean vehicles and fuels development in relation to three socio-technical levels (based on Geels, 2011).

The analysis of these few planning practices, which aim to move towards sustainable development in relation to the realm of mobility in Stockholm, shows that it is still difficult to generalize about transition to sustainable urban mobility. From the analysis of the Urban Mobility Strategy 2012 of Stockholm, it can be seen that the sustainable mobility paradigm ideas are incorporated into the strategy, and they are recognised at the regime level as well. Nevertheless, the strategy must also be in line with the Stockholm Agreement, which includes a numerous infrastructure projects. This underlines that this guiding document is still remarkably influenced by the dominant regime and that current car-based mobility is still deeply embedded in societal systems. This accentuates that the change is needed in various domains because transition must include a set of changes reinforcing each other in societal systems such as economy, technology, policies, infrastructure, behaviour, institutions, belief systems, culture, etc.

Moreover, from the analysis of the Urban Mobility Strategy it becomes clear what actions must be taken in order to move this transition ahead, but there are still several barriers on the way to

it. These obstacles require long and persistent processes for reinforcing new practices of mobility at the user level. Also, much more effort has to be put into overcoming these barriers from the regime level, in particular by governmental agencies, to sustain urban development in relation to sustainable urban mobility paradigm. Therefore, it is required that various experiences carried on in this field in the recent past might help to shape a new urban sustainable agenda, where new tools and rules can be developed at the regime level. This will make the radical change in connection with sustainable mobility to become more visible and co-evolve much more conveniently, together with new developments at the niche level.

To sum up, Stockholm slowly is moving to a transition towards sustainable urban mobility and it has great potential to accelerate it. However, more effort at the regime and niche levels is needed, in order to fundamentally challenge the persistent car-based regime. In other words, more guidance and steering with clear goals and visions are required in order to escape from various lock-in mechanisms and path-dependencies formed by the existing regime.

7. Reflection on the Report

The goal of this research was to investigate how different planning practices contribute to the transition towards sustainable urban mobility in Stockholm. The analysis of two developments of the Trendsetter project and the Urban Mobility Strategy 2012 of Stockholm helped to understand how some elements of the transition can make a difference in relation to the existing car-based regime. However, this research could focus more on the interaction between developments at the niche and the regime levels. Deeper comprehension of the interplay among these two levels is crucial in order to understand complex processes of socio-technical transitions, such as how the current unsustainable regime can be changed into more sustainable one. In this regard, conducting broader research about the topic could help to create a better view of this transition. For example, identifying and analysing more planning practices in relation to sustainable urban mobility would provide with more information about the phenomenon for the research and would lead to the creation of broader picture of sustainable mobility transition dynamics in Stockholm.

Moreover, as it was mentioned above, one of the analysed subjects in this report was the Urban Mobility Strategy 2012 of Stockholm. It is a strategic document, directing the urban mobility till 2030. Not much time has passed since its introduction. Therefore, there is a need to follow how the development of this strategy will be carried on in the future. In other words, it is crucial to investigate how this strategic document can be deviated from the current unsustainable regime and contribute to the introduction of radical change in the realm of mobility. This indicates that there is a continuous need of research on the effects of the Urban Mobility Strategy, as well as how it is combined with other urban planning strategies. For instance, to investigate how urban planning strategies can influence city`s development in order to make more dense urban areas. This will lead to the creation of a reduced need of car mobility by forming conditions to travel short distances, which can be covered by sustainable modes of travel: walking, cycling or public transport. Densification of the urban areas shows that the urban planning as a tool is closely connected to the transition towards sustainable urban mobility and it can help to guide the future of sustainable cities.

From the report it also can be seen that the role of the local government is pivotal for implementing a radical change in relation to mobility. This indicates that politicians have a lot of influence in accordance to radical changes. There is a need to shift their mind-sets about mobility and to understand that radical change is a necessity as well as not to be so reluctant to change social practices, regarding urban mobility, to more sustainable ones. Accordingly, any radical change must be broadly supported and steered politically in a gradual manner.

Bibliography

Cushman & Wakefield. (2010). *European City Monitor.*

Banister, D. (1997). Reducing the need to travel. *Environment and Planning B: Planning and Design*, 437-449.

