Urban Transport Policy Paradigms

A philosophical and engineering analysis

Master thesis

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Preface

Throughout my school and university years, I have always wondered why things are as they are. During my civil engineering studies, I have been taught about infrastructures, planning and different engineering methodologies. In my master though, two issues came up. Firstly, all kinds of engineering solutions do not work in practice. Congestion for example cannot be solved by building more infrastructure alone. Secondly, I discovered that the why behind our built environment does not relate only to infrastructure itself, but also to thinking about what it means. Why is congestion a problem in the first place? This is why I chose to do a second master and combine philosophy with civil engineering.

My master thesis has given me the opportunity to research philosophical concepts in an engineering context. Combining both fields has benefits in my view. Engineers can and should learn about the normative implications of their work, a subject I discuss extensively in this thesis. Infrastructural choices and practices on the other hand reveal to philosophers and sociologists many interesting aspects of society, such as power structures and moral norms held by policy makers. Finishing this thesis, I see myself as a bridge between these two worlds that do not often meet.

Integrating both researches into one set of questions and conceptual framework was harder than I thought. More than once I had to take a step back and overlook the whole project. Doing two theses at a time has also practical benefits. Writing on civil engineering texts made me forget earlier texts I wrote on philosophy and vice versa, which enabled me to 'kill my darlings' quite easily.

I would especially like to thank all my supervisors for their feedback and guidance, open-mindedness and flexibility. Adri, your enthusiasm about the research and support have definitely helped me to just write and carry on. Moreover, meetings with you felt like being with a peer and not a supervisor. Fokko Jan, I am always amazed that you produce such to-the-point feedback while you give the impression that you read my work in 15 minutes time. I would also like to thank my supervisors from the civil engineering department, Karst and Tom, and Marco from CROW, for their supportive feedback on this thesis. Finally, I would like to thank my friends, family – heit, mem en Jesse – and David. Your interest, enjoyable being-together and care have helped me doing this research.

Cover image: Painting by Italian futurist Umberto Boccioni called 'Dynamism of a Cyclist' (1913)

Summary

In order to promote sustainable urban development for all citizens, transport policies have to change. Some municipalities are developing sustainable transport policies whereas other municipalities stay behind. Which factors make up for this difference? This thesis analyses under which conditions policies change from a theoretical perspective, by applying the paradigm concept in a transport planning context. Paradigms are in this thesis an analytic entry to research transport policy change.

Many transport and geography researchers advocate to move from one paradigm to another in both academia and transport planning. They often refer to paradigms as world views exemplified by accepted problem and solution sets, in the classic Kuhnian scientific sense. Based on such literature, I distinguish two different types of conceptual paradigms in an urban context: a dominant mobility-based paradigm which views traveling as a disutility, and an alternative newer accessibility-based paradigm that builds on the value of destination and social dimension of transport.

In order to analyse transport policies and their historic development, I have broadened the paradigm concept as applied in literature by adding institutional elements to it. This so-called planning paradigm can function as an explanatory theoretical model for policy change in empirical research. Policy making is an activity in which the planner works forth-and-back with technology and other planners in a specific organizational context. Therefore, I propose a definition of a planning paradigm, consisting of *conceptual* elements on the one hand and of an *institutional* embedding of these conceptual elements through groups of actors, rules, norms and practices on the other hand. This second part of a planning paradigm is based on the regime concept of the Multi-Level Perspective theory.

Approaching policy making through the planning paradigm concept is beneficiary in multiple ways. Firstly, it acknowledges and reveals the very relevant practical and human context of policy making which is undervalued in academic literature on transport planning. Foucault has analysed how talking about true knowledge depends not only on the individual who speaks, but on others. In fact, truth can only exist if it is accepted through rules in a discourse. The institutional context of a planning paradigm explains better why policy makers and their organizations do not adopt new policies, and why so-called rational arguments by transport academics do not land in such organizations. This thesis shows through historic analysis and reviewing Foucauldian-inspired literature that transport planners have implemented travel time minimization as a norm since the 1920s, through standardization of knowledge and building on the belief that the fast car will win. Speed as a norm has worked through in urban design, by separating traffic flows and distribution of space. Transport modelling with its focus on numbers supported this norm, as it was regarded as a quantitative and

objective analysis. In Foucauldian terms, models proposed highly verifiable results with clear correlating relations.

Secondly, the planning paradigm concept is useful as it is defined in this thesis through concrete criteria and heuristics. This enables to create rich research output through empirical analysis, beyond semiotic outcomes. Analysing how planning paradigms shape practices is important, in order to know how this process can be influenced and shifted towards producing sustainable and inclusive transport policies. This analysis is the main subject in my CEM (Civil Engineering and Management) thesis, which uses the proposed theoretical planning paradigm framework of this thesis.

Finally, the planning paradigm concept could be of interest for planners in the field, as it can question their use of concepts and organizational structure they are part of. New (groups of) innovative actors are able to form different norms, rules and standards in an renewed organizational culture. Paradigmatic policy change can happen through fulfilling the necessary condition of such institutional reorganization. This is not a simple substitution process though, where an old paradigm is replaced by a new one. Every planning activity has a web of cognitive, social and institutional elements, which makes policy shifts difficult. Change starts with a reflection on habits and assumptions, which is hopefully incited through presenting and reading different narratives of transport planning in this multidisciplinary thesis.

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1. Introduction

This thesis connects Philosophy of Technology (PSTS) and Civil Engineering (CEM). In the classic view, philosophy is about ideas, concepts and non-material aspects of our world. Questions like why do we live and how should we live the good life, are classic philosophical questions. Civil engineering on the other hand in this classic view deals with intervening in the material world through design, constructing and maintaining infrastructures. In short, philosophers *think* about the world whereas engineers *build* the world. This dualism and separation between the material and the cognitive remains attractive, but is too simplistic. In fact, both approaches are not that distinct from each other as one might think. Philosophers, especially after the so-called empirical turn, build rationales and cognitive frameworks to understand how and why certain 'things' are made, also helped by engineering practices that shape these conceptualizations. Civil engineers develop and use – often unconsciously – rationales which are embedded within (philosophical) concepts about justice, rationality, certainty and truth.

Particularly transport policies operate at the merge of philosophy and civil engineering, through presenting a narrative of problems and solutions, tied together with political ambitions and (often) social problems. These narratives can change however. New ideas from academia and different social problems and issues influence the way traveling is conceptualized. Transport planning should therefore not only be approached from a conceptual perspective. To capture both the cognitive and social aspects, this thesis will focus on paradigms and paradigmatic changes in transport policies by looking at their interrelated cognitive, social and institutional aspects. I will introduce and operationalize the term 'transport planning paradigm' to approach transport planning policies in an integral way.

Civil engineering and society are interwoven. This is illustrated by actual social challenges of sustainability, CO_2 emissions, climate change, population growth, increasing differences between rich and poor and urban liveability, which will strongly affect policy making in the field of (urban) transport systems. Transport policy making will also influence the social aspect of sustainability in the form of social equity and social inclusion. Moreover, the social challenge of increasing population growth in cities and urbanized areas like the Dutch Randstad is a trend that is expected to continue for the next 20 years (De Jong & Daalhuizen, 2014). This gives all the reason to reflect upon actual and future urban transport policies. In this thesis, this will be done by investigating (underlying) paradigms in urban transport policy reports. Based on literature study, two types of paradigms will be distinguished in the Dutch policy making context. Consequently, the presence of both paradigms is scored through policy document analysis of municipal documents. These scores are then related to different kinds of municipal characteristics, including organizational variables. Finally, organizational and social conditions for paradigmatic change are retrieved through interviews with several municipal transport policy makers.

1.1 Research subject and problem context

According to the Dutch law[1], each governmental layer in the Netherlands such as a municipality has to create a policy plan which includes a vision on long-term development of transport policies. Explicitly, this vision includes defined transport problems and their possible solutions. Also part of the vision are transport policy aims the government has set, like improving public transport or setting the parking costs at 2 euros per hour at a maximum. Implicitly however, the vision also reveals what ideas a government has on traveling and infrastructure, usually described in terms of mobility and accessibility. Problems mentioned in municipal mobility plans have a historical, an organizational and a social context which influence why and how problems and their possible solutions are described. These contexts become socially and institutionally embedded in paradigms which implicitly and/or explicitly shape policy choices, which help framing problems and their solutions, and which become visible in urban transport plans. This paradigm-based process of policy choice and problem framing in urban transport plans is the subject of this multidisciplinary thesis.

In the long term development of transport policies, an economic meaning through the concept of mobility has become dominant as I will show in this thesis. Improving mobility means that travel times are reduced so that individuals can travel faster and further. Policy instruments and measures have been constructed and adopted based on the aims of flow and speed, especially for cars. Transport planning in the form of 'predict-and-provide' places (car) mobility and car infrastructure central as a policy goal and instrument respectively. Success is mostly measured through saved vehicle hours or average flow. For example, ex-ante standardized cost-benefit analysis (CBA) has been used as an instrument to calculate whether a proposed investment is worth the costs or not, given certain benefits (Annema, Koopmans & Van Wee, 2007). In such a format, a possible decrease in travel time through infrastructure investment and ecological effects are monetarily translated through assigning a value to travel time and CO_2. One of the hypothesis of this thesis is that car mobility and car infrastructure-based conceptions are still much used and practiced in most of the Dutch governmental layers, including municipalities.

In recent decades however, other planning conceptions have been developed in academia and other knowledge institutions as a response to social problems and challenges. These new conceptions have challenged dominant problem framing, by linking traveling to accessibility, including social equity. Accessibility can be defined as an indicator for individuals to have the opportunity to participate at activities at different locations (Geurs & van Wee, 2004). Through accessibility, it is challenged what is considered to be a transport problem in the first place and what a suitable transport solution is.

[1] See 'Planwet Verkeer en Vervoer' Par. 4 Art. 8-10, https://wetten.overheid.nl/BWBR0009642/2015-01-01#Opschrift (Accessed 20th of August 2019). Note that this law will be replaced by a new Environmental and Planning Act, which will integrate all spatial planning and transport planning rules into one coherent regulatory framework. This new law will highly influence all future urban planning projects in the Netherlands. It is therefore extra interesting to see how current transport policy plans are prepared for the new planning act.

Where mobility focuses on the trip and infrastructure between location A and B, the concept of accessibility incorporates also reaching destinations and the social dimension of transport. Building physical infrastructures is not the only policy tool anymore, as it requires integrating transport policies with spatial planning policies. From 2021 on, this integration is obligatory in a new national Environmental and Planning Act. Another possibility is to change travel behaviour by smart apps and new transport packages.

1.2 Research aim and hypothesis

As stated previously, a range of institutions and actors are developing new knowledge about transport systems and policies. For example, universities and other knowledge organizations such as CROW create new calculating tools, models and general knowledge on sustainable and just transport. It is often experienced however by the same researchers that it is difficult to let this knowledge 'land' at the policy maker in the field, let alone that something is done with it by creating better policies. In fact, some municipalities are changing toward sustainable transport policies whereas other municipalities stay behind. It is unknown however under which conditions governments change their transport policy plans. Or to put it in other words, why for example does one municipality implement transport policies in line with new insights, which another municipality does not. In order to make future change possible in the direction of equity and sustainability, it is important to know under which circumstances municipalities learn with regard to transport policies. Retrieving the circumstances and conditions of paradigmatic change in municipal transport policy making is the central aim of this thesis.

