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Road Pricing Policy Implementation

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Preface

What a journey! It started with an ambitious plan, I modified the plan and time schedule along the way and, eight years later, finished it. The more time passed, I realized that being a PhD is perhaps the most luxurious job in the world. I increasingly enjoyed my TU Delft days, being the pauses in my week. Over the years I have learned the ins and outs of academic research and improved the skills needed to successfully combine two jobs. The challenges combined with the inspiring people that crossed my path made it a memorable journey, definitely worth the effort. If I could turn back time, I would surely do it again.

I am grateful for all the support I have received from a large number of people, thank you all for your contributions. First of all, I thank my promotor Bert. I realize you are all a PhD can wish for: enthusiastic, knowledgeable, responsive, pragmatic and patient, thank you so much! I am very grateful for the opportunity you gave me to start a part-time Phd project despite the risks involved. You also gave me a lot of freedom to define my own research project, develop various research ideas (whether or not relevant for my thesis) and use the scarce amount of time also for many conferences and courses. Thank you also for being so generous with your time and ever-positive feedback.

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My parents, Gerrit and Pieta, thank you for the chances you gave me that contributed to my career. My sister Brenda, thank you for the cover design and of course many thanks to all friends and family members for your support and continuous interest.

Dear Tim, my husband and best friend, with you I have shared the large decisions and many small details. Your love and support made this a joyful endeavor. And of course thank you for accepting my different project management approach, tolerating the piles of papers and patiently awaiting your turn!

Diana Vonk Noordegraaf
Delft, June 2016

Content

1. The implementation of road pricing measures

1.1 Introduction

Road transport supports the activities of people and enables the transport of goods. However, transport is not without negative consequences. Urban areas suffer from the negative externalities of road transport like congested road networks, air pollution and accidents. The costs of congestion can be substantial. For example, the estimated costs of congestion in 2014 in the Netherlands are between 1.8 and 2.4 billion Euros (Jorritsma and Harms, 2015). In Europe congestion costs are close to 100 billion Euros per year (European Commission, 2015). A variety of measures are available to reduce the negative effects of road transport, including building new roads or expanding the existing road network, making better use of the existing road capacity through traffic management and the application of Intelligent Transport Systems and investments in alternatives for road transport such as public transportation (Santos et al., 2010b). Another measure involves policies that impose direct charges on road use (Jones and Hervik, 1992), or road pricing.

Since the introduction of road pricing in the literature (Knight, 1924; Pigou, 1920b), "congestion charging has been advocated by transport economists for many decades" (Santos et al., 2010a:34). Considered a potentially effective measure to reduce traffic congestion it can result in overall welfare gains. It has been demonstrated that the implementation of road pricing in practice can alleviate congestion (Anas and Lindsey, 2011). For example, congestion charging in London led to a reduction in traffic congestion of between 20 and 30 percent (Transport for London, 2008). Studies into the welfare effects of road pricing are also abundant. For example, the cost benefit analyses for the (proposed) road pricing measures in London (Santos and Fraser, 2006), Stockholm (Eliasson, 2009) and the Netherlands (Besseling et al., 2005) showed significant welfare gains. Only a few studies give insights into getting road pricing measures implemented in practice, which implementation factors are involved and what role they play.

Road pricing measures have been implemented in many countries and cities worldwide (e.g. in London, Stockholm and Singapore). Technological advancements have increased the prospects of road pricing (Arnott and Small, 1994). However, the number of plans to implement road pricing is many times greater than the number of actual implemented schemes. Many road pricing initiatives have failed to be implemented (e.g. in Hong Kong, Edinburgh, New York and the Netherlands). Road pricing often gets "discarded due to controversy, disagreements, unanticipated problems, and a whole host of delaying factors. If they ever get implemented, they tend to be watered-down and consequently less effective." (Ieromonachou et al., 2004:75).

The main barriers to the implementation of road pricing "are typically public and political opposition" (Santos et al., 2010a:34). There are also many other factors that can contribute to or hamper road pricing policy implementation such as the use of revenues, exemptions and privacy issues (Banister, 2004; Borins, 1988; Santos and Shaffer, 2004). The majority of studies on road pricing policy implementation discuss only one or a few implementation factors. In this thesis I attempt to include all relevant implementation factors in an analysis of the implementation processes. In this thesis "policy implementation encompasses those actions by public or private individuals (or groups) that are directed at the achievement of objectives set forth in prior policy decisions." (Van Meter and Van Horn, 1975:447).

In the remainder of this chapter, I will first define road pricing policy measures. Next, I will give an overview of the main topics within the road pricing literature, explain the position of this thesis within the current body of knowledge and introduce the research gaps addressed. In the third section I present the research objectives and research questions, the contributions of this thesis and a summary of the cases studied in this thesis. In section four I introduce the research methods used in this thesis. Last, I present the organisation of the thesis.

1.2 Characteristics of road pricing measures affect policy implementation

Road pricing is sometimes seen as a separate category of policy measures (e.g. the former Dutch adage "Building, Making better use of road capacity and Pricing" (Ministerie van Verkeer en Waterstaat, 2001)) or as part of a set of measures (e.g. Travel Demand Management or Mobility management (Ieromonachou et al., 2005; Litman, 2003)). In this thesis road pricing is defined as policies that impose direct charges on road use (Jones and Hervik, 1992). Financial measures related to vehicle ownership or parking are not considered road pricing measures and neither are fuel taxes as they have an indirect effect (through fuel consumption) on road usage. More information and references on financial measures other than road pricing can be found in Santos et al. (2010a).

Table 1.1 presents an overview of road pricing characteristics and examples of their relations to implementation. This illustrates that the design options for road pricing measures are plentiful. The specific combinations of characteristics of measures are relevant for policy implementation because they can have a major impact on the implementation process as they (partly) determine the (expected) effects, number, type and level of acceptance of the stakeholders[1] involved as well as the project complexity, the extent to which the measure fits with other policy measures and the (transport) context in which it is implemented.

[1] In this thesis I use the term stakeholders for individuals, groups and organizations whose behavior (which can be explained by the basic dimensions perceptions, values, and resources) can affect or affects the road pricing policy implementation process. More information on stakeholder analysis can be found in Hermans, L.M., Thissen, W.A.H. (2009) Actor analysis methods and their use for public policy analysts. *European Journal of Operational Research* 196, 808-818.

Table 1.1 Characteristics of road pricing measures and relation to implementation

Characteristic	Examples for each characteristic	Examples of relations to implementation
Target group	Pricing for: • all motorized traffic • only trucks / heavy goods vehicles • only passenger cars	• A small target group reduces project complexity and results in smaller impacts on congestion, emissions and accidents. • Exemptions for target groups (e.g. taxi's, busses, disabled people) can positively and negatively affect stakeholder support. • The target group determines which and how many stakeholders are involved.
Motives and objectives	Pricing: • to influence the behavioural choices of travellers • to generate (or redistribute) revenues • to increase the fairness of transport policies (e.g. the principle of the user pays or the polluter pays) • to decrease the negative effects of traffic (e.g. congestion, emissions, accidents)	• Having multiple objectives can make a measure more appealing to a wider public, yet it makes it also more complicated to communicate. • If the selection of objectives and motives are aligned with other policy measures, this can support implementation.
Geographical scope	Pricing implemented: • nationwide • regionally • in (part of) a city • on a road segment • on a tunnel/bridge	• The geographical scope determines which and how many stakeholders are involved. • The geographical scope determines project complexity.

Incentives	• Charging undesired road use choices (prices)
	• Rewarding desired road use choices (subsidies)
	  ○ Based on the number of passages, kilometres, visits to the area
	  ○ Fixed or differentiation of the charge/reward depending on the time of day (e.g. peak vs off-peak hours), place (e.g. predetermined distinction between more and less congested areas), actual traffic flow/ level of congestion, energy-use, emissions, noise, road safety and driving style
		• The level of the charge or reward affects the effectiveness and the acceptance.
		• The differentiation of the incentive determines project complexity.
		• Technological advancements offer options for more differentiated incentives (at acceptable costs).

Text box: Road pricing terms, measures and cases

A frequently used synonym for road pricing in the literature is 'road user charging', a well-established term in the field of transport economics (Ison and Rye, 2003). In addition, there are terms that refer to a specific configuration of a road pricing measure. Perhaps the oldest specific road pricing measure is road tolling, where road users pay a fee for the use of a road segment of a selection of road. For example "the majority of intercity highways in France, Italy and Spain" (de Palma and Lindsey, 2000:14) are tolled. Other well-known terms indicating specific measures are cordon charging and area charging. "Cordon Charging involves charging drivers crossing a cordon to enter a specific area – usually the city's central business district (CBD)." (Ieromonachou et al., 2007:19). Examples of cordon charging cases are so-called toll-rings in Norway and the proposed cordon charging scheme in Durham, United Kingdom (Ieromonachou et al., 2006). "Area charging applies to vehicles for accessing and travelling within a specified area." (Ieromonachou et al., 2007:19). Examples of cases where this measure is implemented are the case of 'Electronic Road Pricing (ERP)' in Singapore and the case of the "Congestion Charging scheme" in London, the first named after the technology used and the latter after the aim of reducing congestion. Also the case of Ecopass in Milan, 'the zonal scheme designed to reduce pollution' (Anas and Lindsey, 2011:71), was named after one of the main objectives. Another specific and well-known road pricing measure is kilometre charging, implying "the payment of a certain charge for each kilometre by the vehicle user." (Ubbels et al., 2002:256). Examples of kilometre charging cases are the (proposed) truck tolling schemes in the United Kingdom, Sweden and Germany or the Netherlands where kilometre charging was considered but not implemented. In the Netherlands kilometre charging was differentiated to time, place and vehicle characteristics, referred to by Li and Hensher (2012) as daily bottleneck charging. Another example of a specific type of road pricing measure are the congestion-level dependent charges such as the High Occupancy Toll lanes (an extension of the earlier implemented High Occupancy Vehicle lanes). The majority of examples of this type of road pricing are found in the United States. Last, there is the category of measures based on rewarding. Examples are the measure 'Credit Based Pricing', combining pricing and rewarding incentives (Kockelman and Kalmanje, 2005) and the cases of the implemented Peak Hour Avoidance (or simple Peak Avoidance) measures in the Netherlands (see for more information section 1.3.4 and 1.4.4).

Given the large range of characteristics which can be combined in various ways, many different road pricing measure designs are possible. In this thesis various road pricing measures are included (see section 1.4.4 for the introduction of the road pricing measures studied in this thesis) regardless of their specific constellation of characteristics (such as the set of objectives or the targeted groups of road users). In this thesis a road pricing case refers to a policy process for implementing a specific road pricing measure in practice (regardless of whether or not the policy is eventually implemented) at a certain geographical location. The examples below include the most well-known road pricing terms, measures and cases (whilst being by no means exhaustive).

1.3 Road pricing: an overview of literature and research gaps

Road pricing is a topic that has been extensively studied and the literature on road pricing is abundant. In this section I give a short overview of the dominant strands in the scientific

knowledge base on road pricing. This overview is by no means exhaustive but is used to explain how this thesis is positioned within the current body of knowledge. Below I give an overview of the literature on the development of theories on road pricing, of the literature on the effects of road pricing, on innovative road pricing measures and the literature on road pricing cases. In addition I list the research gaps that are the starting points for this thesis.

1.3.1 Road pricing from the theoretical transport economic point of view

The often cited articles of Pigou (1920b) and Knight (1924) are generally considered as the introduction of road pricing in the literature and the starting point of research into road pricing. However, other scholars have also contributed to the intellectual evolution of road pricing (see for an historic overview Lindsey (2006)). The concept of road pricing is based on the idea of using corrective taxes (e.g. toll) to solve the problem of external effects, in other words making road users pay for the additional costs (i.e. travel time) imposed on other road users by congestion. Later studies added other important negative externalities such as accidents, road damage and environmental damage (see Santos et al., (2010a) for further references on this topic). The basic economic principles of road pricing are explained by Rouwendal and Verhoef (2006) and Arnott and Small (1994). An overview of literature on the theory of road pricing can be found in Hau (2005a, b).

The field of transport economics has elaborated on the theory of road pricing. “For decades after 1920, road pricing remained an ivory-tower idea. But in the 1990s interest grew significantly.” (Lindsey, 2006:292). Despite the advancements made in this period, these theories were still based on some utopian assumptions (Verhoef, 2002). Examples of these assumptions are the options for perfect differentiation and perfect information of road users and regulator (Verhoef et al., 1996). This understanding led to the introduction of so-called second-best road pricing schemes, designed in response to the often unrealistic assumptions behind the first-best solutions (Small and Verhoef, 2007). The second-best theories continued to work on modelling a more realistic picture of road congestion. This includes for example using different values of time and values of reliability (Brownstone and Small, 2005; Yang and Huang, 2004) inside the queue behaviour of hyper-congestion (Small and Chu, 2003) and differentiation in road design (Small and Ng, 2014).

1.3.2 The effects of road pricing

The literature on the effects of road pricing is abundant. There are ex ante studies on the effects of road pricing using models and ex post studies on the effects of a wide variety of specific road pricing measures in practice. Furthermore, for each measure a variety of direct and indirect effects are estimated and calculated.

The direct effects of road pricing are the effects on the demand for road usage. Examples include the ex ante studies of the traffic effects for road pricing cases, with cases where road pricing is in the early stages of the implementation process such as Paris (de Palma and Lindsey, 2006) and Copenhagen (Rich and Nielsen, 2007) to cases where the implementation process has progressed much further such as cordon charging in Edinburgh (Shepherd, 2003) and the effects of kilometre charging in the Netherlands (4Cast, 2006; Besseling et al., 2008; Hilbers et al., 2015; MuConsult, 2009). There are also many papers which discuss the traffic effects of the implemented road pricing schemes, for example, the effects of the area charge in London was a 18% reduction in the number of vehicles entering and leaving the area (London, 2005) and a 14% reduction of vehicles in the extension zone (Transport for London, 2008). Givoni’s (2012) paper discusses the extent to which the effects can be attributed to the

congestion charging. The effect of a cordon charge in Stockholm was a reduction in traffic flow of 20% and a reduction in the vehicle kilometres driven within the cordon by around 16% (Eliasson, 2008).

As well as affecting road usage, road pricing can also impact on vehicle ownership and the use of other modalities. The effects on vehicle ownership and the composition of a vehicle fleet are for example studied by de Jong et al., (2009) and Percoco (2014a). Road pricing can also change the role of other modes. For example Small (2004) explores the effects of road pricing on urban bus transport using a theoretical model and the Stockholm case demonstrated congestion charges accounted for a 4.5% increase in the use of public transport (Eliasson, 2009).

Road pricing is often used as a measure to reduce traffic demand and congestion. Depending on the design of the road pricing instrument it can also affect emissions and traffic accidents. Several papers studied the role of road pricing in the internalisation of external effects. For example Beevers and Carslaw (2005) investigated the effect of speed on vehicle emissions for the London case, and Tsai et al., (2015) investigated accident externalities. In addition, there are studies into the effects of road pricing on other markets. For example the effects on the housing market (Percoco, 2014b), the labour market (McArthur et al., 2012) and on retail (Quddus et al, 2007).

Last, there are also a considerable number of cost benefit analyses of road pricing that include many of the effects listed above. Examples include the costs benefit analysis of the London case (Prud'homme and Bocarejo, 2005; Santos and Fraser, 2006; Santos and Shaffer, 2004), the Stockholm case (Eliasson, 2009), the Milan case (Rotaris et al., 2010) and the Copenhagen case (Rich and Nielsen, 2007).

1.3.3 Public and stakeholder acceptability of road pricing

An extensively studied topic within the road pricing literature is the public acceptability of road pricing. Many studies have investigated the factors that affect the public acceptability. An extensive overview is included in the book edited by Schade and Schlag (2003a). Furthermore, Li and Hensher (2012) provide an overview of twenty congestion pricing studies, synthesizing the findings on, amongst other factors, acceptability and behavioural responses. There are two specific factors related to public acceptability that have received much attention in road pricing literature, the first being equity (e.g. Di Ciommo and Lucas, 2014; Eliasson and Mattsson, 2006; Langmyhr, 1997; Richardson and Bae, 1998; Viegas, 2001; Weinstein and Sciara, 2006) and the distributional effects of road pricing, which is closely related to equity, studied by amongst others Santos and Rojey (2004) and Hau (1990). The second extensively studied topic in the road pricing literature is the use of revenues (e.g. Schuitema and Steg, 2008; Welch and Mishra, 2014). In addition to these two topics, a wide variety of subtopics can be identified within the body of literature on public acceptability. There are papers studying the acceptability of road pricing for specific cases (Dieplinger and Fürst, 2014; Schade and Schlag, 2003b). A sub-category of papers have studied the public acceptability of the implemented road pricing schemes. Public acceptability of the Stockholm case in particular has been elaborately studied (e.g. Börjesson et al., 2012; Eliasson and Jonsson, 2011; Schuitema et al., 2010). Furthermore, there are studies into specific factors affecting public acceptability such as public transport (Kottenhoff and Brundell Freij, 2009), the attitude structures, direct experience and reframing (Eliasson, 2014) and the interaction of factors (for example Kim et al., (2013)). In addition, there are papers on how public

acceptability can be increased (e.g. Grisolía et al., 2015; Harrington et al., 2001; Oberholzer-Gee and Weck-Hannemann, 2002). There are also studies into people's responses to design aspects of more complex road pricing measures (Bonsall et al., 2007; Francke and Kaniok, 2013).

A part of this body of literature on public acceptance focuses specifically on car drivers. Studies have used psychological theories to explain how car drivers respond to road pricing (Schade and Baum, 2007) or what determinants affect car users' acceptance of road pricing (Jakobsson et al., 2000). There are also studies that investigate specific aspects of understanding car drivers responses such as the impact of socio-economic factors (Gehlert et al., 2011). The role of other stakeholders in road pricing has also been studied, for example freight carriers and shippers (Holguín-Veras, 2008; Mahendra, 2008), stores making logistics decisions (Quak and van Duin, 2010), local authorities and academics (Ison, 2000), politicians (Chorus et al., 2011; Hensher and Bliemer, 2014) and the media (Ardıç et al., 2013b).

1.3.4 Literature on innovative road pricing measures

Compared to the large body of literature on road pricing, there are relatively few papers on innovative road pricing measures. There are a number of papers published on the use of rewards instead of charges. This body of literature predominantly focuses specifically on the reward measure 'Peak Hour Avoidance'. In chapter 3 a brief overview of the literature of Peak Hour Avoidance (PHA) is given. After the publication of the paper included in chapter 3, several new articles on PHA were published including a more detailed description of commuter behavior in response to rewards (Knockaert et al., 2012), a study on the temporal effects of rewarding (Khademi et al., 2014) and comparisons of rewarding and charging focusing on stated commuter behavior (Tillema et al., 2013) and a transport economic comparison (Rouwendal et al., 2012).

Other examples of measures that include the principle of reward are credit-based congestion pricing (Kockelman and Kalmanje, 2005), a raffle based system (Loiseau et al., 2011) and credits and prizes (Merugu et al., 2009). In addition, there are quite a number of papers on tradeable credit schemes, references can be found in the review article of Grant-Muller and Xu (2014). At the time of writing (2015) the only reward-based measures to have been implemented in practice are PHA and the pilot described in Merugu et al., (2009). I consider these measures based on a reward incentive to be innovative. Especially PHA is considered innovative because it is based on a reward incentive and has been implemented in practice, which has not been done before.

Another measure that I consider innovative is the proposed road pricing policy of kilometre charging in the Netherlands due to the nationwide scale, a wide scope including both passenger and freight transport and a differentiated incentive. Chapter 2 includes references on that case. During the publication process another paper on this case was published (Van Wee, 2010).

1.3.5 Implementation of road pricing

A large body of the road pricing literature concerns scientific papers on road pricing in practice. A more elaborate set of references is included in chapter 3. There are many papers on implemented road pricing schemes such as Singapore, London and Stockholm (e.g. Banister, 2003; Börjesson et al., 2012; Phang and Toh, 2004). Fewer papers are published on the not implemented road pricing cases such as Hong Kong, Edinburgh and New York

(examples include (Gaunt et al., 2007; Hau, 1990; Schaller, 2010). Innovative road pricing cases such as rewarding (see section 1.3.4) and more complex road pricing measures such as kilometre charging in the Netherlands have been given the least attention. Many papers on road pricing cases include explicit or implicit information on the policy implementation, often with many other aspects of the case (e.g. scheme design, stakeholder attitudes, effects). Papers that focus on specific aspects of road pricing can also shed light on policy implementation. Examples of specific aspects of road pricing that can affect implementation are governance (Hamilton, 2012), ownership regimes for toll roads (de Palma and Lindsey, 2000), the costs (Hamilton, 2011) and the technology (Anas and Lindsey, 2011).

Among the body of literature on road pricing cases, there are a number of papers explicitly discussing the implementation factors for one road pricing case (e.g. Banister, 2004; Langmyhr and Sager, 1997; Rye et al., 2008) or several (e.g. (Albalate and Bel, 2009; Anas and Lindsey, 2011; Buchanan and Buchanan, 2007)). Few papers discuss implementation factors for multiple implemented and not implemented cases and only a small number of implementation factors are included in these papers.

There are also some papers that give implementation advice based on case studies (e.g. Ieromonachou et al., 2005; Ison, 2000). Most recommendations are related to two topics of policy implementation that have been given some attention and are both closely related to the extensively studied topic of public acceptance: the trial (Winslott-Hiselius et al., 2009) and the referendum (Hensher and Li, 2013). Lastly, there are a few papers on road pricing policy implementation that include a theoretical component. For example, a few papers include frameworks on policy implementation that were developed from empirical insights or from theories.

1.3.6 Policy implementation literature

There are a few papers on road pricing policy implementation that include a theoretical component. However, the literature on policy implementation in general (without a focus on road pricing) is abundant. The starting point of this large body of literature on policy implementation is generally considered to be the seminal work of Pressman and Wildavsky (1984). The subsequent literature, that assumes implementation follows a hierarchical model starting with clear policy goals, is labelled top-down. This was followed by a stream of bottom-up approaches “starting at actors most proximate to the problems to be solved by policies” (Winter, 2003b:206). Also attempts were made to synthesize these two perspectives (see for a review of this literature for example Schofield, 2001; O'Toole, 2004; Hill and Hupe, 2008). Most of these policy implementation theories choose a specific starting point or focus on specific aspects, for example, the role of street-level bureaucracy (Lipsky, 1980), networks (O’Toole, 2004) and having a policy window or policy opportunity (Kingdon, 1984; Koppenjan, 1993). There are a few papers that apply a specific policy implementation theory to road pricing. Examples are the framework of Walker et al. (2001), which focuses on “uncertainties related to the implementation” (Marchau et al., 2010:949) and apply this theory to the Dutch kilometre charging case, the paper of Dudley (2013) explaining the rarity of policy windows for road pricing and Ardiç et al. (2015) that use the Advocacy Coalition Framework (Sabatier, 1988) to analyse the policy position changes of policy actors in the road pricing policy process in The Netherlands. There a few papers that have attempted to integrate insights into policy implementation into a generic framework or a coherent theory capable of capturing a multitude of factors affecting the policy implementation process. Examples include the frameworks of Van Meter and Van Horn (1975), and Sabatier and Mazmanian

(1980), and the more recent frameworks proposed by Brynard (2005) and (Winter, 2003b). Besides these papers describing a generic implementation framework, also a few transport implementation frameworks were found such the frameworks proposed by Feitelson and Salomon (2004) and Attard and Ison (2010). Hence, the number of papers that focus on the theory of road pricing policy implementation are limited.

1.3.7 Summary

To summarize, from this brief overview of the road pricing literature I have identified several research gaps. There is a large body of theoretical literature on road pricing, mainly from the transport economic viewpoint. This includes studies which model the (transport) effects of road pricing and design related issues. There are quite a number of studies into road pricing cases that include insights into policy implementation. However, not implemented road pricing cases and innovative road pricing cases are underexposed within this strand of literature. In addition, few studies on road pricing focus solely on the policy implementation of road pricing. Last, there are very few studies that focus on the theory of road pricing policy implementation.

1.3.8 Research gaps

The following three research gaps concerning the implementation of road pricing are central to this thesis:

- Gap 1: Road pricing cases which were not implemented and/or innovative are under-exposed in the road pricing literature and therefore limited knowledge is available on these cases.

The studies on implemented cases outnumber the studies on not implemented cases and only a limited number of studies include both implemented and not implemented cases. In addition, innovative road pricing measures are underexposed in road pricing literature. As explained in section 1.3.4, I labelled implemented rewarding measures and nationwide road pricing for passenger and freight transport as innovative road pricing cases. Following the limited (attempts at) implementation, literature on implemented rewarding measures is scarce as well as literature on cases of nationwide road pricing for passenger and freight transport.

- Gap 2: Few studies on road pricing have focused solely on the policy implementation of road pricing and therefore little is known on the complete implementation process.

Few studies on road pricing have focused solely on the policy implementation of road pricing. Hence, an overview of a broad set of implementation factors found in road pricing cases is lacking. Furthermore, these studies on road pricing focus largely on the attitudes of the general public or road users and the attitudes of other stakeholders, and in particular their relation to policy implementation, has not been studied in detail.

- Gap 3: Road pricing policy implementation has hardly been studied from a theoretical perspective which is why insights are lacking.

The majority of studies into road pricing that include insights into policy implementation, are mainly of an empirical nature. There a very few studies that focus on the theory of road pricing policy implementation.

In the next section I specify the specific contributions of this thesis to fill these research gaps.

1.4 Objective, questions and contributions

1.4.1 Research objective

The main objective of this thesis is to increase the understanding of which implementation factors can play a role in road pricing policy implementation and in what way. The implementation of road pricing can be complex and can be affected by many different factors. In this thesis policy implementation is studied in various cases and insights are derived from both theoretical and empirical sources.

1.4.2 Research questions

This thesis consists of four papers, included in chapter 2 -5, together addressing a selection of topics (for an overview see Figure S.1). Each paper contributes to filling one or multiple research gaps as listed in section 1.3.8. In section 6.3 I give, as part of the directions for further research, an overview of the remaining topics that were not (fully) addressed in this thesis yet are in my view necessary to fully address the research gaps listed in section 1.3.8.

In this subsection I relate the contents of each chapter to the research gaps and present the research questions (in italics) answered in each paper included in the subsequent chapter.

Chapter 2:
This paper studies a specific road pricing case, kilometre charging in the Netherlands. This case is interesting because it concerns a not implemented case that also has an innovative character. This case is studied from the perspective of policy implementation and analyses the road pricing case using a theoretical perspective.

- How did the policy implementation process for implementing road pricing evolve, based on the Dutch case of kilometre charging?
- How does a conceptual framework look like that gives a comprehensive overview of the factors that affect the likelihood of a transport policy instrument being implemented?
- What insights has the application of the conceptual framework to the Dutch case of kilometre charging given us and how useful was this framework for the analysis of this case?

Chapter 3:
The specific road pricing case, Peak Hour Avoidance, is central to the second paper. This measure is implemented in the Netherlands and unique because the Netherlands is the only country that has gained ample practical experience with this rewarding measure. The paper focusses on a specific implementation factor – the attitudes of employers as one of the stakeholders in the policy process. Employers were considered relevant for facilitating future implementations of Peak Hour Avoidance and the options employers provide to their employees to avoid driving in peak hours was also seen as a key factor in the effectiveness of this measure (in turn also related to future implementations).

- What are the attitudes of Dutch employers towards Peak Hour Avoidance and what factors affect their attitudes?
- What contribution to Peak Hour Avoidance (PHA) can be expected from employers?

Chapter 4:
This paper generated knowledge on both implemented and not implemented road pricing cases. Furthermore, it specifically focusses on the factors that have affected the policy

implementation processes in these cases. In contrast to most previous studies, this paper identifies broad sets of implementation factors for each case and compares these implementation factors for a relatively large number of cases.

- Which implementation factors that have affected the policy implementation process can be identified in the implemented road pricing cases of Singapore, London, Stockholm and the Norwegian cities as well as the two not implemented cases of Hong Kong and Edinburgh and how often are these factors listed?
- What similarities and differences are found when the detailed sets of implementation factors of these cases are systematically compared?

Chapter 5:
Six policy implementation frameworks from existing literature that can be used for road pricing policy implementation are reviewed in this thesis. By comparing the level of consensus on implementation factors among the selected frameworks and how much these frameworks have in common with the findings from the analysis of road pricing policy implementation in practice, recommendations are formulated for the further application and development of transport policy implementation frameworks in the analysis and support of road pricing policy implementation.

- What is the level of consensus among the six transport policy implementation frameworks analysed regarding the implementation factors included in these frameworks?
- What is the overlap between the set of implementation factors included in selected transport policy implementation frameworks (theory) and the set of implementation factors from the analysis of road pricing policy implementation in six real-world cases (practice)?
- How suitable are the transport policy implementation frameworks for the analysis of road pricing policy implementation?

1.4.3 Scientific and societal contributions

This thesis contributes to the implementation of road pricing in several ways. In this section, the scientific and societal contributions are discussed.

Scientific contributions:

- An overview of the factors important in the implementation of the Dutch road pricing policy ‘kilometre charging’.
- A conceptual framework, partly based on theoretical concepts, that provides a comprehensive overview of the factors that affect the likelihood that a transport policy instrument in general will be implemented and a first impression of its usefulness for analysing a road pricing case.
- Insight into the attitudes of employers towards Peak Hour Avoidance.
- A broad set of implementation factors for the six empirical cases and an initial insight into the importance of implementation factors in these six cases.
- An assessment of the similarities and differences between the implementation factors included in six transport policy implementation frameworks, and an assessment of the overlap between the set of implementation factors from these frameworks and the set of implementation factors from the analysis of road pricing policy implementation in six real-world cases.
- An assessment of the suitability of transport policy implementation frameworks for the analysis of road pricing policy implementation, and recommendations for the further application and development of transport policy implementation frameworks in the

analysis and support of road pricing policy implementation. In section 1.5.1, it is explained why we propose using a checklist, instead of developing my own policy implementation framework for road pricing in this thesis.

Societal contributions:
The societal contributions mainly concern the policy relevance of this thesis, which starts by detailing the policy implementation process a kilometre charge in the Netherlands. Future Dutch governments or foreign authorities considering the implementation of road pricing (specifically kilometre charging) can use this analysis as a history lesson. In addition, this thesis includes insights into generic and case-specific implementation factors and policy implementation lessons based on six road pricing cases.

This thesis can help policy-makers who (intend to) implement road pricing, by providing a better understanding of the implementation factors that can play a role in the policy implementation process and, through that, to the effectiveness of policy implementation. Furthermore, it can "alert policy makers to the variables that can be manipulated to improve the delivery of public services." (Van Meter and Van Horn, 1975:484). An increased understanding of road pricing policy implementation factors can reduce the effort and costs involved in the policy implementation process.

Authorities considering the implementation of road pricing can use policy implementation frameworks to increase their understanding, support their analysis, structure their approach to policy implementation and make this approach more proactive and responsive. In this thesis, we developed a framework that was used to analyse the case of kilometre charging (Chapter 2). In chapter 5, the suitability of a selection of transport policy implementation frameworks is discussed and put into perspective. The insights provided by these frameworks are used to draft a checklist for road pricing policy implementation. This discussion, included in chapter 5, may make users of these frameworks - policy makers and scientists - more aware of the options and limitations, which eventually can lead to better design, analysis and implementation decisions for road pricing.

Contrary to some pricing measures, the Peak Hour Avoidance (PHA) measure proved relatively easy to implement. Employers are not considered to be dedicated actors, as they did not have an active influence on the implementation process. However, for future implementations, the attitude of employers is relevant for two reasons. Firstly, PHA requires substantial investment and employers may be willing to contribute to these investments, thereby facilitating the implementation of PHA. Secondly, employers are considered critical, because they have a big impact on the effectiveness of the measure by providing flexible working hours and times. If PHA is to be implemented on a larger scale, insight into flexible working hours and times will help estimate the behavioural changes of road users as a result of PHA, and as such the effectiveness of the measure. Since the estimated effectiveness is a crucial implementation factor, this study can contribute to the future policy implementations of PHA. In addition, these insights can be used to refine the design of PHA for future applications.

1.4.4 Road pricing cases

In this thesis a selection of cases are analyzed. Figure 1.1 gives an overview of the road pricing cases studied in the four papers comprising chapters 2-5. As lessons regarding road pricing implementation can be learned from both implemented and not implemented cases

(Van Wee, 2009), I included both cases, implemented cases being Peak Hour Avoidance in the Netherlands and road pricing in Singapore, London, Stockholm and the Norwegian cities, and the not implemented cases being kilometre charging in the Netherlands, and road pricing in Hong Kong and Edinburgh. As can also be seen in Figure 1.1, the insights of this thesis are primarily derived from practice complemented by insights from theory. A summary of the selected cases is included in Table 1.2.

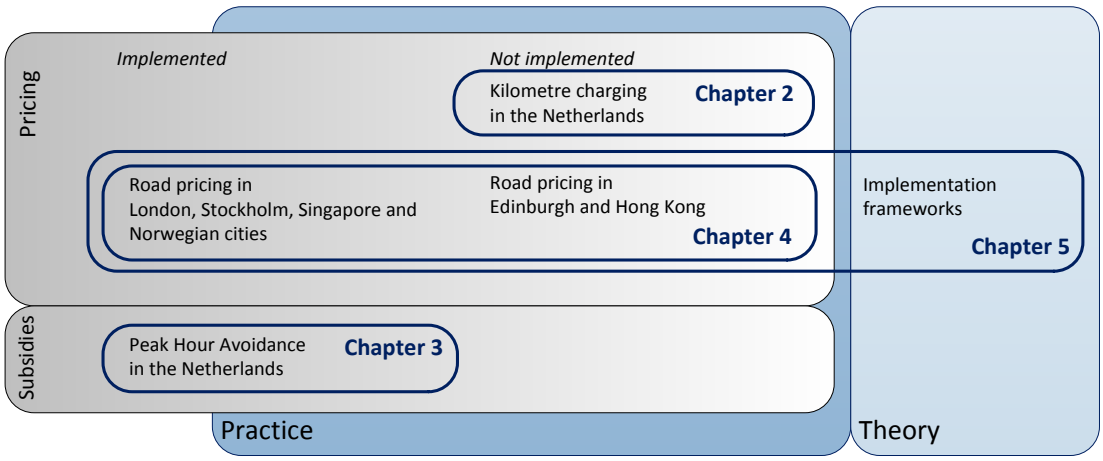

Figure 1.1 Organisation of this thesis

Table 1.2 Summary of selected cases

	Kilometre charging, The Netherlands	**Peak Hour Avoidance, The Netherlands**	**Singapore, Republic of Singapore**	**London, United Kingdom**
Label	Kilometre charging	Peak Hour Avoidance (PHA)	Area Licensing Scheme (ALS) Electronic Road Pricing (ERP)	London Congestion Charging Scheme (LCCS)
Brief description	A nationwide kilometre charge differentiated by time, place and environmental costs for all cars and trucks. Included a gradual run-down of car taxes (overall a budget neutral scheme).	PHA gives frequent car drivers a financial reward for reducing the proportion of trips that they make during peak hours on a specific motorway section.	ALS is an area charge and ERP a cordon charge. Applies to restricted zone with the Central Business District as core area. ERP also includes several expressways.	LCCS is an area charge in Central London (8 square miles, 22 with the western extension). Camera controlled, flat charge.
Important dates	Announced in policy document in 2004. Government decided not to implement kilometre charging in 2010.	First PHA pilot in 2006. Followed by PHA projects in seven geographical areas.	ALS: June 1975 ERP: announced in 1989, implemented in September 1998 and extended in 1999.	LCCS: February 2003 Western extension: 2007-2010.
Key references	Van Wee, (2010)	Ben-Elia and Ettema (2011); Knockaert et al., (2012)	Foo, (2000); Phang and Toh, (2004); Yap, (2005)	Dix, (2002); Banister, (2003); Peirson and Vickerman, (2008); Santos et al., (2008)

	Stockholm, Sweden	**Norwegian cities, Norway**	**Edinburgh, United Kingdom**	**Hong Kong, China**
Label	Stockholm Congestion Charge (SCC)	Urban road tolling *	Edinburgh's Congestion Charging Scheme (ECCS)	Electronic Road Pricing System (ERPS)
Brief description	SCC is a cordon charge in the inner city (30 km2 with 18 control points). Variable charge.	First European introduction of road pricing in Bergen. Most documented cases are Bergen, Oslo and Trondheim. All tolling systems.	Cordon charge with once-a-day charge for crossing one or both cordons in an inbound direction.	The first test of Electronic Road Pricing in a two year experiment. Use of automatic vehicle identification.
Important dates	Trial: decision to hold a trial in 2002, trial duration from January 3 – July 31 2006 Reintroduction charges: 2007.	Bergen: 1986 Oslo: 1990 Trondheim: 1991-2005.	Announced in council plan in 1999, Referendum: February 2005.	Announced in March 1983, to introduce ERPS in 1987 Trial: September 1983- June 1985.
Key references	Eliasson, (2008); Eliasson, (2009); Börjesson et al., (2012)	Langmyhr (2001); Larsen, (1995); Ramjerdi et al., (2004)	Gaunt et al., (2007); Rye et al., (2008)	Pretty, (1988); Borins, (1988), Hau, (1990)

* The included Norwegian cities are Oslo, Bergen, Trondheim, Kristiansand, Stavanger, Tønsberg, Standnes and Nord-Jæren.