Banister, D. (2000). *European Transport Policy and Sustainable Mobility.* Spon Press.

Banister, D. (2005). *Unsustainable Transport: City transport in the new century.* Routledge.

Banister, D. (2008). The sustainable mobility paradigm. *Transport Policy*, 73-80.

Banister, D. (2011). Cities, mobility and climate change. *Journal of Transport Geography*, 1538-1546.

Birath, K., & Padam, S. (2010). *Clean vehicles in Stockholm: Historic retrospect 1994-2010.* Stockholm: The Environment and Health Administration in the City of Stockholm.

Borjesson, M. (2012). The Stockholmcongestioncharges—5 yearson.Effects,acceptability and lessonslearnt. *Transport Policy*, 1–12.

Cairns, S. (2008). Smarter Choices: Assessing the Potential to Achieve Traffic Reduction Using 'Soft Measures'. *Transport Reviews: A Transnational Transdisciplinary Journal*, 593-618.

City Development. (n.d.). Retrieved May 13, 2015, from Stockholm: http://international.stockholm.se/city-development/sustainable-efforts/

City of Stockholm Executive Office. (2011). *FINAL REPORT: STOCKHOLM – THE FIRST EUROPEAN GREEN CAPITAL.* Stockholm: City of Stockholm Executive Office.

City Ranking: Stockholm. (n.d.). Retrieved May 9, 2015, from European City Ranking : http://sootfreecities.eu/city/stockholm

Coenen, L., Benneworth, P., & Truffer, B. (2012). Toward a spatial perspective on sustainability transitions. *Research Policy*, 968-979.

Cohen, M. (2012). The future of automobile society: a socio-technical transitions perspective. *Technology Analysis & Strategic Management*, 377-390.

Covenant of Mayors. (2014, May 7). Retrieved April 16, 2015, from Covenant of Mayors: http://www.eumayors.eu/news_en.html?id_news=557

Eliasson, J. (2008). Lessons from the Stockholm congestion charging trial. *Transport Policy*, 395–404.

Erman, M. (2012). *The walkable city – the concept of Stockholm.* Viena: City Planning Administration.

European Union. (2010). *Stockholm European Green Capital 2010.*

European Union. (2012). *EU transport in figures.* Luxembourg: European Union.

European Union. (2013). *Innovation in urban mobility: Policy making and planning.* European Union.

Farla, J., Alkemade, F., & Suurs, R. (2010). Analysis of barriers in the transition toward sustainable mobility in the Netherlands. *Environmental Innovation and Societal Transitions*, 1260-1269.

Firth, D. (2012). *Urban Mobility Strategy.* Stockholm: City of Stockholm, the City of Stockholm Traffic Administration.

Foxon, T. (2009). Transition pathways for a UK low carbon energy system: exploring different governance patterns.

Geels, F. (2004). From sectoral systems of innovation to socio-technical systems: insights about dynamics and change from. *Research Policy*, 897–920.

Geels, F. (2005). The dynamics of transitions in socio-technica lanalysis of the transition pathway from horse-drawn carriages to automobiles (1860–1930). *Technology Analysis & Strategic Management*, 445-476.

Geels, F. (2010). Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective. *Research Policy*, 495-510.

Geels, F. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, 24-40.

Geels, F., & Kemp, R. (2012). The Multi-level Perspective as a New Perspective for Studying Socio-technical Transitions. In F. Geels, R. Kemp, G. Dudley, & G. Lyons, *Automobility in Transition? A Socio-technical Analysis of Sustainable Transport* (pp. 49-83). Routledge.

Geels, F., & Shot, J. (2007). Typology of sociotechnical transition pathways. *Research Policy*, 399–417.

Geerlings, H., Shifran, Y., & Stead, D. (2012). *Transition Towanrds Sustainable Mobility: The Role of Instruments, Individuals and Institutions.* Ashgate.

Gerring, J. (2004). What Is a Case Study and What Is It Good for? *The American Political Science Review*, 341-35.

Geurs, K., Krizek, K., & Reggiani, A. (2012). *Accessibility Analysis and Transport Planning: Challenges for Europe and North America.* Edward Elgar Publishing.

Given, L. M. (2008). Semi-structured Interviews. In *The SAGE Encyclopedia of Qualitative Research Methods.* SAGE Publications.