In order to analyse policy making at a municipal level, I will introduce the term 'transport planning paradigm' in this thesis. This term is defined as a social and cognitive way of conceptualizing and intervening in the transport system by transport policy makers. This is exemplified by philosophical assumptions (1), policy goals (2), policy instruments (3) and evaluative criteria of the transport system (4). Finally, the planning paradigm needs institutional embedding of policy practices through organization and values. The four elements enable to analyse and quantify transport policy plans in a structured way which does right to literature on policy making through the so-called policy cycle: problem detection and rationale can be related to philosophical assumptions, setting objectives with policy goals, the appraisal of policy instruments with monitoring and different evaluative criteria of the transport system (Bochel & Duncan, 2007; HM Treasury, 2018; Stopher & Stanley, 2014). The institutional embedding of a paradigm represents different types of policy practices, value orientations and organization of the paradigm. I will go now shortly into both main aspects of a transport policy paradigm.

Theoretically, it is possible that governments change their plans based on *content*. For example, if numbers show that pollution by car traffic has increased in the last four years, a municipality adopts a new policy instrument to solve this problem. Also, new insights from for example academia on

good policy instruments could lead to setting different policies. The classic policy cycle incorporates such changes based on epistemic insights. This cycle assumes a linear policy process which starts with a rationale or problem. Based on this problem, objectives are stated which are translated into certain instruments. The effect of instruments is monitored and evaluated, which eventually leads to a different rationale or problem. A conceptualization of the policy cycle can be found in Figure 1.

Figure 1: Policy cycle after the Green Book (2018)

The assumed linearity of policy making and process of change in general is not accurate though, which is advocated by for example Geels (2012) through the Multi-Level-Perspective (MLP). In this framework, interactions between three levels are the basis for socio-technical transitions: the landscape (macro trends like changes in economy and politics), the regime (patterns of actors, rules, institutions and practices) and niches (local individual actors, technologies or innovations). Especially the regime concept describes why transitions do not happen, as it is 'geared towards the status quo and thus towards optimization and protecting investments rather than system innovations' (Van Der Brugge, Rotmans & Loorbach, 2005, p. 167). The institutional embedding of a planning paradigm through groups of actors, rules and practices could therefore explain why a municipality does (not) change its conceptualization of the transport system and eventually policies. For example, a change in organizational structure like top-down or democratic participation can lead to different policy objectives, instruments and monitoring measures. All in all, this thesis will test the hypothesis that institutional reorganization is at least as important for paradigmatic change as epistemic learning can be. Connecting this hypothesis with the central aim of this thesis, this means that organizational circumstances are just as important for paradigmatic policy change as progressive insight is through epistemic learning.

1.3 Research questions

All in all, this leads to the following main research question of this thesis: How can changes, orientations and practices of Dutch urban mobility policies be explained by using the paradigm concept?

Firstly, this question relates to philosophy and STS (Science, Technology and Society) concepts and questions. An analysis of different conceptualizations of traveling throughout the history of transport planning and an operationalization of the paradigm concept will therefore form the theoretical PSTS basis for this thesis. The main research question will be worked out from a PSTS perspective through answering the following two sub questions:

1. How can travelling be conceptualized in terms of paradigms in a planning context?
2. How did the historical processes of modelling and institutional embedding make the mobility-based paradigm dominant?

Secondly, this research is about policy practices in municipalities. An empirical analysis of municipal policy documents will be the main body of the Civil Engineering thesis. The main research question will be worked out from a CEM perspective through answering the following three sub questions:

1. What kind of transport policy paradigms are present in Dutch urban municipal transport policy plans?
2. Which transport-related, demographic, spatial and institutional characteristics relate with the transport policy paradigm of municipal documents?
3. Which factors of a transport policy paradigm are promoters and barriers for a paradigm shift?

1.4 Research methodology

To answer the first two research questions, a qualitative conceptual analysis in the form of literature study will be carried out. In Chapter 2, I will start with exploring how within STS-based mobility studies, geography studies and planning studies the term paradigm is used. Based on that, one conceptual paradigm is distinguished. This paradigm views mobility as a disutility, thus economically meaningless. The second paradigm distinguished in literature is based on the accessibility concept. Next, I will evaluate the use of the paradigm notion used by transport planners and scholars in the field of mobility studies, by taking into consideration practices of transport planning. By reviewing literature within philosophical and STS-based studies that apply Kuhn's paradigm concept in a policy context through looking at knowledge-based practices, I will propose a coherent transport planning paradigm definition. Thereafter, I will go deeper into the conceptualization of traveling which forms the philosophical basis for each of the two planning paradigms distinguished. Finally, based on the evaluation of the first, and dominant mobility paradigm, and based on a reconceptualization of

mobility by using sociological, anthropological and philosophical arguments, I will argue for an understanding of travelling as a social practice.

In Chapter 3 I will answer the second sub question, by historicizing the notion of speed in transport models and planning practices. To do so, I will go into the institutional and organizational history of travel time and its meaning by looking into the rationale for more efficiency, speed and consequently more infrastructure. I will not approach the history of travel time as a historian, but instead I will use some historic sources which enable me to understand concepts and processes in general terms, situated in a local organizational context. Analysing the dominant economic conception of traveling through its meaning(s) enables to understand why it has become so dominant. Understanding the rationales, motives and assumptions behind this conception is interesting and useful as most transport policy choices of today are still based on such language. In order to change concepts, you first have to know where its ontology is based upon.

The methodology taken in this thesis is loosely based on Foucault's archaeological approach. In this thesis I do not intent to give a full overview of his work or his ideas, but only the elements that have enabled me to think about travel time and paradigms in a productive way, especially in relation with technology and transport models. These elements are the development of a discourse, episteme, and verifiability of truth through quantitative working. Episteme refers to the historical ground rules that are conditional for discourses to develop. By bringing in Foucault in this thesis I contribute to a growing field of scholars who apply Foucault's work in transport and mobility studies (Bonham, 2006; Bonham & Cox, 2010; Frello, 2008; Manderscheid, Schwanen & Tyfield, 2015).

In this thesis I use the terms travel, transport (planning), traffic, mobility and accessibility. In order to prevent confusion, I will go shortly into the terms here. Travel is about the process that people and products become travellers and goods respectively. Transport refers to actual modal systems to support traveling, such as the car system, public transport system and cycling system. Traffic refers to the relation between modal systems and practical design of infrastructures. Consequently, transport planning is defined as the process of balancing the (conceptual) traveling realm and the (infrastructural) traffic realm through creating policies. Mobility and accessibility, especially in combination with the paradigm concept, are within transport planning different lenses, which I will elaborate on in this thesis. In other words, both terms are not just concepts with a meaning but include a different set of criteria and heuristics that have historically constituted practices of good planning. By conceptualizing both terms as sets of criteria and heuristics, the creation of rich research output in the form of empirical analysis is made possible beyond semiotic outcomes. In the CEM research, this will be put into practice by using both terms to analyse and score policy documents based on their content.

2. Transport planning paradigms: Travel as a disutility or a as social practice

The term ‘paradigm’ is often used in transport planning, mainly referring to different conceptual ideas and assumptions around travelling and planning which form the basis for a coherent approach to tackle transport problems. In this chapter, I distinguish two conceptual directions which are the basis for two paradigms in the transport planning field: the mobility-based paradigm and the accessibility-based paradigm. Conceptual ideas are in my view not enough though to explain how transport planning works in practice. Therefore, I introduce the term ‘transport planning paradigm’ in this chapter, in order to explain how a planning paradigm is not just a model to explain the world but an integral view of assumptions and institutional practices. Consequently, I will go deeper into conceptual critique on the dominant mobility-based paradigm in transport planning. In Chapter 3, I will talk about the institutional and organizational practices which constitute a transport planning paradigm. All in all, Chapter 2 will answer the following sub research question: How can travelling be conceptualized in terms of paradigms in a planning context?

2.1. The mobility-based paradigm

Within the field of STS-based mobility studies, geography studies and planning studies the term paradigm is used in different ways. Based on literature study, I distinguish a first conceptual paradigm. This mobility-based paradigm has a conceptual basis of travel time reduction, thus increasing the possible distance radius of traveling. Travel time reduction has been one of the main aims in transport policies in the Netherlands and other Western countries. Transport policies on for example road safety and sustainability were developed later on, subordinate to the prime goal of travel time reduction (Norton, 2015; Schwanen, Banister & Anable, 2011). In fact, the focus of speed and flow creates safety problems and negative externalities such as air pollution. Policy instruments and measures have been constructed and adopted based on the aim of speed. According to Lyons and Urry (2005, p. 258), ‘economically, transport connects people to opportunities and hence yields positive benefits. Yet journey time itself is judged in economic terms as wasted time’. Travelling itself is thus considered to be a disutility. The policy maker assumes thus that one can decrease his or her traveling disutility either by living closer to points of interest or increasing travel speeds. The latter has been the main focus of transport planners since the profession was invented in the 1920s and 30s (Popkema, 2014). Stopher (2016) has shown how the earliest attempts of transport modelling in in the United States during the 1950s and 60s were focused around two ideas: the problem to solve was a weekday peek transport problem, and this was primarily related to a highway context which, as a consequence, made the car the only mode of research. When numbers of public transport were included in calculations some years later, these numbers were used to make better highway traffic volume estimations as public transport trips were subtracted from the trip distribution process. Cresswell and Merriman (2011) as cited by Jensen (2015, p. 480) note that transport geography and transport modelling was mostly a quantitative, positivist, and law-seeking activity in the context of

conceptualizing travellers and travel time. Conceptions of travel time as disutility and travellers as rational free agents minimizing their travel time still work through as assumptions in transport planning instruments such as computer traffic models and cost-benefit analysis (CBA). Values such as causality, rationality and clarity underly these assumptions. Schwanen (2015) mentions that in transport research assumptions of stability and change in the form of a causal process are central to Western philosophy[2].

In current traffic and transport models, costs are used to calculate how so-called trips are assigned to car, public transport and cycling networks. It is a way for modelers to predict travel behaviour. To do so, they use the assumption that 'costs' are involved in travelling, which travellers want to minimize. The concept of trip has been invented to distinguish every action between origin and destination of travelling. The trip is considered as a cost in terms of distance, time or money units. It is often convenient to use a measure combining all the main attributes related to the disutility of a journey and this is normally referred to as the *generalized cost of travel*' (Ortúzar & Willumsen, 2011, p. 165; emphasis in original). In public transport, costs can also be defined as waiting time and transfer penalties (Brands, De Romph, Veitch & Cook, 2014).

One of the most important (current) planning instruments is a CBA of potential infrastructure projects. Such an analysis always includes an estimated reduction of travel time. This reduction of travel time is consequently translated into a monetary value given a value of time of travellers. Ex-ante standardized approaches such as CBA are used to evaluate infrastructures funded by the national government, so that the quality and objectivity of decision-making can be improved (Annema et al., 2007). A project is profitable if the beneficiaries (often consisting of around 80% or more of travel time reduction) outweigh the costs. Main components of a CBA are accessibility benefits (e.g. travel time savings and travel time reliability), traffic safety effects, environmental effects and costs. Since 2007, not only national infrastructure projects need to go through a CBA, also local and regional projects funded by national government have to be evaluated according to a CBA (Beukers, Bertolini & Te Brömmelstroet, 2012). A social CBA (or sCBA) also includes social impacts of infrastructures, although often in a very limited way (Geurs, Boon & Van Wee, 2009) because social effects are often hard to estimate and quantify in ex-ante appraisals.