1.5 Theories and research methods

In this thesis I have applied a wide diversity of theories and research methods. Each chapter explains the particular theories and research methods used in the studies described in that chapter. The insights in this thesis on road pricing policy implementation are primarily derived from practice complemented by insights from theory. In this section I summarize the different research methods used in this thesis, first addressing my position towards theories from which I derived insights into the implementation factors. In the next subsection the methods used to derive the insights into the implementation factors from practice. All research methods have their own limitations and drawbacks. These are partly addressed in the individual papers. In the section on the contributions of this thesis (section 6.2.1), I discuss the importance of the methodologies chosen in this thesis. Section 6.2.2 includes a discussion on the limitations of this thesis, mainly resulting from methodological choices.

The focus of this thesis is on road pricing policy implementation. The study of policy implementation is at the heart of the policy analysis domain. Within this field six clusters of activities can be distinguished: research and analyze, design and recommend, clarify arguments and values, provide strategic advice, democratize and mediate (Mayer et al., 2013). In this research I have adopted a reflective viewpoint and limited my policy analysis activities to research and analysis and to a limited extent giving policy recommendations. I did not engage in participatory research.

1.5.1 Implementation factors from theory

The insights into the implementation factors from theory are derived from a literature study of policy implementation theories. The main characteristic of the theoretical approach of this thesis is that I do not choose in advance one theoretical perspective to study road pricing

policy implementation. The theoretical approach in this thesis consists of investigating what different theories have to offer to the analysis of road pricing policy implementation and, more specifically, which theories include multiple aspects that are relevant to road pricing policy implementation in general. This involved browsing through theoretical concepts from a wide range of research areas (e.g. transport economics, innovation literature, transition management, policy analysis, public administration, public policy and transport), all related to transport and policy analysis. In the first paper (Chapter 2), we integrate several theoretical notions from transport and policy analysis into a conceptual framework of factors that affect the general likelihood that a transport policy instrument will be implemented. Although we initially did not intend to develop a framework, existing literature only provided fragmented notions relevant for policy implementation and incomplete frameworks, which is why we decided to try and develop a more inclusive framework for policy implementation. In chapter 6, I reflect on this choice and the limitations of the framework I presented in this first paper.

Throughout the research, I found more theories that included multiple aspects relevant to road pricing policy implementation than I had initially identified. Note that several of these frameworks are derived from empirical experience, making road pricing policy implementation an overall empirical topic. Rather than developing our own implementation framework, I decided to investigate what can be learned from these frameworks and applied to road pricing drafted by others.

We selected and compared six transport policy implementation frameworks with each other and with the findings from the analysis of road pricing policy implementation in real-world road pricing cases. As a sensitivity analysis, we made the same comparisons using seven policy implementation frameworks from other fields. We found that there is little consensus among the transport policy implementation frameworks we analysed about which factors affect policy implementation. In chapter 5, we reflect on the current state of policy implementation frameworks and how suitable transport policy implementation frameworks are for the analysis of road pricing cases. In addition, we present a list of recommendations for improving the further application and development of transport policy implementation frameworks in the analysis and support of road pricing policy implementation.

1.5.2 Implementation factors from practice

The core of this thesis concerns insights into implementation factors derived from practice. Several methodologies were used to gather the empirical knowledge needed to answer the research questions. It was not the aim of this thesis to contribute to the further development of the methodologies themselves. The added value lies in the application of the methodologies to the topic of road pricing policy implementation adding scientific rigor to the analysis. Three methodological components are included in this thesis – the analysis of cases and reviews of literature; a web questionnaire and a Structural Equations Model; and content analysis including intercoder reliability testing.

The core of this consists of the analysis of road pricing cases. There were several reasons for choosing these cases in this thesis. The kilometre charging case was chosen because it concerned a not implemented and an innovative road pricing case that has not been studied in detail. Peak Hour Avoidance was studied because it concerns an innovative road pricing case. The selection of cases included in chapters 4 and 5 resulted from using the following criteria: 1) the selection needs to include implemented and not implemented cases, 2) cases need to be

well-documented with regard to policy implementation and 3) the cases need to have a delineated policy process covering a consecutive time period and focused on a specific road pricing measure for a defined geographical area.

I focused in the case studies on road pricing policy implementation. Except for the analysis of the kilometre charging case which also used policy documents, I predominantly used peer reviewed scientific papers to gather information on road pricing policy implementation. It turned out that the most information was available on the implementation factors (and less on the relations between variables and the importance of the implementation factors). Besides the literature review on implementation factors in road pricing cases, I also studied the literature on policy implementation frameworks (see section 1.5.1).

Second, I have investigated employer attitudes to Peak Hour Avoidance using web questionnaires. From the literature on mobility management there were already insights into the type of factors that could affect employer attitudes to a mobility management measure. I used this information as the basis for a quantitative study into employer attitudes to PHA. A web questionnaire was used to collect the data from large Dutch employers (with more than 100 employees). The web questionnaire targeted HR managers who were asked to answer the questions on behalf of their organization. The data, 103 fully filled-in questionnaires, enabled a quantitative analysis of employer attitudes and the factors that affected these attitudes (such as the distribution flexibility in working times and locations across employers) and for estimating a model. A Structural Equations Model (SEM) was estimated to explore the factors that influence this willingness to support PHA. SEM is a suitable technique to verify a complex conceptual model consisting of multiple exogenous and endogenous variables (Golob, 2003). A major advantage of SEM is its ability to test more complex relations between factors (Golob, 2003).

Last, I collected data on implementation factors in road pricing policy processes by examining other scientific studies addressing these implementation factors. In total I included 106 papers on six road pricing cases. The average number of papers discussing implementation factors for one case is 27. So far, most studies on road pricing that included insights into the policy implementation mainly focused on one or several cases and do not give a detailed account of implementation factors for all cases included. By studying 106 papers for the implementation factors I was able to list on average 36 implementation factors for each case. This approach has in my view resulted in a detailed set of implementation factors that have affected policy implementation in these cases.

I used a structured approach to analyze this implementation data – content analysis – a method to systematically reduce the amount of data into content categories using coding rules (Stemler, 2001). Except for some applications (e.g. by Mouter et al., (2013) and Ardıç et al., (2013b)), the rigorous use of this method is an exception in the field of transport. I used content analysis to systematically analyze the 106 papers presenting studies on one or multiple road pricing cases for information on implementation and to reduce that information to count data on implementation factors, making a predominantly qualitative topic, semi quantitative.

1.6 Organization of the thesis

The remainder of this thesis is organized as follows. The next chapter analyses the implementation of road pricing in the Netherlands. Chapter three analyses the attitudes of

employers towards Peak Hour avoidance. Chapter four presents a content analysis of implementation factors found in six real world road pricing cases. Chapter five provides a comparison of implementation factors included in transport policy implementation frameworks and implementation factors included in six road pricing cases. Chapter six summarizes the main conclusions, discusses the findings, and lists directions for further research and policy recommendations, and concludes with the reflection.

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2. The policy implementation process for road pricing in the Netherlands

Diana Vonk Noordegraaf, Jan Anne Annema, Odette van de Riet (2012). The policy implementation process for road pricing in the Netherlands. In Geerlings, H., Shiftan, Y., Stead, D. (eds) Transition towards sustainable mobility: the role of instruments, individuals and institutions, Ashgate, Farnham.

2.1 Introduction

Sustainable mobility is proving a challenge to achieve (Banister, 2008). There are negative effects of road use, such as environmental pollution, reduced safety and congestion and a number of policy instruments have been developed to reduce these effects. Road pricing is one such instrument, and from an economic point of view is generally considered to be an effective transport policy (Feitelson and Salomon, 2004; McFadden, 2007). Given its potential to reduce the need to travel (less trips), to encourage modal shift, to reduce trip lengths and to encourage greater efficiency within the transport system, it may contribute to making the transport system more sustainable (Banister, 2008). The EU White Paper aims for a more sustainable transport system and considers road transport pricing to be an effective instrument in achieving this aim (European Commission, 2001). In a recent policy update (European Commission, 2009), pricing policies were again seen as an important step towards more sustainable transportation.

Although there are some examples of successfully implemented road pricing policies in cities such as Singapore, London and Stockholm (Ieromonachou et al., 2007) and nationwide truck tolling schemes in Germany, Austria and Switzerland (McKinnon, 2006), in practice

implementation is a cumbersome process. It seems very difficult to obtain sufficient public and political support to adopt road pricing and to get it implemented (Ison et al., 2008). In particular the more complex systems such as nationwide distance-based schemes for all road users prove hard to implement. Such is the case with the stalled nationwide road pricing proposal in the United Kingdom (Department for Transport, 2004; Milmo, 2008) and the halted road pricing policy process for implementing kilometre charging in the Netherlands (Rijksoverheid, 2010a). Road pricing, and in particular the effects of road pricing, has been studied in detail (e.g. Verhoef et al., 2008). Much progress has been made in recent years in the field of modelling urban road pricing (e.g. de Palma et al., 2006). However, the policy process is one of the remaining challenges (van Wee et al., 2008). The key to a better understanding of why nationwide road pricing initiatives have not yet been implemented is to take a closer look at the policy process and the role of the policy actors. Policy actors are politicians and interest groups that can exert influence on the policy making process. Their role is to decide which policy to implement and to make choices between the available policies. It is not clear why some policy actors are willing to adopt certain policies while other policies reach a deadlock.

One of the countries that has been struggling with the implementation of road pricing is the Netherlands. Since 1988 various road pricing policies have been proposed but to date (2010) none of them have been implemented. Using the Netherlands, and more specifically the attempt to introduce kilometre charging between 2004 and 2010, as a case study, the aim of this chapter is to give an overview of the factors that are important in the implementation of a road pricing policy and to consider the lessons learned, from which other countries may be able to learn. Thus, this chapter aims to contribute to the scarce international literature on road pricing implementation processes by giving insights into the difficult policy processes for implementing road pricing based on the Dutch case of kilometre charging. This chapter complements the work of, amongst others, Ison et al. (2008), Attard and Ison (2010) and Schaller (2010), who investigated road pricing policy implementation in Cambridge, Edinburgh, Valletta and New York. A second aim of this chapter is to develop a conceptual framework that gives a comprehensive overview of the factors that affect the likeliness that a transport policy instrument in general will be implemented. The basis of this framework is the transport innovation literature, the theory of policy learning and the theoretical concept of a policy opportunity. We apply this framework to the Dutch case of kilometre charging to get a first impression of the usefulness of the framework.

The remaining part of this chapter is structured as follows. We begin by discussing the research approach. Next, we present our conceptual framework and then apply our conceptual framework to the Dutch case of kilometre charging. This chapter evaluates the case up until September 2010. The chapter concludes by discussing the lessons learned from the policy implementation process for road pricing in the Netherlands.

2.2 Research approach

The research approach taken consists of three steps: (i) a literature review of the factors that affect the likelihood that a transport policy instrument in general will be implemented, (ii) the integration of these factors into a conceptual framework of the implementation process of a policy by policy actors, and (iii) the application of the conceptual framework to the Dutch case of kilometre charging.

The basis of the conceptual framework developed is the framework of Feitelson and Salomon (2004) on the adoption of transport innovations, in which feasibility is the key concept.

Transport innovation is 'new ways to manage transport systems and new technologies' (Feitelson and Salomon, 2004). Introducing new policies, including a road pricing policy, can be seen as an example of this. The adoption depends on the actors' appraisal of the feasibility of the transport innovation (Feitelson and Salomon, 2004). Moreover, they identify several feasibility aspects, which they have positioned in a conceptual framework.

However, their framework does not give insight into how actors appraise these feasibility aspects and how this appraisal can change over time. We have therefore expanded their framework using the theory of policy learning (Sabatier, 1988). Furthermore, we are interested in the implementation of a policy instrument and consider that to be a step further than adoption. We do not consider feasibility to be sufficient to ensure a successful policy implementation and therefore we complement feasibility in our framework with the theoretical concept of a policy opportunity (Kingdon, 1984; Koppenjan, 1993) and with the factor political decisiveness. A policy opportunity is the moment at which decision-making on a specific policy can take place. Political decisiveness refers to the effort, time and perseverance often needed in a policy implementation process as these processes can be complex, long-lasting and involve many uncertainties (Walker et al., 2001).

The outcome is a conceptual framework that consists of three components: policy actors' appraisal of the feasibility of the policy instrument, the opportunity to put a policy on the policy agenda and the political decisiveness needed for the adoption of a policy instrument.

In the third step, we have applied the conceptual framework to the Dutch case of kilometre charging to give a first impression of the usefulness of the framework. The information for our case study was collected through desk research, and analysing scientific literature and web sources to understand the factors that have affected the policy implementation process for road pricing in the Netherlands.

2.3 The adoption of new policy instruments by policy actors

When policy actors are faced with a specific problem (e.g. congestion) or an opportunity they can decide to adopt a policy to deal with this. This often implies making choices among the policy instruments available. In this section we describe the conceptual framework that we developed that gives a comprehensive overview of the factors that influence the willingness of a policy actor to adopt a policy instrument. This framework gives more insight into why actors advocate one policy instrument over another. The framework consists of three components, which are discussed below:

A. The feasibility of a policy instrument (A1) and the appraisal of the feasibility of a policy instrument (A2)

B. The need for a policy opportunity

C. The need for political decisiveness

2.3.1 The feasibility of a policy instrument (A1)

Feitelson and Salomon (2004) suggest that the adoption of a transport innovation (e.g. a road pricing policy) depends on the economic, technical, social and political feasibility. A policy instrument is technically feasible if it can work technically. The positive outcomes of a (rudimentary) benefit-cost analysis are is a minimal requirement for economic feasibility. The social feasibility criterion is met if the public (i.e. the majority of voters) support the

instrument. Public support is 'a function of the public perception of problems and the perceptions of the effectiveness of the proposed innovation in addressing these problems' (Feitelson and Salomon, 2004). Public acceptance depends on the effectiveness and efficiency of the policy.

Furthermore, the policy instrument needs to be fair for the individual and the society as a whole (Banister, 2008). The social feasibility is increased if the costs are borne by a large group of voters but are still low enough not to generate opposition. Hence, social feasibility entails issues such as the public's opinion on the need for action (demand for the innovation), equity issues and revenue use. Public perceptions are influenced by the dominant ideologies and what the media and elites see as publicly acceptable, i.e. the 'sanctioned discourse'. The sanctioned discourse also influences the political feasibility. If a policy instrument easily suits the sanctioned discourse it is more likely that policy actors will consider the instrument feasible. Moreover, the political feasibility is also increased if there is support from a wide range of specific interest groups. Furthermore, the political feasibility increases if the social feasibility is high. The importance of sufficient public acceptance as a driver for political acceptability is also supported by Banister (2008).

In Feitelson and Salomon's framework (2004) the feasibility components were interrelated with factors that impact these components. We have abstracted this framework and focus only on the four distinguished types of feasibility that are requirements for the adoption of innovations. The relations between the feasibility components are illustrated in Figure 2.1. We follow Feitelson and Salomon (2004), who stated that economic feasibility enables social feasibility which in turn enables political feasibility. The feasibility components together, including technical feasibility, determine the overall feasibility.

In Feitelson and Salomon's framework (2004) the technical and political feasibility are important requisites for the adoption of innovations. We also consider feasibility as a necessary condition for policy implementation. However, we also consider additional aspects to be important for predicting the likelihood that a policy will be implemented. These aspects are discussed in the following subsections (A2, B and C).

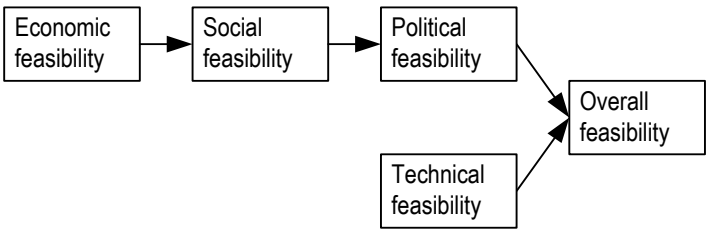

Figure 2.1 Feasibility components (adapted from Feitelson and Salomon (2004))

2.3.2 The appraisal of the feasibility of a policy instrument (A2)

The work of Feitelson and Salomon (2004) does not provide insight into how actors appraise the overall feasibility and how this appraisal can change over time. This appraisal of feasibility components and the overall feasibility is context and actor dependent. Understanding from which perspective a policy instrument is appraised helps to understand the policy actors' willingness to adopt a policy.

Policy instruments are appraised differently by various policy actors. Each policy actor has his own perception of reality based on his beliefs (Deelstra et al., 2003). The adoption of a new policy instrument normally takes place in the context of existing policies or policy plans.

A policy actor's preferred policies are important frames of reference in their appraisal of new policy instruments. Hence, to understand the appraisal of the feasibility of new policy instruments, it is necessary to take these preferred public policies into account (Sabatier, 1988).

Sabatier (1988) conceptualizes public policies as belief systems. Three types of beliefs are discerned: deep core beliefs, policy core beliefs and secondary aspects. Deep core beliefs contain the basic assumptions of reality such as assumptions about the nature of man, the relative priorities of values such as freedom, security, power, knowledge and the basic criteria of distributive justice (e.g. whose welfare counts). These beliefs apply to all policy areas and are not likely to change. Policy core beliefs are the assumptions of actors about the content of the policy area of interest. Examples are the desirability of participation by various segments of society, basic choices concerning policy instruments (e.g. coercion vs. inducements vs. persuasion) and the proper scope of governmental vs. market activity. Secondary aspects are the components of a policy that are easily modified during the policy process. These are the instrumental decisions and information searches specific to the policy of interest and are customized to support the policy that the policy actors prefer. These aspects are interchangeable and subject to negotiation processes. The adoption of a new policy instrument can imply changes in the policy actors' belief system.

Sabatier's conceptualization helps to explain why policy actors consider certain policy instruments more feasible than others. The policy actors' views on the feasibility of the policy instrument can be influenced by information and experiences and can change their attitudes. This is called policy learning and refers to the 'relatively enduring alterations of thought or behavioural intentions which result from experience and which are concerned with the attainment (or revision) of policy objectives' (Sabatier, 1988:133). Thus, policy learning can imply the change of attitudes of actors and can change the preferred (package of) policy instruments.

However, policy learning can be selective (Sabatier, 1988). First, policy actors are more interested in learning about the variables and causal relations that are consistent with the policy core. Thus, their attitude towards a new policy instrument depends on the contribution of the instrument towards the objectives and the resemblance with the preferences of the policy actor. Second, the rationality of the policy actors is limited, i.e. it is not always the best solution that is preferred. Third, policy learning depends on the current policy preferences of policy actors (belief system). In other words, the public policy that policy actors at that moment advocate is taken as a reference to compare the new policy instrument to and hence directs policy learning.

The policy actors' willingness to support a new policy instrument not only depends on if considerable policy learning took place, but also on how radically they have to change their belief system based on new information. Deep core beliefs are not likely to change and also core policy beliefs are rarely modified. Hence, the resistance to change in the attitudes of actors is least when the secondary aspects are concerned (Sabatier, 1988). Hence, if no or few changes are required in the policy actor's beliefs, it is more likely that the policy actor will consider the policy instrument feasible. The appraisal of the feasibility of a new policy instrument is thus directed by the perspective of the public policy currently considered feasible by the policy actors.

2.3.3 The need for a policy opportunity (B)

Feitelson and Salomon indicate that the feasibility aspects can be seen as minimal criteria: if these are not met, the innovative policy instrument will not be adopted. We endorse that feasibility is the minimal criterion for a policy actor to implement a new policy instrument. In fact, feasibility and how it is appraised is only the starting point for understanding the implementation of a policy instrument. Even if a policy instrument is considered feasible, whether it has a chance to be put on the policy agenda depends on the context of the policy process.

Feitelson and Salomon (2004) briefly refer to Kingdon's 'policy windows' (Kingdon, 1984) to indicate that propitious moments exist when new ideas can be put on the policy agenda. In a 'crisis' situation, different policy solutions (in this chapter we use the term policy instruments) for the perceived problems are competing for the attention of decision makers. Thus, even if a policy instrument is considered feasible, there still has to be an opportunity to get the instrument on the policy agenda.

We use the stream model of Koppenjan (1993), to illustrate the policy-making process (see Figure 2.2). This process consists of solutions (e.g. policy instruments), problems, participants and couplings. The policy process is not a linear, structured, predictable process in which clear phases can be distinguished, but is contingent and unpredictable, being highly dependent on the context in which it takes place. Decisions are taken if there is a (coincidental) coupling between a problem that is urgent for most actors, a solution that can be supported, and participants who are inclined to make a decision. This is called a policy opportunity. All flows are continuously in motion. Therefore, a coupling is a matter of timing and taking temporary chances. This model emphasizes the importance of a receptive policy context and participants for the implementation of a policy instrument. New policy instruments will only be implemented at the moment of decision making when all flows come together and the window of opportunity opens.

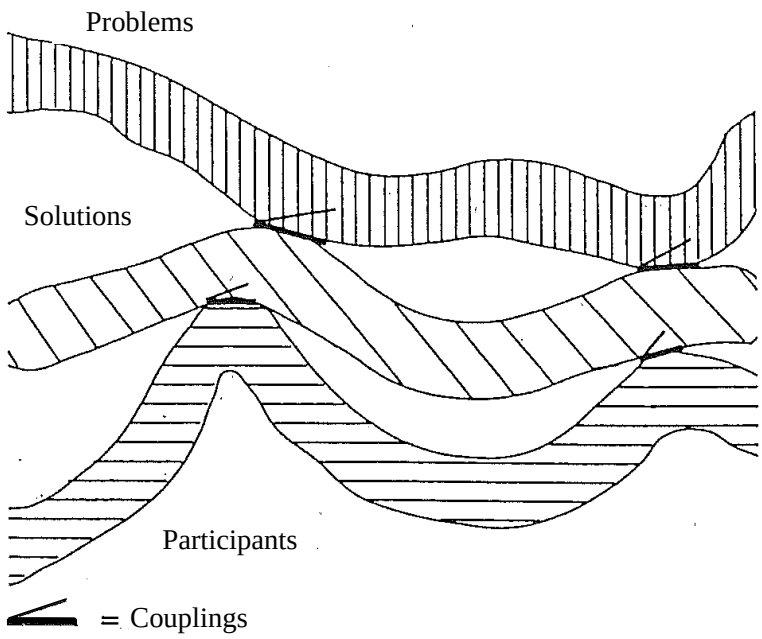

Figure 2.2 The stream model Source: Koppenjan (1993:25), reproduced with permission from the publisher

2.3.4 The need for political decisiveness (C)

Having policy actors consider a policy instrument as feasible and having a policy opportunity are minimum requirements for its implementation, but no guarantee. Another factor that can play a role in the policy actors' willingness to implement a policy instrument is the need for political decisiveness. Overall, policy implementation is more likely when the policy instrument does not require great decisiveness from the policy actor.

The required political decisiveness depends on the nature of the policy instrument (the characteristics of the policy and how it is appraised by the policy actors). Many policy problems are complex and take place in continuously changing and unpredictable systems (Walker et al., 2001). Unpredictability can be caused by uncertainties in the policy context, making policy changes sooner or later almost inevitable. These adjustments may be needed to mitigate vulnerabilities that were previously not noticed or to prevent opportunities being missed. Adjustments can be the result of learning, interactions between stakeholders, changes in stakeholders' behaviour and external changes. These complex problems often require complex policies. As these policies include many assumptions that may be incorrect, the policy itself can also provide reasons why changes in policies take place. Therefore policies should be adaptive to be robust across a range of plausible futures and include explicit provisions for learning (Walker et al., 2001). Complex policies are more difficult to adapt according to new insights when they do not include explicit provisions for learning, and these adaptations are also more costly than for simple policies (the risk of path dependency). Implementing complex policies is therefore more uncertain and challenging for policy actors and requires greater political decisiveness than simple policies.

The required political decisiveness also increases when policies need a longer implementation period (which is often the case with complex policies). This leads to a longer period of time before the policy demonstrates the full results. As long as the policy is not fully implemented the politicians' support is needed which requires decisiveness.

When policy actors appraise a policy the current policy context is also taken into account. Generally, people mistrust proposed changes from their status quo and have the tendency to minimize risk (McFadden, 2007). Decision makers also tend to disproportionally stick to the status quo when choosing between alternatives. This status quo bias (resulting from rational and psychological factors) partially accounts for the difficulty in changing public policies (Samuelson and Zeckhauser, 1988). It is therefore expected that policy actors will be more willing to implement policies that do not require major changes in the current policies. For example, gradually modifying an existing policy or adding a simple policy measure to a policy package is only a small modification compared to replacing a policy that has been in place for years with a completely different policy.

The required political decisiveness also depends on the nature of the policy making process. The political system, as well as the rules of the game, differ between countries. De Jong (1999:213) typifies various countries in terms of a 'family of nations' based on institutional and constitutional factors. He argues that whether a policy instrument will land on fertile soil depends on a country's basic structure and culture. Moreover, the implementation of a specific policy instrument might be relatively easy in one country but may be a major challenge in another country. The level of required political decisiveness can differ between various political contexts.

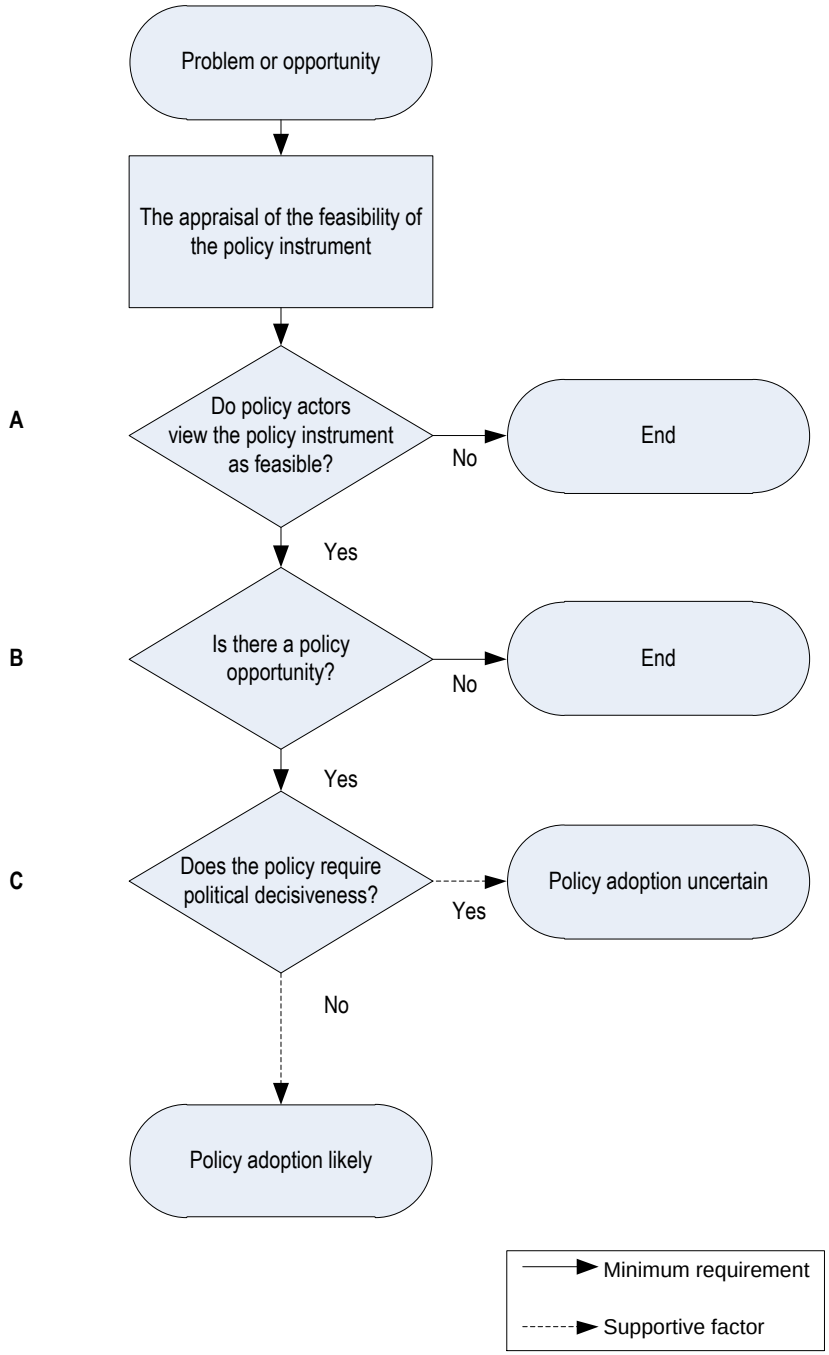

Figure 2.3 The implementation of a policy instrument

Figure 2.3 summarizes the components of our conceptual framework. This framework does not show all the relations between the included components but it shows a likely order of decisions involved in the policy implementation process. It must be noted that this framework is a simplification because policy processes in practice can be messy. Furthermore, the aspects of our conceptual framework that help to explain the likelihood that policy implementation occurs are more important thatn the order chosen. Policy implementation is most likely when policy actors view the policy instrument as feasible, when there is a policy opportunity and when the policy instrument does not require political decisiveness.

2.4 Applying the conceptual framework to road pricing

In this section we analyse the Dutch implementation process for kilometre charging using our conceptual framework. We will subsequently answer the following questions:

A. Do Dutch policy actors view the road pricing policy as feasible?

B. Is there a policy opportunity for the road pricing policy?

C. Does the road pricing policy require political decisiveness?

We start our analysis with an overview of the Dutch history on the implementation of road pricing. This demonstrates that the implementation process has been long and complicated. Mom and Filarski (2008) found that road pricing was already put forward in 1965 by Dutch transport engineers as a promising policy instrument, inspired by the English Smeed report (Smeed, 1964). Around 1970 the government asked two scientific committees to develop future transport policies. Both committees suggested congestion charging or road pricing as possible effective future transport policies. The first notion of pricing incentives in road transport was found in a policy document from 1977 (Structuurschema Verkeer en Vervoer – SVV).

The Text box (see next page) gives an overview of the different road pricing proposals that have been debated since 1988 and the main reasons why these policy instruments have not been implemented.

We will focus our analysis on the latest road pricing proposal, the kilometre charginge, which is considered the most concrete, elaborate and (technically) complex instrument in the history of road pricing in the Netherlands. It must be noted that this evaluation of the policy implementation process for road pricing should be considered as a snapshot of the situation in September 2010 and that, given all the uncertainties included in the implementation process, the picture can change very rapidly.

The main objectives behind kilometre charging were the improvement of accessibility (reduction of congestion on motorways) and environmental quality. Furthermore, replacing the fixed vehicle taxes by a variable usage-based charge is considered fairer.

The main characteristics of the concept design of the kilometre charging scheme are (Rijksoverheid, 2009a):

- all motor vehicles – trucks, vans and passenger cars, including foreign vehicles – with the exception of motor bikes will be charged;
- road users pay for each kilometre of the Dutch road network that they use (all roads are included);
- the basis consists of a fixed charge per kilometre that is based on the environmental characteristics (CO_2 emissions) of the vehicle type (truck, van, passenger car);
- a peak hour supplement at congested locations is included as a future possibility;
- the current vehicle ownership and registration taxes will be abolished;
- overall no more revenues than the current vehicle taxes will be collected and the revenues from kilometre charging will be earmarked for infrastructure instead of going to the general treasury which is currently the case;
- a GPS-based system for positioning will be used to determine the road use. The vehicles will be equipped with an on-board unit (OBU) that collects information and regularly sends the aggregated data (amount of kilometres driven, classified by different tariff groups) to the collection office to support the billing process.

Text box: The history of road pricing in the Netherlands (van der Sar and Baggen, 2005; NOS, 2009)

The first concrete proposal for road pricing was introduced in a policy document from 1988 (Tweede Structuurschema Verkeer en Vervoer – SVV2). The proposal to introduce a time and place differentiated cost increase for passenger transport (rekeningrijden) was fiercely debated and not considered socially or politically feasible. In 1990, the cabinet decided, on the basis of the SVV2, to introduce the implementation of a toll charge to enter cities. This proposal was not successful due to the opposition of the provinces, municipalities and political parties. In 1991 fuel tax was increased and a congestion supplement to the vehicle registration taxes was proposed. Although this time an agreement was reached with the four large cities and some pilot projects were executed, the plan failed in 1993 due to the lack of political support. In 1994 growing congestion levels initiated new research into the possibilities of electronic road pricing using toll gates (again referred to as rekeningrijden). However, after years of research no final decision for implementation was taken.

In 1998 the decision to introduce road pricing based on tolling was included in the coalition agreement. In the summer of 1999 fierce opposition suddenly emerged from various interest groups, of which the ANWB[2] was the most apparent, as well as a national newspaper. The proposal politically 'died' (the official reason claimed was the growing technical opportunities for the implementation of kilometre charging).

After a period of political silence, there was renewed interest in the road pricing expressed in the 2004 policy document (Nota Mobiliteit). Contrary to earlier initiatives, this time the importance of stakeholder support was acknowledged and this resulted in the installation of the Nouwen committee, (named after their chairman). Also called the National Platform for Paying Differently for Mobility (Platform Anders Betalen voor Mobiliteit)), this committee consisted of representatives of governmental organizations, interest groups and societal organizations and was installed to investigate the options for implementing road pricing. In 2005 this committee recommended nationwide kilometre charging (kilometerprijs) for all vehicles to replace the fixed vehicle ownership and registration taxes. This proposal was broadly supported, primarily because the 'pay for usage' principle was considered fair.

Although the new government in 2007 embraced the proposal for kilometre charging they decided to start the implementation preparations to enable a successor cabinet to implement the policy instead of starting the implementation during their period of government (2006–2011). At the end of 2009 the concept kilometre charging act (Rijksoverheid, 2009b) was sent to parliament and full implementation was considered feasible around 2018. In addition, several tendering processes for technical systems and for large scale pilot projects (in 2012 with 60,000 volunteers) as preparation for the implementation have been initiated. Amid some political turmoil over the influence of the ANWB on the policy process, the government fell (19 February 2010). The Dutch parliament declared kilometre charging a politically controversial subject and halted the policy process until the formation of the new government (Rijksoverheid, 2010a). The new government (installed on 14 October 2010) has decided not to implement kilometre charging (Rijksoverheid, 2010b).

[2] The ANWB is the Royal Dutch Tourist Association which aims to represent the interests of their 3.9 million members in the areas of mobility, holiday and leisure ANWB (2010) Over ANWB (about ANWB).

2.4.1 Do Dutch policy actors view the road pricing policy as feasible?

The road pricing policy is technically feasible, according to most technical experts, but there are uncertainties. Kilometre charging will make use of satellite technology for positioning complemented by communication technology. The plan is that the government will provide an on-board unit with minimal functionality. In addition, selected service providers can provide a more sophisticated OBU (e.g. integrated in a navigation system). In addition, the vehicles will be equipped with a trusted element for fraud prevention. However, Cottingham, et al. (2007) argue that a complex distance-based nationwide scheme, 'is not technically achievable in the short-term', because the technologies cannot accurately determine the precise location of road use, and because privacy is not adequately protected. A report by Mapflow (2007) concluded that the technology is sufficiently accurate in determining on which road a vehicle has driven and when. Privacy is protected by aggregating the data in the on-board unit or by the service provider, before sending the data to the collection office. This ensures that the government is not able to track a vehicle or to determine route information. As this scheme is not yet implemented, it is uncertain whether it is technically feasible. However, to explore possible technical problems, the technology wais going to be tested in several pilot projects.