Healey, P. (2012). Communicative Planning: Practices, Concepts, and Rhetorics. In S. Bishwapriya, L. Vale, & C. Rosan, *Planning Ideas that Matter* (pp. 333-357). Cambridge: MIT Press.

Hichman, R. (2007). *Reducing Travel by Design: A Micro Analysis of New Household Location and the Commute to Work in Surrey.* London: University of London.

Hiselius, L., & Brundell-Freij, K. (2007). Time inconsistence in preferences. The case study of congestion charges in Stockholm. *Department of Technology and Society, Lund University, Sweden*.

Holden, E. (2007). *Achieving Sustainable Mobility: Everyday and Leisure-time Travel in the EU.* Ashgate.

Hult, A., Metzger, J., & Olsson, A. (2013, October 23). *Articles*. Retrieved April 20, 2015, from chinadialogue: https://www.chinadialogue.net/article/show/single/en/6434-Just-how-sustainable-is-Stockholm-

Isaksson, K. (2014). Mobility Transitions: The Necessity of Utopian Approaches. In K. Bradley, & J. Hedren, *Green Utopianism: Perspectives, Politics and Micro-Practices* (pp. 115-130). Routledge.

Jorgensen, U. (2012). Mapping and navigating transitions - The multi-level perspective compared with arenas of development. *Research Policy*, 996-1010.

Kemp, R. (2007). Transition management as a model for managing processes of co-evolution towards sustainable development. *International Journal of Sustainable Development and World Ecology*, 78-91.

Kemp, R., & van Lente, H. (2011). The dual challenge of sustainability transitions. *Environmental Innovation and Societal Transitions*, 121-124.

Kemp, R., Avelino, F., & Bressers, N. (2011). Transition management as a model for sustainable mobilty. *European Transport*, 25-46.

Kemp, R., Geels, F., & Dydley, G. (2012). Introduction: Sustainability Transitions in Automobility Regime and the Need for a New Perspective. In F. Geels, R. Kemp, G. Dudley, & G. Lyons, *Automobility in Transition? A Socio-technical Analysis of Sustainable Transport* (pp. 3-28). Routledge.

Kemp, R., Loorbach, D., & Rotmans, J. (2009). Transition management as a model for managing processes of co-evolution towards sustainable development. *International Journal of Sustainable Development & World Ecology*, 78-91.

Lindgren, E., Lindgren, U., & Pettersson, T. (2010). Driving from the centre to the periphery? The diffusion of private cars in Sweden, 1960–1975. *Umeå University*, 164-181.

Lyons, G. (2012). Visions for the Future and a Need for a Social Science Perspective in Transport Studies. In F. Geels, R. Kemp, G. Dudley, & G. Lyons, *Automobility in Transition? A Socio-technical Analysis of Sustainable Transport* (pp. 29-48). Routledge.

Marletto, G. (2013). Car and the city: Socio-technical transition pathways to 2030. *Technological Forecasting & Social Change*, 1-15.

Miciukiewicz, K., & Vigar, G. (2012). Mobility and Social Cohesion in the Splintered City: Challenging Technocentric Transport Research and Policy-making Practice. *Urban Studies*, 1941-1957.

Miciukiewicz, K., & Vigar, G. (2012). Mobility and Social cohesion in the Splintered City: Challenging Technocentric Transport Research and Policy-making Practices. *Urban Studies*, 1941-1957.

News: Nordic. (n.d.). Retrieved May 2, 2015, from Nordstjernan: http://www.nordstjernan.com/news/nordic/5239/

Nykvist, B., & Whitmarsh, L. (2008). A multi-level analysis of sustainable mobility transitions: Niche development in the UK and Sweden. *Technological Forecasting & Social Change*, 1373-1387.

Pel, B. (2008). Transition by system reproduction? The role of traffic management in the mobility transition.

Richardson, T. (2010). Changing Frames of Mobility through. *International Planning Studies Radical Policy Interventions? The Stockholm Congestion Tax*, 53-67.

Richardson, T., Isaksson, K., & Gullberg, A. (2010). Changing Frames of Mobility through Radical Policy Interventions? The Stockholm Congestion Tax. *International Planning Studies*, 53-67.