2.2 The accessibility-based paradigm

Based on critiques I will elaborate on later, scholars have proposed to move from the mobility-based paradigm based on travel time reduction to a more holistic view on mobility, namely accessibility (Banister, 2011; Cervero, 1997; Ferreira, Beukers & Te Brömmelstroet, 2012; Geurs, Zondag, de Jong

[2] Later in the book chapter, Schwanen (2015) argues that past, present and future are always tightly interwoven. Transport research practices and methods select and leave out something of the timeline however. An ontology of becoming is therefore preferred according to Schwanen, not based on a-priori rules but focusing on potentiality of traveling and research methodology.

& de Bok, 2010; Litman, 2013). Accessibility can be defined as an indicator for individuals to have the opportunity to participate at activities at different locations (Geurs & van Wee, 2004). The idea is that transport planning should move from being a technocratic practice, where predict-and-provide principles are the main focus. Not the focus on trips and its costs is the main focus, but reaching certain destinations which are valuable for an individual. This means that focusing on infrastructure development to tackle congestion (i.e. travel time reduction) is not the main priority anymore. Travel time itself is not per se a disutility, as train traveling for example shows when people work or read a book. Transport planning through the lens of accessibility means that the experience of access for individuals in space and time are the most important. Planners should thus be focusing on accessibility of different locations for different people at different times of the day as main indicator, rather than travel time reduction only. An important part of accessibility planning is acknowledging the integral character of transport planning. A difference in land-use can lead to a difference in activities which consequently leads to different traffic flows (Wegener & Fürst, 1999). Therefore, transport planning cannot be dealt with in a separate municipal department, and not in isolation from the spatial planning department. Lack of institutional and professional cooperation can in fact lead to policies which are working against goals of other departments. Another very important aspect of the accessibility-based paradigm is the acknowledgement that transport policies are clearly related to both engineering and social practices, and have both social and technical impacts. This conceptual addition to understanding transport systems has been highly inspired and influenced by Urry (2000, 2007) and is called the new mobilities paradigm (Sheller & Urry, 2006). This research field aims to approach mobility from a multidisciplinary and human-centred perspective, in order to analyse the meanings travellers attach to traveling (practices), spaces and themselves in an interconnected society. All in all, this means that social (equity) problems are just as much a problem for traffic engineers as flow problems of transport systems. The conceptual use of the paradigm concept is just one part though of understanding policies and practices in a planning context. Its institutional embedding through actors, rules, norms and practices is just as important.

2.3 Overview of two paradigms

To clarify the differences between the two conceptual paradigms, I provide an overview of the flow of ideas which form the bases for each of the paradigms in Figure 2. This flow chart focuses on conceptual differences, rather than similarities. In practice, car mobility is still the dominant mode of transport which receives most attention in transport policies and practices despite a different conceptual paradigm. A broader view of what a paradigm entails in a planning context is therefore necessary.

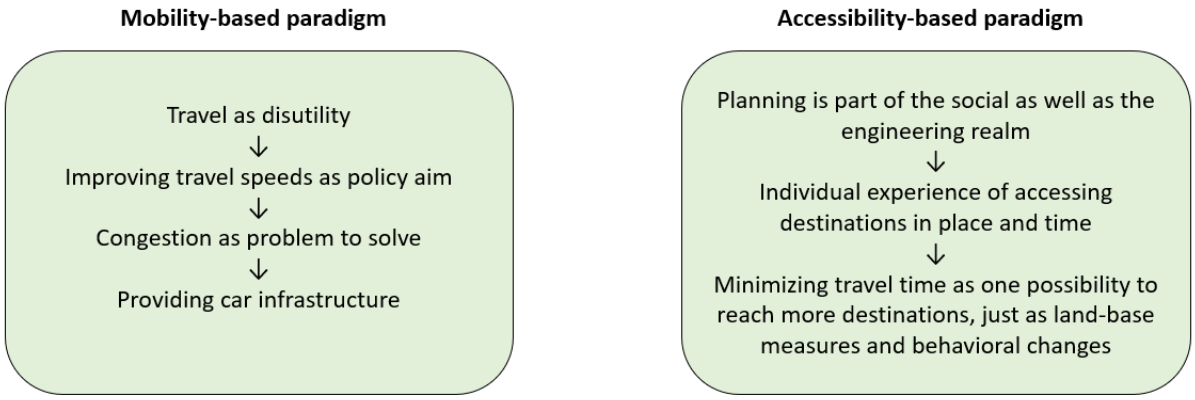

Figure 2: Overview of conceptual flows in the two paradigms distinguished based on planning literature

2.4 Paradigms in a planning context: transport planning paradigms

It is often unclear what the term paradigm entails in a transport planning context because of its lack of proper definition by researchers. In literature, many transport and geography researchers advocate to move from one paradigm to another. For example, Cervero (1997) advocates to move from a mobility-based planning paradigm to an accessibility-based paradigm. Banister (2008) suggest to move towards a sustainable mobility paradigm without defining what a paradigm exactly is. More recently, Lyons (2018) aims to align 'the smart' and 'the' sustainable planning paradigm with each other. The definition of a paradigm refers with all authors to the adjective that is placed before the word, which makes the paradigm concept fuzzy in a planning context. Within the field of mobility studies, the term paradigm is mainly used in the classic scientific sense, through conceptualization of a different 'set of questions, theories and methodologies' (Sheller & Urry, 2006, p. 210). It should be noted that mobility studies do not aim to be applied in a planning context, as the field mostly tries to understand traveling, materialities and networks from an integral perspective. Jones (2014) has actually tried to define a transport planning paradigm, but directly applies the Kuhnian (scientific) definition of a paradigm into a planning context. Another issue is that Jones' (2012) idea of a paradigm is only dealt with in term of ideas and not in terms of planning activities. This approach to paradigms is also present with the earlier-mentioned authors. Such argumentation underestimates what a paradigm entails, and that a paradigm has to be supported by planners, scientists and technological instruments in a practical context. I therefore suggest to operationalize the term 'paradigm' in a planning context, which enables to understand transport planning practices more properly. What would such an operationalization need? Most importantly, a paradigm should be approached from an activity-based perspective through its practices. A paradigm not only consists of ideas, perspectives or beliefs held by policy makers. Rather, policy making is an activity in which the planner works forth-and-back with technology and other planners in a specific organizational context. Knowledge about technologies, best practices and state-of-the-art research is shared through both formal and informal networks of rules and norms of the regime (Geels, 2012; Van Der Brugge et al., 2005). A regime can be defined as a social-technical configuration of actors, artefacts

and rules within a socio-technical system. Moreover, policy makers rely on (political) values such as a (dis)belief in freedom, rationality or logic. All these institutional and policy aspects play an important role in the (slow) adoption of alternative concepts in municipal organizations.

The methodology to approach planning paradigms from an activity-based perspective is inspired[3] by the archaeological approach that Foucault (1970) takes in 'The Order of Things' and further worked out in 'The Archaeology of Knowledge and the Discourse on Language' (Foucault, 1972). In these works, Foucault analyses how talking about truth depends not only on the individual who speaks, but on others. In fact, truth can only exist if it is accepted through rules in a discourse. Foucault thus emphasizes the importance of language, rules and the social acceptance of rules[4]. Foucault's rule-based analysis can also be applied to transport planning with its focus on technological transport models. Like science, technology (including models), can and should be conceptualized from an activity-based perspective. How do activities and the social organization around supporting planning technologies reveal the institutional organization of a paradigm? I will go deeper into this matter now.

2.5 A transport planning paradigm based on Kuhn and others

To get a better image of what a paradigm entails in a transport planning context, I will begin approaching the term from philosophy of science perspective as the term has been introduced in this field. A planning context is not the same as a scientific context for which Kuhn applied his ideas. I still think though that some elements of Kuhn's definition of a paradigm provide valuable insights for the flow of ideas within organizations in general.

The term paradigm has been introduced by Thomas Kuhn (1962) in his ground-breaking work 'The Structure of Scientific Revolutions'. The original and most common explanation of a paradigm is described as a set of beliefs to which a certain scientific community subscribes. A paradigm describes and prescribes the set of problems that are acknowledged as a problem and the solutions that are

[3] There is a growing amount of literature which deals with mobility and transport issues from a Foucauldian perspective. For an overview and more background literature, see the introduction in Manderscheid et al. (2015) in their special issue of Mobilities and Foucault.

[4] Necessary social acceptance of rules does not mean that truth becomes relativistic per se. Rather, truth becomes something that is conditioned by rules. Foucault tries to reveal these rules by his archaeological approach. People adhere to rules, without knowing the overall framework (i.e. the discourse). The only thing that is known is that there *is* a discourse. Foucault also links archaeology with technological instruments. By studying different notions of truth in ancient Greece, he concludes that a major change of truth was caused and characterized by technology. The original notion of truth in the Homeric age depended according to Foucault on a struggle between parties. Consequently, the outcome of this struggle in the form of 'truth' was highly uncertain. The later version of truth was constructed by the Greek as a conception in which knowledge depended on 'verifiable procedures and a concomitant notion of law' (Behrent, 2013, p. 79). Cities lived in by soldiers, merchants and artisans increasingly depended on measurement techniques which assured social order. This second interpretation of truth seems like a first step towards a definition of truth that has been dominant in the modern sciences and eventually transport planning. In such a context, true knowledge must be justified by a scientific method, laws and rules and technological instruments.

appropriate for these problems, based on certain shared rules and standards. The scientific community and a paradigm can according to Kuhn not really be distinguished from each other. Rather, paradigms determine the boundaries of a scientific community and vice versa. In contract with for example a functionalist picture of science by for example Merton (1979) who thinks that science is governed by explicit rules and procedures, Kuhn sees a paradigm as a picture, perspective or conceptual framework adhered to by a scientific community (Boon, 2017). This perspective influences what is considered to be a phenomena, which hypotheses and explanations are constructed and what conclusions are supported by this evidence. Adhering to paradigmatic beliefs and values such as objectivity, consistency, or causality are according to Kuhn thus essential to be a functioning scientist. Another important aspect of a paradigm is the fixedness of it. In a period of so-called normal science the key aspects of a paradigm stay relatively the same, until a revolution takes place. In the case of Dutch water management, this revolution was more of a transition. This transition of the water management regime was initiated by ecological concerns and local initiatives on a micro-level, and possible dangers of climate change on a macro-level (Van Der Brugge et al., 2005). Through emergent and accidental reorganization, niche players became more powerful and different ideas on water management were therefore implemented as policies, also catalysed by some major floods.

Because the term paradigm was interpreted differently by readers, Kuhn (1970) reframed the idea of a paradigm as a disciplinary matrix in the postscript of the second edition of the book (see Figure 3). It is disciplinary because it applies to a certain scientific community. It is called a (disciplinary) matrix because it contains a number of elements, as a non-exhaustive list. Originally, Kuhn mentions four elements: symbolic generalizations, metaphysical assumptions, epistemic values and exemplars. Symbolic generalizations refer to the theoretical content of formulas and so-called laws. For example, the three laws of Newton are part of the Newtonian paradigm in the field of physics. Metaphysical assumptions are shared beliefs or assumptions by the scientific community about the structure and ontology of the world, for example if the world is fundamentally ordered or non-structured. Epistemic values entail the criteria by which a theory is judged such as accuracy, clarity, simplicity or coherency. Kuhn wanted to stress here that 'truth' is not the ultimate epistemic aim by which a theory is evaluated. Finally, exemplars are illustrations of symbolic generalizations in the form of clear problem-solution cases, which are for example taught to students.