Implementing a kilometre charging nationwide is economically feasible, but again there are uncertainties. Several impact assessment studies have been carried out (for example CPB (2005); Rijkswaterstaat (2005); Geurs and van den Brink (2005)). These studies showed that the proposed kilometre charging has a positive impact on reducing congestion and the improvement of environmental quality and demonstrates a positive benefit to cost ratio. Later in the process the uncertainty in these impact estimates was debated scientifically (Geurs et al., 2007). Different Dutch transport scientists argued in a technical workshop that the mobility impacts and the related travel time and environmental gains were overestimated in the impact studies, because of some specific characteristics of the transport model used (Geurs et al., 2007; Geurs and van Wee, 2010). However, most experts still argue that the benefit to cost ratio would be positive, even if these uncertainties are taken into account (see for example CPB (2008)).

The social feasibility is uncertain. A very important step in the Dutch policy implementation process was the installation of the Nouwen committee in 2003 (see tekst box). The aim of this committee was to create broad support for road pricing, as the Minister of Transport realized that this was vital for the implementation to be successful. The committee included representatives from, amongst others, business representatives, labour unions, the ANWB, some scientists and environmental groups, to give advice on the option of road pricing to reduce congestion. The committee advised the implementation of the kilometre charging nationwide. The core of their advice was to replace the existing fixed vehicle taxes with a variable kilometre charge. The committee was almost unanimous in their advice except for opposition by representatives of environmental organizations who did not agree with the suggestion to start by solving some severe road bottlenecks quickly. However, around 2005 broad public support for road pricing emerged.

In 2009 the kilometre charging act was sent to parliament (see tekst box). A brief internet search in February 2010 showed the opinions of some main actors. Environmental groups (SNM, 2009), business representatives (RAI-BOVAG, 2009; VNO-NCW, 2009) and freight transport organizations (Nieuwsblad transport, 2009) are all in favour of the concept act. The ANWB had not determined its position on the act and had decided to carry out a web survey

to investigate the views (pros and cons) of their members (ANWB, 2010).

It was the position of the ANWB in particular that was uncertain. As it represents a large proportion of the Dutch population (at least: motorists), this may explain the reason why the Minister of Transport tried to stay in close contact with them. He told the Dutch press that he would listen very carefully to the result of the web survey of the ANWB. The Dutch parliament was not amused by this because they felt it was up to them and not the ANWB to make a final decision.

Amidst this limited political turmoil and before the survey results were published, the Dutch government fell (19 February 2010). The survey showed that the majority of the respondents (68 per cent of the 400,000 respondents) agreed with the 'pay for usage' principle of road pricing: they think that it is fair that people have to pay for the usage of roads instead of having to pay fixed vehicle ownership taxes (Onkenhout et al., 2010).

Political feasibility concerns the willingness to support the policy in the political arena. In the case of road pricing, the impact of social acceptability on achieving political feasibility as conceptualized by Feitelson and Salomon (see Figure 2.1) seems to be vital. During the elections for the Dutch national parliament in 2006 there was broad political support for road pricing: all major political parties including the VVD (conservative-liberals) and CDA (Christian-Democrats), who now form the new government, favoured road pricing (Annema and van Wee, 2008). This broad positive attitude in 2006 was, to a considerable extent, the result of the positive advice given by the Nouwen committee in 2004.

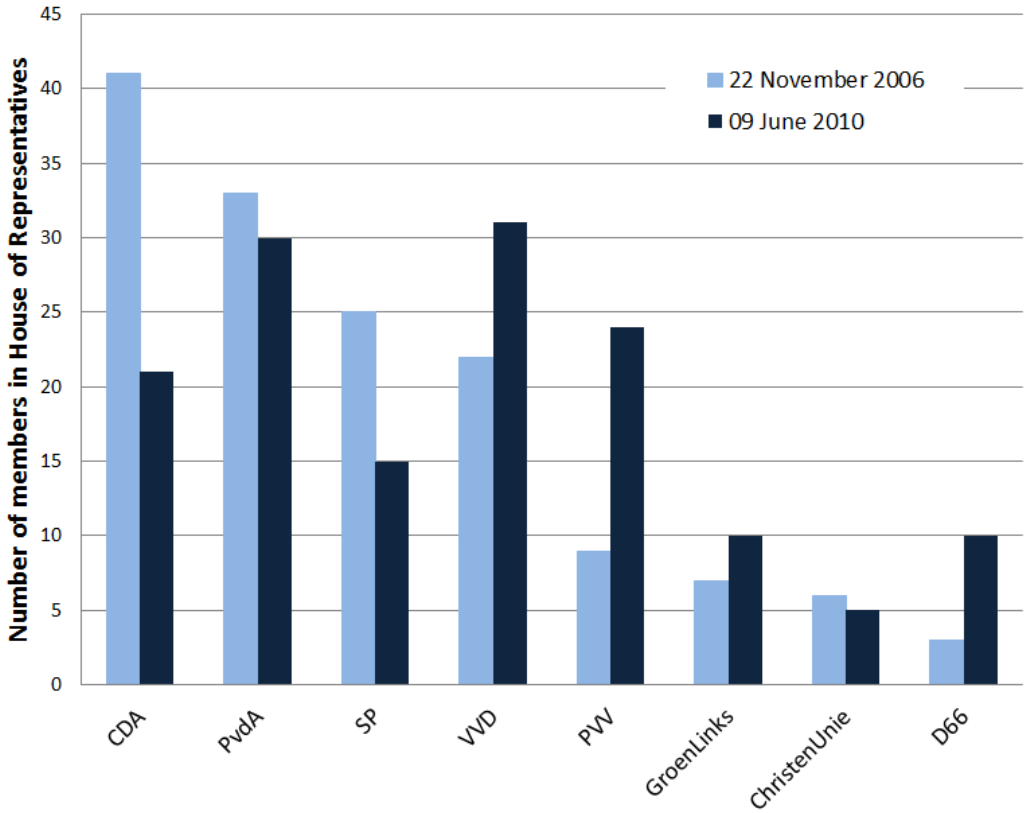

Figure 2.4. Compositions of the House of Representatives after the 2006 and 2010 elections Source: Kiesraad (2010)

2.4.2 Is there a policy opportunity for the road pricing policy?

Around 2006 there seems to have been a policy opportunity. At that time there was broad societal support (platform Nouwen) and almost all the main political parties were in favour. Also congestion was a fast-growing problem in the Netherlands at that time (see Figure 2.5). Figure 2.5 illustrates that the vehicle hours lost in congestion on motorways in the Netherlands has almost tripled between 1985 and 2007; an average growth of 4.8 per cent per year. After the small dip in the Dutch economy around 2001 (when the internet bubble burst), both the economy and congestion grew abundantly between 2004 and 2007. Nevertheless, despite the sense of urgency to reduce congestion and broad support for road pricing that resulted from this growth, the Dutch government had to conclude that implementing the first phase of the system would not be possible before the change of governments. In the coalition agreement, however, this implementation was promised. Therefore they decided to 'carry out a first practicable, meaningful and irreversible step towards road pricing' (Ministerie van Algemene Zaken, 2007). At that time it was not clear what this step implied but after the installation of the new government it became clear that, despite the effort of the previous government, it was still possible that kilometre charging would not be implemented.

The worldwide financial crisis has affected the Dutch economy considerably – in 2009 the decrease in GNP was 4 per cent (CBS, 2010). Congestion levels have also decreased in the past few years (see Figure 2.5), most probably closely related to the financial crisis (Jorritsma et al., 2009a; Jorritsma et al., 2009b). However, it is to be expected that the Dutch economy will recover in the coming years resulting in relatively high congestion levels again. Hence, congestion will remain a problem that is urgent for most policy actors. The proposed solution – kilometre charging – is, although further details have been added, the same as in 2006. Hence, the question of whether there is still a policy opportunity will depend on the policy actors' willingness to make a decision on the implementation of road pricing.

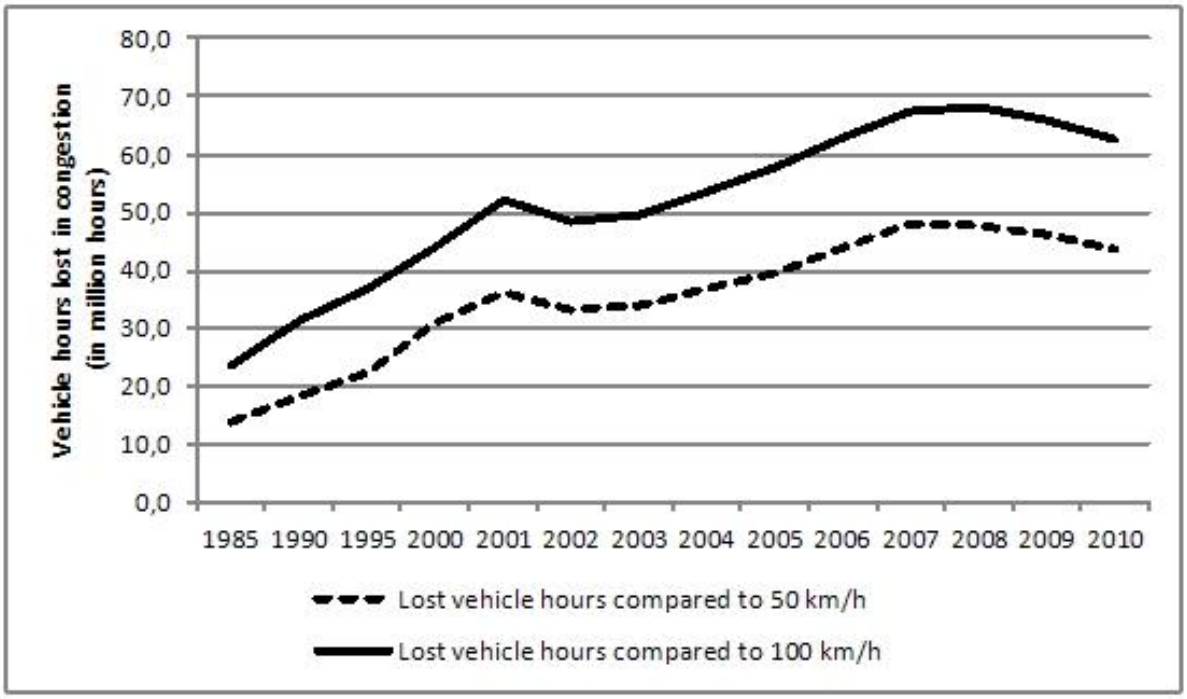

Figure 2.5 Hours in congestion on motorways in the Netherlands (1985 – 2007). The 2010 estimate is the average number for the period January – July 2010 only
Source: Rijkswaterstaat (2010); Van Mourik et al. (2008)

2.4.3 Does the road pricing policy require political decisiveness?

Road pricing, particularly the proposed kilometre charging, requires political decisiveness. The main factors that determine the required political decisiveness relate to the nature of the policy instrument (the characteristics of the policy and how it is appraised by the policy actors) and policy making process.

The policy instrument, kilometre charging, is complex and cannot be implemented at once. To date, no road pricing policy has been implemented with a comparable spatial scale and scope as the Dutch road pricing proposal. The implementation of kilometre charging therefore consists of many challenges such as the technological system and privacy protection. The technical feasibility of the policy can and would be tested using small-scale experiments. Nonetheless, all road vehicles would have to be equipped with OBUs (requiring investment costs of 4 billion Euros in 2010 prices) that work, all road vehicles would have to be monitored with working GPS technology, all data would have to be correctly sent to the collection office, trustworthy privacy protection agreements would have to be made and so forth. During such an implementation process it is likely that start-up problems would arise which would test the politicians' perseverance.

In addition, the political decisiveness needed to implement complex policies can also be partly understood when the appraisal of policies is considered. Kilometre charging is a significant change in the status quo of the road vehicle taxation which has been in place for decades. Mistrust from the public and interest groups can therefore be expected, making the political process highly complex and again testing politicians' decisiveness. The mistrust in this case can be illustrated easily by the words used by the political opponents (see before), such as: 'foolish plan', 'disastrous plan', 'spy devices', 'congestion taxation'.

Furthermore, the implementation of kilometre charging requires a long transition phase. For example, if the vehicle ownership tax for passenger cars was abolished immediately, it would have a sudden and large effect on car prices (in the Netherlands this tax can amount to 40 per cent of car sales prices without taxes) and, therefore, disturb the car market. To avoid this market disturbance, the concept act proposes phasing out the vehicle ownership tax gradually, and including it in the yearly vehicle registration tax. The yearly vehicle registration tax would then be converted into the base kilometre charge. The whole implementation process is expected to take years (Rijksoverheid, 2009a). It is likely that over time changes will be required (resulting from the complexity of the design, experiences, and political preferences). This will therefore require a great deal more political decisiveness than policy instruments that can be implemented in a much shorter term.

The implementation of the policy also requires more decisiveness when the policy making process is generally more complex due to the nature of the political system and the culture of policy making. The Netherlands is a parliamentary democracy. Every four years (or sooner if a cabinet falls) Dutch voters choose a new national parliament. The multi-party system requires a coalition to create majority support. This institutional (neo) corporatist system is characterized by social dialogue, negotiation, consensus seeking, compromise and/or joint consultation between a wide range of parties. In the Netherlands this system and the corresponding decision-making culture are referred to as the 'polder model' (Karsten et al., 2008). As the term polder model is not internationally widespread, we will use the term bargaining culture to characterize the culture of Dutch policy making processes. Forming a coalition is a complex bargaining process. In the Netherlands it is often said that it is more important for a political party to win this bargaining process than the elections (NIMD and IPP, 2008). So, in the Netherlands political decisiveness is related to bargaining, which adds

to the complexity of decision-making processes and sometimes makes it relatively unclear and slow. After the 2010 elections, the political power became even more fragmented, resulting in a difficult coalition-forming process. The bargaining culture, combined with an increased fragmentation of political power is expected to make firm majority decisions and holding on to those decisions over time less likely.

2.5 Conclusion

We conclude that, although road pricing has been on the political agenda in the Netherlands several times since 1988, to date it has not been implemented. In fact, the latest Dutch government decided in 2010 not to implement the most recent proposal of kilometre charging. Therefore it is highly unlikely if implementation of road pricing will ever succeed and the Netherlands finds itself in the situation 'policy implementation adoption uncertain' (see Figure 2.3). The first aim of this chapter was to give an overview of the factors that were important for the implementation of the proposed kilometre charging policy between 2004 and 2010. From the analysis of this case we found that the three factors included in our framework have an impact on the policy implementation process for kilometre charging: the feasibility of the policy, the policy opportunity and political decisiveness.

The first aspect that had an impact on the implementation process was the feasibility of the proposed kilometre charging. We conclude that kilometre charging is considered technically, economically and socially feasible by important policy actors. However, these factors are not undisputed and there are uncertainties. The political feasibility has changed from broad consensus on the implementation of kilometre charging in 2006 to insufficient political support in 2010. Part of the explanation is the changing political context. Since 2006 three political parties have revised their position regarding kilometre charging which can be partially explained as a return to their core policy beliefs. The PVV, a party that first entered parliament in 2006 and made huge gains in the 2010 election, denotes kilometre charging simply as a 'disastrous plan'. We particularly feel that psychological aspects (e.g. that the assessment of feasibility aspects is based on beliefs) are important in explaining both why there is insufficient political support and why the policy implementation process failed.

The second aspect, the policy opportunity, exists when a specific problem, a policy instrument that deals with the problem and the support of the actors come together. Due to the lack of actor support, kilometre charging proved politically infeasible in 2010. Hence, there is currently no policy opportunity. However, the other two aspects of a policy opportunity give rise to the expectation that new policy opportunities might occur. First the burden of road transport (e.g. congestion, environmental impact) is severe and expected to increase which increases the sense of urgency among policy actors to implement policies. Second, effective alternatives to reduce congestion and at the same time generate comparable welfare gains are lacking. Therefore, we expect that kilometre charging will remain a potentially attractive policy instrument. In addition, given the long history of political debate on road pricing in the Netherlands, we expect that sooner or later a road pricing policy will be put back on the policy agenda, whether it is kilometre charging or something else.

The third aspect that impacts on policy implementation is political decisiveness. We conclude that, besides political feasibility, the lack of political decisiveness seems to have been the most important barrier in the implementation of kilometre charging in the Netherlands. With the political fragmentation after the 2010 elections and the Dutch bargaining culture political feasibility and decisiveness has become even more difficult. Additional complicating factors include the complex nature of the proposed kilometre charging scheme and the long

implementation period necessary before the scheme is fully implemented (and demonstrates its full potential), requiring perseverance by the policy actors.

To summarize, we conclude that a lack of political feasibility and decisiveness are the most important explanatory factors for the failed policy implementation process of kilometre charging in the Netherlands. A second aim of this chapter was to develop a conceptual framework that gives a comprehensive overview of the factors that affect the likeliness that a transport policy instrument in general will be implemented. We conclude that the framework is helpful to systematically describe and analyse the Dutch case of kilometre charging. In addition all factors included in the framework were relevant and contributed to the overall assessment of whether or not kilometre charging will be implemented in the Netherlands. We consider this framework to be generally applicable to assess the likelihood that a transport policy instrument will be implemented, but this is something that needs to be validated.

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3. Employer attitudes towards Peak Hour Avoidance

Diana Vonk Noordegraaf, Jan Anne Annema (2012). Employer Attitudes towards Peak Hour Avoidance. EJTIR Issue 12(4), 373–391.

3.1 Introduction

Similar to many other countries, the road network in the Netherlands experiences severe congestion during peak hours (KiM, 2011). Changing travel behaviour by making use of mobility management measures can contribute to reducing the congestion externalities of road transport. Mobility management[3] measures aim to change travellers' attitudes and behaviour (EPOMM, 2010). There is a wide variety of mobility management measures (see e.g. Cairns et al. (2008)), including both carrots and sticks (Meyer, 1999). Carrots generally encourage individuals in their transport choices whereas sticks constrain, often increasing costs and decreasing availability (Ryley, 2010). Financial incentives play a significant role in mobility management (Van Malderen et al., 2012). Examples of financial sticks are road user charging and parking costs. The literature on road pricing is abundant and includes theoretical contributions (e.g. Arnott et al., 1995, Verhoef, 2002, Vickrey, 1969), contributions regarding political and social acceptability (e.g. Ison, 2000, Schade and Schlag, 2003, Viegas, 2001) and real-world implementation (e.g. Börjesson et al., 2012, Anas and Lindsey, 2011, Santos, 2005).

[3] Commonly referred to as Transportation Demand Management in the USA.

The general advantage of carrots compared with sticks is that it is often easier to gain stakeholder support for measures with a relatively low or no cost to the general public (Ison, 2000, Rye, 1999b). Financial carrots often include cheaper public transport fares. The use of subsidies to achieve behavioural changes for road users is, compared to road pricing, a rather novel concept. One of the few exceptions are cashing out employer-paid parking (Shoup, 1997) and the concept of credit-based congestion pricing (Kockelman and Kalmanje, 2005, DeCorla-Souza and Whitehead, 2003). Another example is the experiment discussed by Merugu et al. (2009) in which commuters were paid random rewards (a raffle mechanism based on credits) for not driving or using buses in peak hours. In 2006 a new subsidy-based mobility management measure was introduced in the Netherlands: 'Peak Hour Avoidance' (in Dutch 'Spitsmijden', henceforth referred to as PHA). The carrot comprises rewarding frequent car drivers with subsidies for reducing the proportion of trips that they make during peak hours on a specific motorway section. Although this instrument also aims to change the behaviour of car drivers with financial incentives, the most important differences with road pricing are that, instead of charging driving in peak hours and being applied to all drivers, PHA is based on subsidies for not driving in peak hours and only eligible to a small proportion of road users. One of the ideas behind the development of this measure was the suggestion that rewarding "can achieve a similar behavioural change to that of pricing" (Ben-Elia and Ettema, 2011:568). In a trial in the Netherlands under real highway conditions participants reduced the proportion of their car trips during peak hours by 50% to 70% (Spitsmijden Group, 2007b). After further development of PHA it is currently being applied as policy measure in the Netherlands.

The objective of this paper is to investigate employer attitudes towards PHA. The reason for focussing on employer attitudes is that employers are the "primary creators of commuting traffic" (Van Malderen et al., 2012:10). The majority of Dutch car drivers (68%) in peak hours consists of commuters (Rijkswaterstaat, 2006). Hence, employers can play a key role in PHA because they can provide their employees with alternatives to single occupancy car driving during peak hours such as other travel times, work locations or travel modes and encourage them to use these alternatives. This paper is of scientific interest because employer attitudes to PHA have not yet been investigated. The concept of PHA and the empirical effects are studied (see section 2 for references) but the potential role of the employer in achieving peak hour avoidance is not known.

Although employers have implemented workplace travel plans, the role of employers in commuting behaviour has been underexposed in literature (Van Malderen et al., 2012, Vanoutrive et al., 2010). The relatively few studies on employer attitudes towards mobility management conclude that it 'does not yet appear to have been taken up with great vigour by the vast majority of employers' (Rye, 1999b:14). Although this is not a promising perspective for PHA, the employers' involvement in mobility management is being encouraged by the European Commission (European Commission, 2011), the Dutch government and, 50 leading employers and employer associations (SWSR, 2011). The Netherlands has a particularly long history of promoting mobility management measures (Rye, 2002). Recent Belgian research demonstrated an increasing interest of companies in mobility management (Van Malderen et al., 2012). Hence, current employer attitudes to mobility management measures may have changed over the last decade. It could be that employers attitudes towards mobility management in general have become more positive over the years, because employer's have become more motivated to implement measures, the effort to implement measures has reduced or they could have become more experienced with it. In addition, PHA has several specific characteristics which could result in employers having a different attitude to PHA

than mobility management in general. There are, for example, differences in the level of acquaintance and experience with the measure, the level of involvement of private parties (PHA was initiated by a public-private partnership while mobility management has traditionally been the domain of public parties) and the selection of road users able to participate. Employer attitudes to PHA are therefore currently unknown, making this a highly interesting study topic. By exploring the factors that are related to the employer attitudes to PHA and by exploring which factors have the largest effects, this research may help modify the PHA measure or the general mobility management implementation strategy such that employer support for PHA and mobility management can be fully utilised.

This paper is structured as follows. Section 2 discusses the PHA measure in more detail and discusses the role of employers in PHA. Furthermore, we propose and discuss a conceptual model of employer support for PHA. Section 3 presents the methodology. The results are presented and discussed in section 4. Section 5 summarises the main conclusions and discusses the main implications for public and private parties that want to initiate a PHA project or provide support for PHA.

3.2 Peak Hour Avoidance and employers

3.2.1 Peak Hour Avoidance

The objective of the first PHA project is "to extend the repertoire of management instruments that may be used to influence road usage during peak periods" and "to gain insight in the travel behaviour of commuters when confronted with positive incentives for not driving during peak hours" (Spitsmijden Group, 2007a:3)". The first application of the PHA concept was during a trial under real highway conditions in 2006 (see for details Knockaert et al., 2007). This study involved 340 voluntary participants, frequently driving in peak hours, who were able to earn a reward (between 3 and 7 Euros, 2007 prices) relative to their driving frequency in peak hours (defined between 7:30 and 9:30 am) during the pre-test. During the trial, the participants reduced the proportion of their car trips during peak hours on a specific motorway section by 50% to 70% (Spitsmijden Group, 2007b).

Table 3.1 lists the most chosen alternatives to driving in peak hours by PHA participants. Using rewards to change commuters' behaviour in the short-term seems to work (Ben-Elia and Ettema, 2011). This confirms that commuters are willing to change behaviour if the incentive is sufficiently strong or effective (Giuliano et al., 1993, Meyer, 1999). The first trial sparked a number of follow-up initiatives across the Netherlands (Spitsmijden, 2010) with longer project durations, more participants and a larger geographical scope (see for examples Bliemer et al., 2009, Spitsmijden Group, 2009b). For three projects the effects on traffic conditions were studied and positive results were reported (Bliemer et al., 2009). PHA is now being applied as a measure mainly when there are roadworks. The objectives include enhancing short term regional accessibility and making employers and employees more conscious about travel alternatives (Ministry of Infrastructure and the Environment, 2011).

Table 3.1 Alternatives chosen by PHA participants Adapted from: Knockaert et al. (2007)

Behavioural response*	Before implementing PHA	With a reward of 3 Euros	With a reward of 7 Euros
By car before 07.30h	20.1%	33.0%	38.5%
By car 07.30-08.00h	17.8%	8.9%	6.0%
By car 08.00-09.00h	27.4%	15.1%	10.9%
By car 09.00-09.30h	4.8%	2.4%	2.2%
By car after 09.30h	10.3%	16.0%	15.1%
Passenger in carpool	0.8%	1.9%	2.2%
Public transport	3.9%	9.5%	11.4%
Bicycle	5.2%	4.1%	3.5%
Other means of transport	2.8%	2.1%	2.2%
Teleworking	2.6%	3.1%	3.9%
Other work location	3.2%	2.7%	3.4%

* route choices were not rewarded in this project

In our view there are two major drawbacks to PHA which mean that it is not a real alternative to road pricing. Firstly, PHA can only be implemented temporarily. In contrast to road pricing which (even when using relatively expensive systems to collect the charge) raises net revenues, PHA results in net costs due to the payment of the rewards. It is uncertain whether there would be sufficient financiers to accommodate a (more) permanent implementation. This study shows that, at least from employers, no significant contributions can be expected. What complicates the matter of a more permanent implementation is that PHA requires information about the participants' reference behaviour to determine the amount of subsidy that a participant receives. For PHA projects which last longer, it becomes more likely that this reference behaviour is no longer correct, e.g. due to changes in either working patterns or origin/destination of the trips. If these changes are not included in the calculations, participants will receive an undeserved or insufficient amount of subsidy. Secondly, PHA raises a specific equity issue. Although participating in PHA is voluntary, people who have already chosen alternatives or have no alternatives are not eligible to become a PHA participant (Ben-Elia and Ettema, 2009).

3.2.2 The role of employers in Peak Hour Avoidance

Employers are an important stakeholder in PHA (Spitsmijden Group, 2009b). Reasons why employers are interested in PHA is because they expect it reduces congestion, thus keeping their region accessible, and because the flexible work arrangements required to facilitate PHA may contribute to attracting and retaining employees (Ben-Elia and Ettema, 2009). The involvement of employers in the PHA projects has been rather limited (Spitsmijden Group, 2009a). Several new PHA projects intent to change this and are involving employers in the region to recruit participants, to promote PHA by providing alternatives to single occupancy car driving during peak hours to their employees and encouraging them to use these alternatives (e.g. Spitsmijden Haaglanden, 2011, Spitsmijden Brabant, 2011).

Employers can support PHA through providing and encouraging employees to make use of work-related alternatives such as teleworking, working at another location and driving outside peak hours. These alternatives require flexible working hours or places or a combination of both. Both PHA participants and non-participants have indicated the importance of flexible working schedules. The probability of participation in PHA is greater when an employee's weekly working schedule is more flexible (Ben-Elia and Ettema, 2009). Of the local residents who did not participate and were unwilling to participate in the first PHA trial 65% mentioned

work-time restrictions as the reason for not participating (Ben-Elia and Ettema, 2009). In the second PHA project restrictions relating to working hours were also the most frequently cited reason for non-participation (39%) (Spitsmijden Group, 2009b). Besides the flexibility offered by employers, employees also face employee-imposed constraints such as fixed appointments and work times of colleagues (Emmerink and van Beek, 1997). Almost 65% of the participants in the first PHA traial had to make special arrangements at work in order to be able to participate. This concerned arrangements with the employer about working times or teleworking and arrangements with colleagues about working times (Spitsmijden Group, 2007a). Furthermore, 13% of the participants mentioned work-related requirements as the reason for not avoiding (or less frequently avoiding) peak hours (Knockaert et al., 2007) and 40% indicated that arrangements with the employer were facilitating their behavioural change (Ben-Elia and Ettema, 2011). The importance of flexible working hours is also illustrated by the fact that the preferred alternative of the PHA participants in the first trial was to drive before or after the peak hours instead of during peak hours (see Table 3.1).

In addition, employers can support PHA by providing their employees with carpooling or alternative modes of transport (see Table 3.1 for examples) or encouraging them to use these alternatives through information and financial incentives. In this study employer support is defined as the organisations' willingness to support PHA through (a combination of) flexibility in working times, working places and mode choice for commuting trips. These options provide employees with the opportunity to participate in PHA.

3.2.3 A conceptual model of employer support for PHA

Employers support mobility management measures for a variety of reasons. Gerwig (1996), as cited in Meyer (1999), Shoup (1997), Roby (2010), Van Malderen et al. (2012), Vanoutrive et al. (2012) mentions the following reasons: (supposed) legal requirements, business growth, cost reductions or revenues through commuting costs, office space, access infrastructure for new developments, productivity, extended hours of service, link to core business, company image, leading by example, recruitment and retention, demands from the workforce, health benefits for employees, Corporate Social Responsibility, environmental concerns, improved regional mobility, enhanced customer access and less car parking and congestion.

To the authors' knowledge there is no conceptual model for the factors that affect employers' attitudes to mobility management measures, let alone PHA. In this section a first conjecture of a conceptual model on employer support for PHA is proposed which consists of the hypotheses that will be tested in this study. The selection of factors and the hypotheses for the relations between these factors is primarily based on the mobility management and transport literature. All hypothesised relations between the variables included in our conceptual model can be found in the appendix. Below only the eight most important factors and relations are discussed.

Generally smaller organisations are less interested in mobility management (Coleman, 2000). It is hypothesised in our conceptual model, firstly, that the larger the size of the organisation, the greater the willingness to support PHA will be, as larger organisations usually have more HR staff members and can therefore create the conditions, such as flexible working times and places, to allow employees to participate in PHA more easily.

The support of mobility management can differ between sectors depending on the type of the workforce (Vanoutrive et al., 2012, Van Malderen et al., 2012). As a second factor in our

model, it is assumed that organisations in sectors in which employees have very flexible working times and places are able to support PHA more easily and will therefore be more willing to do so. Financial institutions and business services are sectors that are assumed to have more flexible working conditions. In addition (semi) public sector employers are expected to be more willing to support PHA because they might feel obliged to lead by example (Roby, 2010).

Thirdly, accessibility is probably an important factor (Rye, 1999a, Vanoutrive et al., 2010) and is therefore included in our conceptual model. One of the reasons why employers implement mobility management measures are parking problems or traffic congestion (Roby, 2010, Rye, 1999a). These problems might also make employers feel more responsible for influencing commuting behaviour. However, several studies did not find a link between accessibility problems and measures taken by employers (Van Malderen et al., 2012, Vanoutrive et al., 2010, Vanoutrive et al., 2012). Another factor is the workplace characteristics in terms of accessibility by public transport and car. These factors determine which alternatives for peak hour driving are available (Vanoutrive et al., 2010). Workplace location affects which modes are most suitable for employers to promote (Van Malderen et al., 2012). High public transport accessibility offers PHA participants with an alternative for not driving in peak hours and could therefore contribute to the organisation's support for PHA. However, for PHA driving before and after peak hour is the most chosen alternative (see Table 3.1). Preconditions for this alternative is that employees have flexible working conditions. Hence, our model anticipates that employers with a high car accessibility and flexible working conditions are most able to support their employees in peak hour avoidance. Furthermore, high car accessibility is expected to be accompanied by higher levels of car commuting amongst employees, increasing the likeliness that employees can participate in PHA and therefore that the employers at these locations will be the most willing to support PHA.

In this study several indicators are included to test the influence of accessibility on the organisation's willingness to support PHA. The ABDCR indicator, a combined indicator of public transport and car accessibility of work locations in the Netherlands, is included. A indicates high car and public transport accessibility, B high car and good public transport accessibility, D good car and public transport accessibility, C good car accessibility and R other (see Hilbers et al. (2006) appendix 2 for details). Besides this combined indicator are two simpler indicators, being the 'distance to the nearest highway entry/exit' and the 'distance to the nearest train station' were tested.

In 1999 17% of Dutch companies had implemented mobility management measures (Rye, 2002). Van Malderen et al. (2012) found that Belgium companies between 2005 and 2008 on average increased the number of implemented measures. Therefore, as a fourth factor, it is expected in our conceptual model that employers who already have mobility management measures implemented are more willing to support PHA.

Fifthly, a factor included in the conceptual model which also might explain why organisations are willing to support PHA could be because it suits their Corporate Social Responsibility (CSR) (Roby, 2010), their "voluntary firm endeavours which benefit society" (Sprinkle and Maines, 2010:446). Taking CSR by supporting PHA can be beneficial for the organisation's image and positively contribute to the environment (Spitsmijden Brabant, 2011, Spitsmijden Haaglanden, 2011). Moreover CSR can contribute to attracting the most qualified employees (Albinger and Freeman, 2000). In this study CSR is operationalized in how responsible an organisation feels itself to be in influencing the commuting behaviour of employees,

specifically the number of peak hour trips. This factor is expected to positively influence the HR manager's attitude and the organisation's support for PHA.

Work schedules also have an important impact on travel behaviour of employees (Vanoutrive et al., 2010, Vanoutrive et al., 2012). Therefore, the flexibility of working times as a sixth factor, and the flexibility of working places as seventh factor, are included in the model because they determine whether it is possible in terms of work-related options for employees to avoid peak hour driving. It is expected that these working times and places are less strict in larger firms organisations and in flexible sectors. The more flexible the organisation's working times and places, the higher the support for PHA will be.

Finally and eighth, the HR manager is assumed to be of key importance in an organisation's willingness to support PHA in the model (see also section 3.3). The more positive the HR manager's personal attitude is, the more likely it is that (s)he will convince the other members of the management team to support PHA. The conceptual model therefore includes the hypothesis that organisations with flexible working practices might have HR managers who are more positive towards PHA and that those organisations will be more willing to support PHA. The reason is that generally employers prefer to support measures with low costs or that require little effort (Rye, 1999a, Vanoutrive et al., 2010, Vanoutrive et al., 2012). The effort required to ensure employees can participate in PHA depends on how flexible the working practices already are and how much effort would be required to implement a more flexible working practice. As most other mobility management measures also benefit from flexible working practices, it is possible that organisations that already support other mobility management measures offer more flexibility. If flexible working practices are already present, supporting PHA requires little additional effort.

3.3 Data and method

3.3.1 Structural Equation Modelling (SEM)

Structural Equation Modelling (SEM) was chosen as the method to explore the factors affecting employers' attitudes towards PHA. SEM is a suitable technique to verify a complex conceptual model consisting of multiple exogenous and endogenous variables (Golob, 2003) and is being increasingly applied in the field of transport (e.g. Bamberg et al., 2011, Molin and Brookhuis, 2007, Shiftan et al., 2008). SEM has been used for a path analysis in order to test hypothesised interrelationships between constructs (Weston and Gore, 2006). A path model includes covariances, direct and indirect effects and is composed from a series of linked regression equations with each equation representing a path being a (causal) relationship between two variables (Bollen, 1989). SEM distinguishes direct and indirect relations and estimates each single effect which gives insight into the composition of the total effect. For each path the path coefficient is calculated which demonstrates the strength of the relationship (Weston and Gore, 2006). The indirect effects cannot be modelled simultaneously in simpler analysis techniques such as regression analysis. Using simpler techniques could result in ignoring these indirect relationships and oversimplifying the conclusions. Hence, a major advantage of SEM is its ability to test more complex relations between factors (Golob, 2003). The fit indices for the complete model give an indication of how well our hypothesised theory conceptual model matches with the collected data.

However, both the application and interpretation of the results of a SEM analysis should be treated with caution. There is no general consensus on which model fit indicator and values of

these indicators are representing an acceptable overall model fit. The Chi-square value is an indicator for the model fit and compares the observed with the estimated correlation matrix and should not be significant. If this is not the case, the model fit indices can be examined and the overall model fit might be improved by adding paths. However, SEM confirms or disaffirms specified relations so modifying the SEM model should be based on plausible theoretical assumptions.

3.3.2 Measurements

The data for this study were collected by means of a self-explanatory web-based questionnaire. Several open questions were included because PHA is a new measure and new arguments regarding the support for mobility management might have emerged. The questionnaires from the study of employer attitudes towards employer transport plans by Rye (1999a) and the insights from a semi-structured face-to-face interview with a transport management association (VCCR, 2009) were used as inspiration for drafting the questionnaire. The draft questionnaire was tested by several test respondents, including two Human Resource (HR) advisors. Their comments and feedback were incorporated into the final version of the questionnaire. The suggestions largely concerned the wording of individual questions and the general lay-out of the questionnaire. The appendix lists the items enclosed in the questionnaire and indicates for which items open or closed questions were formulated. The questionnaire included items on PHA, mobility management and current working practices.