Rip, A., & Kemp, R. (1998). Technological Change. In S. Rayner, & E. Malone, *Human choice and climate change malone* (pp. 327-399). Washington: Batelle Press.

Roorda, C. (2012). Transition Management in Urban Context.

Rotmans, J., Kemp, R., & van Asselt, M. (2001). More evolution than revolution: Transition management in public policy. *International Journal of Sustainable Development & World Ecology*, 78-91.

Ruprecht Consult. (2013). *Guidelines: Developing and Implementing a Sustainable Urban Mobility Plan.* European Union.

Saven, M. (2014, December 10). *Transport*. Retrieved March 6, 2015, from CityMetric: http://www.citymetric.com/transport/heres-how-swedish-capital-changed-debate-urban-transportation-566

Sheller, M. (2004). Automotive emotions: Feeling the car. *Theory, Culture & Society*, 221-242.

Shove, E. (2010). Beyond the ABC: climate change policy and theories of social change. *Environment and Planning*, 1273-1285.

Shove, E., & Walker, G. (2007). CAUTION! Transition ahead: politics, practice and sustainable transition management. *Environment and Planning*, 763-770.

Smart Eco City. (2014, October 21). Retrieved May 3, 2015, from Smart Eco City: http://www.smartecocity.com/eucities/stockholm/

Smith, A. (2005). The governance of sustainable socio-technical transitions. *Research Policy*, 1491-1510.

Stead, D., Banister, D., Steen, P., Akerman, J., Dreborg, K., Njikamp, P., et al. (2000). *European Transport Policy and Sustainable Mobility.* Spon Press.

Stockholm stad. (2013). *Stockholm a sustainably growing city.*

Sunnerstedt, E. (2006). *CIVITAS.* Retrieved April 28, 2015, from CIVITAS: http://www.civitas.eu/sites/default/files/documents/CIVITAS_Award_2006_nondemonstration_city_Stockholm.pdf

Sustainable Cities. (n.d.). Retrieved May 11, 2015, from DAC &: http://www.dac.dk/en/dac-cities/sustainable-cities/all-cases/transport/singapore-the-worlds-first-digital-congestion-charging-system/

The City Planning Administration. (2010). *THE WALKABLE CITY: Stockholm City Plan.* Stockholm: The City Planning Administration.

Thynell, M. (2010). Sustainable transport and the modernisation of urban transport in Delhi and Stockholm. *Cities*, 421–429.

Tools of Change. (n.d.). Retrieved May 2, 2015, from Tools of Change: http://www.toolsofchange.com/en/case-studies/detail/670

Trendsetter. (2006). *Sustainable Urban Transport: Final report from the European project Trendsetter.* Stockholm: Environment and Health Administration, City of Stockholm.

United Nations. (2014, July 10). Retrieved May 13, 2015, from United Nations: http://www.un.org/en/development/desa/news/population/world-urbanization-prospects-2014.html

Urry, J. (2007). *Mobilities.* Oxford: Polity.

Urry, J. (2011). *Climate Change & Society.* Polity Press.

van Wee, B. (2011). *Transport and Ethics: Ethics and the Evaluation of Transport policies and Projects.* Edward Elgar Publishing.

Vergragt, P. (2004). Transition Management for Sustainable Personal Mobility: The Case of Hydrogen Fuel Cells. 13-27.

Whitmarsh, L. (2012). How useful is the Multi-Level Perspective for transport and sustainability research? *Journal of Transport Geography*, 483-487.

Wikiwand. (n.d.). Retrieved April 25, 2015, from Wikiwand: http://www.wikiwand.com/en/Stockholm

World Population Review. (2014, October 19). Retrieved April 5, 2015, from World Population Review: http://worldpopulationreview.com/world-cities/stockholm-population/

Yin, R. (2014). *Case Study Reseach: Design and Methods.* Retrieved April 15, 2015, from https://books.google.dk/books?hl=lt&lr=&id=AjV1AwAAQBAJ&oi=fnd&pg=PP1&dq=yin+robert+case+study+research+design+and+methods&ots=gkQamxQN6N&sig=_aQwIJ8Z7z6Sl1nHSDMnRRKjYe0#v=onepage&q=reconstruction&f=false

Zainal, Z. (2007). Case study as a research method. *Jurnal Kemanusiaan*, 1-6.