Disciplinary matrix elements	Example
1. Symbolic generalizations	Formulas and laws (e.g. Three laws of Newton)
2. Metaphysical assumptions	World-order is chaos-based or rule-based
3. Epistemic values	Accuracy, clarity, simplicity, coherency
4. Exemplars	Clear learning cases, illustrative for paradigm

Figure 3: Overview of Kuhn's disciplinary matrix elements

The disciplinary matrix provides a clearer picture of what a paradigm entails for an organization in general, although this picture cannot be fully extended to the transport planning field yet. To begin with, transport policies have to be set over a longer period of time, in order to be a planning paradigm. I translate thus the relative fixedness of a paradigm as a planning culture. One of the most-cited papers which came up with the term policy paradigms is written by political economist Hall (1993). He draws an analogy of policy paradigms and scientific paradigms, in order to analyse economic policymaking in Britain. He defines policy paradigms as interpretive frameworks of ideas and standards 'that specif[y] not only the goals of policy and instruments that can be used to attain them, but also the very nature of the problems they are meant to be addressing' (Hall, 1993, p. 279). This framework is according to Hall embedded in the terminology policy makers use and influential precisely because policy makers are not aware of it.

The role of technology and practices are not enough incorporated in both Kuhn's framework of a disciplinary matrix and Hall's framework of a policy paradigm. Transport planning is typically an activity performed by the use of planning instruments such as traffic models and GIS-based maps. Kuhn talks a lot about ideas, and not about the pragmatic part of a paradigm such as instruments and standards which embody the paradigm, such as (traffic) models. Therefore, I will use a more practical interpretation of Kuhn's work by the philosopher of science Rouse (2003) since he approaches science not only as an epistemological endeavour, but from a practical perspective. This approach to philosophy of science is derived from the idea that science is an activity, and not only knowledge derived from that activity. This enables to open the black-box that science (or any other knowledge-based activity) sometimes can be. Rouse sees paradigms not as beliefs or epistemic values only, but as 'exemplary ways of conceptualizing and intervening in particular situations' (Rouse, 2003, p. 107), like acquiring and using a set of skills. According to Rousse, scientists *use* paradigms, instead of believing them. This interpretation of a paradigm implies that paradigms are not mere Platonic ideas. Rather, a paradigm can be embodied through instruments which reinforces a certain scientific system, or in a policy context institutional and professional practices. Just as Boon (2017), Rousse thinks that science should be also approached from a pragmatic perspective, through criteria of usefulness via technological constraints in the form of instruments for example. These instruments do not have to be limited to physical ones such as a computer, programs or books but can also be methodological (e.g. standardized approaches and procedures) or conceptual heuristics. Criteria of evaluation of a system are thus important, as such criteria embody the overall paradigm. Again, believing these heuristics is not enough: doing science according to a paradigm and its corresponding criteria is using these heuristics in particular situations and contexts. An example of how Rouse's ideas on paradigms can be worked out to analyse transport planning has been shown by Schwanen et al. (2011). This article explores climate change mitigation in transport planning, through an analysis of the path dependencies that exist within transport studies. According to the authors, these

dependencies have led to a preference of quantitative modelling with technology, pricing and infrastructure oriented solution directions in transport planning.

What is missing still in this review of a paradigm is a institutional and organizational perspective in a policy context. The institutional embedding of a planning paradigm through groups of actors, rules and practices is essential for sustaining the planning culture in an organizational context, as Geels (2012) and Van Der Brugge et al. (2005) have shown through a multi-level perspective analysis on paradigms in the cases of decarbonizing society and Dutch water management respectively. They showed that policy makers rely on (political) values such as a (dis)belief in freedom, rationality or logic, originating in different educational backgrounds and personal preferences. For example, in the Dutch water management case, bringing biologists into engineering teams led to more ecologically oriented water management. On a practical and organizational level, departments can be organized in a different way. Again, the Dutch water case shows this: Through re-organization, water quantity and water quality policies have been integrated. The mobility-based paradigm and accessibility-based paradigm not only differ in a conceptual way in my view as earlier-described literature on transport paradigms tell. An important organizational difference is that the mobility-based paradigm is characterized by a top-down planning approach, where professionals determine how the transport system should look like. An accessibility-based approach is open to more participatory approaches, as a broader variety of (socio-technical) solutions is possible. Furthermore, the mobility-based paradigm views transport in a sectoral way, whereas the accessibility-based paradigm works in an integral way, including socio-technical and spatial element of the city as well. In Chapter 3, will go deeper into the institutional background of planning paradigms through a historic analysis of the mobility-based paradigm.

To sum up, transport planning paradigms are not only ideas, perspectives or beliefs held by policy makers. Rather, as policy making is an activity in which the planner works forth-and-back with technology and other planners, the paradigm should be more than idea-based only. Based on the disciplinary matrix as proposed by Kuhn, the definition of a paradigm should contain metaphysical presuppositions, in this case of the transport system and travelling itself. Main questions are here: how is travelling conceived by policy makers? In what terms do they conceptualize the transport system, as a pure technological system or as a hybrid system in which the social world and the technological world are entangled? Policy goals as written down in transport policy documents are based on assumptions held by the policy maker of how the world is. By Rouse's interpretation of paradigms, it has become clear that actual planning instruments and evaluative standards are important, as they are the embodiment of the planning paradigm and the corresponding activities. In a planning context, planning instruments can be accessibility and transport models, in which different accessibility measures are incorporated. Hall (1993, p. 279) stipulates that policy goals matter very much, apart from instruments and assumptions which are already mentioned by other

authors. Finally, the institutional embedding through groups of actors, rules and practices account for the organizational context of a planning paradigm. These assumptions build on epistemic values such as an adherence to logic, objectivity, clarity or rationality. In fact, language rules and their institutional embeddings are crucial in policy making, as Foucault has also shown. All in all, I define a transport planning paradigm as a social and cognitive way of conceptualizing and intervening in the transport system by transport policy makers. This is exemplified by philosophical assumptions (1), policy goals (2), policy instruments (3) and evaluative criteria of the transport system (4). Finally, it needs institutional embedding of policy practices through organization and values.

An overview of the two transport planning paradigms has been displayed in Figure 4. A paradigm consist of two parts: the green part symbolizes the conceptual basis for a paradigm, consisting of assumptions, goals, policy instruments and evaluative criteria. The blue part symbolizes its institutional embedding of different values, organization and logic on a practical level. Consequently, the green arrow symbolizes the classic policy cycle through which change based on content-learning can be characterized. In other words, it displays paradigmatic change on an epistemic level. The blue arrows symbolizes paradigmatic change based on institutional reorganization. The hypothesis of this thesis is that the blue-arrow process is of more importance for paradigmatic change in Dutch municipal policy making than the green-arrow process. Only after working out the empirical part of this thesis, this hypothesis can be tested. Also, a more concrete conceptualization of both arrows can then be defined.

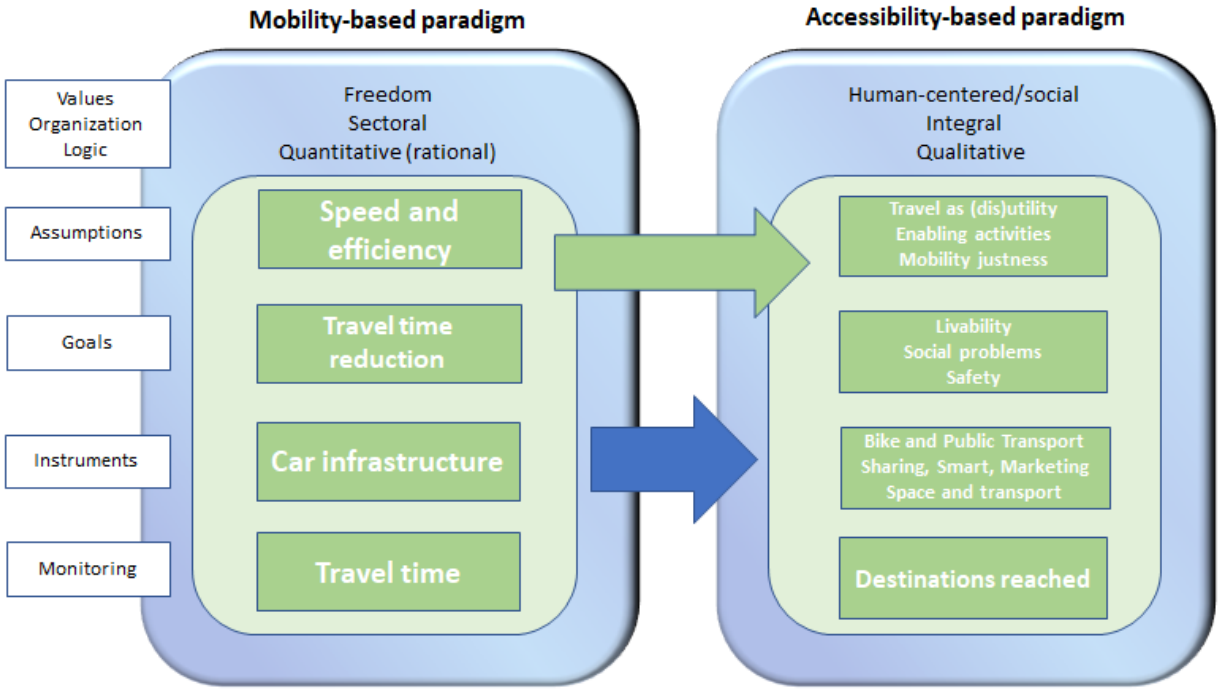

Figure 4: Schematic overview of transport planning paradigms, where the green arrow symbolizes change based on epistemic learning and the blue arrow symbolizes change based on institutional reorganization.

2.6 Critiques on the mobility-based paradigm

Throughout the development of the transport planning field, one paradigm has been dominant: the mobility-based paradigm which views travelling as a disutility. However, based on statistical empirical research, sociological empirical research and philosophical research I will argue that traveling does not have to be a disutility per se on a conceptual level. Economically, I think there exists a scale for conceptualizing traveling which ranges from 100% disutility (e.g. a leisure trip) on the one hand till 100% utility (e.g. a hospital trip) on the other hand. All trips consist though of a diverse mix of social aspects with specific meanings and practices, even the 100% utility trips: speed, comfort, pleasure, (physical) access, individual preferences, habitual behaviour and cultural norms can all be rationales for choosing a certain mode at a certain time. The mobility-based paradigm mostly focuses on speed, i.e. time reduction, thus ignoring the other motives and characteristics of traveling. The alternative planning paradigm based on accessibility instead incorporates assumptions on traveling as a social valuable practice. As a result, accessibility analysis reaching destinations at different times and places.

Travelling as a disutility, or mobility as a derived demand from other activities has been criticized by several scholars (Banister, 2008; Lyons & Urry, 2005; Metz, 2008; Mokhtarian & Salomon, 2001; Watts & Urry, 2008). This criticism comes from different academic fields and empirical experiences, especially from transport economics (1), equity analysis of transport systems (2) and humanities and social science research on travelling and travel time (3). In the following paragraphs, I will briefly deal with these three type of criticisms (2.6.1 – 2.6.3 respectively) since they form an important academic basis for a shift in transport planning.