3.3.3 Sampling

As especially web questionnaires seem vulnerable to a sampling bias (Bonsall and Shires, 2009), special attention was paid to this. The selection of employers was based on location and size. Employers in the province of South Holland were selected in order to include organisations with employees who have and who have not had the opportunity to participate in PHA. Only large employers with more than 100 employees were selected. Coleman (2000) concludes, based on a study of the attitudes of small employers towards green commuter plans, that a focus on large employers is the best way forward given the low priority this topic gets from smaller employers. Also other empirical studies on mobility management focus on employers with more than 100 employees (e.g. Rye, 1999a; Vanoutrive et al., 2010). The Netherlands Chamber of Commerce trade register contained 947 employers from all private sectors that matched our criteria. It was supplemented with a number of contacts, including public sector employers, from the Peak Hour Avoidance project team.

Providing employees with alternatives for driving in peak hours is related to the HR policy, including flexible working practices and contributing to employees' commuting costs. As the HR department is primarily involved in flexible working practices (Roby, 2010), HR managers are considered to be the primary decision maker on PHA and best capable of capturing an organisation's current practices and viewpoints. The names and email addresses of the majority of HR managers and directors were collected by telephone. This enabled us to carefully target the questionnaire by using personalised emails. In July 2009, 562 personalised e-mails and 101 e-mails addressed to the HR departments (to companies from whom no name or personal e-mail address was received) were sent with the link to the web-based questionnaire. Non-respondents were sent another e-mail two weeks after the first invitation was sent.

3.3.4 Sample description

In total 141 respondents participated in this study, a response rate of 21%. This level of response rate is reasonable for an unsolicited web questionnaire (which was lengthy and distributed during summer holidays) and similar to the response rates in the studies on employers by Coleman (2000) (19%) and Rye (1999a) (15%) and high compared to the response rate of Bonsall and Shires (2009) (≤1%). The sample is likely to reflect the self-selection of employers who generally are more interested or find the subject more relevant than the employers who did not respond. In fact, several HR managers explained that they did not fill in or complete the questionnaire because they felt it was not applicable to them due to a lack of flexibility in their business activity. Our effort to personalise the invitation email helped to increase the response. The group of respondents who had received personalised emails showed a significantly higher response (Pearson Chi –Square 7.6, Sig. 0.006) and completed more questionnaire items (Kruskal-Wallis Chi –Square 7.4, Sig 0.007) than those who had been approached by emails addressed just to the HR department. In total 37 questionnaires with missing data were excluded from the analysis. It was assumed that the missing data was mainly due to the length of the questionnaire (completing took up to 20 minutes) and because the last part of questionnaire included questions on reasons for supporting PHA which were, for many employers, hypothetical and probably less interesting to answer. In total 103 fully completed questionnaires were included in our data analysis.

Most respondents were HR directors or managers (60%) and HR assistants (30%). The other respondents were general managers (7%) or had other positions (3%). Our sample includes all sectors but is not representative of employers in South Holland with more than 100 employees. The construction, transport and communication, financial services and business services sectors are slightly over-represented. Under-represented sectors include public administration and social security, education, healthcare and public welfare. Most respondents (68%) estimated the average employee commuting distance to be between 10 and 30 kilometres, which is consistent with the average commuting distance of 17 kilometres measured in the Netherlands in 2009 (KiM, 2011). On average, respondents estimated that 21% of their employees' commuting trips were made by public transport, and 62% were made by car. Although not asked explicitly, it is likely that the most dominant mode for the rest of the trips is cycling. In 2009 50% of the commuters in South-Holland used the car, 12% public transport and 26% cycled (Rijkswaterstaat, 2010).

3.4 Results

3.4.1 PHA, mobility management and current working practices

This section briefly presents the descriptive statistics from the questionnaire. About 35% of the respondents stated that they were not well acquainted with PHA. After providing all respondents with basic information about PHA, 51% expressed (very) positive personal opinions regarding the concept of PHA (32% were neutral and 18% were (very) negative). About 60% of the respondents who reported (very) positive attitudes towards PHA were also personally (very) willing to engage in the active promotion of PHA in their own organisations. Reasons for having a positive attitude towards PHA included the measure's contribution to reducing traffic congestion and the potential benefits it offers to employees. The primary reason for a negative attitude towards PHA was the inability to support PHA due to the business activities. Other reasons for having a negative attitude included a preference for measures other than those based on subsidies (PHA) and doubts about the measure's effectiveness.

Slightly more than one third (34%) of the respondents perceived their organisations as willing to support PHA by offering flexible working times or places (20% neutral, 46% (definitely) not willing to support PHA). Employers were asked (regardless of whether they were (un)willing to support PHA), to indicate how important they considered four specified reasons to – now or in the future – support PHA. The most important reason was that PHA was in line with the organisation's (corporate social responsibility) policy (indicated by 60% of the respondents as (very) important). The other reasons (costs savings, already flexible so support is hardly any additional effort, mobility problems such as local accessibility, parking problems or general congestion problems) were each considered important by half as many respondents. A further step in the commitment of employers to support PHA is their willingness to pay or contribute to the PHA subsidy. Of the respondents that answered this question (n=56) 20% thought their organisations would probably be willing to contribute to paying the PHA subsidy.

The majority of employers (83%) indicated that they already had mobility management measures in place. Table 3.2 lists the most important reasons for implementing or not having implemented mobility management measures. Nearly half (45%) of the respondents were of the opinion that employers are responsible for influencing the commuting trips of their employees.

Table 3.2 Reasons for having implemented and for not having implemented mobility management measures

Reasons for having mobility management measures (n=84, 83%)	Reasons for not having mobility management measures (n=19, 17%)
• Benefits to employees (satisfaction, health, work-life balance) (n=48)	• Not possible due to the nature of the business activities (which makes flexible working times and places impossible) (n=12)
• Benefits to employer (n=45) Costs Attractiveness to employer Local problems (lack of parking/ office space, reduced accessibility)	• No priority (n=4) • Other (n=3)
• Benefits to society (n=26) Less congestion/ improved accessibility Improvement environment Corporate social responsibility	
• Other (n=11)	

The vast majority (94%) of the responding employers contribute to the travel costs of their employees, and only 6% have no arrangements. Half of the employers indicated that their working times were not (very) strict. The strictness of working times varied greatly among the respondents' organisations. Respondents have more flexible working times compared to having flexible working places, with 62% of the respondents indicating that their working places are considered (very) strict. A quarter of the respondents answered that their working places are not strict. The experiences of employers with flexible working times and places and mobility management measures varied from no experience to having had experience for several decades. For 64% of the respondents, the average working day in their organisations starts between 8:00 and 9:00 am and ends between 5:00 and 6:00 pm.

3.4.2 Estimation procedure and model fit

The initial recursive model was estimated following the relations specified in the appendix. The path analysis was conducted with Amos 18 using the maximum likelihood method as this is the standard method for estimating free parameters in structural equations models. Path coefficients that were not statistically significant at the 90% reliability level were fixed to zero. As the path between strictness of working place and organisation's willingness to support PHA was insignificant, this variable was excluded from the model. Accessibility was also removed from the model because the accessibility indicators also proved insignificant. This could be explained by the regional bias in the sample. All organisations are located in South-Holland and the public transport and car accessibility of organisations included in this sample is probably more homogeneous than when organisations from the entire country were included. As PHA participants prefer driving before and after peak hours to using public transport this could explain why using the public transport accessibility indicator did not result in significant effects. Some paths turned out to be significant at the 90% reliability level. The final SEM model, as illustrated in Figure 3.1, has a satisfactory model fit ($\chi 2(2)$, p=0.505; RMSEA=0.000; CFI=1.000).

3.4.3 Direct and indirect effects

Figure 3.1 presents the estimated path model. The estimated standardised effects are included which gives an indication of the magnitude of the effect of an independent variable on a dependent variable, when controlling for all other variables in the model. It was found that almost all estimated paths were in the expected direction and the relations, as discussed below, seem plausible.

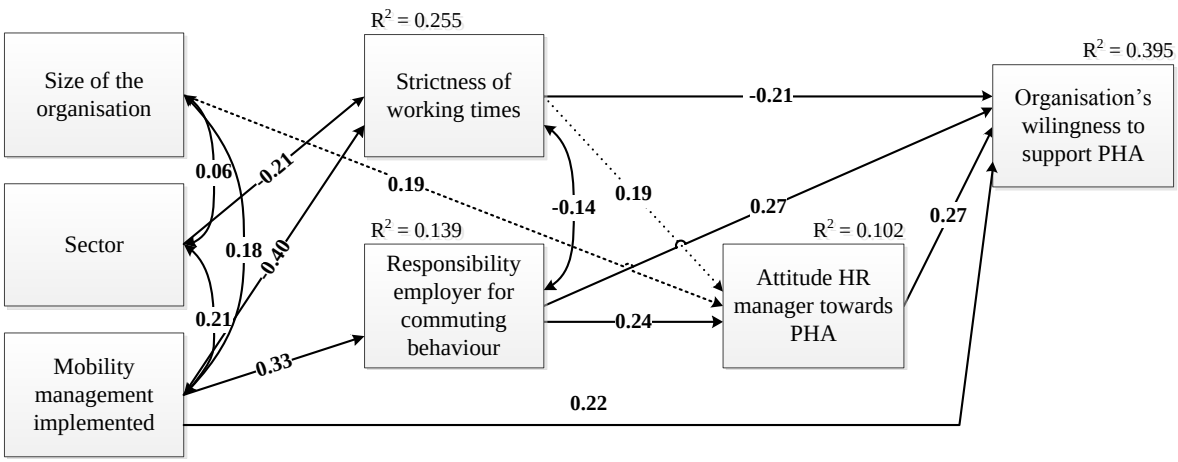

Figure 3.1 Path diagram of the estimated structural model - Dotted arrow indicates a significant effect at the 0.1 level

Sectors hypothesised as being flexible have less strict working times (a direct effect of -0.21). Also employers who have already implemented mobility management measures have less strict working times (-0.40). Furthermore, having implemented mobility management also positively affects the employer responsibility for commuting behaviour (0.33). The attitude of the HR manager towards PHA is directly influenced by the size of the organisation (0.19), the strictness of working times (0.19) and more strongly by the extent to which the employer feels responsible for influencing the commuting behaviour of employees (0.24). The sign of the relationship between strictness of working times and the HR manager's attitude is not in the anticipated direction. This result cannot be explained. As it concerns a relation that is less

significant (p- value 0.077) than other relations in our model, it is considered less important. The organisation's willingness to support PHA is directly influenced by the strictness of working times (-0.21), the extent to which the employer feels responsible for influencing the commuting behaviour of their employees (0.27), the attitude of the HR manager towards PHA (0.27) and whether an employer has already implemented mobility management measures (0.22). Organisations with more flexible working times, who feel more responsible for influencing the commuting behaviour of their employees, with HR managers who have a positive attitude towards PHA and who have already implemented other mobility management measures are more likely to support PHA. The responsibility for commuting behaviour has a positive indirect effect on the organisation's willingness to support PHA of 0.64, strictness of working times of 0.052 and implementation of mobility management of 0.18. Remarkable is that two exogenous variables – size and sector – only have an indirect effect on the organisation's willingness to support PHA. The indirect effect of size through the attitude of the HR manager is 0.063 and of sector through the strictness of working times is 0.087. Generally more support for PHA was expected from larger organisations. As the total effect of organisation size is small (0.06) compared to the total effect of having implemented mobility management (0.40), the responsibility for commuting behaviour (0.33) and the attitude of the HR manager (0.27), the strictness of working times (-0.16), and the sector (0.12), involving only large organisations seems no guarantee for the successful involvement of employers in PHA. Moreover, as the most important factors require employer information that is much less easy to obtain than organisation size and sector, identifying employers willing to support PHA ex ante will be challenging and a more general strategy for employer involvement might be more practical.

3.5 Conclusions and discussion

3.5.1 Employer attitudes to PHA

This paper investigated the attitudes of Dutch employers towards PHA. It was found that there is a large variation in employer attitudes to PHA. Slightly more than one third (34%) of the respondents perceived that their organisations would be willing to support PHA by offering flexible working times or places. When exploring the factors that influence this willingness to support PHA, it was found that organisation size only has an indirect effect through the attitude of the HR manager. Sector has an indirect effect through the strictness of working times. The highest willingness to support PHA was found among organisations with flexible working times, and from organisations known to feel responsible for influencing their employees' commuting behaviour. Moreover the HR managers of these organisations are more likely to have a positive attitude towards PHA which also makes it more likely that the organisation will support PHA.

Employers are an important stakeholder in PHA. This study found that almost half of respondents (45%) feel that the employer is responsible for influencing the commuting behaviour of their employees. It is as yet uncertain how much effort these employers are willing to invest to translate their responsibility into concrete actions.

Based on these conclusions, our recommendation is to encourage employers to take up this responsibility. Many employers were not well acquainted with PHA, implying that promotion of this measure among HR managers seems appropriate. Our recommendation is to focus the marketing on the benefits of PHA for the employees, the society and the employers. Focussing also on the benefits for employers – such as the potential cost savings in expenses on commuting costs (see Martens and Zuiver ((2005) for an example) or the effects of being

an attractive employer – is particularly important as these employer benefits were not acknowledged by our respondents. Furthermore, best practices can illustrate how PHA can contribute to an organisation's (corporate social responsibility) policy, as this turned out to be a very important factor. Furthermore it would be helpful to reduce HR managers' doubts about the measures' effectiveness. Although half of the respondents already expressed positive personal opinions regarding the concept of PHA further promotion might convince even more HR managers.

3.5.2 The role of employers in PHA

The largest contribution that employers can be expected to make to PHA is offering employees a range of alternatives for single occupancy car driving. Contrary to many other mobility management measures, PHA is not solely aimed at a modal shift. From all the alternatives that an employer can offer and promote, PHA benefits most from employers encouraging flexible working times. Many employers indicated that they already support flexible working times and, to a lesser extent, flexible working places. Incentives (e.g. information, subsidies) could therefore be used to encourage many more commuters to use these alternatives than are currently doing so. Hence, a general policy aimed at achieving more flexible working times might be a viable supporting policy to enhance employer support of PHA. There is a small opportunity that some employers might even be willing to contribute to paying the PHA subsidy for a certain period. A less demanding opportunity, however, viable in countries where travel allowances are common, is to use existing travel allowances to encourage alternatives for peak hour driving among employees. As 94% of Dutch employers already contribute to their employees' travel expenses, there seems to be room to use these contributions in a more flexible way to support PHA.

3.5.3 Limitations of the study

This explorative study into employer attitudes to PHA has several limitations. The conclusions cannot simply be transferred to all employers because the relatively limited number of respondents included in the sample are not representative of all employers. It is expected that Dutch employers are more willing to implement mobility management measures than employers in other countries due to contextual differences. Positively contributing to the willingness of Dutch employers to implement mobility management measures are their ample experience with mobility management measures, their tradition of contributing to employees' commuting costs, the government funds that have been available throughout the years for mobility management initiatives (Rye, 1999a; Vanoutrive et al., 2010) and because commuting costs can be partially deducted from taxes (Potter et al., 2006). It is expected that this more than offsets the absence of legal incentives in the Netherlands (in contrast to other countries, see Rye et al. (2011)). Several other drawbacks also need to be taken into account. First, the sample is likely to reflect the self-selection of employers who are generally more interested or find the subject more relevant than the employers who did not respond. Second, our sample included large employers (> 100 employees) only. It was expected that smaller employers are less willing to support PHA as they generally have less interest in mobility management (Coleman, 2000) and fewer options for providing alternatives to their employees (Rye, 1999a; VCCR, 2009). Third, the employers included in our study are located in South-Holland, part of the urban Randstad region, which has different accessibility characteristics than less urbanized regions (KiM, 2011), which might affect employer attitudes. As some sectors were slightly overrepresented and others underrepresented in our sample it is difficult to indicate the implications of that. The limited number of respondents made it impossible to distinguish subgroups (e.g. based on sector) within our sample or make comparisons between

or within the subgroups. Lastly there is the issue of how to capture the organisation's attitude through one respondent that fills in the questionnaire on behalf of the organisation (Lyons et al., 2009). The HR managers' estimations of the organisation's attitude is not necessarily an accurate reflection. However, in our view the HR manager is for PHA best capable of estimating the organisation's viewpoint. In fact, one of the merits of this study is that the questionnaire was carefully targeted at the HR department and by using personalised emails most of the data was collected among high level managers and directors. Not included in this study, but interesting directions for further research, is the importance of the relationship between the employer and employee (Brewer and Hensher, 2000), the socio-economic status of the workforce and the organisational culture (Rye, 1999c). Overall the respondents are expected to be more positive towards PHA and mobility management than the average employer. Hence, the results reflect the uppermost positive boundary and the results for all employers are likely to be less optimistic. Despite these limitations, a number of interesting conclusions are derived from this first study on employer attitudes towards Peak Hour Avoidance.

This study had an explorative nature and because PHA is a new measure which has been studied only to a limited extent, the conjecture of our conceptual model should be seen as a first attempt for which alternative specifications might very well be possible too. Furthermore, when a relation is confirmed it only means that this relation is plausible. Hence, the results of this SEM as part of the explorative study should be carefully interpreted. Especially with a complex model that cannot be based on firm hypothesis, further testing and validating is always necessary.

3.5.4 PHA as a policy tool

PHA has already proved its value in practice as a temporarily implemented policy instrument. Rewards are effective in changing the behaviour of participants (Spitsmijden Group, 2009b) and when implemented temporarily during road constructions works it can have a positive cost benefit ratio (Rienstra, 2009). To determine the cost effectiveness of PHA for wider applications more research into the traffic effects of PHA is recommended. PHA has no incentives to suppress induced demand. Although Bliemer et al. (2009) showed that in two cases (both bridges) PHA has significantly contributed to a reduction of traffic sufficient to compensate for the induced demand, this might not be true for other locations where induced demand might be larger or the reduction of peak hour trips is more dispersed over the network. In addition, further research is needed to determine the lasting effects of PHA.

Policy makers considering implementing PHA should avoid conflicting financial incentives. For example in the Netherlands it is possible to deduct costs of commuting from taxes (KiM, 2011) which encourages car driving and living further away and this conflicts with the aim of PHA to reduce car driving. The same recommendation applies to employers. For example many employers provide free parking or a company car which may contribute to being an attractive employer but make it harder for employees to choose alternatives to car driving (O'Fallon et al., 2004, Vanoutrive et al., 2010, Vanoutrive et al., 2012). This is counterproductive when simultaneously having policies aimed at less car driving (in peak hours).

This research has shown that there are employers who have a positive attitude towards PHA and are willing to support PHA. More importantly, the PHA initiatives have contributed to the wider discussion on the responsibility of employers in influencing the commuting behaviour of employees and on flexible working conditions in the Netherlands. The largest contribution

to PHA that can be expected from employers is providing employees with flexible working times and encouraging employees to fully utilise this option as an alternative for driving in peak hours. This would not only be beneficial for PHA but for a wide range of mobility management initiatives as well.

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Appendix Variables

Variables: The variables in brackets are included in the conceptual model and the hypothesized relations were tested. Only the significant relations are included in Figure 3.1 - = relation ~ = correlation	**Type of question:**	**Assumed relations between variables:**
General questions		
Check: is respondent the right contact person	Closed	
Position	Open	
Location to check if located in South-Holland	Open	
Organisation size: total number of employees (all branches) (**A**)	Open	A-EFGHI, ~ B,C
Sector: flexible sectors are assumed to be financial institutions, business services and public administration and social security (**B**)	Closed	B-EFI ~ A,C
Average percentage commuting trips of all employees by public transport	Open	
Average percentage commuting trips of all employees by car	Open	
Average commuting distance employees	Closed	
Mobility management		
Implementation of mobility management measures (examples included in question) (**C**)	Closed	C-EFGHI
Reason for implementing mobility management measures	Open	
Reason for not implementing mobility management measures	Open	
Start implementation mobility management	Open	
Responsibility of the employer for influencing the commuting behaviour of their employees (**G**)	Closed (likert scale)	G-HI, ~ E,F
Attitudes towards PHA		
Familiarity with PHA	Closed (likert scale)	
Personal attitude PHA (**H**)	Closed (likert scale)	H-I
Reason for personal attitude PHA	Open	
Organisation's willingness to support PHA through a (combination of) flexibility in working times, working places and mode choice (**I**)	Closed (likert scale)	-
Organisation's willingness to contribute to the PHA subsidy	Closed (likert scale)	
Participating employees in PHA	Open	
Potential share of employees that could participate in PHA on the A12	Open	
Willingness to personally promote PHA in own organisation	Closed (likert scale)	
Reasons to support PHA. Are the following reasons important to include in the decision on supporting PHA?		
Cost saving	Closed (likert scale)	
Organisation’s (corporate social responsibility) policy	Closed (likert scale)	
Already flexible, so support is hardly any additional effort	Closed (likert scale)	
Mobility problems such as local accessibility, parking problems or the general congestion problem	Closed (likert scale)	
Open category	Open	
Working practices		
Travel allowance	Closed	
Normal start time workday	Open	
Normal end time workday	Open	
Strictness of working times (**E**)	Closed (likert scale)	E-HI, ~ F,G
Strictness of working place (**F**)	Closed (likert scale)	F-HI, ~ E,G
Start implementation flexible working times and places	Open	
Accessibility (**D**)	Not included in the questionnaire	D-EFGHI

4. Policy implementation lessons from six road pricing cases

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4.1 Introduction

Since the introduction of road pricing in the literature (Knight, 1924; Pigou, 1920), it has been generally accepted among transport planners and economists that this is a potentially effective measure to reduce externalities, in particular traffic congestion (Anas and Lindsey, 2011; King et al., 2007). Many papers discuss the relation between the characteristics of road pricing schemes and the welfare effects (e.g. Arnott and Small, 1994; Eliasson et al., 2009; Hau, 1990; Li and Hensher, 2012; Santos et al., 2010; Santos and Shaffer, 2004; Small and Verhoef, 2007). Despite the available knowledge and the empirical evidence that road pricing does not always have to be a "technical, political or financial impossibility" (Ison and Rye, 2005:464), implementation has been limited (Santos et al., 2010). The literature that discusses the challenges of policy implementation includes papers that do not focus on road pricing or choose a normative approach (e.g. King et al., 2007; May, 2013). The number of papers which discuss the implementation of road pricing is much smaller and most focus on specific implementation factors such as public acceptability and equity (e.g. Altshuler, 2010; Gaunt et al., 2007; Schuitema et al., 2010; Viegas, 2001) or discuss the implementation factors for a single case (e.g. Banister, 2004; Langmyhr and Sager, 1997; Rye et al., 2008). Few papers discuss both implemented and not implemented cases. The three papers that discuss most cases, each discussing implementation factors for five cases, are, Albalate and Bel (2009), Anas and Lindsey (2011) and Buchanan and Buchanan (2007). However, the first two papers

only include a more detailed account of implementation factors for two cases and the third paper discusses none of the cases in detail.

To the authors' knowledge there is no paper that systematically identifies and compares detailed sets of implementation factors that have affected the policy implementation process of empirical road pricing cases. By means of a content analysis of 106 scientific papers, this paper aims to fill this gap. More specifically, implementation factors that stand out most in six road pricing cases are discussed and policy implementation lessons are formulated to aid local and national authorities considering the implementation of road pricing.

In line with Jones and Hervik (1992), we use the definition of road pricing as 'policies that impose direct charges on road use', regardless of the set of objectives or the targeted groups of road users . All the factors that have affected the course of events during the policy formulation, decision-making and implementation process are considered. This process starts with the outline of a particular road pricing measure and the intention of the responsible governmental institution to implement the policy and ends with either implementation of the policy (extensions or scheme modifications are also included) or a decision to terminate the process (before real world implementation). In this paper this process is referred to as the policy implementation process. The selection of cases, explained in the next section, consists of the implemented cases Singapore, London, Stockholm and the Norwegian cities and the not implemented cases Hong Kong and Edinburgh.

The remainder of this paper is organized as follows. Section 2 discusses the methodology. Section 3 presents the results, followed by section 4 which discusses the findings, the main conclusions and recommendations.

4.2 Methodology

4.2.1 Selection of cases and papers

Lessons regarding road pricing implementation can be learned from both implemented and not implemented cases (Van Wee, 2009). Hence, including both types of cases was our first case selection criterion. The second criterion was that the cases were well-documented with regard to policy implementation[4] in order to obtain a detailed picture of each case. The last criterion was that the cases had a delineated policy process covering a consecutive time period and focused on a specific road pricing measure for a defined geographical area.

Following these three criteria, our selection consisted of Singapore, London, Stockholm and the Norwegian cities as implemented road pricing cases and Hong Kong and Edinburgh as cases where the implementation of road pricing ultimately did not take place. The Area Licensing Scheme (ALS) and Electronic Road Pricing (ERP) in the Singapore case were combined because ERP was introduced to overcome several shortcomings of the ALS (Goh, 2002) and thus naturally evolved from the ALS. The most challenging case selection choice concerned road pricing in Norway. The choice was made to consider all the road pricing implementations in Norwegian cities together as one case due to the many similarities – they all concerned toll financing projects (Larsen, 1995), the projects followed the same decision-making process (Odeck and Bråthen, 2002) and the national government played an important

[4] Papers that discuss factors that could potentially affect implementation, such as a cost-benefit analysis or effects on traffic congestion, without relating these factors to policy implementation are beyond the scope of this research.

role by providing the required approval for the initiatives and supplementing them with national grants (Ramjerdi et al., 2004). In addition, many of the reviewed papers do not distinguish between the individual road pricing projects (e.g. Osland and Leiren, 2007; Ramjerdi et al., 2004). We excluded well-known road pricing cases such as the high-occupancy toll lanes in the USA (e.g. in Orange County, San Diego, Houston, Minneapolis, Denver, Salt Lake City, Seattle and Miami), the congestion charging scheme in Milan, the tolling in Sydney, the implementation attempts in the Netherlands and New York, previous initiatives in London and Stockholm and the nationwide truck tolling schemes in Europe (e.g. Germany, Austria and Switzerland) because the number of papers discussing the implementation factors for these cases[5] is limited and therefore the second selection criterion is not met.

Three databases were used to search for the papers: Scopus, ScienceDirect and Google Scholar. For each case similar search strings were used including the location of the case (e.g. London) and the label of the scheme (e.g. congestion charging). A snowball method was used to select additional papers. This resulted in a selection of 106 journal papers, conference papers and book chapters. If a conference paper or book chapter contained similar information to a journal article, only the journal article was included. The references per case are included in appendix A, where a distinction is made between papers discussing one case and papers discussing multiple cases. Table 4.1 gives a summary of the selected cases with key references for more information on the details of the road pricing schemes and their effects.

[5] For example, the number of papers discussing implementation factors for a single HOT lane case does not exceed four.

Table 4.1 Summary of selected cases

	Singapore	**London**	**Stockholm**	**Norway**	**Edinburgh**	**Hong Kong**
Label	Area Licensing Scheme (ALS) Electronic Road Pricing (ERP)	London congestion charging scheme (LCCS)	Stockholm congestion charge (SCC)	Urban road tolling *	Edinburgh's Congestion Charging Scheme (ECCS)	Electronic Road Pricing System (ERPS)
Brief description	ALS is an area charge and ERP a cordon charge. Applies to restricted zone with the Central Business District as core area. ERP also includes several expressways.	LCCS is an area charge in Central London (8 square miles and 22 with western extension). Camera controlled, flat charge.	SCC is a cordon charge in the inner city (30 km^2 with 18 control points). Variable charge.	First European introduction of road pricing in Bergen. Most documented cases are Bergen, Oslo and Trondheim. All tolling systems.	Cordon charge with once-a-day charge for crossing one or both cordons in an inbound direction.	The first test of Electronic Road Pricing RP in a two year experiment. Use of automatic vehicle identification.
Important dates	ALS: June 1975 ERP: announced in 1989, implemented in September 1998 and extended in 1999	LCCS: February 2003 Western extension: 2007-2010	Trial: decision to hold a trial in 2002, trial duration from January 3 – July 31 2006 Reintroduction charges: 2007	Bergen: 1986 Oslo: 1990 Trondheim: 1991-2005	Announced in council plan in 1999, Referendum: February 2005	Announced in March 1983, to introduce ERPS in 1987 Trial: September 1983-June 1985
Key references	Foo, (2000); Phang and Toh, (2004); Yap, (2005)	Dix, (2002); Banister, (2003); Peirson and Vickerman, (2008); Santos et al., (2008)	Eliasson, (2008); Eliasson, (2009); Börjesson et al., (2012)	Langmyhr, (2001); Larsen, (1995); Ramjerdi et al., (2004)	Gaunt et al., (2007); Rye et al., (2008)	Pretty, (1988); Borins, (1988), Hau, (1990)

** The Norwegian cities for which implementation factors were found are: Oslo, Bergen, Trondheim, Kristiansand, Stavanger, Tønsberg, Standnes and Nord-Jæren.*

4.2.2 Content analysis

The methodology of this study comprised two steps: 1) the analysis of the 106 papers to identify and rank the most important generic and case specific implementation factors per case and 2) a factor analysis to determine which cases were most alike or divergent.

For the first step content analysis was used to systematically reduce the amount of data into content categories using coding rules (Stemler, 2001). The rigorous use of content analysis in transport research is rare, an exception to this being Mouter et al., (2013). In this paper the selected papers were analysed for observations, strings of text that refer to factors which affected the process of policy formulation, decision-making and the implementation process of real-world road pricing schemes. A content-based clustering of these observations into implementation factors was performed to enable a count to be made of how often an implementation factor was listed by all the reviewed papers. For example, all observations concerning the role of newspapers are clustered into the implementation factor media. Factors that are present in all six cases are referred to as generic factors and case specific factors are factors which are only present in one to five cases. A factor which contributes positively overall to the policy implementation process is referred to as a success factor and one which hampers the process a failure factor. When this is not clear, the factor is simply included as an implementation factor. A factor is counted twice if it is indicated as being both a success and a failure factor at different moments or from different perspectives in the implementation process. In addition to including decisive factors, the analysis attempted to reconstruct the more or less complete sequence of interrelated causes and effects affecting policy implementation, as for example illustrated by Hamilton (2011). The reviewed papers often also include general recommendations given to aid implementation. Only recommendations specifically related to the selected cases were included.

As a second step, a factor analysis was carried out to investigate whether clusters of cases (i.e. factors) could be found among the six cases (the variables in the factors analysis). A factor analysis in which the implementation factors were clustered into sets of implementation factors was not possible because the ratio of the number of observations (i.e. is the implementation factor present in the cases) to implementation factors (the variables in the factors analysis) was not acceptable. Instead, our factor analysis investigated whether clusters of similar cases can be found. If clusters of cases showed similarities and shared certain characteristics, it could be expected that a new road pricing case with similar characteristics would have most in common with that cluster and that therefore specific lessons learnt might apply instead of generic lessons based on all six cases. We had two a priori expectations of cases which might form a cluster – Singapore and Hong Kong due to similarities in their policy implementation process and secondly a cluster of the implemented cases and a separate cluster of the not implemented cases. To cluster the cases our matrix with scores on 61 implementation factors for six cases was rotated. Hence, we analysed how alike or divergent the 6 cases were by comparing the six sets of scores on 61 implementation factors (i.e. observations) for each case. As only six of the 61 implementation factors had scores for all six cases, the majority of implementation factors had one or more missing scores. The missing scores were treated as missing values in the factor analysis, because the reviewed papers did not make the (un)importance of these implementation factors for that specific case explicit. We therefore treated the missing scores as missing rather than assuming that these factors had no importance a t all for implementation. However, as a sensitivity analysis a factor analysis where the missing scores were treated as zero observations was also performed. Success factors were given a positive sign and failure factors a negative sign. An exploratory factor

analysis using principal component analysis was executed. Only factors with an eigenvalue greater than one were included (Hair et al., 2010).

4.2.3 Intercoder reliability test

As the reliability of the coding is of vital importance for determining which conclusions can be drawn from the content analysis, we assessed the intercoder reliability. This gives a measure of the extent to which independent judges make the same coding decisions when evaluating the characteristics of messages (Lombard et al., 2002:587). The intercoder reliability test focussed on the identification of the observations on implementation factors, labelling the identified factors as a success or failure factor, clustering similar factors and ranking the factors. General guidelines recommend recoding 10% of the complete sample (e.g. Lombard et al., 2004). To test whether it is valid to rank the most important implementation factors per case a stratified sample was selected. The case and the papers discussing this case were randomly selected. The sample consisted of eight papers on the London case (8% of all reviewed papers and 19% of the papers on London). In the intercoder reliability test the coding of the first author was compared with the coding of a second coder. The second coder was an independent researcher with experience with content analysis, active in the field of transport policy and without further involvement in this research. A coding protocol was drafted and the second coder was trained in using the coding protocol (see Mouter and Vonk Noordegraaf (2012) for more details).

The literature indicates that at least two coders should be involved (Krippendorff, 2004b). In this study the reliability was thoroughly tested. As this turned out to be time consuming and tests gave clear outcomes, there was no reason to involve an additional coder. Furthermore, as the results tended to saturate after 6 papers it was decided not to extend the sample. There are several widely used agreement indices, see for an overview Lombard et al. (2002). As there is no consensus on a “single “best” index” (Lombard et al., 2002:593) the selected indices are briefly discussed. For the first part the Holsti’s coefficient (Holsti, 1969) was selected. This coefficient is simple and transparent and, as the chance that a coder selects a factor accidently is considered negligible, using a more sophisticated coefficient was considered unnecessary. This coefficient is calculated by dividing the number of implementation factors identified by both coders with the sum of the number of implementation factors identified by coder one and the number of implementation factors identified by coder two. Hence, it accounts for situations in which the coders have identified different strings of text as implementation factors (Lombard et al., 2002). For the second and third parts the Krippendorff’s coefficient was selected because this coefficient can be used for many categories and it corrects for the fact that agreement on the labelling and clustering could result by chance (Krippendorff, 2011; Lombard et al., 2002). The Krippendorff’s coefficient compares the observed disagreement between coders with the “disagreement that can be expected when chance prevails.” (Krippendorff, 2004a:222). More information on how to calculate this coefficient can be found in Krippendorff (2004a, 2011). The last part is assessed by comparing the two coders’ rankings of the most frequently cited implementation factors. All coefficients were calculated manually. Although there is no agreement on what constitutes an acceptable level of agreement, 0.9 is generally acceptable, 0.8 in most situations and 0.7 is used in exploratory research (Neuendorf, 2002:145 in Lombart et al., 2002).

The results reveal that the Holsti’s value for the identification of observations on implementation factors was 0.61. Hence, we can conclude that the identification of implementation factors might not be complete. The main differences between the two coders

were caused by incorrectly coding general recommendations and differences in the aggregation level, e.g. clustering or separately listing factors. Krippendorff's alpha for the labelling was 0.71. However, 7 out of 8 differences were caused by a simple and easily reparable error. A failure factor being formulated positively as a recommendation in the reviewed paper (or vice versa) was accidently coded by the second coder based on the recommendation (positive formulation) instead of based on the characteristic of the factor itself (e.g., actually played a negative role in the specific case). With a correction for this specific discrepancy the Krippendorff's alpha becomes 0.94. We therefore consider the labelling of factors reliable. Third, the Krippendorff's alpha for the clustering was 0.79. The agreement between the two coders for this clustering is therefore generally acceptable. Only factors that can be assigned to adjacent implementation factors[6] were less obvious, however, disagreements concerned the less important implementation factors. Finally, when comparing the rankings of the clusters of the most frequently cited factors amongst the two coders it was found that both coders had the same top five, although the order differed. Hence, we can conclude that it is reliable to identify the set of most listed implementation factors for a specific case, although not reliable to precisely rank the most frequently cited implementation factors for a case. Overall the intercoder reliability test shows that the labelling and clustering of implementation factors is reliable. Although it is not reliable to claim that all the implementation factors for each case are identified, the identification of the set of most listed implementation factors is considered reliable.

4.3 Results

This section starts with a brief discussion of the main characteristics of the data set. Next, the most frequently listed implementation factors that all six cases have in common are discussed, followed by the particularities of each individual case.

4.3.1 Characteristics data set

The main characteristics of the data set are included in Table 4.2. The average number of papers discussing one case is 27. The most papers discussing implementation factors were found for London (43) and the least for Hong Kong (16). The average number of observations for each case is 171. For each case, on average 36 different implementation factors (clustered observations) were listed, giving in total across all six cases 61 different implementation factors. Appendix B gives an overview of the implementation factors listed for each case and distinguishes between success factors, failure factors and implementation factors. The average number of observations of one implementation factor listed in a case is 4 although for the implementation factor most often listed 33 observations within a single case were counted. It was found that for Edinburgh and Hong Kong slightly less than half of the papers listed only one implementation factor. It seems that the not implemented cases have been less thoroughly analysed regarding implementation factors; in many papers they are often only briefly referred to. In the remainder of this paper the number of observations clustered in one implementation factor is presented as a percentage of the total number of observations for one case (with the sum of the percentages for all implementation factors in one case adding up to 100%) because the number of papers (and with that the number observations and implementation factors that were found) varies considerably per case.

[6] An example of adjacent implementation factors is the factor severity of the problems and the factor perceptions of the problems.

Table 4.2 Characteristics data set

	Singapore		**London**		**Stockholm**		**Norway**		**Edinburgh**		**Hong Kong**		*Average*
Number of observations	*Number of papers*												
1	4		5		7		4		14		7		
2-5	11		17		12		5		9		4		
6-10	6		13		2		7		5		4		
>10	1		8		6		7		6		1		
Total # papers	**22**		**43**		**27**		**23**		**34**		**16**		*28*
One*/ Multiple**	10	12	14	29	10	17	15	8	9	25	6	10	
Total # observations	**95**		**298**		**152**		**204**		**193**		**84**		*170*
Total # of implementation factors	**27**		**48**		**32**		**41**		**39**		**30**		*36*

* 1 = Number of papers that discuss one case only

** Multiple = Number of papers that discuss this case as well as other cases

The papers differ in the number of observations on implementation factors included, both the total number and for each case (see appendix A). The total number of observations on implementation factors in the papers varies between one and 31 observations in Albalate and Bel (2009, discussing 5 cases) and Osland and Leiren (2007, discussing 2 cases). The number of observations on a single case varies between one and 30 in Borins (1988). This variation in the number of observations on implementation factors included in the papers is obviously related to the primary objective of the paper. In the analysis a distinction was made between papers that particularly focused on implementation and papers that had other objectives but included observations on implementation factors. Furthermore, a distinction is made between papers that had collected their own empirical data from interviews or surveys on implementation factors versus papers that based their findings on implementation factors on other sources or did not make the sources explicit. It was found that 12 of the 106 papers focus on implementation and 14 of the 106 papers give some clarity on whether empirical data was used in the papers. The overlap between the papers in these categories is limited; hence the papers with a focus on implementation do not seem to use empirical data more frequently than papers with a different focus. The large majority of the papers studied are not explicit regarding the data sources used to support the observations on implementation factors. From the 14 papers that give some clarity on the data sources used, 5 papers mention the use of interviews without giving any further details (Attard and Enoch, 2011; Attard and Ison, 2010; Langmyhr, 1999; Langmyhr, 2001; Langmyhr and Sager, 1997). Marsden and May (2006), Ison and Rye (2005), Altshuler (2010) and Rye et al., (2008) make the number of interviewees and their affiliations for each case explicit and Ieromonachou et al., (2007) and Ieromonachou et al., (2006) also add the names of the interviewees and more information on the methodology. Interviews were therefore used for the case analysis, although it is not clear which observations came from the interviews. Only the papers of Isaksson and Richardson, (2009) and Hamilton, (2011) and Borins, (1988), explicitly refer to the interviews, making it possible to determine which observations are based on the interviews and which on other sources.

4.3.2 Generic implementation factors

Although in total 61 different implementation factors were found, only six implementation factors were present in all six cases. These factors concern general political support, general public support, information campaign, various actor perceptions, characteristics of the transport system and marketing of the scheme. Table 4.3 gives an overview of these generic implementation factors. The generic factors are sorted based on the average percentage indicating how frequently this factor is mentioned in all six cases together. General political and public support are the most commonly listed generic implementation factors, accounting for 9.0% and 7.6% respectively of all the observations for those cases. Other generic factors are all mentioned less than half as frequently. Half of the generic factors are among the factors listed most frequently for that case (indicated with * in Table 4.3). The most important finding is that the generic factors only account for on average 27% of all the listed implementation factors. Table 4.3 also distinguishes between success and failure factors. Overall, the generic factors were listed as success factors in the implemented cases and as failure factors in the not implemented cases. Deviations from this overall pattern are discussed below. The reviewed papers often only mention an implementation factor without explaining precisely what it is, its importance or how it contributes to the implementation process. The discussion below focuses therefore on how frequently a factor has been listed in a specific case and more details on the factor or its role in a specific case are discussed where relevant and possible. The discussion of these factors as well as the contribution of each generic factor to the implementation processes of the six cases is structured by clustering meaningful insights and does not follow the order of Table 4.3.

Table 4.3 Overview of implementation factors present in all six cases

	Implemented				Not implemented		
	Singapore	London	Stockholm	Norway	Edinburgh	Hong Kong	*Average*
General political support	9.5%*[2]	4.7%*	14.8%*	14.7%*	5.6%*	4.8%*	*9.0%*
General public support	3.2%	4.4%*	12.8%*	5.9%*	17.3%*	2.4%	*7.6%*
Information campaign	6.3%*	3.0%	2.0%	1.5%	1.5%	4.8%	*3.2%*
Various actor perceptions[1]	3.2%	0.7%	1.3%	0.5%	4.1%*	7.1%*	*2.8%*
Characteristics of the transport system	2.1%	4.4%*	3.4%*	2.9%	0.5%	3.6%*	*2.8%*
Marketing the scheme	2.1%	0.3%	2.0%	2.0%	1.0%	3.6%*	*1.8%*
Total % of generic factors	**26.3%**	**17.4%**	**36.2%**	**27.5%**	**30.0%**	**26.2%**	***27.3%***

The scores that are underlined are failure factors, the other scores are success factors.
The scores with an * are among the factors most often listed for that case (see table 4.4).
[1] Various perceptions of actors (e.g. regarding exemptions, objectives, effects on local economy etc.)

As the final outcome of an implementation process relies on a political decision, it is not surprising that the first factor, general political support, is one of the four most frequently listed implementation factors in all six cases. In Singapore this factor specifically refers to the political will to implement the scheme (e.g. Santos, 2005). In London the factor concerned political will and commitment (Hensher and Puckett, 2005; Santos, 2005) which proved stronger than some political opposition. In Stockholm, a “fortuitous set of political

circumstances" (Schaller, 2010:272), including "extensive political logrolling" (Armelius and Hultkrantz, 2006:163) positively contributed to policy implementation. The trial was demanded by the Green party (Eliasson, 2008) and the implementation of the charges forced another political party to break their election promise (Börjesson et al., 2012). Furthermore, the new government respected the positive referendum outcome (Osland and Leiren, 2007). In Norway road pricing was never "politically controversial" (Albalate and Bel, 2009:969). For example, the local political parties in Bergen agreed that the implementation "should not be made into a major political issue" (Larsen, 1995:191) and in Trondheim the implementation was the result of an uncomplicated compromise (Langmyhr, 2001). In Hong Kong the district boards did not support the scheme (Borins, 1988), leading to a lack of political support. In Edinburgh political opposition was also frequently listed despite the approval in principle of the Scottish executive (Saunders, 2005). This was caused by minimal national support (Gaunt et al., 2007) and the initiator having marginal control over the City of Edinburgh Council (Ryley, 2010). The decision to hold a referendum was even seen as an indication of the weak support in the city council (Rye et al., 2008).

The second factor, general public support, is in the Edinburgh case by far the most frequently listed factor, three times as much as the lack of political support, which held second place. For Stockholm public support is the second most frequently listed factor. In both cases the (lack of) public support was demonstrated in the referendum outcome. Although the process started in Edinburgh with public support in the stakeholder consultation process, this declined over time (Grieco and McQuaid, 2005). In the referendum 74.4 % voted against the congestion charging scheme (Gaunt et al., 2007). The outcome of the referendum in Stockholm, was a majority in favour (53% yes, 47% no (Eliasson et al., 2009:248)) of making the system permanent (Eliasson et al., 2009) leading to the reintroduction of the charges in 2007 (Eliasson, 2008). This followed a period in which "the public opinion gradually changed from support of less than 30% before the trial to just over 50% towards the end of the trial." Public support was "nearly 70% at the end of 2007, after the reintroduction" (Eliasson, 2008:402, 403). Although road pricing was implemented in Norwegian cities, public opposition was surprisingly listed twice as frequently as public support. In Singapore, Hong Kong and London this factor is mentioned much less frequently.

Providing information about the scheme and marketing of the scheme are the third and fourth related implementation factors present in all six cases. These factors were most listed in the cases Singapore, Hong Kong and Stockholm. In Singapore these factors involved a massive public relations exercise (Tan and Subramaniam, 2006) and the fact that the scheme was marketed as part of an overall transport strategy (Foo, 2000; Yap, 2005). In Stockholm, the successful information campaign (Eliasson, 2008; Hamilton, 2011) and the scheme being branded as an environmental charge, were frequently listed (Börjesson et al., 2012; Eliasson, 2010; Eliasson and Jonsson, 2011). On the other hand, in the Hong Kong case the "lack of advertising campaigns and literature" (Attard and Ison, 2010:18) and a government which did not effectively sell the scheme (Hau, 1990) were frequently mentioned. In Norway and London these two factors were also present but less frequently listed than in the other cases (Attard and Enoch, 2011; Santos, 2004). These failure factors were less frequently listed in the Edinburgh case, probably overshadowed by the factor communication. The communication was considered unsuccessful (Lapsley and Giordano, 2010; Rye et al., 2008) because the public had limited understanding of the scheme (Albalate and Bel, 2009; Gaunt et al., 2007; Saunders and McLeod, 2005). The scheme was perceived as being not well developed, complex and, therefore, difficult to explain to the public (Gaunt et al., 2006). Furthermore, the scheme's benefits were not sufficiently promoted (Rye et al., 2008).

The fifth common factor is the characteristics of the transport system. In all six cases this played a modest role. It refers to how susceptible the context is for the implementation of road pricing. Singapore, London and Stockholm have an existing well-functioning public transport system (Anas and Lindsey, 2011; Yap, 2005). Furthermore, in Stockholm the "initial high public transport share contributed to the acceptance of the road charging package" (Kottenhoff and Brundell Freij, 2009:304). Although not made explicit, this could indirectly have positively contributed to policy implementation. In London where public transport accommodates "some 85 percent of travellers entering central London" (Anas and Lindsey, 2011:83) this unique circumstance is considered to have contributed to the policy implementation (Nash, 2007). Similarly, the low car use in Singapore made implementation easier (Morrison, 1986). These modal splits result in a relatively small group of 'losers' (Lee, 2008) being outnumbered by the winners (Metz, 2008). Even in the not implemented case of Hong Kong, the high usage of public transport is listed as a success factor, called "the ideal climate for the successful implementation" by Hau (1997:9). Conversely, in Edinburgh it was the high car-dependency that was mentioned for negatively contributing to implementation (Kottenhoff and Brundell Freij, 2009). The outlier with respect to how this factor contributed to implementation, is the case of the Norwegian cities, where it refers to the scarcity of public budgets, making road pricing an interesting option (Bråthen and Odeck, 2009).

The sixth factor, various actor perceptions, actually comprises a cluster of both success and failure factors. As this is a heterogeneous cluster, the composition of the clusters differs per case and the individual perceptions contributed differently to the various cases, the cases have less commonalities regarding actor perceptions than initially thought and are, where relevant, discussed in the next section. Common perceptions are actor perceptions of the problem, the perceived effectiveness and views on the technical feasibility. In addition, all six cases mentioned a variety of other actor perceptions. Examples include fears for future trade in the city centre (Tretvik, 2007), resistance to charging what used to be free (McQuaid and Grieco, 2005) and lack of agreement on the objectives (Rye et al., 2008).

4.3.3 Case specific implementation factors

Table 4.4 gives an overview of the most frequently listed factors per case, including both generic and case specific factors. For each case at least the ten most listed factors are included. If the next factors were exactly as frequently listed as the tenth factor, these factors are also included. Appendix B gives an overview of the implementation factors listed for each case. Similar to the discussion in the previous section, this section discusses only the most remarkable insights on the case specific factors in detail. The three implementation factors most often listed for each case account on average for 30% of all the implementation factors listed in the cases. This indicates that the set of implementation factors is relatively broad.

Table 4.4 The most listed factors per case

	%
Singapore	
Experience[a]	16.8
Transport policy and supporting measures	11.6
General political support*	9.5
Information campaign*	6.3
Culture of decision-making	4.2
Few decision-making layers	4.2
General public support*	3.2
Geographical layout	3.2
Overall policy design[b]	3.2
Participatory process	3.2
Power[c]	3.2
Privacy concerns	3.2
Project management	3.2
Technical feasibility	3.2
Various actor perceptions*[d]	3.2
Various design factors[e]	3.2
Stockholm	
General political support*	14.8
General public support*	12.8
Implementation strategy[f]	9.4
Legislation	6.0
Overall policy design[b]	6.0
Political process	4.1
Studies and research	4.1
Characteristics of the transport system*	3.4
Media	3.4
Perceptions on effectiveness	3.4
Political support of the central government	3.4
Timing	3.4
Use of revenues	3.4
Edinburgh	
General public support*	17.3
Implementation strategy[f]	6.6
General political support*	5.6
Media	5.1
Communication	4.7
Support of regional politicians	4.7
Legislation	4.1
Various actor perceptions*[d]	4.1
Transport policy and supporting measures	3.6
Trust[g]	3.6
London	
Transport policy and supporting measures	7.4
Political support of the mayor	6.0
Participatory process	5.0
General political support*	4.7
Political champion (in this case the mayor)	4.7
Power[c] (in this case of the mayor)	4.7
Characteristics of the transport system*	4.4
General public support*	4.4

(continued on next page)

	%
Studies and research	4.4
Legislation	3.7
Media	3.7
Scope and exemptions	3.7
Norway	
General political support*	14.7
Experience[a]	6.9
General public support*	5.9
Partial funding of the central government	5.9
Support of the road authority	5.9
Use of revenues	5.4
Overall policy design[b]	4.9
Level and structure of charge	3.4
Various design factors[e]	3.4
Characteristics of the transport system*	2.9
Perceptions of the problems	2.9
Hong Kong	
Privacy concerns	15.5
Various actor perceptions*[d]	7.1
General political support*	4.8
Information campaign*	4.8
Non-business interest groups	4.8
Perceptions of cost and benefits	4.8
Technical feasibility[h]	4.8
Technology[h]	4.8
Trust[g]	4.8
Characteristics of the transport system*	3.6
Marketing the scheme*	3.6
Perceptions of the problems	3.6
Timing	3.6

The scores that are underlined are failure factors, the other scores are success factors.
The scores with an * are generic implementation factors.
a The use of experience of other road pricing implementation processes in the implementation process.
b The starting points for making the policy design and the general requirements that the policy should fulfil (e.g. flexible, easy to understand).
c The capability of an actor (e.g. the government) to have a significant influence on the decision-making process or determine this process.
d Various perceptions of actors (e.g. regarding exemptions, objectives, effects on local economy etc.).
e Various general characteristics of the policy design (e.g. user friendliness, implementation for a limited time period).
f The strategy used by the organisation responsible for managing the policy implementation process.
g The trust other actors have in the organisation responsible for policy implementation.
h Technology refers to the design choice for a specific technology, the technical feasibility refers to how this choice is perceived by the involved actors.

Singapore

The most cited factor in the Singapore case is experience. The only other case where this factor is prominent is the Norwegian cities. Experience in Singapore basically refers to the complexity and inconvenience of ALS (Santos, 2005) which led to the introduction of ERP to overcome operational difficulties (Goh, 2002). Furthermore, the ALS was considered not to

fit with the high-tech image of Singapore (Santos et al., 2004). The next most cited factor in the Singapore case is that the scheme was part of an integrated transport policy (Santos et al., 2004). Hence, ERP was implemented together with improving public transport, leading to an increase in public acceptance (Santos, 2005), and with tax reductions to ease implementation (Enoch, 2003; Phang and Toh, 2004; Tan and Subramaniam, 2006). Finally, there are three related institutional factors that are frequently mentioned in the Singapore case: the culture of decision-making, power and few decision-making layers. First, Foo (1997:163) characterizes the decision-making culture as "Singaporeans are generally literate, well-informed and law-abiding citizens who are normally cooperative and supportive of government policies. There is ample public respect for the country's laws and statutes." (Foo, 1997:163; Foo, 2000). Next, the government is powerful (Phang and Toh, 2004). Third, having a one level government is efficient because of the absence of coordination across different layers of government (Albalate and Bel, 2009; Foo, 1997). Finally, "painstaking" project management during nine years resulted in a smooth implementation process, including feasible technology (e.g. installing the On Board Unit) (Menon and Chin, 1998:179).

London

Transport policy and supporting measures was the most frequently listed implementation factor. The London Congestion Charging Scheme was part of an integrated and coherent transport strategy (Richards, 2008; Santos, 2005). The additional investments in an already well-functioning public transport system and traffic management are also considered to have positively contributed to the implementation (Dix, 2002; Livingstone, 2004). Yet, it was mayor Livingstone and the exceptional role he played in the implementation of congestion charging that is most distinctive of the London case. Frequently listed factors were the power of the mayor, the political support of the mayor and the mayor as political champion. The mayor was able to play a large role because of the institutional setting in which "the mayor of London had sufficient powers to forge ahead with road pricing without the need to build a political coalition." (Anas and Lindsey, 2011:83). This "unilateral authority to implement this promise proved critical" (Altshuler, 2010:167). This power was provided to the mayor by enabling legislation from the central government (Banister, 2003). This legislation is also separately listed as a success factor. Next, the mayor supported congestion charging, often referred to in more specific terms as his commitment, strong will, determination, charisma, vision and leadership (Banister, 2003, 2004; Lee, 2008; Santos et al., 2008). In fact, his role reaches far beyond supporter as the mayor is frequently qualified as project champion with adjectives as 'bold' and 'strong' to further reinforce this qualification (Marsden and May, 2006; Peirson and Vickerman, 2008).

The general political support, and to a lesser extent public support were also frequently indicated as success factors. However, the lack of public support was also mentioned, mainly in relation to the western extension of the scheme, leading eventually to its removal (Baigabulova, 2010; Santos and Fraser, 2006). Characteristic of the London case is the participatory process implying "continuous and extensive public consultation" (Banister, 2003:253). Responsiveness refers to the fact that the views of stakeholders were taken into account (Santos, 2004) and led to modifications in the scheme (Livingstone, 2004). "A range of exemptions would appear to have smoothed the introduction of congestion charging in Central London." (Ison and Rye, 2005:458).

However, despite support from some key players, strong opposition remained (Ieromonachou et al., 2007). Most present in this perspective is the role of the media, in contrast to the previously discussed factors, the only failure factor in this case. The implementation in

London faced a sceptical, hostile press (Altshuler, 2010; Ryley and Gjersoe, 2006) leading to predominantly negative newspaper coverage (Livingstone, 2004; Peirson and Vickerman, 2008). Yet, as implementation was accomplished, this failure factor was apparently not decisive. Finally, similar to Stockholm, having sufficient and comprehensive research available (Baigabulova, 2010) and having monitoring in place (Buckingham et al., 2010) are also listed as implementation factors.

Stockholm

After the generic factors of political and public support, the most cited implementation factor is the implementation strategy, in this case primarily referring to holding a trial followed by a referendum. This made the scheme perceptible to the public (Oehry, 2010), was key for the public support (Albalate and Bel, 2009; Gudmundsson et al., 2009) and led to a majority voting in favour of the scheme (Poole, 2011). Yet, upfront this outcome was by no means certain. This decision was "initially forced through by opponents" (Eliasson and Jonsson, 2011:637) and was intended to reduce political risks (Buchanan and Buchanan, 2007). Furthermore, surviving "a heated and complicated political and legal process" (Börjesson et al., 2012:1; Eliasson, 2008; Isaksson and Richardson, 2009) was also a factor that defines this case as legislation and the political process are frequently listed as failure factors. The initially hostile media, first cited as a failure factor, became more positive during the trial (Börjesson et al., 2012; Eliasson and Jonsson, 2011). The factor policy design was most prominent in the Stockholm case. Overall, Hamilton (2011) concludes that there was a successful scheme design (Hamilton, 2011). Perhaps this is caused by the also frequently listed factor available expertise (Osland and Leiren, 2007) and the extensive and scientific evaluation (Eliasson, 2008).

Norway

After the generic factor political support, the second most cited factor is, similar to Singapore, the case specific factor experience. Norway has more than 100 years of experience with toll financing (Bråthen and Odeck, 2009). The implementation of the toll cordon in Bergen in 1986 made the public more familiar with road pricing which helped public acceptance (Larsen, 1995). This implementation inspired other cities (e.g. Trondheim and Oslo) to build on this experience (Ieromonachou et al., 2006; Waersted, 2005).

As explained in the previous section, all the Norwegian cases received additional funding from central government (Larsen, 1995; Ramjerdi et al., 2004; Waersted, 1992). Another important factor in the Norwegian case is the support of the road authority, which in many cities acted as a promoter by providing leadership (Osland and Leiren, 2007), manpower and know-how for implementation (Langmyhr, 1999; Langmyhr, 2001). The role of this actor is unique to the Norwegian case.

Finally, the use of revenues is, compared to other cases, frequently mentioned in this case. Langmyhr (2001:67) argues that "the purpose of raising funds for infrastructure investments and environmental improvements is more acceptable to the general public than tolls aimed at managing demand." Also in other cities the importance of earmarking the revenues for infrastructure investment (Waersted, 2005) in public transport is stressed (Bekken and Norheim, 2007). Also for several cities factors were listed related to the level of complexity of the overall policy design (e.g. Foo, 1997; Langmyhr and Sager, 1997; Osland and Leiren, 2007; Waersted, 1992).

Edinburgh

The Edinburgh and the Stockholm case have the same three most cited implementation factors – political and public support and the implementation strategy of holding a referendum. However, the Edinburgh proposal was rejected in a public referendum. The reasons for the referendum are completely different from Stockholm. For Edinburgh holding a referendum was neither mandatory nor demanded (Lapsley and Giordano, 2010). "While the decision to persist with congestion charging may, in the circumstances, be considered brave, the decision to hold a referendum was not." (Gaunt et al., 2007:100). The referendum was planned without a trial in which road users could have the opportunity to experience the scheme (Anas and Lindsey, 2011), it was controversial because not all those who wanted to vote got the opportunity (Gaunt et al., 2006; Rye et al., 2008) and it consumed the resources of an already small implementation team with a limited budget (Rye et al., 2008; Saunders, 2005). Being the first to interpret the legislation also added time, expense and complexity to the process (Gaunt et al., 2006).

Striking in the Edinburgh case is the opposition from two actors that played a less important role in other cases. First of all, there was opposition from regional politicians in neighbouring authorities in reaction to exemptions for Edinburgh residents which were considered unfair (Ryley and Gjersoe, 2006). Secondly, the role of the media was important, specifically the newspapers, which had been "highly politicized and increasingly negative over the time period leading up to the referendum" (Ryley and Gjersoe, 2006:66).

Hong Kong

Striking about the Hong Kong case, compared to the other cases, is the large variety and higher frequencies of occurrence of actor perceptions, in this case all comprising concerns. Concerns about the invasion of the road user's privacy was the most cited. This "highly controversial" factor (Fong, 1985:38) comprises 16% of all the factors listed for this case. The other factors are mentioned half as much or even less. Although privacy is also mentioned in the Singapore and London case (3% and 1%), this factor is typical for the Hong Kong case. Not only the public and motorists but also the councillor, district board members and computer society shared this concern (Borins, 1988; Ison and Rye, 2005). This can partly be explained by the timing, shortly after the decision to hand Hong Kong over to China. "Naturally, the invasion of privacy and fear of a "big brother" government were foremost in people's minds." (Hau, 1990:210).

Next, the "traffic conditions were not seen to be sufficiently bad" (Pretty, 1988:319). For example, the automobile association found that the congestion problem was exaggerated by the government (Borins, 1988:40). Moreover, timing was mentioned referring to the reduced need for road pricing after the introduction of several other measures and in the face of an economic decline (Hau, 1990; Ison and Rye, 2005). Other actor perceptions include the public and the automobile association which perceived the scheme as a tax increase (Borins, 1988; Khan, 2001). In addition, there was also criticism of the resource allocation (Fong, 1985), doubts about equity (Hau, 1990; Ison and Rye, 2005; Pretty, 1988) and concerns about the technical feasibility (Borins, 1988). Last, there was a range of other concerns, e.g., regarding the funding, the study results (Borins, 1988) and the export of employment to the United Kingdom (Hau, 1990). Despite concerns about technical feasibility, there are several references to the technical pilot as a success factor (e.g. Pretty, 1988). All these concerns might be linked to "the government who did not succeed in effectively selling ERP to the public" (Hau, 1990:211) and the timing, as the problem was perceived to be in decline.

4.3.4 Factor analysis

Rather than performing a factor analysis on implementation factors (see section 2.2), the factor analysis was performed to analyse whether clusters of similar cases could be found. If clusters could be found with distinct characteristics, it is possible more specific lessons could be formulated than the generic lessons based on all the cases. The results of the factor analysis included in Table 4.5 show that we found that the cluster of the Singapore, Stockholm and Norway cases loads high on factor 1, the cluster consisting of the London and Stockholm cases loads high on factor 2, and the cluster of the London and Hong Kong cases load high on factor 3. From the factor analysis it becomes clear that Edinburgh is the most deviant case. The three factors together account for 96% of the variance. Hence, we can conclude that there are similarities between cases. However, the clusters found are not the expected clusters of the Singapore and Hong Kong case nor the clusters of implemented cases or not implemented cases. The first policy implication of our findings is that it is not possible to a priori determine with which cluster of cases a potential new case would have most similarities in terms of which implementation factors are likely to play a minor or large role in such a case. Second, it is not possible to learn specific policy implementation lessons based on similarities in the implemented versus the not implemented cases.

In trying to explain why these three factors were found in the factor analysis, we analysed the underlying items (e.g. implementation factors) which scored high on each factor. As factor scores are only given for the six generic implementation factors (the specific implementation factors have missing values), it is not known how specific implementation factors have contributed to the clustering. The most important generic implementation factor for the cluster of Singapore, Stockholm and Norway is political support, for the cluster of London and Stockholm public support and for the cluster of London and Hong Kong the characteristics of the transport system. However, only the contribution made by these factors is known and this is insufficient to derive new policy lessons from. From the sensitivity analysis, i.e. a factor analysis where unlisted factors are treated as zero observations instead of missing values (see section 2.2), three factors were also found. However, there are fewer cases that load on two factors (Stockholm does not load on factor 1 and London does not load on factor 2 anymore). Furthermore, a broader cluster of underlying implementation factors scores high on the factors even though the explained variance is lower. The sensitivity analysis therefore does not give additional insights. If the (un)importance of each implementation factors had been made explicit, it is possible that larger clusters of underlying items would have scored higher on the cluster. Overall this factor analysis shows that several cases have similarities with other cases except for Edinburgh. However no specific policy implementation lessons can be drawn from this factor analysis.

Table 4.5 Factor loadings (Varimax rotated), values higher than 0.5 in bold, software: IBM SPSS 20 for Windows.

Cases	Factor*1	Factor 2	Factor 3
London	.482	**.606**	**.573**
Singapore	**.918**	.283	-.231
Stockholm	**.510**	**.800**	.171
Norway	**.971**	-.133	.086
Edinburgh	.197	-.973	.065
Hong Kong	-.128	.004	**.988**
Eigenvalues	2.913	1.652	1.220
Percentage variance	48.5	27.5	20.3

*Note that this factor represents a cluster of variables (i.e. cases) and does not refer to a specific implementation factor.

4.4 Discussion and conclusions

4.4.1 Policy considerations

Our results suggest that a broad set of factors defines road pricing implementation processes. Of the 61 implementation factors found in this research, on average 36 implementation factors played a role in the six road pricing cases studied. The three implementation factors most often listed for each case account on average for 30% of all the implementation factors listed in the cases. Thus, policymakers need to take into account a broad set of factors when managing a policy implementation process for road pricing. This makes the implementation process a rather precarious endeavour.

There are six generic implementation factors that are recurrent in each case. Not surprisingly political and public support are implementation factors in each case. These factors are success factors in the implemented cases and failure factors in the not implemented cases. For Singapore and Hong Kong public support is much less frequently mentioned than in the other cases. This makes sense as the political system and the role of public opinion in the policy process is different in these countries. Unexpectedly public support was also less mentioned in the London case. Perhaps the dominance of the political circumstances may have made public support relatively less important. Results reveal that the support and power of the mayor played a major role. It is also highly likely that, seeing that the mayor made the implementation of the scheme an election promise, the public knew what they voted for and in this way implicitly expressed their support. Other important implementation factors that all the analysed cases share, are the relevance of an information campaign, marketing of the scheme and the characteristics of the transport system.

The most prominent case specific implementation factors are the role of specific actors such as the mayor in London and the road authorities in Norway. Furthermore, the supporting governmental funding was a specific factor in Norway. The concerns about privacy and the scheme being perceived as a tax increase were prominent specific concerns for the Hong Kong case.

In our analysis the generic factors account on average for only 27% of all the listed implementation factors. In addition, the factor analysis showed that although several cases have similarities there are large differences as well, with the Edinburgh case as the most deviant case. Hence, also many case specific factors need to be taken into account in a policy implementation process. In our view, the fact that besides generic factors case specific factors are also frequently listed puts general policy recommendations into perspective. Many papers aid policy makers with generic recommendations for policy implementations based on implementation factors found in road pricing cases (e.g. Albalate and Bel, 2009; Ison and Rye, 2003; King et al., 2007). Our analysis shows, however, that the importance of case specific factors cannot be underestimated.

It is interesting to note that the factor experience was only listed in the Singapore and Norway case as an implementation factor and not in the more recently implemented schemes in London and Stockholm. In the Singapore and Norway cases they could draw on the experiences in their own country. Policy learning from the same country appears to be more valuable therefore in implementation than from other countries. Theories on cross cultural policy transplantation describe many challenges to policy learning across multiple countries (De Jong et al., 2002).

When drawing potential policy lessons from the implemented compared with the not implemented cases, our results reveal that there are not many typical factors that only occur in implemented cases or only in the not implemented cases. Yet, the two not implemented cases have some commonalities. The factor various actor concerns is in the top of the most listed factors for both not implemented cases Hong Kong and Edinburgh whereas in the implemented cases this factor is much less frequently mentioned. In fact, as explained in this paper, a remarkably wide variety of concerns played a role in the Hong Kong case. Furthermore, the lack of trust is a factor that only occurred in the not implemented cases. Finally, the factors marketing in Hong Kong and communication in Edinburgh were failure factors and played, compared to the implemented cases, a much more prominent role. It seems that the important role of communication, marketing and information in a road pricing implementation process cannot be underestimated.

We think our conclusions and recommendations are valid for urban road pricing schemes. Possibly they are also relevant for other road pricing schemes but that needs to be validated. Our study makes clear that when studying other road pricing cases there can be large differences between cases in the importance of implementation factors and the manifestation of individual factors . For example, power can play a role. In London it was embodied by the mayor (Altshuler, 2010) and in Singapore by the government (Phang and Toh, 2004). Perhaps, as recommended from the adaptive policy making perspective, adequate monitoring of the implementation process could provide helpful pointers in managing the uncertainty (Marchau et al., 2010) regarding the importance of an implementation factor and its specific manifestation in the implementation process.

Summarizing, the main policy implementation lessons are:

- Road pricing policy implementation requires managing a broad set of implementation factors.
- Political and public support were frequent implementation factors present in all six road pricing cases and could therefore play a role in other road pricing cases as well. The most prominent case specific implementation factor is the role of specific actors.
- Neglecting communication, marketing and information seems to hamper road pricing implementation processes.
- The results are expected to be relevant for other road pricing cases although the implementation factors found in this study are not a priori transferable to new cases. Other implementation factors than the 61 factors found in this study could play a role. The relative importance of factors may be different in other cases. The implementation factors found in this study may have different manifestations in other cases (see section 4.1). The importance of case specific factors cannot be underestimated.

4.4.2 Methodological considerations

A contribution of our methodology (selecting six cases, a review of an elaborate set of scientific papers per case and content analysis) is that it resulted in a rich set of implementation factors. For example, on average six implementation factors per case were included in the reviewed papers. Compared to for example Anas and Lindsey (2011) who list nine implementation factors for London and ten for Stockholm, we were able to list respectively 48 and 32 implementation factors. Furthermore, the fact that our research reviewed 106 scientific papers which include implementation factors for the six selected cases supports a more thorough and detailed analysis of the implementation processes than has

previously been done. There are some papers that list the most important implementation factors for each case although they do not claim to be complete. Our account of implementation factors is based on a much wider selection of sources than the reviewed papers and we therefore conclude that we have identified an elaborate set of the most important implementation factors for road pricing, at least for the six cases we studied.

One remark on the methodology is that in this paper we have used frequency of occurrence as an indicator of importance. We assume that the reviewed papers only list the implementation factors that had a considerable impact on the course of events in the case concerned. The factors that we listed most for a case are either the distinct implementation factors, such as the role of the mayor in London, or the decisive factors. This latter claim is supported by the fact that several reviewed papers make the importance of particularly the most listed factors of a case explicit. For example, (Ison and Rye, 2005:463) call the absence of public opposition "most important" and communication "a key lesson" for future implementations. However, we are unable to make a ranking of the most important implementation factors based on the indication of importance of the factors in the reviewed papers as most reviewed papers do not make this explicit for the majority of the implementation factors. Furthermore, from the intercoder reliability test it also became clear that ranking the implementation factors is not very reliable. Hence, this paper gives an overall account of which implementation factors played a role in each case and which set of factors were most relevant. Yet, it does not indicate the precise ranking within the set of important factors. In future research a ranking could for example be made by interviewing the actors involved in order to explicitly evaluate the importance of each factor and to combine these evaluations. More generally, to obtain an even more detailed and complete picture for each case, we recommend examining non-academic literature as well.

Another comment is that the majority of the reviewed papers do not make explicit which evidence is used in the discussion of implementation factors; only 13% collected their own empirical data on implementation factors. Even in papers that focus on road pricing implementation (11% of the selection) only half of these papers give some clarity on the data sources. This could result in papers echoing the role of prominent implementation factors and, as a result, an overestimation of the importance of the most listed factors in our paper. However, we still consider our analysis to be valuable, for two reasons. First, an analysis of data for which the sources are not made explicit can be valuable if the author is an expert on the case. Second, our analysis combines not just a few papers but the insights of at least 20 different (co)authors for each case. This makes our work less vulnerable to the possibility that in our selection of papers, biased analyses are included. However, given the importance of policy implementation, we think a more rigorous case analysis with a specific focus on the implementation issues would be a valuable scientific contribution. We specifically recommend that future (case) studies on road pricing make their methodology, including the data sources, transparent. Furthermore, the use of empirical data in case studies on road pricing policy implementation is highly recommended.

The last comment we would like to make is that it was not an a priori choice to only select urban road pricing schemes. However, that our selection criteria resulted in this set of cases, might not be a coincidence given the relevance of context specific factors. We feel that the implementation in cities and at the national level can require both a huge effort in coordination across governmental layers (e.g. a failure factor in the Edinburgh case and for the nationwide road pricing implementation in the Netherlands (Vonk Noordegraaf et al., 2012)). However, practice has showed that in specific circumstances, e.g. a mayor with

implementation power or sufficient governmental support, the level of coordination for cities is not the main issue. Perhaps the main key to implementing road pricing in cities lies in having adequate transport alternatives in place, with winners outnumbering the losers.