2.6.1 Transport economics

Transport economics uses the idea of stable travel time budgets. Empirical research has already found in the 80s that there exist travel time budgets on an aggregated level of around 60-70 minutes per day, irrespective of time, place and culture (Hupkes, 1982; Zahavi, 1974). This means that faster modes of transport will lead to more distance travelled, given that the overall travel time remains the same. One would expect if travellers tend to minimize their travel time, that less travel time is not ‘invested’ in covering more distance. At least on an aggregated level this idea seems not to be the case. On an individual or household level, the idea of travel time budgets do not apply. Hupkes (1982) described his theory as a ‘law’ from which all kinds of rules can be deduced for local situations. This law does not right however to individual preferences, constraints and situational contexts which eventually determine where and how a person goes. Schwanen (2008, p. 711) puts it in a comment to Metz (2008) in this way: ‘Implicitly, there is an average traveller moving through his text who has much discretion over where, when and how to travel, and it is this average person who is conserving—almost cherishing— travel time by choice. Yet, this traveller is a nobody, a statistical artefact who bears little resemblance to actual road users’. According to Schwanen, the concept of

travel time budget does no right to the complex and open-ended process which influences people's way of travelling. Some people are in fact forced to travel a short distance, because they don't have a car or cannot cycle. They would like to go further however. A more individualized hypothesis of travel time budget has been proposed by Mokhtarian and Salomon (2001, p. 712), which does right to this contextualized notion of travel time budgets: 'Rather than uniformly trying to minimize travel, people seek to decrease their travel if it exceeds the desired optimum, but seek to increase travel if it falls short of their ideal amount'. What does become clear is that the idea of travel time minimization for all travellers does not apply, but still remains powerful on an aggregated level. Question is then, if extra distance is covered by providing extra infrastructure, how should this extra distance be socially distributed to citizens? Van Wee and Rietveld (2008) comment on Metz (2008) that valuing the benefits of travel time savings is in fact useful. My response is then, for whom is it useful? For the people who have already enough accessibility or those who are lacking accessibility because of individual disabilities or public transport dependencies? This relates to problems of equity and just transport systems.

2.6.2 Equity analysis

A second critical perspective on the focus of decreasing travel time in transport planning comes from studies about social equity and social exclusion. Accessibility to locations is unequally distributed over people in society: some people have more access to locations or not. Thomopoulos, Grant-Muller, and Tight (2009) provide an overview of equity categories in planning on different scales: individual, on a group level and regional. Unequal access to locations can also occur either voluntarily or involuntarily. If individuals desire to go to a certain location but cannot access it, one can speak of social exclusion. van Wee and Geurs (2011, pp. 358-359) define social exclusion in this way: 'the fact that some people or population groups are excluded from a certain minimum level of participation in location based activities, in which they wish to participate'. Although research does not provide direct causal links between social exclusion and underlying factors, it is generally acknowledged that income and car possession are the main explanatory factors for a lack of travel possibilities within certain social groups (Lucas, 2012; van Wee & Geurs, 2011). Such a lack of possibilities is defined as mobility poverty. Note here that car travel is seen as the benchmark of high potential accessibility. Other influencing factors for mobility poverty include age, ethnicity and physical wellbeing (Beyazit, 2013). Public transport is considered to be a solution for issues around equity and mobility poverty. In a Dutch context, the social-spatial differences between different people are limited to certain extent due to the high bicycle use (Jorritsma, Berveling, De Haas, Bakker & Harms, 2018), although not every social group has the possibility to cycle and the potential action radius is relatively small in comparison with car and public transport. In this same Dutch research, larger cities and rural regions with a declining population are defined as areas in which people live who are more likely to be socially excluded by mobility poverty. Such groups are most-often people with a low income, unemployed, elderly, people without a driver's license and people with a migration background.

Although urban regions have a high potential accessibility rate through public transport (Pritchard, Stępniak & Geurs, 2019), it very much matters which locations at what times can be reached by public transport from low-income neighbourhoods. For example, factories might not be reached at 7 AM by public transport whereas inner city centres are accessible from all parts of the city. There are also large differences in between cities in terms of potential accessibility by car and public transport.

In a planning context, traditional transport planning has been mainly focusing on providing more accessibility to those who already have a high level of potential accessibility by car travel, for example by solving congestion bottle necks through adding more road capacity (Martens, 2017). Future travel demand predictions which are input for infrastructure investments are based on models that seek to predict behaviour of persons who have a relatively high potential accessibility, i.e. those who own and use a car. This means road investments often increase equity problems. A planning paradigm based on travel time reduction can thus lead to a status-quo bias of car travel. This bias does not help socially excluded groups who do not have access to such transport systems, in which car mobility is the benchmark.

This kind of mobility planning criticism can be interpreted as a consequence of the idea that travelling (mobility) is just as much part of the social realm, as it is part of the economic realm. This evaluation is the starting point of critical reflection and analysis from social sciences and the humanities, especially philosophy.

2.6.3 Social sciences and philosophy

Social scientists and philosophers dealing with mobility, emphasize that there is an (non-economic) utility to travelling, which is undervalued in the dominant conception of travelling in the field of for example modelling and planning. The economic conception views traveling as meaningless. This does not mean that it is socially meaningless. Going from A to B through means of infrastructure is more than an efficient or technocratic practice. The alternative approach to mobility has been initiated by Urry (2000, 2007) and is often called the mobilities turn. This sub field of mobility studies aims to approach mobility from a multidisciplinary perspective, in order to analyse the meanings travellers attach to traveling (practices), spaces and themselves in an interconnected society. What is new here is the rejection of the classic binary between social studies and transport research, which means that transport is now connected with complicated social patterns (Sheller & Urry, 2006, p. 208). The turn has inspired many research and additional frameworks which enables to understand mobility from a holistic perspective[5]. Lyons and Urry (2005) mention for example that travel time has increasingly become activity time, in which people sleep, read, work, discuss, eat, and call. New technologies have made many of these activities possible, such as mobile phones and apps like Skype. Especially in

[5] In my view, the new mobility movement could be called accessibility movement as well. Such a definition would be in line with other literature on holistic and integral planning. For the sake of consistency with literature though, I will keep referring to the mobilities turn by mobility and not accessibility.

public transport, travelling does not have to be an economic disutility if the traveller can work on his laptop (Gustafson, 2012). Travelling can also have a leisure motive, so-called undirected travel (Mokhtarian & Salomon, 2001). Moving yourself can be a way to relax by enjoying the speed in a car or the landscape outside. A person can also make a trip by bike to exercise. Moreover, such motives can also play a role in traveling with highly directed motives such as going to work. A trade-off can be made here by a person to travel slower by bike if that is healthier. Redmond and Mokhtarian (2001, p. 202) conclude that based on empirical findings, 'results support the contention that commute time is not unequivocally a disutility to be minimized, but rather that there is an optimum to be achieved which can be violated in either direction'. This optimum depends on the individual context in which the traveller is situated. It is unclear however how this context can be understood: what type of conditions make up for this context? To go deeper into the social aspects and contexts of traveling, I will use the conceptual framework of Cresswell (2010) to provide a first step to answer to this question. I have chosen this framework as it covers all aspects of travelling in a coherent way. The framework deconstructs traveling in the three parts: movement, representation and practice. By doing so, it enables to analyse the term from an individual traveller perspective, a historic perspective and a policy perspective.

2.7 Travelling as a social practice

Cresswell (2010) argues that mobility can be described as an entanglement of movement, representation and practice. The combination of the three processes are described as the politics of mobility[6]. Physical movement in the form of going from A to B is of course essential to mobility, which can be mapped and modelled[7]. But, this first part of mobility does not say anything about its meaning and practices that go along with them. The meaning or representation of mobility can be diverse: it can figured 'as adventure, as tedium, as education, as freedom, as modern, as threatening' (Cresswell, 2010, p. 19). Cresswell calls such meanings narratives, which tells a story about who the traveller is or how a particular transport society is constituted with trains, cars, bikes and boats. I will go more into these narratives and meanings in Chapter 3. The final part of the politics of mobility is its practice: the everyday sense of traveling. By going into the social practices of traveling both as an embodied sensory experience and an arrangement in which infrastructure and ideas get folded, I will try to show how the social aspect matters just as much for traveling as the movement as much itself. Movement can actually not exist without the social meaning and vice versa. Mobility consists of

[6] More recently, the argument by Cresswell has been extended by Nikolaeva et al. (2019) as a 'politics of mobility transition', by focusing on 'mobility as commons' or 'commoning mobility'. The authors define this term as 'a process that encompasses governance shifts to more communal and democratic forms while also seeking to move beyond small-scale, niche interventions and projects (2019, p. 353).

[7] Earlier, I have described how modelling is currently executed. Some authors like Frello (2008) reject that movement is relational with meaning and representation. Rather, what counts as movement is co-evolved through a discourse of power relations, resulting that only certain people can say what an actual trip is or not. I will go more into these Foucauldian-inspired arguments in the following chapter.

movement within a socio-technical network, in which the traveller, his behaviour, and the surroundings matter very much. The mobility-based paradigm ignores this part of traveling, since (economic) benefits are fully subscribed to the destination. Such an approach does no right to the experiences, benefits and opportunities traveling can have socially.

For example, the sensory experience of traveling by train, car, walk or bike can be completely different. Different technologies form a different experienced world and subject who experiences that world. For example, Gatersleben and Uzzell (2016) have explored how different travellers using different modes experience their commute. They found that car commuters are more stressed than public transport users and cyclists. Especially walking and cycling journeys are according to their survey the most relaxing and exciting in affective terms. That cyclists have a different sensory and embodied experience when traveling through a landscape or city has already been discussed in other research (Spinney, 2009). Furthermore, Van Duppen and Spierings (2013) found based on empirical research that different commuters experience different 'sensescapes' while going from home to work. They define sensescapes as the way in which commuters both sense urban spaces and apply cycling tactics. The researchers found that cycling between home and work 'involves preferences and intentions, as well as biographies and memories' (Van Duppen & Spierings, 2013, p. 242). In practice, different surroundings evoked different feelings with the commuters: a bridge marked the beginning of the city and different types of cycle lanes led to do different mental commute experiences.

Even in a car, the assumed mode of transport in the mobility-based paradigm, commuters experience different sensescapes. Analysed from a philosophical perspective, Thrift (2004) analysis the embodied practice of car driving inspired by the work of Michael de Certeau[8]. He argues that car driving is heavily mediated by technology. The experience of road resistance, weight and ergonomic design of cars produce a intermediated contact with the road, i.e. the surroundings. 'Sound and even video systems, climate control, better sound insulation, ergonomically designed interiors [..], all conspire to make the car into a kind of monad which increasingly refers to the world outside itself via heavily intermediated representations' (Thrift, 2004, p. 51). Car drivers are often alone in their car, giving them the opportunity to play a guilty pleasure song or think about issues either of home or work. This means that different experiences, thoughts and eventually identities are formed precisely during traveling.

This formation of all kinds of parts of human existence is made possible by so-called arrangements of infrastructures and materiality (Shove, Watson & Spurling, 2015). These arrangements can consist of 'actors, materials, standards, ideas and images' (Harvey, Casper & Morita, 2017, p. 24) which get folded into infrastructures. In history, planners have always tried to design arrangements of

[8] In this work, de Certeau analyses the city and spaces within a city from a walker perspective, creating a phenomenology of sensory experience and embodiment. See for example De Certeau's work 'The Practice of Everyday Life' (1980). According to Thrift (2004), this phenomenology can be extended to car driving.

infrastructures from scratch, which select and leave out certain modes. In the period 1920-1950, 'local policy makers and planners defined cyclists as old fashioned, irresponsible, and anarchistic, who needed to be controlled' (Oldenziel & Albert de la Bruhèze, 2011, p. 42). This idea has highly influenced the way in which (cycling) infrastructures were developed from then until now[9]. The role of (preferences of) planners and organization will be dealt with in the following chapter.