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Appendix A Overview of reviewed papers

Table A.1 Number of observations in reviewed papers discussing one case

	A	B	C	D
Singapore				
Chin	2005	8	N	N
Chin	2009	2	N	N
Christainsen	2006	3	N	N
Enoch	2003	1	N	N
May	2004	1	N	N
Menon and Chin	1998	8	N	N
Morrison	1986	4	N	N
Santos et al.	2004	6	N	N
Tan and Subramaniam	2006	5	N	N
Yap	2005	11	N	N
London				
Banister	2003	22	N	N
Banister	2004	7	Y	N
Buckingham et al.	2010	9	N	N
Dix	2002	12	N	N
Goodwin	2004	3	N	N
Ieromonachou et al.	2006	8	N	N
Litman	2005	7	N	N
Livingstone	2004	24	Y	N
Peters and Gordon	2009	2	N	N
Richards	2008	5	N	N
Santos	2004	4	N	N
Santos and Schaffer	2004	7	N	N
Van Wee	2009	1	N	N
Viegas	2001	2	N	N
Stockholm				
Armelius and Hultkrantz	2006	3	N	N
Börjesson et al.	2012	13	N	N
Eliasson	2008	15	N	N
Eliasson and Jonsson	2011	12	N	N
Eliasson et al.	2009	3	N	N
Gudmundsson et al.	2009	3	N	N
Hamilton	2011	23	N	Y
Jansson	2008	1	N	N
Munnich	2008	2	N	N
Oehry	2010	1	N	N

Table A.1 *(Continued)*

	A	B	C	D
Norway				
Bekken en Norheim	2007	7	N	N
Bråthen and Odeck	2009	7	N	N
Hårsman	2001	4	N	N
Ieromonachou et al.	2006	13	N	Y
Langmyhr	1999	25	Y	Y
Langmyhr	2001	25	Y	Y
Langmyhr and Sager	1997	23	Y	Y
Larsen	1995	10	N	N
Larsen and Ostmoe	2001	7	N	N
Meland et al.	2010	2	N	N
Odeck and Bråthen	2002	4	N	N
Ramjerdi et al.	2004	7	N	N
Tretvik	2007	6	N	N
Waersted	1992	11	N	N
Waersted	2005	17	N	N
Edinburgh				
Gaunt et al.	2006	23	N	N
Gaunt et al.	2007	9	N	N
Gorman et al.	2008	5	N	N
Lapsley and Giordano	2010	10	N	N
McQuaid and Grieco	2005	8	N	N
Rye et al.	2008	24	Y	Y
Saunders and McLeod	2005	6	N	N
Saunders	2005	16	Y	N
Saunders and Lewin	2005	12	Y	N
Hong Kong				
Arnott and Small	1994	1	N	N
Borins	1988	30	Y	Y
Dawson and Catling	1986	3	N	N
Fong	1985	5	N	N
Hau	1990	10	N	N
Pretty	1988	8	N	N

A: Year
B: Number of observations
C: Focus of paper on implementation (Yes/No)
D: Empirical data collected (Yes/No)
E: Total number of cases included in the paper

Table A.2 Number of observations in reviewed papers discussing multiple cases

		Singapore	London	Stockholm	Norway	Edinburgh	Hong Kong	Total			
	A	B	B	B	B	B	B	B	C	D	E
Albalate and Bel	2009	3	11	3	3	11		31	Y	N	5
Anas and Lindsey	2011	2	9	10		3	1	25	N	N	5
Buchanan and Buchanan	2007	3	1	1	1	1		7	N	N	5
Altshuler	2010		9	4		1		14	N	Y	3
Hårsman and Quigley	2010			4	1	1		6	N	N	3
Isaksson and Richardson	2009		3	16		1		20	N	Y	3
Kottenhoff and Freij	2009		2	5		1		8	N	N	3
Lemoine	2009		2	2	2			6	N	N	3
Metz	2008		4	3		1		8	N	N	3
Ryley	2010		3	1		2		6	N	N	3
Schaller	2010		2	1		1		4	N	N	3
Armstrong-Wright	1986	1					2	3	N	N	2
Attard and Enoch	2011		9			5		14	N	Y	2
Attard and Ison	2010		1				1	2	Y	Y	2
Baigabulova	2010		18	1				19	N	N	2
Eliasson	2010			1		1		2	N	N	2
Foo	2000	7					1	8	N	N	2
Foo	1997	7			1			8	N	N	2
Goh	2002	4					1	5	N	N	2
Grieco and McQuaid	2005		1			3		4	N	N	2
Hau	1997				1		6	7	N	N	2
Hensher and Li	2013			5		2		7	N	N	2
Hensher and Puckett	2005		1			1		2	N	N	2
Ieromonachou and Warren	2008		4			8		12	N	N	2
Ieromonachou et al.	2007		10		7			17	N	Y	2
Ison and Rye	2005		10				9	19	Y	Y	2
Khan	2001	3					4	7	N	N	2
Laird et al.	2007		3			23		26	N	N	2
Leape	2006		8			1		9	N	N	2
Lee	2008	1	20					21	N	N	2
Marsden and May	2006		4			2		6	N	Y	2
Nash	2007		7			1		8	N	N	2

		Singapore	London	Stockholm	Norway	Edinburgh	Hong Kong	Total			
	A	B	B	B	B	B	B	B	C	D	E
Osland and Leiren	2007			11	20			31	N	N	2
Peirson and Vickerman	2008		12			1		13	N	N	2
Phang and Toh	2004	5					1	6	N	N	2
Phang and Toh	1997	2					1	3	N	N	2
Poole	2011		2	2				4	N	N	2
Ryley and Gjersoe	2006		2			5		7	N	N	2
Santos	2005	8	5					13	N	N	2
Santos and Fraser	2006		7			2		9	N	N	2
Santos et al.	2008		15			1		16	N	N	2
Schuitema et al.	2010			6		1		7	N	N	2

Appendix B Overview of implementation factors in the six cases

	Singapore				London				Stockholm				Norway				Edinburgh				HongKong				#	Av.
	S	F	I	T	S	F	I	T	S	F	I	T	S	F	I	T	S	F	I	T	S	F	I	T		
General political support	8.4	1.1	0.0	9.5	3.7	1.0	0.0	4.7	11.4	3.4	0.0	14.8	9.8	4.9	0.0	14.7	1.5	4.1	0.0	5.6	0.0	4.8	0.0	4.8	6	9.0
General public support	3.2	0.0	0.0	3.2	3.0	1.0	0.3	4.4	9.4	2.7	0.7	12.8	2.0	3.9	0.0	5.9	1.5	15.8	0.0	17.3	0.0	2.4	0.0	2.4	6	7.6
Information campaign	6.3	0.0	0.0	6.3	3.0	0.0	0.0	3.0	2.0	0.0	0.0	2.0	1.0	0.0	0.5	1.5	0.0	1.0	0.5	1.5	0.0	4.8	0.0	4.8	6	3.2
Various actor perceptions	2.1	0.0	1.1	3.2	0.7	0.0	0.0	0.7	0.0	1.3	0.0	1.3	0.0	0.5	0.0	0.5	0.0	4.1	0.0	4.1	0.0	7.1	0.0	7.1	6	2.8
Characteristics of the transport system	2.1	0.0	0.0	2.1	4.4	0.0	0.0	4.4	3.4	0.0	0.0	3.4	2.0	1.0	0.0	2.9	0.0	0.5	0.0	0.5	3.6	0.0	0.0	3.6	6	2.8
Marketing the scheme	2.1	0.0	0.0	2.1	0.3	0.0	0.0	0.3	2.0	0.0	0.0	2.0	2.0	0.0	0.0	2.0	0.0	1.0	0.0	1.0	0.0	3.6	0.0	3.6	6	1.8
Transport policy and supporting measures	11.6	0.0	0.0	11.6	7.0	0.0	0.3	7.4	0.7	0.0	0.0	0.7					0.0	3.6	0.0	3.6	0.0	1.2	0.0	1.2	5	4.9
Implementation strategy					1.0	0.0	0.0	1.0	8.1	1.3	0.0	9.4	2.0	0.0	0.0	2.0	0.0	6.1	0.5	6.6	0.0	1.2	0.0	1.2	5	4.0
Overall policy design	3.2	0.0	0.0	3.2	1.0	0.0	0.0	1.0	5.4	0.7	0.0	6.0	3.4	1.0	0.5	4.9	0.0	3.1	0.0	3.1					5	3.6
Legislation	1.1	0.0	0.0	1.1	3.7	0.0	0.0	3.7	0.0	6.0	0.0	6.0	0.0	0.5	0.0	0.5	0.0	4.1	0.0	4.1					5	3.1
Use of revenues	2.1	0.0	0.0	2.1	2.7	0.0	0.0	2.7	2.7	0.0	0.7	3.4	4.9	0.5	0.0	5.4	0.0	1.0	0.0	1.0					5	2.9
Perceptions of the problems					3.0	0.0	0.0	3.0	0.7	0.0	0.0	0.7	2.0	1.0	0.0	2.9	0.0	2.6	0.0	2.6	0.0	3.6	0.0	3.6	5	2.6
Project management	3.2	0.0	0.0	3.2	2.3	0.0	0.0	2.3	2.0	0.0	0.0	2.0	2.0	0.5	0.0	2.5	0.0	1.5	0.5	2.0					5	2.4
Participatory process	3.2	0.0	0.0	3.2	4.7	0.3	0.0	5.0	0.7	0.0	0.0	0.7	1.0	0.5	0.0	1.5	0.5	0.5	0.0	1.0					5	2.3
Technical feasibility	3.2	0.0	0.0	3.2					1.3	0.0	0.0	1.3	0.0	1.5	0.0	1.5	0.0	0.5	0.0	0.5	1.2	3.6	0.0	4.8	5	2.2
Timing					1.7	0.0	0.0	1.7	2.0	1.3	0.0	3.4	0.0	1.5	0.0	1.5	0.0	1.0	0.0	1.0	0.0	3.6	0.0	3.6	5	2.2
Political support of regional politicians					0.0	1.0	0.0	1.0	0.0	0.7	0.0	0.7	0.0	0.5	0.0	0.5	0.0	4.6	0.0	4.6	0.0	2.4	0.0	2.4	5	1.8
Various design factors	3.2	0.0	0.0	3.2	1.3	0.0	0.0	1.3	0.7	0.0	0.0	0.7	2.5	1.0	0.0	3.4	0.0	0.5	0.0	0.5					5	1.8
Perceptions on effectiveness					1.3	0.0	0.3	1.7	3.4	0.0	0.0	3.4	0.5	0.0	0.0	0.5	0.0	2.0	0.0	2.0	0.0	1.2	0.0	1.2	5	1.8
Geographical layout	3.2	0.0	0.0	3.2	0.7	0.0	0.0	0.7	1.3	0.0	0.0	1.3	1.5	0.0	0.0	1.5					1.2	0.0	0.0	1.2	5	1.6
Various management issues	1.1	0.0	0.0	1.1	0.7	0.3	0.0	1.0	1.3	0.7	0.0	2.0	1.5	0.0	0.0	1.5	0.0	1.0	0.0	1.0					5	1.3
Media					0.0	3.0	0.7	3.7	2.7	0.7	0.0	3.4	0.5	1.0	0.0	1.5	0.0	5.1	0.0	5.1					4	3.4
Political champion					4.7	0.0	0.0	4.7					1.5	0.0	0.0	1.5	1.0	2.0	0.0	3.1	0.0	2.4	0.0	2.4	4	2.9
Non-business interest groups					1.7	1.0	0.7	3.4					0.5	1.0	1.0	2.5	0.0	1.0	0.0	1.0	0.0	4.8	0.0	4.8	4	2.9
Technology	2.1	0.0	0.0	2.1	2.0	0.3	0.0	2.3					0.0	2.0	0.0	2.0					4.8	0.0	0.0	4.8	4	2.8
Scope and exemptions					3.4	0.3	0.0	3.7	0.0	0.7	0.0	0.7	0.5	0.5	1.0	2.0	0.0	2.6	0.0	2.6					4	2.2
Communication					0.7	0.0	0.0	0.7	1.3	0.0	0.7	2.0					0.0	4.6	0.0	4.6	0.0	1.2	0.0	1.2	4	2.1
Power	3.2	0.0	0.0	3.2	4.7	0.0	0.0	4.7	0.0	0.7	0.0	0.7	0.5	0.0	0.0	0.5					1.2	0.0	0.0	1.2	4	2.0
Political process					0.7	0.0	0.0	0.7	1.3	2.7	0.0	4.0	0.5	0.5	0.5	1.5	0.5	0.5	0.0	1.0					4	1.8
Objectives	1.1	0.0	0.0	1.1	2.0	0.0	0.0	2.0	1.3	0.0	0.0	1.3	2.5	0.0	0.0	2.5									4	1.7

	Singapore				London				Stockholm				Norway				Edinburgh				HongKong				#	Av.
	S	F	I	T	S	F	I	T	S	F	I	T	S	F	I	T	S	F	I	T	S	F	I	T		
Equity					0.0	0.3	0.0	0.3					0.0	1.5	0.0	1.5	0.0	2.6	0.0	2.6	0.0	2.4	0.0	2.4	4	1.7
Level and structure of charge	0.0	1.1	0.0	1.1	0.3	0.0	0.0	0.3					3.4	0.0	0.0	3.4	1.0	0.0	0.0	1.0					4	1.5
Experience	16.8	0.0	0.0	16.8									6.9	0.0	0.0	6.9	0.5	0.5	0.0	1.0					3	8.2
Privacy concerns	3.2	0.0	0.0	3.2	0.3	0.3	0.3	1.0													0.0	14.3	1.2	15.5	3	6.5
Studies and research	1.1	0.0	0.0	1.1	4.0	0.0	0.3	4.4	4.0	0.0	0.0	4.0													3	3.1
Trust													1.0	0.0	0.0	1.0	0.0	3.6	0.0	3.6	0.0	4.8	0.0	4.8	3	3.1
Many decision-making layers	4.2	0.0	0.0	4.2									0.0	1.0	0.0	1.0	0.0	1.5	0.0	1.5					3	2.2
Culture of decision-making	4.2	0.0	0.0	4.2													0.0	0.5	0.0	0.5	0.0	1.2	0.0	1.2	3	2.0
Businesses					1.7	1.0	0.0	2.7					0.0	0.5	0.0	0.5	0.0	2.0	0.0	2.0					3	1.7
Political support of the central government					0.7	0.7	0.0	1.3	3.4	0.0	0.0	3.4					0.0	0.5	0.0	0.5					3	1.7
Motorists									0.7	0.0	0.0	0.7					0.0	2.0	0.0	2.0	0.0	2.4	0.0	2.4	3	1.7
Cost	0.0	1.1	0.0	1.1	0.0	0.3	0.0	0.3													0.0	2.4	0.0	2.4	3	1.3
Implementing organisation	1.1	0.0	0.0	1.1	0.3	0.0	0.0	0.3									0.0	1.0	0.0	1.0					3	0.8
Risk management					0.3	0.0	0.0	0.3	0.7	0.0	0.0	0.7	0.0	0.5	0.0	0.5									3	0.5
Support of the road authority					0.3	0.3	0.0	0.7					4.9	1.0	0.0	5.9									2	3.3
Severity of the problems					1.7	0.0	0.0	1.7													0.0	2.4	0.0	2.4	2	2.0
Perceptions on exemptions																	0.0	1.5	0.0	1.5	0.0	2.4	0.0	2.4	2	2.0
Revenues													0.5	0.0	0.0	0.5					1.2	0.0	0.0	1.2	2	0.8
Political support of the council					0.0	0.0	0.3	0.3													0.0	1.2	0.0	1.2	2	0.8
Duration of the process					0.3	0.3	0.3	1.0									0.0	0.5	0.0	0.5					2	0.8
Various context factors					0.7	0.0	0.0	0.7					0.5	0.0	0.0	0.5									2	0.6
Decision-making procedures					0.3	0.0	0.0	0.3					0.5	0.0	0.0	0.5									2	0.4
Political support of the mayor					6.0	0.0	0.0	6.0																	1	6.0
Partial funding of the central government													5.9	0.0	0.0	5.9									1	5.9
Perceptions of cost and benefits																					0.0	4.8	0.0	4.8	1	4.8
Automobile associations									0.0	1.3	0.0	1.3													1	1.3
Political support within political party																	0.0	1.0	0.0	1.0					1	1.0
Industry interests													0.5	0.5	0.0	1.0									1	1.0
Teething troubles in early stage of operation					0.3	0.3	0.0	0.7																	1	0.7
Various actors					0.0	0.3	0.0	0.3																	1	0.3
Procurement and tenders					0.3	0.0	0.0	0.3																	1	0.3

is the number of cases in which the implementation factor is listed
Av. is the average percentage indicating how frequently this implementation factor is mentioned in all cases together
S= success factor, F= failure factor, I= implementation factor, T= total

5. Comparing transport policy implementation frameworks with each other and with real-world road pricing cases

Diana Vonk Noordegraaf, Jan Anne Annema, Bert van Wee (Submitted). Comparing transport policy implementation frameworks with each other and with real-world road pricing cases.

5.1 Introduction

The implementation of road pricing worldwide has been limited (Santos et al., 2010a). Road pricing is defined as consisting of policies that impose direct charges on road use (Jones and Hervik, 1992). The prospect that this measure would reduce the external effects of transport - e.g. traffic congestion - has resulted in many implementation attempts. However, since only a few attempts have succeeded, implementation is not seen as simply a "matter of carrying out that which has been decided upon" (Thomas and Grindle, 1990:1164). In fact, both the decision and the subsequent implementation process are often considered to be "the most crucial aspect of the policy process" (Thomas and Grindle, 1990:1165). Scientists have examined the factors that are critical in the implementation of complex transport policies, such as road pricing, to contribute to the understanding of policy implementation. The aim of this paper is to analyze how suitable transport policy implementation frameworks are for the analysis of road pricing policy implementation, in order to improve the understanding of road pricing policy implementation and, through that, to increase the effectiveness of policy implementation.

"Policy implementation encompasses those actions by public or private individuals (or groups) that are directed at the achievement of objectives set forth in prior policy decisions." (Van Meter and Van Horn, 1975:447). The implementation of a transport policy, and specifically road pricing, can be supported by the use of frameworks, as these can "alert policy makers to the variables that can be manipulated to improve the delivery of public services." (Van Meter and Van Horn, 1975:447). Also, frameworks can be used as a means "to help the analyst to better think through the problem" (Porter, 1991:98). To the authors' knowledge, at the moment, no other paper provides an overview and assesses the suitability of the policy implementation frameworks that can support the analysis of road pricing implementation. This paper aims to fill these gaps.

There is a large body of literature on policy implementation, including papers presenting general policy implementation frameworks, such as the frameworks proposed by Van Meter and Van Horn (1975), and Sabatier and Mazmanian (1980), and the more recent frameworks proposed by Brynard (2005) and (Winter, 2003b). "Theories about policy implementation have been almost embarrassingly plentiful, yet theoretical consensus is not on the horizon. The number of variables offered by researchers as plausible parts of the explanation for implementation results is large and growing […], validated findings are relatively scarce. […] And, most telling of all, those who have specialized in studying implementation questions systematically have had relatively little to say to practitioners." (O'Toole, 2004:310). Whether or not these observations also reflect the state of affairs within the transport policy is unclear. Because we expect that implementation frameworks developed specifically for the transport domain are most suitable for road pricing policy implementation, this paper focusses on these transport policy frameworks, examples of which include the frameworks proposed by Feitelson and Salomon (2004), and Attard and Ison (2010). These transport policy frameworks are generic and capable of capturing a multitude of factors affecting the policy *implementation* process. Frameworks for other phases of the policy cycles (see for references Jann and Wegrich, 2007), such as Lo and Hickman's evaluation framework for road pricing (1997), were not taken into account.

In this paper, we conduct two comparative analyses. Firstly, the various transport policy implementation frameworks are compared to each other. In our view, insight into the similarities and differences between the frameworks increases the understanding of these frameworks and their proper applications. Secondly, this paper assesses how much the frameworks (theory) have in common with the findings from the analysis of road pricing policy implementation in various real-world cases (practice). Findings on road pricing policy implementations in practice are derived from earlier work by Vonk Noordegraaf et al. (2014) - see the next section for further details.

The remainder of this paper is organized as follows. Section 2 discusses the methodology and includes an overview of the implementation checklists and frameworks analyzed. Section 3 presents the results of the analysis of the comparative analysis of the theory and practice of road pricing policy implementation. Section 4 summarizes the main conclusions and discusses the main findings. Section 5 provides recommendations.

5.2 Methodology

5.2.1 Selection of transport policy implementation frameworks

Transport policy implementation frameworks[7] were identified in scientific literature using a snowballing method. The first paper was the implementation framework of Banister (2005), which we found using the combined search words "road pricing", "implementation" and "framework". The selected frameworks are (implicitly or explicitly) intended to be used to analyse transport policy implementation. In addition, frameworks were selected that were generic and that address multiple factors of policy implementation. Hence, for example, the framework of Walker et al. (2001), which, although applied to road pricing by Marchau et al. (2010), focuses on one aspect of implementation being "uncertainties related to the implementation" (Marchau et al., 2010:949) and is therefore not included. Table 5.1 (see next page) provides an overview of the six selected frameworks and their main characteristics.

5.2.2 Comparative analysis of the transport policy implementation frameworks

Two comparative analyses are carried out. First, the transport policy implementation frameworks are compared to each other, providing insight into the similarities and differences among the frameworks. In comparing frameworks, the first step would be to compare the variables (i.e. implementation factors), followed by the relations, their directions and the values of variables and mathematical specifications. However, this paper only includes the first step, since only the framework of Feitelson and Salomon (2004) specifies relations between implementation factors and most empirical studies on road pricing lack this kind of information (Vonk Noordegraaf et al., 2014). The analysis of the implementation factors included in the frameworks (henceforth framework factors) consist of determining the degree of overlap and the degree of differences in implementation factors between the frameworks. Furthermore, we analysed whether implementation frameworks placed the same weight on implementation factors.

Next, we compared the framework factors to the implementation factors found in practice (henceforth empirical factors). For the factors found in practice, this paper uses the set of 61 implementation factors found in road pricing policy implementation processes in six real-world cases (Singapore, London, Stockholm, the Norwegian cities, Hong Kong and Edinburgh), as compiled by Vonk Noordegraaf et al. (2014) - see Appendix A for the implementation factors and Appendix B for more details on case selection. The factors that overlap in the frameworks and in practice could be affected by the coding rules we used to determine when to include a factor in our analyses as a framework factor. To that end, two sets of coding rules - a strict and a lenient set of coding rules - were applied. The main difference between the strict and lenient coding rules is that, using the strict rules implied only including implementation factors presented in the framework itself (often a table, list or figure), whereas the lenient rules also allowed the inclusion of factors from the written explanations of the frameworks involved. The details of the strict and lenient coding rules are included in Appendix B.

[7] The search aimed for a set of propositions. Ostrom distinguishes three different types of sets "operating a long a continuum involving increasing logical interconnectedness and specificity but decreasing scope"
Sabatier (2007:6) (Sabatier, P.A. (2007) The Need for Better Theories. *Theories of the policy process* ed Sabatier, P.A. Westview Press, pp. 3-17.) being a framework, a theory and a model. Although our search did not a priori exclude theories and models, our selection only includes frameworks. Therefore we use the term frameworks in this paper. For elaborate definitions, see Ostrom (2007) (Ostrom, E. Ibid.Institutional Rational Choice. An Assessment of the Institutional Analysis and Development Framework. pp. 21-64.)

Table 5.1 Characteristics of the selected frameworks

References	Brief description
Attard and Ison (2010)	Critical issues affecting the implementation of road user charging schemes. Combines insights from different papers based on experiences in different cities. List of factors including headings.
Banister (2005:58,60)	"Five framework conditions that need to be addressed" in policy implementation"; the approach supports overcoming barriers to implementation. List of factors that "form a coherent whole or package in themselves".
Feitelson and Salomon (2004)	Political economy framework specifying factors (some of which are conditions) affecting the adoption of transport innovations, including policy innovations. Combines various strands of theories. Factors and hypothesized relations.
Ieromonachou and Warren (2008) Ieromonachou et al. (2004:78); (2006:12)	Strategic Policy Niche Management, developed for transport polices, particularly "for more radical policies that prove to be difficult to implement" and to help "identify key factors that contribute to the success, or weakness, in road pricing cases" and show where there are common lessons. Provides a further development of Strategic Niche Management and includes main areas of concern based on road pricing cases from three European countries. List of factors.
Schade (Unpublished results) CUPID project (2005)	Implementation actions for introducing road user charging; eleven steps to increase the probability of a successful implementation and operation; focus on policies that aim to change behavior. Model is an elaboration of a model for the process of behavioral change in the context of transport polices and developed as part of the European project CUPID (Coordinating Urban Pricing Integrated Demonstrations). List of factors with a distinction between tasks for a certain period and permanent tasks.
Van den Bergh et al. (2004), (2007:248)	Framework for studying the relationship between five different categories of factors and the degree of 'success' of a project. The framework includes "a broad range of success and failure factors" for studying sustainable transport innovations. Draws on literature from various disciplines and its application to eight case studies. List of factors including headings and an indication of the relative importance of each category.

For each *individual* framework, we assessed the extent to which the implementation factors overlap with the set of empirical factors found in practice. Two criteria used for this are the percentage of factors from the framework that have an overlap with the set of empirical factors and the percentage of factors that do not overlap with the set of empirical factors. Not all frameworks explicitly claim to cover the complete policy implementation process. It could be that the frameworks, when combined, have more overlap with the *set* of empirical factors. Therefore, the *set* of framework factors (consisting of all the implementation factors included in all the selected implementation frameworks) is also compared to the set of empirical factors. This comparison additionally allowed for an analysis of the similarities and differences between these sets. Finally, we examined whether there is a consensus among the set of framework factors and the set of empirical factors regarding the relative importance of factors, using the relative frequency with which each factor is listed in these sets as a rough indicator. We assume that, the more important a factor is, the more likely it is to be included in the framework or in an empirical case, and the more frequently it will be listed in the set of factors. We expect important implementation factors to be acknowledged in multiple

frameworks and hence, to be listed more frequently among framework factors. The factors listed in the empirical cases are either the distinct or decisive factors and, although combining the insights for six cases does not allow for a precise ranking of factors based on the frequency, it does give an indication of which set of factors is the most relevant (for a further discussion, see (Vonk Noordegraaf et al., 2014).

5.3 Results

5.3.1 Comparison of implementation frameworks

The first observation is that there is a striking difference between the various implementation frameworks in the amount of implementation factors they include (see Table 5.2). The coding rules (strict and lenient) led to different numbers of implementation factors for each framework. The framework proposed by Banister (2005) has the least, while the most extensive list of implementation factors is included in the framework of Van den Bergh et al. (2004), with 21 and 52 factors, respectively.

Table 5.2 Number of implementation factors in each framework (using strict and lenient coding rules)

	Strict	Lenient
Attard and Ison, 2010	14	21
Banister, 2005	5	10
Feitelson and Salomon, 2004	14	23
Ieromonachou et al., 2004	10	30
Schade, 2004	11	20
Van den Bergh et al., 2004	52	57

Secondly, we found that there is little overlap between the implementation factors included in the different frameworks. Overlap was determined by counting the amount of implementation factors included in both frameworks being compared. Table 5.3 includes the results of the overlap of each framework with the other frameworks. Since the same conclusion was reached when using both strict and lenient coding rules, only the results using strict coding rules are included. To allow a correction for the large differences in the number of implementation factors included in each framework, the percentage of the total number of implementation factors included in both frameworks was taken (sum of all implementation factors included in both frameworks). The highest level of overlap - 16% in total - was found between the frameworks of Attard and Ison (2010) and Schade (Unpublished results). The bottom row shows the average percentage of overlap (Av.),which does not exceed 9%.

Table 5.3 Overlap between frameworks (using strict coding rules) (%)

	Attard and Ison, 2010	Banister, 2005	Feitelson and Salomon, 2004	Ieromonachou et al., 2004	Schade, 2004	Van den Bergh et al., 2004
Attard and Ison, 2010		0	11	4	16	8
Banister, 2005	0		5	13	6	4
Feitelson and Salomon, 2004	11	5		8	8	8
Ieromonachou et al., 2004	4	13	8		5	8
Schade, 2004	16	6	8	5		8
Van den Bergh et al., 2004	8	4	8	8	8	
Av.	8	6	8	8	9	7

The low degree of consensus between the frameworks about which factors affect policy implementation is also illustrated by Figure 5.1 from the perspective of the implementation factors. It lists how many implementation factors (vertical axis) are included in how many frameworks (horizontal axis). This figure shows that, in total, 20 factors are only listed in one framework. About half of these factors listed in only one framework (9 out of 20) are included in the framework proposed by Van den Bergh et al. (2004). Only 18 of all 38 implementation factors are included in two or more frameworks. In fact, not one implementation factor included in all six implementation frameworks.

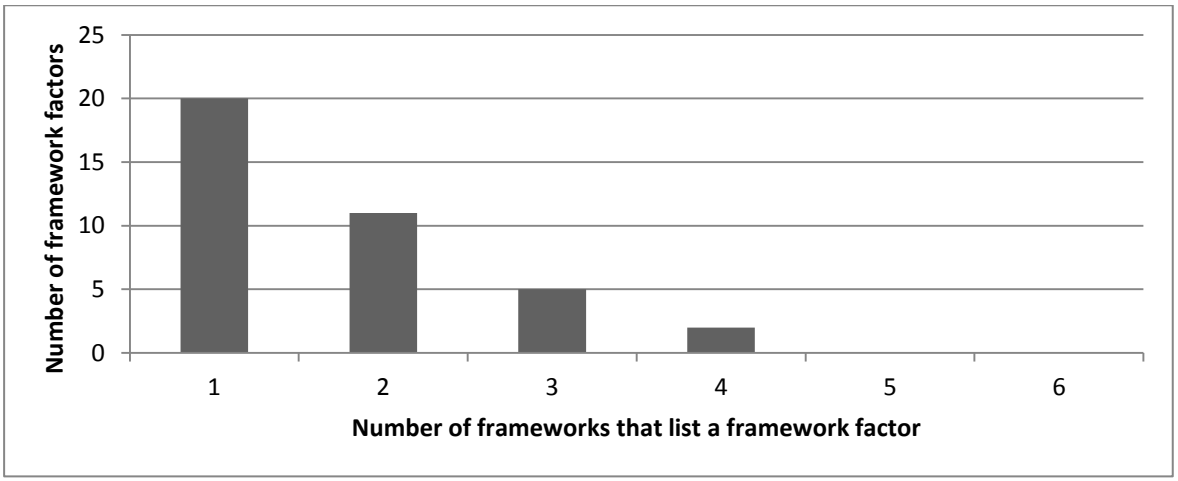

Figure 5.1 The number of frameworks in which a given implementation factor is included

The implementation factors that recurred most frequently in the set of framework factors are “perceptions on effectiveness” and “transport policy and supporting measures”. Both are listed in four of the six frameworks. The other frequently listed factors are “communication”, “perceptions of cost and benefits”, “political champion”, “general public support”, “technology” and– all of which listed in three frameworks.

5.3.2 Individual implementation frameworks and the set of empirical factors

Figure 5.2 illustrates, for each framework, how many of the included framework factors match and do not match the set of empirical factors (for an overview of empirical factors, see Appendix A).

Despite the differences identified in the degree of overlap between the frameworks and the set of empirical factors, overall the frameworks only cover a limited part of the empirical factors. In absolute numbers, applying both strict and lenient coding rules, van den Bergh's framework (Van den Bergh et al., 2004) has the highest number of framework factors that can be matched to the set of empirical factors (23 of the 61 empirical factors using strict coding rules and 30 of the 61 empirical factors using the lenient coding rules).

In addition to the overlap, the number of framework factors that could not be matched is also shown. Using the strict and lenient coding rules, a minority of the framework factors could not be matched, with the exception of the framework of Van den Bergh et al. (2004), in which about half of the framework factors could be matched.

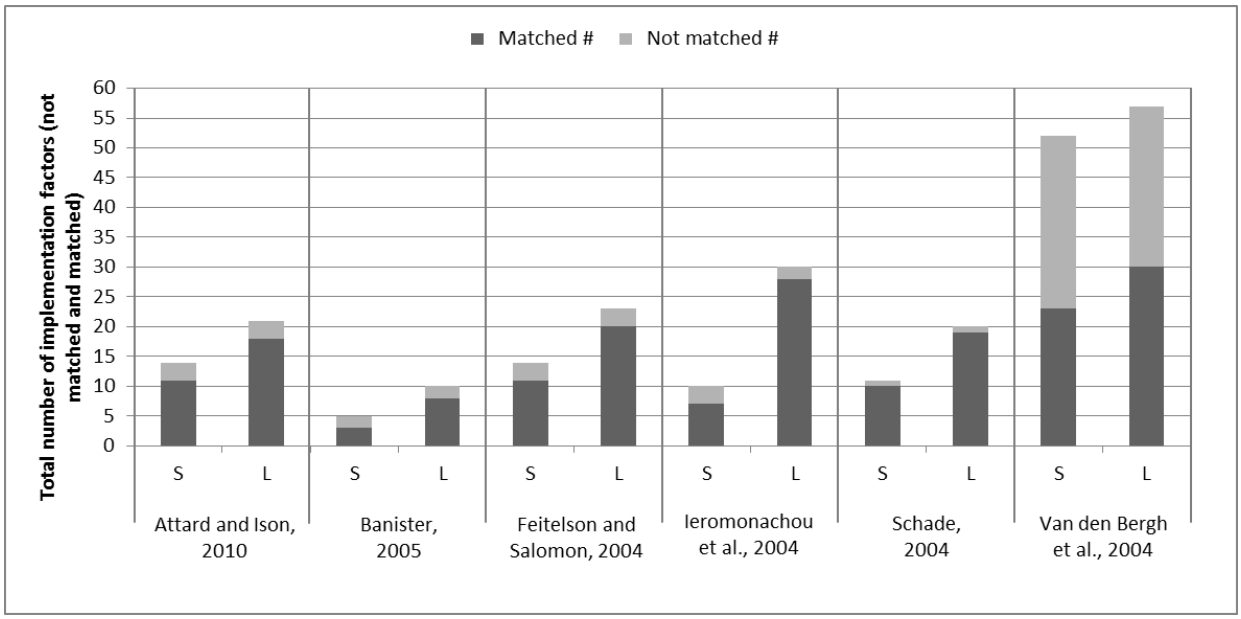

Figure 5.2 Matches of framework factors and the set of empirical factors (applying strict (S) and lenient (L) coding rules)

When we present this information in a table (see Table 5.4), we can show more clearly that there are differences between the results when using the strict and lenient coding rules. The overlap of the frameworks with the set of empirical factors is modest and varies considerably between one framework and another (ranging from 5% to 20%). Overall, the average degree of overlap with the empirical set of implementation factors is about twice as high when using the lenient coding rules, but it still remains limited. The percentage of framework factors that could not be matched to the empirical factors is very small, with the exception of the framework of Van den Bergh et al. (2004).

Table 5.4 Overview of percentages of the framework factors that are matched and not matched with the set of empirical factors

	Strict coding rules		Lenient coding rules	
	% Matched	% Not matched	% Matched	% Not matched
Attard and Ison, 2010	15	4	22	4
Banister, 2005	5	3	11	3
Feitelson and Salomon, 2004	15	4	24	4
Ieromonachou et al., 2004	10	4	31	2
Schade, 2004	14	1	23	1
Van den Bergh et al., 2004	20	26	25	23

5.3.3 The set of framework factors and the set of empirical factors

Next, the complete set of factors included in all the implementation frameworks was compared to the set of empirical factors (see Figure 5.3). Using both the strict and lenient coding rules, both sets have 38 and 45 factors in common, respectively (see factors in Appendix A with values of more than 0 in column A and B). Using the strict coding rules, in total two-thirds of the empirical factors were found in at least one of the six frameworks, while 23 empirical factors were not included in any of the frameworks. Using the lenient coding rules, 45 empirical factors were found in at least one of the frameworks. However, a large share of the framework factors (38 factors) could still not be matched to the set of empirical factors.

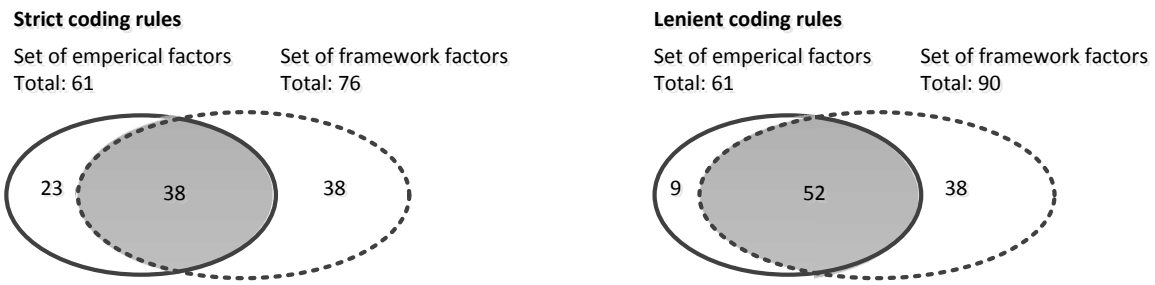

Figure 5.3 Overlap between the set of implementation framework factors and the set of empirical factors

5.3.4 Similarities and differences between the set of framework factors and the set of empirical factors

The set of framework factors have 38 and 45 factors in common, respectively with the set of empirical factors (see Figure 5.3). The complete list is included in Appendix A. The most frequently listed factor that the frameworks have in common with the set of empirical factors is “perceptions on the effectiveness” (included in four frameworks using strict coding rules and in five frameworks using lenient coding rules). When analysing the overlap, no content-based clusters factors were found that distinguish this subset from the other subsets (e.g. the subset of factors only included in the set of framework factors and the subset of factors only included in the set of empirical factors). The framework factors without a match to the empirical factors, 38 in total, were all listed in only one framework. Hence, in this set of implementation factors, no clusters of factors were found either. In the subset of factors that are only included in the set of empirical factors (23 and 16 factors), however, there were three clusters of factors that were not, or less explicitly, listed in the set of implementation factors

from the frameworks. Firstly, it was found that, in the set of empirical factors, more attention is paid to specific, predominantly governmental actors. Secondly, five road pricing specific factors were included in this empirical set that were even absent from the frameworks that had already been applied to road pricing. Finally, there are several practical aspects of policy implementation included in the set of empirical factors that are not (explicitly) listed in the frameworks.