All in all, the practical part of traveling shows how it can be a way to relate to the world. While traveling is defined as economically useless by the mobility-based paradigm, it is definitely not philosophically useless as shown through literature: a traveller perceives the world differently and is differently shaped as a person through modes, speeds and corresponding arrangements of infrastructures. Conceptually, there is plenty of reason to move from a mobility-based paradigm to an accessibility-based paradigm in planning practices.

2.8 Conclusion

If there are so much conceptual arguments to move from a mobility-based paradigm to an accessibility-based paradigm, why has the change not taken place yet? Apparently, (academic) arguments and shifts of thinking are hard to translate and apply in a planning context. In the following chapter, I will further work out the idea that a paradigm not only consists of conceptual elements. Rather, organizational and institutional barriers in the form of a regime may be significantly more important as explanatory factor why most policy making still adheres to the aim of travel time reduction in their plans. I will therefore specifically look at the assumptions, meanings and language of the mobility-based paradigm, building on a political and organizational notion of transport policies. Transport policies are not just on providing infrastructures. Creating infrastructures is a highly political activity, which determines how citizens experience the world and eventually live in their country. By political I refer here to an arrangement of power and authority, as well as a form of governmentality to provide a certain social order by means of and during the construction of things like bridges and mobility models (Larkin, 2013; Winner, 1980). Within organizations, different (political) meanings and assumptions are attached to mobility, which is the second aspect of mobility in Cresswell's framework.

In this chapter, I have critiqued the use of the term 'paradigm' by a variety of scholars, as they only approach planning from a conceptual perspective. Therefore, I have defined a paradigm concept in the form of a transport planning paradigm with an activity-based centre stage. All in all, I define a

[9] Another example of how social arrangements of power and ideas get folded into infrastructures is told by the story on bicycle taxes as policy tool (Albert de la Bruhèze & Oldenziel, 2016). This paper explores arguments in discussions whether bicycle taxes should be levied to cover the cost of constructing bicycle lanes, just as car users pay taxes for maintaining the road. Such discussions include argumentative lines which adopt different meanings to bicycles and cycling: it is both viewed as slow, old fashioned, dangerous and sustainable, healthy or clean. The point is that both meanings can exist next to each other, in co-existence with and co-shaped by practices and meanings of car travel.

transport planning paradigm as a social and cognitive way of conceptualizing and intervening in the transport system by transport policy makers. This is exemplified by philosophical assumptions (1), policy goals (2), policy instruments (3) and evaluative criteria of the transport system (4). Finally, it needs institutional embedding of policy practices through organization and values. I have elaborated upon the philosophical assumptions of the two transport planning paradigms I define in this thesis. The transport paradigm that has been dominant as a planning culture is mobility-based: it views traveling as a disutility. Apart from critiques from transport economics and from planning based on equity, I have focused on the perspective of travel as a social practice. The mobility-based paradigm ignores this part of traveling since it views traveling as an economic disutility. By assuming the world like this, it does no right to the experiences, benefits and opportunities traveling can have socially.

3. Organizational history and symbolism of the politics of speed

In this chapter, I will deal with the last aspect of mobility which has not been discussed yet: its meaning from a practical perspective. Cresswell (2010), in a Foucauldian sense, refers to the meaning of mobility as a representation or narrative. This narrative has to be sustained through a specific organizational and institutional context, and contextual practices. Analysing the mobility-based paradigm through such an institutional lens enables to understand why it has become so dominant. As has become clear in the previous chapter, a radical change in paradigms has not happened based on conceptual arguments only. Most transport policy documents of today still refer to the mobility-based paradigm language. A key then to change current transport systems is to know how such systems and policies work through organizational factors. Or, to pose it as a research question: How did the historical processes of modelling and institutional embedding make the mobility-based paradigm dominant?

To answer this question, I will look into the context of the need for speed, firstly by looking into the modelling activity practices of transport planners. This will be done from the Foucauldian idea that a discourse can be constituted by technological practices. In the early days of transport engineering namely, planners looked for laws and rules that could explain human travel behaviour. Consequently and secondly, I will go more deeply into the assumption itself that travellers always want to minimize their travel time, which is one of the most important norms in transport planning. I will contextualize this assumption by reviewing Foucauldian-inspired literature on the policy organization of mobility. Thirdly and finally, I will conclude with some implications for transport planning practices, illustrated by a short reflection on bicycle highways and the acceleration of bicycles in general.

3.1 Institutional embedding of actors and modelling practices

The profession of transport planning in the form of traffic engineering has been mainly developed in the United States in the 1950s and 60s. The basis for transport sciences and planning lies more interestingly in the 1920s and 30s however (Popkema, 2014, pp. 25-39). Different actors have had a prominent role in this process. In the USA, the Bureau of Public Roads (BPR) manifested itself as a technical expert office, pushing towards the development of a national highway system. The bureau did research to promote efficiency of the road network which resulted in the introduction of terms like ‘design speed’, ‘curve radius’ and ‘vertical alignment’. The road had to be designed according to the wishes of the car and the car-user. One should note that already in 1925 the USA car system was at the same level the Netherlands would have in the 1960s and 70s. In Europe, Germany is the initiator of institutionalizing expert knowledge on transport and traffic, by setting up different courses on these topics at different universities in the 1920s. These courses were part of economic curriculums. At the same time, policy makers, traffic engineers and urban planners worked together to define fast and slow traffic, cars and non-cars respectively (Oldenziel, 2018). For example, the Permanent International Association of Road Congresses (PIARC) introduced standards for speedy

travel and at the Congrès Internationaux d'Architecture Moderne (CIAM) it was decided that the future belonged to fast cars (Oldenziel & Albert de la Bruhèze, 2011). In the 1930s, the integration of economic courses and traffic engineering was even more stimulated by the Fascist and Nazi regimes, in order to mobilize the Italian and the German population as fast as possible.

In the USA, transport modelling (i.e. calculating traffic volumes rather than making educated guesses) became dominant from the 1950s on. In 1956, the Interstate Highway Act was established by congress, which ensured 25 billion dollars of funding for highway construction. Moreover, this Highway Act 'determined that the development of the highway system remained in the hands of federal and state highway-engineers, which resulted in a technical orientation' (Popkema, 2014, p. 29). The successor of the Bureau of Public Roads (BPR), the Federal Highway Administration (FHA), developed its own methodologies and models to answer the call for more highways. This lead to an acceleration of highway construction[10]. According to Stopher (2016), the problem to be solved was a weekday peak period transport problem. This meant that data collection in the form of car counts and modelling only focused on this problem. The BPR formula linked travel times on a link with volumes and capacity. Numbers produced by such formulas and computers were not questioned, as it was assumed that computers told the truth. Since all people were assumed to want a car, providing efficient car mobility was the main focus of the profession. No other modes were considered[11]. If they were considered, it was used with the objective to 'simply estimate what fraction of household trips would be made by each of car and public transport, so that the latter trips could be removed from the process and trip distribution and highway assignment be performed using only car trips' (Stopher, 2016, p. 43). Car possession was estimated using socio-economic characteristics, as (poor) people were assumed not to have a car.

The methodology developed in the early days of traffic engineering to calculate traffic volumes still exists: it is in fact the main modelling approach in transport modelling and is therefore also referred to as the classical approach (Ortúzar & Willumsen, 2011). The methodology consists of four steps, namely trip generation (1) which calculates the total amount of traveling per cell, trip distribution (2) which links different origins and destinations, modal split (3) which calculates the allocation of all trips to different modes and assignment (4) which finds routes for each origin and destination. The

[10] Although the car-based paradigm seems the only one existing in the 60s, there were already thinkers who argued against the immense construction on freeways and their devastating effect on cities. See for example Halprin (1966), reviewed in Cresswell and Merriman (2011, pp. 108-113). Halprin has argued that freeways ruptured local urban communities, thus destroyed urban qualities and values. Such thinkers were however in a minority.

[11] That public transport was marginalized in transport planning can also be detected through other sources: see for example Keefer (1966) who spoke about an illusory demand of mass transit and Hilton (1969) who mentioned that automobility had won over rapid transit because of its flexibility. Public transport could not serve a diffused urban pattern according to the author. Automobility might decline because of its parking problems, therefore a 'self-contained airborne vehicle' (1969, p. 135) was the solution. Circumferential highways were the most promising solution though for congestion according to Hilton.

third step missed in the 60s and 70s, as the main mode of interest was the car. Through bottom-up social protest and increasing awareness of the environment, more modes were finally added to the transport model later on (Oldenziel & Albert de la Bruhèze, 2011). Why the four-step model with its (hidden) assumptions is still the main methodology in transport planning is a very complex question to answer. One answer could be that the model itself became so sophisticated and developed that no alternative model was developed (Koglin & Rye, 2014; Oldenziel, Albert de la Bruhèze & Veraart, 2016). In Kuhnian language, other ways of seeing and defining the problem was blocked in the community and its institutes as the planning paradigm was in its normal phase and fixed as a planning culture (Schwanen et al., 2011). Restated, the socio-technical regime of earlier-described actors, institutions, rules, and practices only accepted incremental innovation.

Moreover, transport planning with its focus on numbers was highly regarded as an objective science. Institutional rules and norms such as the highly interwovenness of economic programs and planning programs shows this aim of objectivity. Objectivity of data can be questioned though, which is already shown through a selection bias: as a norm, data was only gathered for car traffic by many planners. Public transport, walking and cycling have been ignored in the transport models, which also means that research data and literature about these modes is (still) very limited in comparison with car research. Bonham and Cox (2010, p. 46) mention about this: 'As cyclists were ignored in transport data collection and transport texts, they were also ignored in street space'. More recently, such modes are included more and more in models although usually only for bicycle and public transport in a narrow way (Ziemke, Metzler & Nagel, 2017). Practically speaking, car modelling thus had a huge head start of knowledge, data collection and research and policy experience over public transport modelling and bicycle modelling. This development is also enhanced through the institutionalization of the four-step model in educational programs, like civil engineering. The four-step model is relatively easy to interpret with simple basic premises which describe human behaviour. If there are enough basic socio-economic criteria, the model will easily produce some outcomes through ticking the boxes and pressing the button. In Foucauldian terms, this makes the model highly verifiable with quite clear causal relations. It provides clear-cut answers for difficult policy questions. This means that policy makers can follow up on the outcomes of the model straightforwardly, if the assumptions that were input do not look too far-fetched[12]. In a slow-evolving and conservative policy making world this difference partly explains why the classical approach is still so dominant, even when other methodologies might be more appropriate to model active modes.

[12] Through a personal conversation I had with an insider from the engineering consultancy, I learned that some traffic consultancy firms spend quite some time on making graphics and movies of a new traffic situation, so that the municipality is convinced that the model 'works'. The traffic model itself is not questioned. Images and videos produced are consequently used to convince local citizens that the construction project will have positive effects on the neighbourhood. Video only displays a nice flow traffic of course, leaving out noise and air pollution effects: the mediating role of technology at work.

Apart from the stabilizing role of actors, institutions and modelling practices in the car-base regime, norms have also played an important role. The whole classical modelling approach should also be seen in a context of different cultural meanings that are assigned to car, bike and public transport traveling (Oldenziel et al., 2016). The car mode is mostly referred to as fast, modern, sexy, luxurious, and middle-class, whereas cycling and public transport are seen as old-fashioned, slow, unsafe, and only used by the poor and the needy. Transport planning has taken over these conceptualizations, actively supported by industrial car and road lobbies (Geels, 2012; Norton, 2015; Oldenziel, 2018). All in all, transport planning has reflected the societal expectation and norm that the fast car will win and other modes will lose. Transport planning helped to make this norm a social value.