5.3.5 Comparison of the importance of factors

The number of times a factor was listed in the frameworks or in the empirical cases was taken as a rough indicator of its importance (see section 5.2.2) and we compared the importance of factors in the frameworks and in practice.

The factors that are considered important in the set of framework factors as well as the set of empirical factors are “transport policy and supporting measures”, “general public support” and “general public support”. These factors are among the top ten of factors in the frameworks and in the top five of most listed empirical factors. However, these factors seem to be exceptions as, for other factors, the importance of factors in the set of framework factors differs from the importance in the set of empirical factors.

The factors considered to be the most important in the set of empirical factors are of varying importance in the set of implementation factors included in the frameworks and vice versa. Two of the top ten empirical factors are actually not included in the set of framework factors when using the strict coding rules (i.e. “privacy concerns” and “characteristics of the transport system”). Factors that are considered relatively important in the set of framework factors (e.g. “perceptions on effectiveness” and “perceptions on costs and benefits” were listed in 4 and 3 frameworks, respectively) were relatively unimportant in the set of empirical factors. Hence, there does not seem to be an overall relation between the importance of framework factors and empirical factors, as is illustrated in Appendix C, which includes a scatter chart of the importance of the factors that were included in the set of framework factors (horizontal axis) and in the set of empirical factors (vertical axis).

5.3.6 Sensitivity analysis

The body of literature on policy implementation is extensive. In order to test when using implementation frameworks from other fields would lead to the same results, we performed a sensitivity analysis. Using the same approach we used to select the transport policy implementation frameworks, we looked for generic frameworks that address multiple factors of policy implementation. Since road pricing is generally implemented by a government, we selected frameworks suitable for analysing government policy (not specifically road pricing). As such, frameworks that explain private sector innovations, such as the framework on innovative success by Van der Panne et al. (2003) or the seminal and frequently cited Diffusion of Innovations model (DIM) created by Rogers (2003), are not included.

This resulted in the selection of seven implementation frameworks: Bressers (2004), Brynard (2005), Cutt and Tydeman (1981), Sabatier and Mazmanian (1980)[8], Sutton (1999), Van Meter and Van Horn (1975) and Winter (2003b). We carried out the same analysis as we used in this section using these frameworks and learned that this did nog change our conclusions.

5.4 Conclusions and Discussion

5.4.1 Conclusions

The policy implementation frameworks we analyzed seem to make only a modest contribution to the analysis of road pricing. This paper firstly concludes that there is little consensus among the implementation frameworks reviewed. About half of all implementation factors included in any of the frameworks were only included in one framework. As a result, each framework will point to a different subset of implementation factors. Secondly, this paper concludes that there is little overlap between the implementation factors found in the implementation frameworks and the implementation factors found in practice. Most frameworks only cover an average less than 10% of all the implementation factors found in practice. Even the combined set of implementation factors from all the frameworks has limited overlap with the implementation factors found in practice; about half of the implementation factors from the frameworks are not listed in practice. Thirdly, this paper concludes that there are some factors that seem especially important, as they were considered important in a majority of the implementation frameworks and included in the top 10 empirical factors: “transport policy and supporting measures” “general public support” and “general political support”. In addition, both acknowledge the role of actors and actor support. As far as the other implementation factors are concerned, the implementation frameworks and findings on implementation factors from empirical cases do not seem to agree on the importance of the factors.

5.4.2 Suitability of implementation frameworks

The consequence of using one framework in the analysis or support of a policy implementation process is that many implementation factors will not be included in the framework. Note that, as frameworks by definition are an abstraction of reality, there will always be a tension between keeping the framework parsimonious and providing an all-inclusive picture. Moreover, the frameworks do not claim to provide a complete synthesis or overall picture for road pricing and, as case-specific factors are very important (Vonk Noordegraaf et al., 2014), it is not surprising that frameworks do not cover all the factors. Nonetheless, the fact that the frameworks we studied all aim to support the analysis of transport policy implementation and all included multiple implementation factors may have set us on the wrong track regarding our expectations.

This raises the question how suitable the frameworks analyzed in this study are for the analysis road pricing policy implementation and what contribution they can make to

[8] Note that we did not select Sabatier’s most recent framework - the Advocacy Coalition Framework (Sabatier, P.A. (1988) An advocacy coalition framework of policy change and the role of policy-oriented learning therein. *Policy sciences* 21, 129-168.) – but we did include the most frequently used framework of Sabatier and Mazmanian (Sabatier, P., Mazmanian, D. (1980) The Implementation of Public Policy: A Framework of Analysis. *Policy studies journal* 8, 538-560.) because the more recent framework “actually moved the focus of analysis away from implementation” (Winter, 2003b:216) (Winter, S.C. (2003a) Implementation Perspectives: Status and Reconsideration. *Handbook of public administration* eds Peters, B.G., Pierre, J. Reprinted 2005 ed. Sage, pp. 212-223.).

improving the understanding of road pricing policy implementation. O'Toole's (2004) observations on policy implementation theories, as quoted in the introduction, are partly supported as far as the transport implementation frameworks studied in this paper are concerned. Consensus among frameworks is limited and the number of variables is large, so the question arises what we have to say to practitioners. We could state that the frameworks we examined are not helpful at all. In our view, this statement would be too bold. We still feel that the policy implementation frameworks studied in their current state to a certain extent can be of value to the analysis and support of road pricing policy implementation. Firstly, they offer a suggestion as to which possible implementation factors could play a role. In addition, the most frequently listed factors give some indication as to which factors are more important than others. Finally, the framework proposed by Feitelson and Salomon (2004) specifies relations between the variables, which could be valuable for further research, because they can serve as hypotheses to be tested.

We wondered whether one framework might be more suitable than the others for the analysis of road pricing. However, we did not find clear evidence to support this. There appears to be a trade-off between having a broad overview of factors (including factors that will not be present in the empirical case) versus a small set of factors (with fewer factors not present in practice). The framework proposed Van den Bergh has the highest degree of overlap with practice (20%), but it also includes most factors not included in practice (26%). Compared to the framework of Van den Bergh, four frameworks have less overlap with practice (10-15%) and include fewer factors that are not found in practice (1-4%).

What do we propose to increase the chance of road pricing policy implementation? Instead of using the insights from one framework, we suggest that it may be helpful in practice to combine the implementation factors included in all six frameworks into one set of framework factors. As we also found that the frequency with which factors are listed provides some guidance as to which factors are more important than others, we propose using a selection of the set of framework factors (top half) as a checklist (the complete checklist is included Appendix A). Using this checklist may help improve the road pricing policy implementation process and make the decision-makers involved more proactive and responsive. Despite this potential value, we would like to make three comments on the value of our checklist. As is the case with any frameworks or checklist, using it does not guarantee policy implementation. Secondly, we feel that, compared to the complete set of framework factors, our checklist reduces but does not eliminate the chance that implementation factors are included that will not be present in practice. Finally, the factors included in our checklist were based on a rough indication of their importance and, since we are unable to establish a precise ranking of the implementation factors, users should be aware that the order of the other factors included in the checklist can vary from case to case.

When analyzing the similarities and differences between the implementation factors found in theory and practice, several interesting pointers can be given. Although the three implementation factors that seem especially important are anything but surprising, perhaps it is more interesting to note that theory and practice only seemed to agree to a certain extent on these three factors and there is a lack of consensus when it comes to other implementation factors that are also often considered important, such as "political champion" or "information campaign".

In addition, we noticed that frameworks generally speaking make fewer subdivisions of actors compared to practice. In the set of empirical factors, much more specific actors, especially

divisions of government, were distinguished. Next, there were several implementation factors on which theory and practice seem to disagree when it comes to their relative importance. Firstly, in the empirical set, other road pricing-specific factors related to actor perceptions were considered important. For example, "perceptions of cost and benefits" and "equity", were considered relatively important in theory, and to a lesser extent in practice, while "privacy" was considered much more important in practice than in theory. Secondly, the set of framework factors appears to pay less attention to the practical aspects (e.g. project management") of implementation than the set of empirical factors. Finally, "marketing of the scheme" and "characteristics of the transport system" appear to be considered more important in practice than in theory, although it must be noted that related factors are included in our checklist (e.g. "information campaign" and "communication" and "transport policy and supporting measures", respectively). Hence, it is important to be aware that, in each road pricing case, other specific actors and other actor perceptions can play a role. In addition, even the precise manifestation of factor ("communication" or "marketing campaign") can vary.

5.4.3 Theory or practice

Our comparison between implementation factors found in implementation frameworks and in empirical case studies made us wonder which set of factors would provide the most accurate view of policy implementation. Our impression is that the set of empirical factors is more robust than the set of framework factors, because the set of empirical factors used in this paper is based on empirical studies, a majority of which did not use any framework to structure the analysis and was unclear about the data sources used to arrive at the selection of implementation factors (Vonk Noordegraaf et al., 2014). However, as the set of empirical factors is based on an extensive review of existing studies - the insights of at least 20 different (co)authors are included for each case - in our view, the chance that an analysis of additional empirical cases would lead to new important factors is relatively small. There are several other aspects that support our impression that the set of frameworks factors is less robust. There could be a risk that frameworks are echoing implementation factors. However, we found no references to papers including the other frameworks, so we think this risk is minimal. We also found no evidence of certain biases in the implementation frameworks we examined. We do support May's finding that "Most conceptual frameworks in implementation literature […] lacking adequate definitions of concepts […]" (May as cited in (Winter, 2003a:217). For example, Attard and Ison's framework (2010) includes a category labeled "political champion" and this category includes only one factor, "catalyst for change", which was unclear to us, and although the implementation factors included in the framework of Van den Berg et al. (2004) are specific, no definitions of the factors are included. Furthermore, we found that it is often unclear what the scope of a given framework is, for which specific applications the frameworks are valid and what the position of the frameworks is compared to other frameworks.

5.4.4 Representativeness

There are many different types of road pricing schemes (e.g. urban or nationwide, a selection of roads or a complete network) and the design parameters of any given scheme have an effect on policy implementation. Therefore, we would like to discuss for which types of road pricing policies our findings are valid. None of the frameworks make explicit in terms of the type(s) of road pricing policies they are applicable. Because the empirical data is all retrieved from urban road pricing cases, we think that our results regarding the comparison of theory

and practice are at least valid for urban road pricing cases, but other types of road pricing (such as nationwide road pricing or rewarding projects) need further validation.

5.5 Recommendations

The following recommendations are made for the further application of transport policy implementation frameworks in the analysis and support of road pricing policy implementation.

- We recommend using the checklist presented in this paper for the analysis and support of road pricing policy implementation, as this support a structured analysis and might provide new insights thereby increasing proactivity and responsiveness. We think particular attention should be paid to the implementation factors "transport policy and supporting measures" "general public support" and "general political support". The proposed checklist should be used for inspiration and for some guidance, but with an awareness that it is not readily applicable to each situation. Each specific road pricing context (comprising the design of the policy, the actors involved, whether the user of the framework is interested in the strategic or more operational level) requires applying the checklist. Also actors wanting to implement road pricing should be aware that which implementation factors are important will change over time. To fine-tune the checklist, case-specific experts and the actors involved could be consulted as well.
- We also think that it may be wise to perform a stakeholder analysis regularly in an actual implementation process, rather than considering this a one-time exercise. Empirical factors show that actors can be subdivided (e.g. the government can consist of different actors). It is also recommended to make an overview of the actor perceptions. Insight from the stakeholder analysis can be used to manage the implementation process and in the communication and information provided to the stakeholders.
- In addition, it seems useful to position a road pricing policy against the wider context of the overall transport policy. In addition, implementing supporting measures showed to be potential useful measures. Also the characteristics of the local transport system (such as the quality of public transport alternatives) seems important as our analysis shows.

The second set of recommendations is aimed at the further development of implementation frameworks.

- Researchers should include adequate definitions of each framework factor, to explicitly describe the importance and the relations between the factors included in the policy implementation framework.
- They also should make the scope of the framework explicit, in terms of what is and what is not included in the framework and why, and the intention of the framework (i.e. generally applicable or specifically for road pricing) as an implementation framework may perhaps have a wider relevance than its original aim.
- It may also be wise for researchers to build implementation frameworks onto previous implementation frameworks (or relevant literature) and not re-invent the wheel, and clarify the contribution of each framework in the context of other implementation frameworks. In building these implementation frameworks, it would be opportune to focus on the most important factors and not to try to completely specify implementation factors included in the frameworks in full. To validate the designed frameworks, it seems good to apply a given implementation framework to policy implementation cases in practice, to test how useful the framework actually is in analyzing these cases.

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Appendix A Comparison of framework factors with a set of empirical factors

Table A.1 Implementation factors included in the implementation frameworks and the set of empirical factors

	Implementation factors	A	B	C		D	1	2	3	4	5	6
1	*Perceptions on effectiveness*	4	5	a	b	1.5	2		1	4	2	2
2	*Transport policy and supporting measures*	4	4	a	b	4.9		2		2	2	2
3	*Communication*	3	4	a	b	1.4	1	3			2	1
4	Perceptions of cost and benefits	3	4	a	b	0.8	2		1	4		2
5	*Political champion*	3	4	a	b	1.9	1			1	3	2
6	*General public support*	3	3	a	b	7.6		2	2	2		
7	*Technology*	3	3	a	b	1.9	1		2			2
8	*Perceptions of the problems*	2	5	a	b	2.1	3		1	3	3	2
9	*General political support*	2	3	a	b	9.0			2	4	1	
10	Objectives	2	3	a	b	1.2	1				2	3
11	*Participatory process*	2	3	a	b	1.9		3			2	2
12	*Studies and research*	2	3	a	b	1.6			3		2	2
13	*Technical feasibility*	2	3	a	b	1.9	3		1			2
14	Implementing organisation	2	2	a		0.4				2		2
15	*Overall policy design*	2	2	a		3.0	2				2	
16	*Power*	2	2	a		1.7		2				2
17	*Various actor perceptions*	2	2	a		2.8				2		2
18	Various actors	2	2	a		0.1				2		2
19	*Information campaign*	1	4		b	3.2	3	3			3	2
20	*Use of revenues*	1	4		b	2.4	1		3	3	3	
21	Businesses	1	3		b	0.9			3	4		2
22	Equity	1	3		b	1.1	1		3	4		
23	*Experience*	1	3		b	4.9			1		3	3
24	*Implementation strategy*	1	3		b	3.4		3		3	2	
25	Industry interests	1	3		b	0.2			1	4		3
26	*Media*	1	3		b	2.3			3	4	1	
27	*Non-business interest groups*	1	3		b	1.9			1	4		3
28	*Scope and exemptions*	1	3		b	1.5	3			2	3	
29	Decision-making procedures	1	2			0.1			1			3
30	Severity of the problems	1	2			0.7	2				3	
31	*Timing*	1	2			1.8	1				4	
32	Culture of decision-making	1	1			1.0						2
33	Geographical layout	1	1			1.3						2
34	*Legislation*	1	1			2.6						2
35	Many decision-making layers	1	1			1.1						2
36	Risk management	1	1			0.2						2
37	Trust	1	1			1.6						2

		A	B	C	D	1	2	3	4	5	6
38	Various context factors	1	1		0.2						2
39	Automobile associations	0	3	b	0.2			3	4		3
40	Cost	0	2		0.6	3		3			
41	Perceptions on exemptions	0	2		0.7	3			4		
42	*Privacy concerns*	0	2		3.3			3	4		
43	*Project management*	0	2		2.0		3				3
44	Revenues	0	2		0.3	3		3			
45	*Marketing the scheme*	0	1		1.8					3	
46	Motorists	0	1		0.8				3		
47	*Political support of regional politicians*	0	1		1.5				4		
48	Political support of the central government	0	1		0.9				4		
49	Political support of the council	0	1		0.3				4		
50	Political support of the mayor	0	1		1.1				4		
51	Political support within political party	0	1		0.2				4		
52	Support of the road authority	0	1		1.1				4		
53	*Characteristics of the transport system*	0	0		2.8						
54	Duration of the process	0	0		0.3						
55	Level and structure of charge	0	0		1.0						
56	Partial funding by the central government	0	0		1.0						
57	Political process	0	0		1.2						
58	Procurement and tenders	0	0		0.1						
59	Teething troubles in early stage of operation	0	0		0.1						
60	*Various design factors*	0	0		1.5						
61	Various management issues	0	0		1.1						

The checklist presented in this paper consists of the implementation factors 1-30 (in bold border).
The implementation factors in italics are included in the top half of list when sorted on average percentage indicating how frequently this implementation factor is mentioned in all cases together (column D).
A= Present in # of frameworks (Strict coding rules)
B= Present in # of frameworks (Lenient coding rules)
C= Listed in at least two frameworks applying strict coding rules (a) and in at least three frameworks applying lenient coding rules (b) and with a match to the set of empirical factors
D= The average percentage indicating how frequently this implementation factor is mentioned in all cases together

1) Attard and Ison, 2010
2) Banister, 2005
3) Feitelson and Salomon, 2004
4) Ieromonachou et al., 2004
5) Schade, 2004
6) Van den Bergh et al., 2004

1= (almost) exactly the same terminology used, no interpretation required
2= obviously related factors but different terminology used, some interpretation required
3= not listed explicitly in the framework, but the factor is listed as an important factor in the framework description
4= factor can be implicitly matched to the empirical factor (e.g. if the framework includes the generic term actors, then implicitly all specific actors in the empirical set of factors are matched to this frameworks factor).

Appendix B Approach to comparing framework factors with empirical factors

The set of empirical factors

The set of empirical factors was adopted from the study by Vonk Noordegraaf et al., (2014). This set, to the authors' knowledge, can be considered to be the most elaborate set of implementation factors identified in the analysis of road pricing implementation in practice. In Vonk Noordegraaf et al., (2014) the implementation processes of six road pricing cases were analysed thoroughly and in detail, using existing scientific literature (on average 27 papers) for these cases. These six cases are Singapore, London, Stockholm and the Norwegian cities for implemented road pricing cases, and Hong Kong and Edinburgh as cases where the implementation of road pricing ultimately did not take place.

Through a content analysis, observations on the implementation factors in 106 papers were clustered, allowing us to count the frequency with which an implementation factor was listed for each case. For each case, an average of 36 different implementation factors were listed, providing 61 different implementation factors in total, across all six cases.

The number of observations clustered in one implementation factor is presented as a percentage of the total number of observations for one case (with the sum of the percentages for all implementation factors in one case adding up to 100%) because the number of papers (and through that the number of observations and implementation factors that were found) varies considerably per case. Appendix A provides an overview of the set of empirical factors. For each empirical factor, the frequency (expressed as a percentage) that the factor was listed on average in the six cases is indicated. More information on the methodology used to arrive at the set of empirical factors and on the implementation factors can be found in Vonk Noordegraaf et al., (2014).

Comparing framework factors with empirical factors

The interpretation of the factors included in each framework was based on the descriptions included in the paper(s) presenting the framework. Based on this interpretation, it was determined for each factor whether an equivalent could be found in the other implementation frameworks and among the implementation factors from the cases. When a framework described multiple factors that all related to the same empirical factor, the framework factor that was most closely related to the empirical factor was matched, and the other framework factors were not matched. Frameworks that include a specific factor (e.g. "experts" as an actor who may influence policy implementation) but no other related factors (e.g. "media", also as an actor who may influence policy implementation), the assumption was that this exclusion was intentional. As a result, only factors explicitly included in the framework were matched (so, in the example, only "experts" were matched). Empirical factors with their equivalent from the frameworks are listed in Appendix A. For each framework factor that could be matched to an empirical factor, the level of interpretation required to make the match was indicated (see Appendix A concerning levels).

The more interpretation that is required to determine whether framework factors can be matched to the empirical factors, the more prone it is to errors and the subjectivity of the researcher. Therefore, two measures were taken to enhance the quality of the comparison. The first measure was that the first and second author of this paper discussed whether or not to include a framework factor in the comparison, the meaning of the factor and how to match the factor, continuing the discussion until a consensus was reached. The second measure was to

match the framework factors to an empirical equivalent, using both strict and more lenient coding rules, and to determine whether this yielded different results.

Using the strict coding rules, only the factors included in the framework itself (often a table, list or figure) were considered. Furthermore, each framework factor that could be matched to an empirical factor was matched only to one empirical factor (the factor with the most similarities, see above). Using the lenient coding rules, factors from the framework explanations (from texts supporting the table, list or figure) are also included and, if relevant, a framework factor is related to multiple empirical factors. When using the lenient coding rules, the factors were also related when the relation is less obvious than the matches based on using the strict coding rules, but where the first and second author agreed that these factors could be related. Mostly, this meant matching a framework factor with both higher and lower levels of aggregation than the level of aggregation in the empirical factors.

Several examples are included to illustrate which additional matches are made using lenient coding rules as opposed to strict coding rules. The “media” factor from Feitelson and Salomon’s framework (2004) was only included in the framework explanation. Using the lenient coding rules, this factor was matched to the empirical “media” factor. An example of a less obvious relation where a match was made using the lenient coding rules is the linking of the “experts” framework factor to the “research and studies” empirical factor.

Appendix C The importance of framework factors and empirical factors

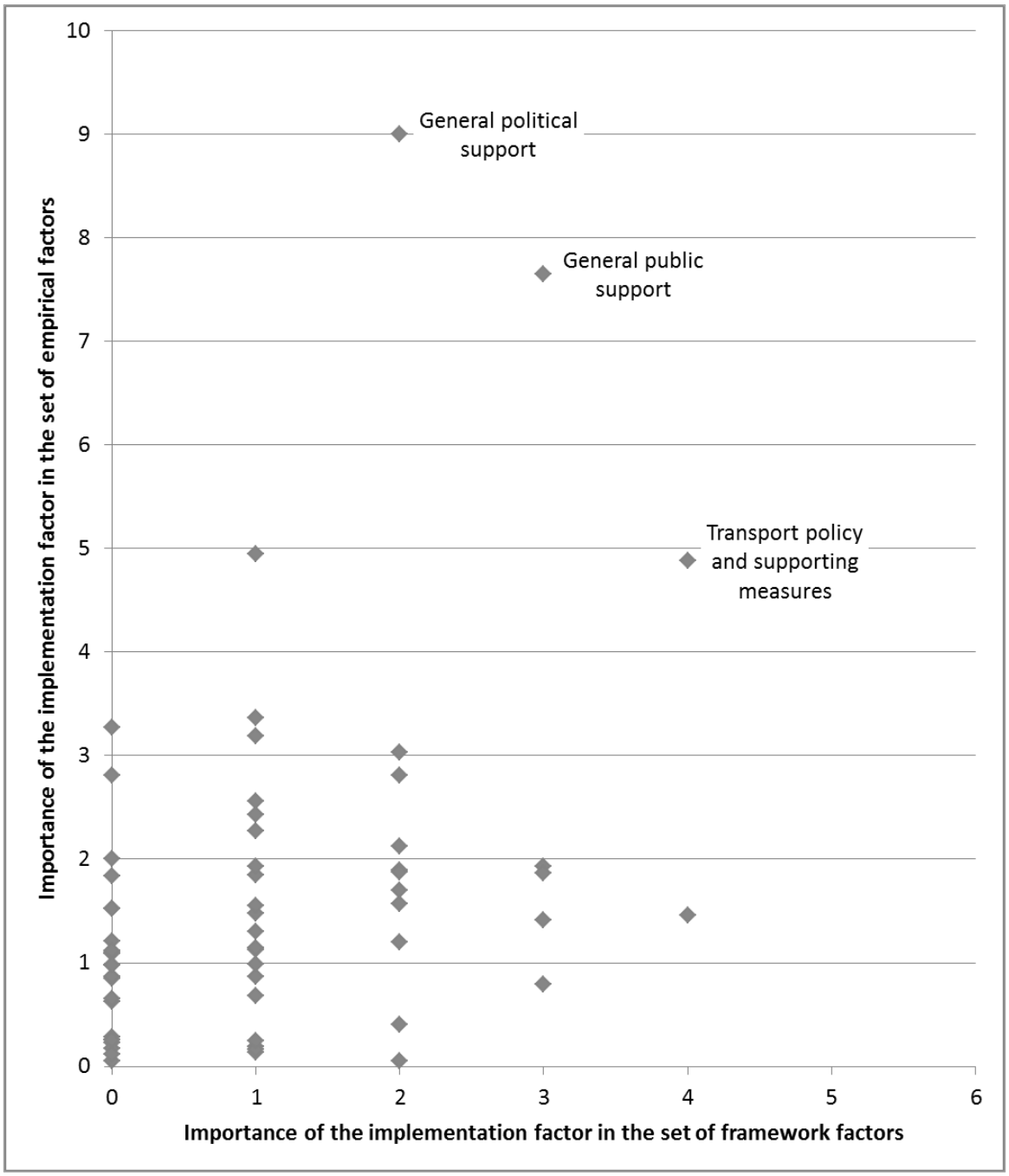

Fig. C.1 Importance of framework factors and importance of empirical factors

Horizontal axis; number of frameworks in which an implementation factor is included, values included in Appendix 1 column A (strict coding rules).
Vertical axis; the average percentage indicating how frequently this implementation factor is mentioned in all cases together, values included in Appendix 1 column D.
Labels of data points are only given for factors considered important in theory and practice.

6. Conclusions

6.1 Contributions on road pricing policy implementation

6.1.1 Contributions to research gaps and answers to research questions

In this section I list the main contributions of this thesis in terms of filling the identified research gaps and thereby increasing the understanding of which implementation factors play a role in road pricing policy implementation and in what way. Furthermore I answer the research questions.

The policy implementation of road pricing was the main theme of this thesis. In this thesis I filled the following three research gaps that were addressed in chapter 1:

- Gap 1: *Road pricing cases which were not implemented and/or innovative are under-exposed in the road pricing literature and therefore limited knowledge is available on these cases.*
  This thesis explicitly included three cases of road pricing which were not implemented – kilometre charging in the Netherlands (Chapter 2), the case of Hong Kong and that of Edinburgh (Chapter 4). Two innovative cases were also studied; kilometre charging in the Netherlands (Chapter 2) and Peak Hour Avoidance (PHA) in the Netherlands (Chapter 3). The former is considered innovative because of its nationwide scale, its scope – concerning passenger and freight transport – and its differentiated incentive. The latter is considered innovative because it concerns a reward incentive and has been implemented in practice, which has not been done before.
- Gap 2: *Few studies on road pricing have focused solely on the policy implementation of road pricing and therefore little is known on the complete implementation process.*
  This thesis focused particularly on policy implementation of road pricing. Different aspects of this case were studied – from the perspective of policy implementation in order to gain a more thorough understanding of why kilometre charging in the Netherlands was not implemented (Chapter 2), examining one specific implementation factor – employer

support (Chapter 3), analysing the implementation factors that were partly hidden or underexposed in existing studies of road pricing cases (Chapter 4) and assessing the suitability of policy implementation frameworks for the analysis of road pricing policy implementation (Chapter 5). By studying road pricing policy solely in terms of different aspects of policy implementation this thesis increases the understanding of this subject.

- Gap 3: *Road pricing policy implementation has hardly been studied from a theoretical perspective, which is why insights are lacking.*
  In this thesis, a framework for factors that affect the willingness on the part of policy actors to adopt a transport policy instrument was developed and then tested for road pricing (Chapter 2). In addition, six (theoretical) policy implementation frameworks were assessed and recommendations were provided to improve the further application and development of transport policy implementation frameworks in the analysis and support of road pricing policy implementation (Chapter 5).

The specific insights gained from this research are listed below as answers to the research questions as presented in chapter 1.

- *How did the policy implementation process for implementing road pricing evolve, based on the Dutch case of kilometre charging?*
- *How does a conceptual framework look like that gives a comprehensive overview of the factors that affect the likelihood of a transport policy instrument being implemented?*
- *What insights has the application of the conceptual framework to the Dutch case of kilometre charging given us and how useful was this framework for the analysis of this case?*

A conceptual framework was used to describe the evolution of the policy implementation process for kilometre charging, from the first proposal to implement road pricing by the Dutch government in 2004 up to the decision in 2010 by a successive government not to implement it.

The framework describes the factors affecting the willingness of a policy actor to adopt a transport policy instrument and consists of three main components:
A. The feasibility of a policy instrument (A1) and the appraisal of the feasibility of a policy instrument (A2)
B. The need for a policy opportunity
C. The need for political decisiveness

Applying the conceptual framework to the kilometre charging case resulted in the following insights. First of all, kilometre charging was considered technically, economically and socially feasible by important policy actors. However, these factors were not undisputed and uncertainties remained. The political feasibility changed from broad consensus on the implementation of kilometre charging in 2006 to insufficient political support in 2010. Due to the lack of actor support, kilometre charging proved politically unfeasible in 2010. Besides political feasibility, the lack of political decisiveness seems to have been the most important barrier to the implementation of kilometre charging in the Netherlands.
The framework was helpful for the systematic description and analysis of the Dutch kilometre charging case. In addition, all the factors included in the framework had an impact on the policy implementation process for kilometre charging.

- *What are the attitudes of Dutch employers towards Peak Hour Avoidance and what factors affect their attitudes?*
- *What contribution to Peak Hour Avoidance (PHA) can be expected from employers?*

The attitude of large Dutch employers (more than 100 employees) towards PHA was investigated. Data were collected from 103 employers through a web questionnaire. A large variation was found in these employer's attitudes to PHA. Slightly more than one third (34%) of the respondents (mainly HR managers) perceived their organisations as willing to support PHA by offering flexible working times or places. When exploring the factors that influence this willingness to support PHA, the estimated Structural Equations Model (SEM) revealed that organisation size has only an indirect effect through the attitude of the HR manager. The sector (e.g. government, construction, education) has only an indirect effect through the strictness of the working times. Results reveal that the highest willingness to support PHA can be expected from organisations who feel responsible for influencing the commuting behaviour of employees, that have human resource managers with a positive attitude towards Peak Hour Avoidance, with flexible working times and that have already implemented mobility management measures.

Employers are an important stakeholder in PHA. This study found that almost half of the respondents (45%) feel that the employer is responsible for influencing the commuting behaviour of their employees. It is as yet uncertain how much effort these employers are willing to invest in translating their responsibility into concrete actions. The largest contribution to PHA that can be expected from employers is providing employees with flexible working times and encouraging employees to fully utilise this option as an alternative to driving in peak hours. This would not only be beneficial for PHA but for a wide range of mobility management initiatives as well.

- *Which implementation factors that have affected the policy implementation process can be identified in the implemented road pricing cases of Singapore, London, Stockholm and the Norwegian cities, as well as the two not implemented cases of Hong Kong and Edinburgh and how often are these factors listed?*
- *What similarities and differences are found when the detailed sets of implementation factors of these cases are systematically compared?*

An elaborate set of implementation factors were found to play a role in the implementation processes of the six road pricing cases studied. A total of 61 implementation factors were found across all six road pricing cases as some factors were present in multiple cases. The three implementation factors most often listed for each case account on average for 30%[9] of all the implementation factors listed in the cases. For each case a set was made of the most listed implementation factors (for an overview of the implementation factors in the six cases, the most listed implementation factors per case and a discussion of implementation factors that stand out in each case, see chapter 4).

Six implementation factors were identified as being common across and recurrent in each of the six cases (so-called generic implementation factors). In order of frequency listed in all the six cases together, these factors are "general political support", "general public support", "information campaign", "various actor perceptions", "characteristics of the transport system"

[9] The number of observations (strings of text that refer to implementation factors) identified in the reviewed papers are content-based clustered into implementation factors. These implementation factors are presented as a percentage of the total number of observations for one case (with the sum of the percentages for all implementation factors in one case adding up to 100%) because the number of papers (and with that the number observations and implementation factors that were found) varies considerably per case.

and “marketing of the scheme”. However, the six generic factors account for on average only 27% of all the implementation factors listed. In addition to these similarities large differences were also found between the most important implementation factors for each of the six cases.

Each case included case-specific factors that were either not or infrequently present in the other cases. The most prominent case-specific implementation factor is the role of specific actors. The factor analysis demonstrated that no clusters of similar cases were found that resulted in policy implementation lessons. Furthermore, it was found that large differences are possible between cases in terms of the importance of implementation factors and the manifestation of individual factors.

- *What is the level of consensus among the six transport policy implementation frameworks being analysed regarding the implementation factors included in these frameworks?*
- *What is the overlap between the set of implementation factors included in selected transport policy implementation frameworks (theory) and the set of implementation factors from the analysis of road pricing policy implementation in six real-world cases (practice)?*
- *How suitable are the transport policy implementation frameworks for the analysis of road pricing policy implementation?*

There is little consensus among the implementation frameworks analysed about which factors affect policy implementation. About half of all implementation factors included in any of the frameworks were only included in one framework. As a result, each framework will point to a different subset of implementation factors.

In addition, there is little overlap between the implementation frameworks and the implementation factors found in practice. Most frameworks only cover an average of less than 10% of all the implementation factors found in practice. Even the combined set of implementation factors from all frameworks has limited overlap with the implementation factors found in practice; about half of the implementation factors from the frameworks are not found in practice. Furthermore, it was found that there are several factors that seem especially important, as they were considered important in a majority of the implementation frameworks and included in the top ten empirical factors: “transport policy and supporting measures”, “general public support” and “general political support”. In addition, both acknowledge the role of actors and actor support. As far as the other implementation factors are concerned, the implementation frameworks and findings on implementation factors from empirical cases do not seem to agree on the importance of the factors.

This chapter therefore concludes that it appears that the policy implementation frameworks analysed can make only a modest contribution to the analysis of road pricing policy implementation. To support a structured analysis and perhaps to provide new insights a checklist, using the insights provided by six transport policy implementation frameworks, for the analysis and support of road pricing policy implementation is proposed.

6.1.2 Contributions of applied methodologies

As explained in chapter 1, in this thesis I applied a variety of methodologies to study road pricing policy implementation. It was not the aim of this study to contribute to the development of research methodologies, its contribution lies in the increased explanatory power, objectiveness and scientific quality established by the application of the

methodologies used in this thesis. Below I explain the importance of each methodology in the overall contribution of this research.

Comprehensive overview of policy implementation in road pricing cases
Policy implementation factors for road pricing were studied in six cases. As explained in chapter 4, compared to most previous studies on road pricing cases, this is a relatively large number. Including this broad set of road pricing cases gave a better understanding of whether the findings were case specific or more widespread, occurring in multiple cases. In turn this allowed us to identify, with greater certainty than if a smaller set of cases had been used, several generic implementation factors that are likely to play a role in all urban road pricing policy implementation processes (note that six cases can provide an indication of generic findings, yet further testing and validation is required, see section 6.2.2). In addition, we were able to explore the extent to which a more or less similar set of implementation factors played a role, finding that such similarities between urban road pricing cases is limited.

In addition to the number of cases used, the fact that the implementation factors were based on a much wider selection of sources than other studies of road pricing cases also contributed to making our analysis comprehensive. In our literature review we included an elaborate set of scientific papers per case (on average 27 papers per case, in total 106 papers were reviewed). This allowed us to establish an elaborate set of implementation factors (on average 36) for each case. Furthermore, the literature review enabled a much more thorough and detailed analysis of the implementation factors in the policy implementation processes for each case than has as yet been done. In addition, including a wide selection of sources to establish the set of implementation factors enabled us to identify the set of most important implementation factors for each of the six cases studied.

Content analysis and intercoder reliability
In this thesis I used content analysis. This method is not frequently applied in the field of transport and there are only a few applications of content analysis to road pricing. Five papers were found on road pricing that used content analysis and four of these papers studied information from newspapers (Ardıç et al., 2013a; Ryley and Gjersoe, 2006; Vigar et al., 2011; Winslott-Hiselius et al., 2009) and one used it to study the data from focus groups (Pronello and Rappazzo, 2014). However, to the best of my knowledge there is no study on road pricing where content analysis was used for the literature review. The merit of content analysis is that it supports a structured and traceable approach to analysing large quantities of qualitative data. Furthermore, the quantification of qualitative data through content analysis supported simple quantitative analyses and supported the execution of a factor analysis. The quantitative analysis objectifies the findings.