3.2 Need for speed as a transport planning norm

Why the classic transport model has been dominant can also be explained by the apparent attraction of the main assumption itself: travellers seek to minimize their costs and aim to travel as fast as possible. Building an efficient transport system based on the above-described assumption fits a compelling and dominant narrative of a society which inevitably goes and should go forward, and which is built on rationality and efficiency. This guiding narrative has been broadly coined by historians and social scientists as 'modernization', in which human made civilization and progress became intertwined with concepts like 'speed' and (unhindered) traffic flow, requiring a focus on decreasing travel times through infrastructural projects, mostly set up by governmental organizations and institutions. This process is not only relevant for car infrastructure. The narrative of speed is also relevant for rail travel (e.g. high speed rail) and more recently cycling (e-bikes, speed pedelecs and so-called bicycle highways). I do not want to define speed as a uniform term that is 'bad' for society. Rather, I argue that the term is contextual, thus multi-interpretable which shows different forms of transport, traffic behaviour, and eventually societies. In addition, different types of speed can co-exist, each of them including and excluding specific social groups, places experiences and histories. Speed in a bicycle context can be sustainable and liberating as a competitor of car travel, whereas speed in a high-speed rail context might also exclude, separate and enlarge the gap between rich and poor. Comparing speed at the level of high-speed rail with air travel however, gives other meanings to 'sustainable' speed in favour of high-speed rail. I will now go into different societal meanings and norms of speed that have specifically supported the mobility-based paradigm within the socio-technical regime of car traveling.

In a context of infrastructure studies, Larkin (2013, p. 333) mentions that 'a road's technical function is to transport vehicles from one place to another, promoting movement and realizing the enlightenment goal of society and economy of unimpeded circulation'. This quote underlines the dominance of the mobility-based paradigm. Infrastructures are at the same time objects that generate desire: countries build fast roads and railways for ideological progress purposes to realize a

(modern) projected future[13]. For example, Merriman (2007) analyses the history of the M1 motorway in the UK, showing that the M1 was built for binding the country economically, but also forging a modern Britain after World War Two. In the years after opening, the highway was 'constructed and experienced as spaces of modern consumption, catching the public's imagination' (Merriman, 2007, p. 22). Moreover, Merriman shows that these sentiments can change: in more recent years the highway is depicted as a 'placeless place', by for example environmentalist and landscape conservators. As described in the previous chapter, sentiments like these are not main-stream. The narrative of the fast road as smooth and efficient still prevails. In fact, the speed norm is also taken over in a rail context[14] and a bicycle context. But how is speed as a norm implemented through institutions and society?

One of the classical works that deals with speed on a societal level is written by Virilio (2006) in 1977. Speed is for him not a derivative of economic demand or human actions. Rather, he views speed as *the* force that drives civilization, the state and progress. In his essay 'Speed and Politics' he mentions that 'there was no 'industrial revolution' but only a dromocratic revolution; there is no democracy, only dromocracy; there is no strategy, only dromology' (Virilio, 2006, p. 69). Dromology is derived from the Greek word δρόμος, which means racetrack. Dromological progress, i.e. the acceleration of the world through technological advances, coincides with social and human progress according to Virilio. However, this progress does not happen without state interference and military control. New and faster technologies enable and require more control, conquering and state interference. A concrete example is the car in the 1930s. On the one hand, car travel created at that time new possibilities of travel, in fact it created a whole new way of a consumer's life. On the other hand, state government was needed to control the highway by setting for example speed limits and drunk regulations. According to Virilio, speed and control thus go hand in hand. Although this might be true for highways, different (implicit) regulations were introduced for urban roads. Norton (2015) mentions for example that road users were deemed responsible themselves through educational

[13] Society's need for controllability, planning, industrialization and technologization is often referred to by historians and sociologists as 'modernity', see for example Giddens (1991). I will not elaborate on the background and criticism on the term of this thesis.

[14] In a rail context, Audikana and Chen (2016) explore the political discourses around high-speed rail (HSR) in the United States, Europe and China. They conclude that the functionality of HSR within transport systems cannot be called critical, whereas their political significance and symbolism is huge. Speed is thus both a symbol and a measure to delineate one's country on the pathway of progress. For Europe, they found that in France the high-speed rail and its TGV is seen as French 'grandeur', and in Italy and Spain the high-speed rail is built to connect Madrid with the rest of the country and North and South Italy respectively. National and regional identity, as well as cohesion play a central role for HSR in Europe. In the USA, HSR was presented under Obama to change American mobility culture. For China, the HSR represents national pride and good Chinese pragmatic leadership, as well as connecting all regions together in one modern China. For example, Hong Kong was connected to the high-speed rail network of China. Commentators fear that this will lead to more influence of Chinese government in Hong Kong, see: https://www.bbc.com/news/world-asia-china-45612749 (Accessed 11th of August, 2019).

programs targeting reckless drivers and pedestrians. Moreover, cyclists were marginalized as illegal users of the street in order to make way for 'fast' and 'modern' cars (Oldenziel, 2018).

What is interesting in Virilio's analysis is the deep relation between the measure of societal progress and speed. He places this relation especially in a context of state involvement and speed by seeing technology and speed management as deterministic forces, echoing Heidegger's term 'enframing' in 'The Question Concerning Technology'[15] (Heidegger, 1977). Implicitly, Virilio's essay is about the controlling force of a state competing with an individual's freedom. Speed and speed limits however are not only a negative (control) force in conceptualizing transport policies, as there are different kinds of speed which cannot be placed under one label (Glezos, 2012). Based on Foucault, Verbeek (2009) for instance calls for a positive form of freedom in the context of (computer-automated) speed limits: freedom as 'the human capability to form oneself against these external influences' (2009, p. 60). Freedom is in this sense the proportion to which we act *with* technologies, and not to which we are constrained *by* technologies. Control by speed does thus not have to mean that it is a restrictive force only. It is a force, but it can also be a productive one: this means that one should move away from Virilio's deterministic 'need for speed', to a more pluralistic 'each speed has its need'. This connects with what Molotch (2017) calls the relativity of speed. Speed is relative in history, by medium, per action and per person. Some people like to travel slow in a scenery environment, whereas others like to travel fast to arrive at a remote destination. The issue here is that low-speed travelers have been marginalized in an urban context, especially cyclists and pedestrians. In this sense, Virilio is right to claim that speed has become the benchmark to which slowness has to comply. Moreover, speed is easy to implement as a norm by an organization. The attractiveness of a simple premise has highly constituted the dominance of the mobility-based planning culture.

Discourses of cars and cyclists have influenced each other through the speed norm in both an productive and controlling way. In a Foucauldian sense, bodies have been disciplined and governed in two ways in relation with mobility and speed according to Bonham (2006). Firstly, speed links with freedom in both a negative (restrictive) and positive (productive) sense. Secondly, movement has been linked with doing activities at the trip destination. This second link especially has enabled to separate, classify, and order travel practices in relation to their (economic) efficiency. In this way, travel practices can be labelled 'rapid, direct, uninterrupted', and travellers can be labelled as 'fast, orderly, single-purpose' (Bonham, 2006, p. 58). Travelers who are fastest have been prioritized in the hierarchy, as they embody a speedy and efficient rationale for traveling, which is easy to objectify in

[15] I did not make this connection myself, the reference is for example made by Bratton in the introduction to the 2006 edition of Virilio (2006, p. 14). According to Heidegger, 'enframing' is the logic under which modern technology reveals nature (or the world in general) being only available for human purposes, and not valuable in itself. In short, modern technology reveals the world as instrumental to us. Eventually, this leads to seeing not only nature as instrumental but also humans as instrumental, making human life meaningless: nihilism.

transport planning. This so-called transport rationalization makes transport planning a relative neat business, with large consequences however for the way how a city is ordered. If speed is to be guaranteed for cars, a separation of traffic flows is necessary for safety reasons. This has consequently led to highways, city ring roads and separated lanes for cars. Norton (2015) refers to this engineering strategy as the safety control paradigm, in which three E's are central: (highway) engineering, education and enforcement. To protect slower travellers from fast cars, measures like crosswalks, traffic lights and separate paths have been installed in the city. Highway engineers thought that they could reconcile safety with speed through design. Apart from exception countries like the Netherlands and Denmark, in Europe a long-term infantilization has taken place since the 1930s, by framing the cyclist as 'a vulnerable' or 'soft' road user' (Bonham & Cox, 2010, p. 50; Oldenziel et al., 2016). In such cases, the cyclist is depicted as strange and interrupting the 'norm' (Lee, 2014). The institutionalization of such norms was established by powerful societal actors like urban authorities, engineering experts and schools. Norton (2015, p. 327) describes for example how the American Automobile Association (AAA) taught children at schools in the 1930s that 'the street is for autos' and that they had to 'accept responsibility for their own safety'. Also, 'urban authorities and traffic engineering experts designed new traffic rules that favoured cars' (Oldenziel, 2018, p. 283), like forbidding to cross the street diagonally as a pedestrian or riding too close to cars as a cyclist. All in all, protecting vulnerable road users and improving car flow can both thus be traced back as consequences of speed as ordering principle in traffic design. This ordering principle should not be read as a negative control force but as a positive force, shaping possible actions and identities if different practices of speed are taken into account with.

The discourse of what counts as transport has been heavily influenced by (urban) transport planners in the modernist demand for efficiency, rationality and flow, thereby shaping what counts as proper (car) movement or not (Frello, 2008). The lack of space in cities in the form of scarcity exists as a narrative of a battle between different modes, which cars have mostly won and pedestrians and cyclists mostly lost. Road congestion, the ultimate lack of space for cars is therefore presented as the most important mobility problem there is. In the Netherlands since 2011, 'through the national program "Optimising Use" ("Beter Benutten"), behaviour change is encouraged via incentives to ration those scarce resources, by driving during alternate times, telecommuting or working at home occasionally, using e-bikes, or carpooling. In this instance, neither environmental impact nor the rationality of driving itself (during low-congestion periods) is questioned' (Nikolaeva et al., 2019, p. 350). Determining a just distribution of space can however be quite tricky as Nello-Deakin (2019) shows, since dividing space according to modal share or kilometres driven still favours the status quo: a car-based planning paradigm and urban traffic regime for cars. It is therefore advocated that transport planners should not look at the distribution of space, but at the distribution of speed. Their claim is that the lower the speeds are, the more equitable the transport system is. In an urban transport network, I think indeed that such a measure can be very relevant for transport planning.

Martens (2017) has for example argued in favour of providing a minimum accessibility level for everyone, instead of improving accessibility levels for those who already have enough opportunity to travel by car. For longer distances, it should also be possible to discern between sustainable and unsustainable speed in my view, as taking a train or car driving can be characterized respectively. Another new take on speed is presented by Banister, Cornet, Givoni, and Lyons (2019) who advocate for the adoption of reasonable travel time by planners, which is expressed by the door-to-door journey time, experience of travel and type of activity at the destination.

3.3 Conclusion and implications for transport planning

Transport modelling and planning has of course changed a lot since the 1960s as most governments have some type of sustainability policy in relation with transport. Transport justice is slowly starting to be acknowledged as a problem in transport planning, at least in academia. Does this mean that a paradigm shift has taken place? It cannot be called a 'revolution' of the mobility-based planning paradigm in Kuhnian terms. A change of the assumption that a traveller always wants to minimize his travel time, rejection of the goal to reduce travel time between cities and a shift of funding from road investments towards cycling and public transport has not happened yet on a large scale.

In this chapter, I have argued that the mobility-based paradigm and its classic transport model has remained so dominant mostly because of organizational reasons and (implicit) political choices that have reinforced the car regime. Several planning organizations were highly influential in determining the discourse, rooted in an economic background. Data and knowledge were in the early days of modelling only available for car traffic, which gave this type of modelling a huge head start. Moreover, in a law-seeking and data-driven society quantitative arguments often overrule qualitative (philosophical and cultural) arguments. I have tried to show however that numbers such as predictions of car possession are not truthful in themselves. By pinpointing at the context in which numbers are created, I think that small steps can be made towards the implementation of other transport planning paradigms. To choose for speed as a benchmark is eventually political, with large consequences for the design of the urban transport system.

It may be the case that none of the described paradigms will be actually adopted. Rather, some new hybrid form might appear which uses both elements from the old paradigm, as well as elements of a new paradigm. I will illustrate this matter by a reflection on speedy cycling, in the form of bicycle highways, e-bikes and speed pedelecs. Given the main assumption of transport modelers and planners to increase efficiency and speed in a network, it might not be a surprise that also cycling infrastructure is speeding up. In recent years, the number of e-bikes and speed-pedelecs has hugely increased. Along this development, infrastructure such as so-called bicycle highways has also been developed. E-bikes and bicycle highways are especially presented to cover longer (commute) distances in a healthy and sustainable way. Building new commute infrastructure for cyclists is clearly a sign that car commuting is not the only norm anymore in transport planning. The application of

speed in a new context raises many interesting issues though. The infrastructure itself is called a highway, suggesting a focus on fast and efficient transport only. Through empirical research it has been analysed what the transport planner's perspective is on this matter (Liu, te Brömmelstroet, Krishnamurthy & van Wesemael, 2019). By eleven interviews with bicycle highway expert planners from five European countries, they found that these practitioners define a bicycle highway through engineering-based criteria, such as design and funding. When asked about the design of a highway, interviewees mention that 'they struggle with how the uniform, predictable and regulated engineering of highway environments can be balanced with the diverse, vibrant, and human-scale design of pedestrian environments' (Liu et al., 2019, p. 7). All practitioners think that a car highway has a different meaning than a bicycle highway, but what exactly the balance is between the two is unclear according to them.

The responses of the interviewees show that planning professionals are still grappling with the application of high-speed for cycling. The old paradigm works through in the new paradigm, but also new elements are added to it. This means that paradigmatic change cannot be understood as simple substitution. The interviews also show that planners are searching to find a new discourse to attach to for building useful bicycle highways, as there are no clear standards yet for cycle highways. On the one hand, this creates uncertainty but on the other hand this give opportunities for academia and policy makers to *form* standards based on new criteria like user narratives, sustainability or a just space distribution. This chapter has provided some criteria for applying speed in a cycling context. For example, designing for cycling speed should not mean to design for traveling as fast as possible from A to B, with a uniform commute cyclist in mind. Rather, it should be about the smooth and gentle implementation of a cycle highway in an already existing cycle network, while at the same time acknowledging that everyone can use the highway: from skateboarder to pedestrian to an elderly person who wants to drive slowly. All in all, such new standards might prevent unjust and unsustainable effects of bicycle highways in the tradition of the classical planning engineering paradigm, promoting liveable and open[16] cities for all citizens. Instead of traffic separation, sharing of road space should be encouraged.

[16] Richard Sennett (2018) has written a worth-reading book on so-called open and closed cities. Closed cities are those who are based on boundaries: boundaries of streams of traffic and functionalities which lead to a diminishing exchange of ideas between different social communities. An open city works like a membrane, it is porous and resistant at the same time. It leaves valuable elements inside, but leaves room for other ideas and values to flow in and out.

4. Conclusion

Transport policies operate at the merge of civil engineering and philosophy through presenting a narrative of problems and solutions, tied together with political ambitions and (often) social problems. Policies change however, and in order to understand under which conditions this change happens I have operationalized the paradigm concept within a planning context. The main research question of this thesis was: How can practices, orientations, and changes in Dutch urban mobility policies be explained by using the paradigm concept? Before analysing actual policies in the CEM thesis, this PSTS thesis has built a theoretical framework which enables to understand and interpret paradigmatic change from a multidisciplinary (theoretical) perspective. In Chapter 2, two different conceptual paradigms have been found based on literature analysis: a mobility-based paradigm and an accessibility-based paradigm. Paradigmatic (policy) change do not have to happen according to an epistemic flow ideas, following the classic policy cycle. In Chapter 3, I have actually shown that the institutional embedding of a planning paradigm is at least and probably more important for paradigmatic change. I therefore argue that changes in transport policies through its paradigms should be more approached from an organizational and institutional perspective than is currently done in classic philosophy (of science) and the civil engineering field. By doing so, an improvement of operational transport policies can be realized, which can contribute at arriving at more social sustainable and more inclusive (urban) transport systems. I will now repeat and answer my sub research questions, and conclude by providing some discussion points of this thesis, as well as further research possibilities.

Based on the first sub research question how travelling can be conceptualized in terms of paradigms in a planning context, I have distinguished two conceptual directions of paradigms in the transport planning field. Firstly, a mobility-based paradigm, which has a conceptual basis of travel time reduction, thus increasing the possible distance radius of traveling. Important in the emergence of this paradigm has been the focus on speed and flow, which have been constructed and operationalized in policy instruments benefitting the car and car infrastructure, which, on their turn, created urban traffic safety problems, urban liveability problems, and urban mobility problems. Secondly, an accessibility-based paradigm in which the experiences of and mobility practices of individuals in space and time are centre stage, and which are framed in terms of accessibility. Within this paradigm planners are focusing on accessibility of different locations for different people at different times of the day as main indicator, rather than travel time reduction only. An important part of accessibility planning is acknowledging the integral character of transport planning, where spatial and transport planning come together. Up to 2021, such an integration is not legally mandatory in the Netherlands until the new Environmental and Planning Act will be adopted.

It is often unclear what the term paradigm entails in a transport planning context because of its lack of proper definition by researchers. In literature, many transport and geography researchers

advocate to move from one paradigm to another, in the sense that the conceptual focus should shift. The Kuhnian definition of a paradigm shift is also characterized in terms of theoretical doubt through anomalies, after which another paradigm is adopted by scientists. In both the Kuhnian context and a planning context, it is underestimated how a paradigm and paradigmatic change has to be supported by planners, scientists and technological instruments in a practical context. In other words, an activity-based and practice-based approach is missing.

I have therefore proposed a definition of a planning paradigm which consists of *conceptual* elements on the one hand, and of an *institutional* embedding through groups of actors, rules, norms and practices on the other hand. This definition of a planning paradigm is not only relevant in a planning context, but could also be used for concretizing theories of science practices and scientific paradigm shifts. A transport planning paradigm is defined as a social and cognitive way of conceptualizing and intervening in the transport system by transport policy makers. This is exemplified by philosophical assumptions (1), policy goals (2), policy instruments (3) and evaluative criteria of the transport system (4). Finally, it needs institutional embedding of policy practices through organization and values.

I have consequently argued that a broad change of transport planning has not taken place yet because of the strong institutional embedding of the mobility-based paradigm. I have answered thereby the second sub research question in Chapter 3: How did the historical processes of modelling and institutional embedding make the mobility-based paradigm dominant? The narrative of the mobility-based paradigm has sustained through a institutional and organizational context of actors, practices and norms, also referred to as a regime. The regime concept adds to the paradigm concept because both frameworks are geared at stabilization, i.e. at preservation of the status quo. Literature study has shown that historically, transport planners have implemented minimization of (car) travel time as a norm, through standardization of knowledge and building on the belief that the fast car will win. Moreover, coincidental factors accelerated the paradigm shift in the water management sector. Therefore, paradigmatic policy changes can be explained by a combination of institutional reorganization and coincidental elements. In the development and adoption of a new paradigm by municipalities, it is particularly interesting which new (group of) actors will have the lead, in what kind of teams they are organized and which norms, rules and assumptions they will use to justify their choices.

This brings me to the operationalization of the planning paradigm concept in an empirical context. In my CEM research, I will use the planning paradigm framework as displayed in Figure 4 in order to analyse and score transport policy documents. The paradigm definition, in the form of a concrete set of criteria and heuristics that characterize good planning, especially enable to apply the term empirically. Through reading, points will be assigned according to elements of the planning paradigms. This methodology is not labelled as a discourse analysis, since this study is not so much

focused on context as on content. Statistical analysis will show to what extent transport-related, demographic and organizational variables correlate with the paradigm scores. Although I have listed three critique directions to support the idea to move from a mobility-based paradigm to a accessibility-based paradigm, this list might not match with experiences and practices of policy makers. Each municipality can have its own local reasons to choose for another planning paradigm which may not be based on actual academic knowledge. Irrationality, unexpected political outcomes and coincidence are hard to grasp within the proposed theoretical framework. This means that it will be hard to detect a fundamental change of planning through empirical analysis of municipal documents only. Therefore, interviews will be carried out in order to retrieve specific institutional characteristics of municipalities that have adopted an accessibility-based paradigm. Such interviews will specifically focus on local triggers and conditions that have enabled to move from one planning paradigm to another, like team reorganization or cooperation with external parties.

This research has advocated to move from a mobility-based paradigm to an accessibility-based paradigm. Paradigmatic change cannot be understood as simple substitution though. The old paradigm works through in the new paradigm though, but also new elements are added to it. There do exist more paradigms which enable to analyse planning activities. The scope of this research has been focused on mobility and accessibility, terms that fit a shift of planning methodology in a rich urbanized Western context. Planning in depopulating rural areas could be described through different planning paradigms, as well as cities of the Global South which have to deal with problems that are not alike Dutch urban problems. Methodology-wise, a critical reader might question the use of a Kuhnian concept outside the scientific context. I agree that there are indeed extra steps necessary in order to operationalize the paradigm concept in a planning context, which I have listed in Chapter 2. I think though that any knowledge-based activity can benefit from insights of philosophy of science, despite institutional and contextual differences. In this thesis, I have connected terms from different fields with a planning paradigm, such as planning culture, discourse, episteme and regime. Especially the regime concept is of importance here. The central element coupling all these terms is the notion that every planning activity has a cognitive, social and institutional dimension. This rich understanding of a paradigm also enables to research the term in an empirical planning context.

Finally, several opportunities for further research have appeared throughout this research, apart from the questions that will be addressed in the CEM thesis. I will list these possibilities below. Firstly, more research is necessary to understand how technological developments play a role in the development of new planning paradigms. Especially data-driven methodologies like machine learning enhance and sometimes overrule classic transport models. This datafication of planning triggers all kinds of questions, regarding data management, quality of data and algorithms, and a possible shifting role of the traditional government in planning activities. For example, Söderström, Paasche,

and Klauser (2014) have explored the increasing role of private parties in the development of smart cities, thereby arguing that urban management becomes technocratic fiction. Research focusing on shifting power relations from public to private parties in determining urban discourses might therefore be worthwhile. Secondly, within the relation between a conceptual paradigm and the institutional regime, more attention should be given to the role of tacit experiences and local policy cultures, to map organizational conditions which sustain a local planning paradigm. Thirdly and finally, it is recommended that more collaboration is necessary between studies of philosophy (of science) and STS in terms of methodology. This thesis has mostly focused on general developments in history by using philosophical (Foucauldian) thinking and concepts. These concepts can and should be made more concrete by empirically investigating them within local planning contexts. A micro study of local cities and their planning practices in the spirit of Oldenziel et al. (2016), focusing on all modes and local political developments as well, could be a first step to understand local planning practices in a broader (philosophical) framework.

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