Part of the content analysis was an intercoder reliability test to assess the reliability of the content analysis. Both testing the reliability of the analysis of interviews and literature reviews in general and reliability testing as part of content analysis is uncommon in the field of transport (Mouter and Vonk Noordegraaf, 2012) although there are a few examples of reliability testing of a content analysis (Ardıç et al., 2013a; Mouter et al., 2013). The testing of intercoder reliability led to a discussion amongst the researchers involved on the reliability and the limitations of their findings, resulting in the findings from this discussion being included in chapter 4. The application of this methodology therefore enhanced the quality of the research.

Survey and Structural Equations Model

Many studies into employer attitudes on mobility management measures examine only a limited number of cases and do not frequently use quantitative methods such as surveys to investigate employers' views. There are several exceptions in the scientific literature (see chapter 3) including one quantitative study of Dutch employers in the field of mobility management (Rye, (1999b). This thesis studied employers' attitudes to Peak Hour Avoidance quantitatively using a web survey. We collected 103 completed surveys. This number seems small compared to the data used in several Belgium studies on mobility management (see chapter 3 for references), however, in these studies employer data is derived from a mandatory questionnaire (Vanoutrive et al., 2010). Our survey offers the most recent extensive dataset on employer attitudes in the Netherlands and was, to the author's knowledge, also the first study of employer attitudes to Peak Hour Avoidance. The advantage of using quantitative data is that it provides an underpinned view of employer attitudes to Peak Hour Avoidance that enables careful generalization for the group of large Dutch employers. Furthermore, quantitative insights can be given into the level of flexibility employers are willing to offer their employees in working times and working places. This provides a solid foundation for drafting (policy) recommendations on the role of employers in Peak Hour Avoidance and other mobility management measures. A specific merit of this study was that the questionnaire was carefully targeted at HR departments and using personalised emails enabled most of the data to be collected from high level managers and directors. It is possible that this reduced the chance that the questionnaire was completed by a random employee. Based on our study we conclude that a personalised email led to a significantly higher response and a greater number of completed questionnaires.

Having quantitative data made it possible to estimate a Structural Equations Model which enables predictions to be made as to which variables are likely to affect employer attitudes to Peak Hour Avoidance. The Structural Equations Model enabled an exploration of latent variables and indirect relations between the variables. Several direct and indirect relations between variables affecting employer support for Peak Hour Avoidance were found that would not have been evident from using a regression model. The core of the conclusions and recommendations included in chapter 3 come from the insights resulting from the use of this methodology.

A comparison of policy implementation frameworks

There are several (transport) policy implementation frameworks and some of these frameworks are applied to a road pricing case (see chapter 5 for references) However, an assessment of transport policy implementation frameworks for road pricing is lacking. In this thesis, we made an assessment of transport policy implementation frameworks that can be used to analyse road pricing policy implementation. We compared the level of consensus among the selected policy implementation frameworks regarding the implementation factors. Furthermore, we assessed how much these frameworks have in common with the findings from the analysis of road pricing policy implementation in practice. This approach to assessing policy implementation frameworks has, to the author's knowledge, not been adopted before in the field of transport. This review of policy implementation frameworks resulted in relevant insights into the suitability of these frameworks for analysing road pricing policy implementation. Based on these insights, we were able to provide a list of recommendations regarding the further application and development of policy implementation frameworks for the analysis of road pricing.

6.2 Discussion of merits and limitations

6.2.1 Understanding road pricing policy implementation

This thesis studies road pricing policy implementation. The main advantage to the study of policy implementation is that it directly results in insights into road pricing policy implementation (in contrast to studies that have a different aim yet also incorporate information on policy implementation) which makes it easier to build on this implementation research or to distil implementation lessons for researchers and policy makers. In this thesis implementation was studied from different angles, each with its own merits. In the next section I will discuss the weaknesses of this thesis.

Angle 1: implementation explicitly studied in one case
I studied road pricing policy implementation and how it evolved during the implementation process for kilometre charging. I consider this approach particularly valuable when a case has not been as elaborately studied, as for example in the six cases in chapter 4. I consider it insufficient to rely solely on the few studies of others and I think the researchers' own analysis contributes to providing a sound case analysis. Furthermore, this thesis demonstrated that generally a large set of implementation factors plays a role and most papers on road pricing cases do not include an elaborate set of factors because listing all implementation factors was not the objective of their study. Hence, the explicit study of implementation factors has contributed to a more complete picture of the implementation process in that case. In addition, it offered the opportunity to analyse the development of factors over time.

Angle 2: one specific implementation factor studied in detail
As this thesis has revealed road pricing policy implementation involves a broad set of implementation factors, the relevance of studying one implementation factor in detail could be questioned. However, although the role of one implementation factor can be modest, I also found that a single implementation factor can be of decisive importance. Furthermore there are several implementation factors that have received overwhelming attention in road pricing literature, such as public support and the factors that affect these attitudes such as equity and the perceptions of costs and benefits, while little is known about other factors (e.g. specific actors). Employers are one of the specific actors that have received little attention in the road pricing literature. The merit of this angle is that insight has been gained into this specific actor and on the role employers can play in road pricing policy implementation.

Angle 3: comparing implementation factors in multiple cases
As indicated in section 6.1.2 the advantages of studying implementation factors in a relatively large number of cases is that I am able to arrive at several more generic insights on road pricing policy implementation. The most important findings from the analysis of multiple cases are:

1) There is a small set of generic implementation factors, with political and public support as the most important factors.
2) The set of implementation factors in road pricing cases is much broader than one might expect from previous papers on the same cases.
3) No clusters of similar cases were found that resulted in policy implementation lessons (hypothesized clusters were Singapore and Hong Kong, the cluster of implemented cases and the cluster of not implemented cases).

Hence, the merit of studying multiple cases is that I was able to draw more solid conclusions than when fewer cases were utilised and these insights have more relevance for other urban

road pricing cases. Furthermore we were able to check whether differences within this set of urban road pricing cases could be identified.

Angle 4: comparing policy implementation frameworks with practice
Perhaps, from a research perspective, I overestimated the value of (transport) policy implementation frameworks, but I found the findings from the comparison of these frameworks with each other and with the findings from the analysis of road pricing policy implementation six real-world cases (practice) rather disappointing. The level of consensus among the frameworks, as well as the overlap between the implementation factors included in the frameworks and in practice, was limited. The merits from this angle are that we have learned more about the suitability of policy implementation frameworks for analysing road pricing cases, we have validated the set of policy implementation frameworks and we were able provide recommendations for improving the application and development of policy implementation frameworks for the analysis of road pricing.

Political decisiveness and employer support: unique implementation factors?
Two noticeable, and in my view important, implementation factors included in this thesis are political decisiveness (Chapter 2) and employer support (Chapter 3). At first sight, these factors do not seem to appear in the other cases included in this thesis. However, this might be caused by the definitions.

Political decisiveness was defined in chapter 2 in terms of the complexity of the policy, the long implementation period, the radical changes from the status quo and the Dutch political bargaining culture. At first sight, decisiveness seems to be a unique implementation factor that only appears in this case. However, when the four sub-aspects are considered, we found that also in the six urban road pricing cases the duration of the decision-making processes and the complexity of the political process are listed. Only a narrow interpretation was found for a radical change in the status quo, referring to how much the car drivers needed to change their attitudes. The complexity of the policy itself was not listed in the urban road pricing cases. We also found an implementation factor in the urban road pricing cases related to decisiveness that was not included in our framework – a political champion. Hence, we conclude that there may be elements related to political decisiveness that are of importance for all road pricing policy implementations, it requires either further definition or the underlying factors should be used.

The one implementation factor that was analysed for the Peak Hour Avoidance case, employer attitudes, was chosen to include both private and non-private employers. In some other cases employers are simply referred to as businesses or the employers' organisations are listed. It should be noted that in these cases the implementation factor concerns employer attitudes affected by the (perceived) impact on their core business (with a focus on retailers and freight carriers). This study, however, investigated employer attitudes towards offering alternatives for driving in peak hours. From this angle employers are implementing mobility measures which can be seen as measures supporting the implementation and the effects of road pricing. This type of supporting measure (in contrast to governments for example offering public transport alternatives) was not found in any of the other road pricing cases. As, in my view, road pricing can be beneficial in a similar way to (more) flexible working conditions offered by employers through PHA, this is perhaps an interesting element to include in the road pricing policy design and implementation processes.

Combinations of angles: generic insights in road pricing policy implementation factors
Several generic insights were found as a result of focussing on the common implementation factors found in a number of chapters included in this thesis. Note that the wider relevance of these insights needs to be validated (see section 6.2.2).

My first conclusion is that the generic implementation factors found in the urban road pricing cases (Chapter 4) are relevant to all road pricing policy implementation processes. In chapter 4, six generic implementation factors were found that played a role in all six of the urban road pricing cases we studied – "general political support", "general public support", "information campaign", "various actor perceptions", "characteristics of the transport system" and "marketing of the scheme". The most important factors were political and public support. In the analysis of kilometre charging in the Netherlands (Chapter 2), political and public support were also identified as important factors. The factors that policy implementation frameworks and the analysis of road pricing policy implementation in practice agree on the most are "transport policy and supporting measures", "general political support" and "general public support", while and both acknowledge the role of actors and actor support (Chapter 5). Hence, based on the findings from three chapters in this thesis and the simple fact that, in democracies, political support and (direct or indirect) public support is required to implement a policy, it would be safe to assume that those factors are likely to play a role in other road pricing cases as well. In addition, the factors "various actor perceptions", "information campaign" and "marketing of the scheme" were also listed in the kilometre charging case and the PHA case in the Netherlands. Hence, we also consider these factors to be relevant to all road pricing policy implementation processes. The final generic factor found in the analysis of all urban road pricing cases is "the characteristics of the transport system". The analysis of policy implementation frameworks pointed to "transport policy and supporting measures" as important factor. Both factors determine the context of policy implementation and whether the policy falls on fertile ground. As a result, I expect these factors to be of relevance as well to all road pricing policy implementation processes.

My second conclusion is that a broad set of implementation factors is likely to play a role in all road pricing cases. Because only a limited set of generic implementation factors was identified, I furthermore conclude that it is likely that there are case-specific implementation factors in each road pricing policy implementation process. A broad set of implementation factors, including case-specific factors, was also found in the kilometre charging case study. Chapter 4 in particular demonstrated that, in each case, specific implementation factors may play a role that is often not or infrequently found in other cases. Chapter 5 showed that the analysis of transport policy implementation frameworks also resulted in a broad set of implementation factors among these frameworks, and that there is little consensus as to which implementation factors play a role.

In addition, several chapters include arguments for why, in my view, it is not feasible to precisely predict the which (set of) implementation factors are going to play a role, are going to be of importance as well as how they will manifest in a specific road pricing policy implementation process. For example, Chapter 2 showed that the manifestation of implementation factors like political feasibility can drastically change over time, while Chapter 4 demonstrated that the manifestation of a factor can vary from case to case. Hence, my third conclusion is that managing a road pricing implementation process requires continuous effort and flexibility. This thesis proposes using a checklist for the analysis and support of the road pricing policy implementation process, and tailor the implementation actions to the specific road pricing policy and context where it is implemented. This thesis

includes several additional recommendations for policy implementation, which are listed in section 6.4.

6.2.2 Discussion on limitations

Limitations to the transferability of results

There are limitations to the transferability of the results in the previous four chapter of this thesis. The specific limitations are discussed in the individual chapters. For each chapter holds that whether the insights included in the chapter are also of wider relevance needs to be validated. I have therefore presented the conclusions as a set of conclusions in relation to each chapter rather than claiming that all the conclusions are relevant for all road pricing cases. Specifically, the insights from chapter 2 on kilometre charging could be considered to be relevant for other kilometre charging cases of comparable complexity and for future analysis of road pricing in the Netherlands. The insights from chapter 3 on attitudes to PHA are relevant for the Netherlands as this measure is not implemented in other countries. Furthermore, as the respondents concern large employers (> 100 employees) from the Province South-Holland, the results should be seen as the upper most positive boundary of the attitudes of all Dutch employers on PHA. I think the insights from chapter 4 are valid for all urban road pricing cases, although this needs to be validated. As some of the findings were confirmed by the findings included in the other chapters I think these insights might even be relevant for all road pricing cases (see subsection 6.1.1). The insights from chapter 5 are valid for the thirteen reviewed policy implementation frameworks. To the best of my knowledge, this chapter included all policy implementation frameworks that could be used for studying road pricing policy implementation.

Studies without focus on implementation used to gather insights on road pricing policy implementation

A limitation of this thesis is that a large part of the data sources used to study six road pricing cases did not specifically aim to analyse the road pricing implementation process and therefore did not give a detailed account of the implementation factors for all the cases included. The consequences of this would appear to be limited for the analysis of the six cases in chapter 4 as we are confident that we found the set of most important implementation factors. However, I do think that an explicit focus on implementation in a case analysis might result in more implementation factors (which is particularly relevant for cases which have not yet been studied frequently). An explicit implementation focus might also result in finding more subtle factors that are less obvious or have an indirect effect (yet could also be less important). Furthermore, such a focus could result in finding relations between factors (that were not studied in this thesis) and provide more insights into the importance of implementation factors. Hence, I think making policy implementation the starting point for a case analysis results in more thorough and detailed insights on implementation factors.

Practical knowledge of policy makers underrepresented

The practical knowledge of policy makers is underrepresented in this thesis. The hands-on experiences of policy makers involved in the policy implementation could add to the thoroughness and level of detail of the case analysis. For the foreign cases the lack of these insights was primarily caused by time and budget constraints. For the Netherlands, the case study on kilometre charging was carried out in 2010. Just before the publication of the paper (January 2011) included in chapter 2, the Dutch government took the decision to halt the implementation of kilometre charging which, as it turned out, became a permanent decision. This new development was included in the paper although the time did not allow additional

analysis. New data was collected for an additional journal paper on the kilometre charging case. This new data collection concerned the practical knowledge of policy makers involved in the kilometre charging case. In June 2011 we conducted face-to-face interviews with three important stakeholders involved in the policy process from the Ministry of Infrastructure and the Environment. Although we agreed beforehand that everything discussed in the group interview could be used in this thesis and we could list the names of the interviewees, it turned out that road pricing was considered too sensitive, even months after the implementation process had been stopped, resulting in only being allowed to use insights from the interview anonymously. These insights were therefore used in a conference paper (in Dutch) and this direction of research was not further pursued.

In hindsight, I consider it unfortunate that I did not incorporate the insights from this interview in the first paper as the interview included detailed insights into the kilometre charging case as well as information on the relations between implementation factors and their importance. Although incorporating the insights from the interview would not change the conclusions, I would have preferred to include some additional insights from the interview. These insights specifically concern the implementation factors "interest groups" and the "duration of the implementation process". Especially compared to previous attempts to implement road pricing in the Netherlands the support of interest groups throughout the process was large and much effort was made by the Ministry of Infrastructure and the Environment to manage the support of interest groups. The duration of the implementation process had already been listed in the paper. From the interview it became clear what specifically caused this to be a failure factor. During the process a political deadline for implementation was introduced and this added to the complexity of the implementation process and acted as a "killer contract" by reducing the Ministry's room to manoeuvre (Ministerie van Infrastructuur en Milieu, 2011).

In addition, including the practical knowledge of policy makers could result in different emphases in the analysis. When considering the case, we endorse the viewpoint included in the discussion of chapter 5 that scientists who draft implementation frameworks might underestimate the more practical implementation factors. I noticed that the interview with the Ministry of Infrastructure and the Environment paid more attention to the more practical implementation factors (e.g. cooperation between departments in and outside the Ministry, complexity of the project and the communication about the project through progress reports) compared to my analysis in chapter 1. Hence, including the practical knowledge of policy makers could result in an even larger emphasis on the more practical implementation factors than already found in the set of empirical road pricing factors.

No synthesis implementation framework for road pricing proposed

Although my main aim was to make a contribution to the empirical knowledge on road pricing, I started this research with the idea that it was possible to draft a synthesis implementation framework for road pricing. In fact, in chapter 1, we propose a framework that describes the factors affecting the willingness of policy actors to adopt a given transport policy instrument. It took quite some effort to define the components of this framework, which provided some clarity on the intended scope of the framework, and we have tried to build the framework based on previous work. Most importantly, the framework proved helpful in the context of the work presented in chapter 1 for systematically describing and analysing the case. However, in my view there are two main limitations to this implementation framework. Firstly, throughout our research, we learned that there is a wider selection of literature on policy implementation than we had incorporated in our framework,

which even includes several policy implementation frameworks and transport policy implementation frameworks. Secondly, I consider it a limitation that the framework was drafted to analyse only one specific aspect of policy implementation (the willingness of policy actors to adopt a given policy instrument). In particular after the analysis in chapter 4 resulted in broad sets of implementation factors, I realised that our framework addressed only a specific aspect of policy implementation. To analyse the kilometre charging case, we do not feel this has led to overlooking important factors as our framework was used to structure the analysis, but perhaps the use of another implementation framework would have led to a different emphasis on some implementation factors. Furthermore, as pointed out in the discussion of chapter 1, validation is required to determine whether or not the framework can also be applied to other road pricing or transport cases. In reaction to these limitations, we decided to assess a set of transport policy implementation frameworks of a more generic character and addressing multiple factors of policy implementation. Using the insights from the analysed frameworks, we drafted a checklist for the analysis and support of the road pricing policy implementation process, being determining the implementation actions adapted to the specific road pricing policy and context where it is implemented. This checklist can be seen as first step towards a synthesis framework, integrating insights from existing frameworks and perhaps even prescribing what actions are necessary to get road pricing implemented. We propose this checklist instead of a synthesis framework, as there is a long road ahead. We think efforts should focus on the further development of policy implementation frameworks and the proper application of these frameworks in the analysis of road pricing policy implementation.

Limited insights on the importance of implementation factors and the relations between implementation factors

In addition to the identification of implementation factors, we think that for understanding road pricing policy implementation also the importance of implementation factors and the relations between implementation factors might be important. With the exception of chapter 3 where we were able to rank the factors based on importance and to determine the direct and indirect relations between variables affecting employer attitudes to PHA, these topics are underexposed in this thesis. The importance of factors is only to a limited extent included in chapter 2. Most information on the importance of implementation factors is included in chapter 4. We were able to make a distinction between the ten implementation factors most often listed and the other implementation factors found in a case. However, the intercoder reliability test showed that the ranking of the implementation factors is not very reliable. Another limitation of this thesis is that it provides no insights into the relations between implementation factors. This was not beyond the scope of the thesis but very little information was included in previous studies on road pricing cases (our most prominent data source) on the relations between implementation factors.

6.3 Directions for further research

The four papers included in chapters 2-5 contain suggestions for further research. In this section I highlight several additional directions for further research.

The majority of the road pricing cases studied in this thesis concerned urban road pricing cases. As explained in chapter 4, although studying new urban road pricing cases will very likely result in new implementation factors, I am of the opinion that the set of most important implementation factors have been found for the studied cases. Studying the implementation factors in other urban road pricing cases is therefore not likely to result in an increased

understanding of implementation factors. Instead, I think additional research could focus on other types of road pricing cases, such as innovative road pricing cases (although this set of cases is limited). It would for example be an option to study the policy implementation of Peak Hour Avoidance as in this thesis only one implementation factor was studied (employer attitudes). However, as discussed in section 6.5 it seems that implementing PHA was not very complex and I therefore think that this might not be the most interesting case to study. Other cases that I consider innovative are nationwide road pricing for both passenger and freight transport. The only other innovative road pricing case in addition to kilometre charging in the Netherlands, to the best of my knowledge, is the proposal for nationwide road pricing in the United Kingdom. This implementation process was not as far developed as in the Netherlands but perhaps some lessons can be learned from this case. Also the implementation of other types of road pricing, such as truck tolling, HOT lanes and tolling schemes, could be studied. Lastly, I think additional research could focus on specific cases or elements of cases to provide insights that may be valuable for future implementations. For example, when road pricing is reconsidered despite the fact that previous attempt(s) at implementation failed and the new case has not yet been elaborately studied or previous studies did not address certain aspects. Additional research could then focus on these elements. Examples include studying the case of New York in more depth (so far studied by Kogut (2009) and Schaller (2010)), studying the detailed views of stakeholders in the case of kilometre charging in the Netherlands or in line with the research of Ardıç et al., (2013b), studying the role of the media in road pricing cases.

A topic that has so far received little attention in road pricing literature is that of implementation strategies, the approach that is adopted by the implementing agency to have the policy implemented. During this research I read several papers that provided recommendations for implementation strategies. By far the most frequently discussed strategy in road pricing literature is the idea that organizing a trial followed by a referendum is an effective way to acquire sufficient political and public support to implement the policy. Another example is the recommendation to implement road pricing at a certain level of governance (such as the suggestion made of King et. al. (2007) to implement road pricing by cities). I think that there are two elements related to the implementation strategy that are worth further investigation. Firstly, the design of a more diverse set of implementation strategies. Secondly, it would appear that implementation receives the most attention *after* (most of) the design phase has been concluded. I consider the policy design phase and policy implementation phase to be related, as, in the policy design phase, choices are made that affect policy implementation, and the policy implementation phase often includes refinements of the policy design. For example, although a road pricing policy can not only be designed to meet certain objectives (e.g. reduce congestion, environmental pollution etc.), it could include additional implementation related requirements as well, such as the government explicitly aiming for broad support among societal stakeholders in the kilometre charging case which affected the design choices. Perhaps different design choices will be made when policy implementation consequences are included in the road pricing policy design. As a consequence, I think that it is worthwhile to examine how to include implementation issue early in the policy implementation process and, specifically, the consequences of design choices on implementation.

Regarding the theory on policy implementation, this thesis showed that there are many different policy implementation frameworks. As explained in section 6.2.2 we proposed a checklist instead of a synthesis framework for road pricing policy implementation, as there

are ample opportunities for improving the development and application of the analysed policy implementation frameworks.

Additional research could focus on the further validation of transport policy implementation frameworks including the (set of) implementation factors for road pricing, their importance and the relations between these implementation factors. This thesis focused on road pricing, in additional research the suitability of transport policy implementation frameworks for other transport policies such as the implementation of Intelligent Transport Systems could be tested as well. Additional research may also shed more light on the desirability of developing a synthesis framework to replace a simple checklist and if desirable, how such a framework could be drafted.

6.4 Policy recommendations

It is in my view, not feasible to predict precisely which (set of) implementation factors are going to play a role, are going to be of importance or how they will manifest in a specific road pricing policy implementation process. In fact, even if the implementation process is well managed, the outcome could be that the policy will not be implemented (see chapter 2 for an example of a policy that is well-managed yet not implemented). This does not mean, however, that I cannot provide any recommendations to policy-makers.

The following recommendations are based on generic implementation factors found in this thesis that also may be of value to other road pricing cases (see subsection 6.1.2). I consider the extent to which it is desirable to influence the views of stakeholders and specifically political and public support towards a policy measure to be a political discussion. However, policy-makers aiming to implement road pricing can at least exert influence on the preconditions of the setting in which the policy implementation takes place. I recommend investigating the attitudes of political actors and the public towards road pricing measures, as this information can be used in the implementation process, for example to ensure that these actors are well-informed. In addition, because various parties may be involved in the implementation process, I recommend conducting an analysis of the parties involved (‘stakeholder analysis’) to identify all the relevant parties. For example, in the Peak Hour Avoidance case, it became clear from the study into employer attitudes that many HR managers were unfamiliar with the measure[10] or the potential benefits (especially for the employers), and doubted the effectiveness of the measure. These insights could be used in an information and marketing campaign. With regard to the role of these factors in the cases we analysed, it is also recommended not to underestimate their role in a potential information and marketing campaign. Finally, it is recommended that the characteristics of the current transport system and the transport policy and supporting measures be taken into account. In our view, this determines the context of policy implementation and whether or not the road pricing policy will fall on fertile ground. Policy-makers can, for example, affect the range of alternatives travellers have when behaviour changes are the response to road pricing. Note that, in our view, alternatives can be more widely interpreted than providing public transport alternatives (as, for example, listed by Anas and Lindsey (2011)), but could also include flexible working conditions enabling employees to travel outside peak hours.

[10] Note that due to the increased number of PHA projects since 2006 I think the measure has become less unfamiliar, however, I do not think this measure and the options employers have to support PHA is already common sense for all HR managers.

As I think it is impossible to predict how a road pricing policy implementation process will evolve, since each implementation process will include specific implementation factors, I advise policy-makers to be alert during the road pricing implementation process, to pay attention to implementation factors throughout the implementation process and to be flexible enough to deal with uncertainties and changes. For example, a stakeholder analysis should not be a one-time exercise, but, in my view, requires periodical updates throughout the implementation process. Hence, I recommend monitoring the progress of the implementation for the most important implementation factors. The areas of project and process management provide ample suggestions for dealing with complex projects and processes. One specific suggestion is (as included in chapter 4 following the adaptive policy making perspective) to adequately monitor the implementation process which could provide helpful pointers in managing these uncertainties (Marchau et al., 2010) in the implementation process.

Regarding the policy implementation frameworks, I think a word of caution is in order that there is little consensus among the implementation frameworks we reviewed, which means that each framework will point to a different subset of implementation factors. In addition, there is little overlap between the implementation frameworks and the implementation factors found in practice, hence, implementation frameworks can also include factors that might not play a role in a specific case. In this thesis, we proposed a checklist using the insights of six transport policy implementation frameworks. I recommend using this checklist for the analysis and support of road pricing policy implementation, as this supports a structured analysis and might provide new insights thereby increasing proactivity and responsiveness of the actors involved in the road pricing policy implementation process. Note that this checklist should be used for inspiration and guidance, keeping in mind that it is not a one size fits all solution and should be tailored to each specific case.

6.5 Reflection

Approach of writing a thesis consisting of papers

In this thesis I started by writing conference papers and then upgrading these conference papers to journal papers. The main benefits of this approach came from going to conferences. First of all, writing conference papers was valuable practice. Furthermore, contrary to what is currently common practice, I did not start off with a research proposal and by visiting conferences I was able to quickly familiarize myself with the field of transport policy, enabling me to define my research project. Visiting conferences also enabled me to build my network and hone my presentation skills. Note that a disadvantage of conferences is in my view that the amount and depth of feedback received for conferences papers is rather limited and no comparison to that received as part of the process of reviewing a journal paper.

In my case, this approach was not an efficient route to creating journal papers. My first idea was to upgrade my Master's thesis and the accompanying conference paper to a journal paper. However, some of the insights had already been published in a scientific paper by the PhD student with whom I cooperated in my Master thesis project (Mahendra, 2008), making it much more difficult than I expected to publish an additional paper on the same topic. Perhaps I could have overcome this challenge but I decided to focus this thesis on other road pricing topics. Second, I had written several conference papers that included some of my research but that was either too small in scope or contained an insufficient amount of data to qualify for an upgrade to a journal paper. This was especially problematic combined with the time-scale of a part-time PhD. I started off working on several sub themes simultaneously, which only contributed to more time being required. I could have collected more data or carried out additional research but because often months or even more than a year went by, this was not

very efficient because time was needed to get into the topic again. I even missed the opportunity to publish a paper in the Transportation Research Records because I explicitly submitted the paper as a conference paper (with the intention to later upgrade the work) and when I found out that the reviewers were willing to accept the paper as a journal paper, changing this choice was not possible anymore. In the end I found that I preferred working on one subtopic and finishing that part before continuing with the next part and I changed my approach accordingly.

Evaluation of road pricing policy implementation

I also reflect on how to evaluate policy implementation. In this thesis I have used the following definition of policy implementation: "policy implementation encompasses those actions by public or private individuals (or groups) that are directed at the achievement of objectives set forth in prior policy decisions." (Van Meter and Van Horn, 1975:447). I consider the objective, the implementation of the policy, the domain of policy makers. Hence, if a road pricing policy is stopped following a political decision, I do not think that this in itself is any reflection of the policy implementation process. In addition, I consider the ex ante or ex post evaluation of whether the effects of the policy meet the intended underlying objectives (e.g. does road pricing contribute to the reduction of congestion) as predominantly an evaluation of the policy design. How then to evaluate road pricing policy implementation? The core element of the policy implementation definition used in this thesis is the actions and whether they are directed at the achievement of objectives. Following this definition, I think the evaluation of policy implementation should focus on the actions taken by the stakeholders in the implementation process and how these actions have (or have not) contributed to the implementation process. Criteria for assessing these actions can be derived from the field of project management and process management. This also reveals my position in the debate on public administration; I think policy implementation is a process that can be influenced and at best managed. However, I think that there are limitations to the extent to which road pricing policy implementation can be affected by the implementing organisation as there will always be coincidences and implementation factors that cannot be influenced by the implementing organisation.

Challenges for drafting a synthesis policy implementation framework for road pricing

The checklist for the analysis and support of the road pricing policy implementation process as proposed in this thesis can be seen as first step towards a synthesis framework, integrating insights from existing frameworks and perhaps even prescribing what actions are necessary to get road pricing implemented. I would like to explain why in my view making, such a synthesis framework is not as easy as one might imagine. One choice that has to be made is whether the insights from road pricing cases or the insights from implementation frameworks should be taken as starting point. Or, if both are chosen, how the truth can be determined. In addition, the insights from the cases and from the implementation frameworks require further validation. Also, I have argued that creating a framework that covers all the relevant implementation factors is impossible. One of the challenges in developing a checklist or synthesis framework is to eliminating an arbitrary choice that suits the personal preferences of the person drafting the checklist or framework. This thesis showed that there are many different theoretical lenses to look at policy implementation each with their own strengths and weaknesses. This brings me to the related issue of the purpose of such a model. I think that, even when focussing on one target group, e.g. policy-makers, the specific needs that can be supported by a road pricing policy implementation framework depend on the phase of the policy-making process (e.g. design or implementation), the type of involvement of the stakeholder (working in the implementing organisation or another stakeholder) and the level

of decision-making within the implementing organisation (e.g. director, project manager or project employee). This process could therefore easily result in different types of frameworks for different target groups. Hence, "much work, indeed, remains to be done. But it would be a mistake to conclude that, on the theory–practice challenge, the effort must begin from square one." (O'Toole, 2004:327).

Added value of policy implementation literature for road pricing policy implementation
I hoped that the attempts to synthesize policy implementation insights into (transport) policy implementation frameworks would give at least some indication of which implementation factors seem more important than others and therefore could be of value for scientist and practitioners. However, in this thesis I found that (transport) policy implementation frameworks only make a modest contribution to the analysis of road pricing policy implementation. Knowing this, it makes sense to further investigate what the broader body of literature on policy implementation has to offer. I expect that this literature can offer at least relevant insights on specific implementation factors using theories that focus on these factors. I also expect that policy implementation literature can support ex post analysis and provide explanations. I think it is uncertain whether this additional research also results in practical hands-on insights and guidelines on which actions to take in a road pricing policy implementation process.

Road pricing in the Netherlands
There are a few remarks I would like to make about being Dutch, having studied two Dutch road pricing cases and my personal engagement in road pricing policy implementation in the Netherlands.

I think it is remarkable that road pricing, specifically charging policies, were and still are such a politically sensitive topic within the Ministry of Infrastructure and the Environment. The sensitivity of road pricing might be related to the fact that kilometre charging was eventually not implemented which can be viewed as a failure. Perhaps a history of attempts to implement road pricing played a role in this. In this thesis I have reconstructed the policy implementation process for road pricing. In a conference paper (not included in this thesis, see section 6.2.2), I included an evaluation of the actions taken by the Ministry of Infrastructure and the Environment and I found that they "scored a considerable number of successes" in the policy implementation process (Vonk Noordegraaf et al., 2011:14). In my view this shows that even if the policy implementation process was successful, it seems to have been insufficient to change the reputation of such a controversial policy instrument as road pricing.

In my view this sensitivity of road pricing introduces the risk of ignoring this potentially effective measure or opportunities improving the current set of policy measures. As recommended specifically in chapter 3, I think that policy makers should try to avoid conflicting financial incentives in transportation. For example, in many places, parking is still free of charge. Also the options for a tax reduction for travel expenses currently disregard the commuting distance. Also there are several taxes such as vehicle ownership and registration taxes as well as many parking fees that are fixed. Hence, there are in my view ample opportunities to introduce more (differentiated) pricing incentives in the current transport system.

Peak Hour Avoidance
As I have been involved in several PHA projects, written several papers and reports on this measure and studied the literature on PHA[11], I feel I am able to make a few comments on the implementation of PHA.

First I would like to point out the difference between the implementation processes of PHA and the other road pricing implementation processes studied in this thesis. Apart from questions in parliament about the first PHA project[12] (Consortium Spitsmijden, 2007b), implementation seems to have faced relatively little opposition. Given the characteristics of PHA this might not be very surprising as compared to the other road pricing cases the PHA projects are less complex due to their limited geographical scope, temporary character, voluntary nature, rewarding of road users (instead of pricing) and incremental implementation. On the other hand, one could view this as surprising given that not everyone receives the same benefits from PHA. For example, PHA is based on a reward for reducing the proportion of trips made during peak hours and travellers that already avoid travelling in peak hours (and cannot demonstrate a reduction of peak hour trips) do not qualify for a reward (Ben-Elia and Ettema, 2009).

Another interesting difference with other road pricing cases is that PHA started as a pilot without a larger vision of the final ambition. Perhaps, if policy makers had considered the possibility that one pilot would eventually result in more than a dozen projects beforehand, other implementation choices might have been made. For example, if the business case for all the parties involved had been considered earlier in this process a more active involvement of private parties might have been possible or benefits from the economy of scale could have been realized (e.g. shared back-office and customer service) (TNO, 2014).

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[11] Before I started this PhD project I worked as a researcher at Delft University of Technology on a Peak Hour Avoidance project. In addition, during this PhD project I also worked as a consultant at TNO where I was involved in several other Peak Hour Avoidance projects.
[12] In 2006 there was some commotion about the first PHA project and the usefulness and necessity was debated. The project team responded by emphasizing the experimental character of the trial. Some argued that there was some sensitivity related to the implementation of kilometre charging Consortium Spitsmijden (2007a) Leerervaringen.

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Summary

Background

Urban areas suffer from the negative externalities of road transport like congested road networks, air pollution and road traffic accidents. A measure to reduce these negative externalities is road pricing, meaning policies that impose direct charges on road use (Jones and Hervik, 1992). Since the introduction of road pricing in the literature (Knight, 1924; Pigou, 1920a), "congestion charging has been advocated by transport economists for many decades" (Santos et al., 2010a:34). Although many road pricing measures have been implemented, many initiatives have also failed to be implemented.

The main barriers to the implementation of road pricing "are typically public and political opposition" (Santos et al., 2010a:34) although other factors that can either contribute to or hamper road pricing policy implementation include the use of revenues, exemptions and privacy issues (Banister, 2004; Borins, 1988; Santos and Shaffer, 2004). Only a small number of studies give insights into how to enable road pricing implementation in practice. The majority of these studies only discuss one or several implementation factors and therefore do not give a complete overview. In this thesis I therefore analyse all known implementation factors in road pricing policy implementation processes. In this thesis "policy implementation encompasses those actions by public or private individuals (or groups) that are directed at the achievement of objectives set forth in prior policy decisions" (Van Meter and Van Horn, 1975:447).

Objective and contents of this thesis

The objective of this thesis is to increase the understanding of which implementation factors can play a role and what role they have in road pricing policy implementation. To this end four studies are executed, included in chapters 2 – 5. In each chapter one or several road

pricing cases are included (see Figure S.1) and various research gaps are addressed. The addressed research gaps are:

- Gap 1: *Road pricing cases which were not implemented and/or innovative are under-exposed in the road pricing literature and therefore limited knowledge is available on these cases.*
  This thesis explicitly included three cases of road pricing which were not implemented – kilometre charging in the Netherlands (Chapter 2), the case of Hong Kong and that of Edinburgh (Chapter 4). Two innovative cases were also studied; kilometre charging in the Netherlands (Chapter 2) and Peak Hour Avoidance (PHA) in the Netherlands (Chapter 3). The former is considered innovative because of its nationwide scale, its scope – concerning passenger and freight transport – and its differentiated incentive. The latter is considered innovative because it concerns a reward incentive and has been implemented in practice, which has not been done before.
- Gap 2: *Few studies on road pricing have focused solely on the policy implementation of road pricing and therefore little is known on the complete implementation process.*
  This thesis focused particularly on policy implementation of road pricing. Different aspects of this case were studied – from the perspective of policy implementation in order to gain a more thorough understanding of why kilometre charging in the Netherlands was not implemented (Chapter 2), examining one specific implementation factor – employer support (Chapter 3), analysing the implementation factors that were partly hidden or underexposed in existing studies of road pricing cases (Chapter 4) and assessing the suitability of transport policy implementation frameworks for the analysis of road pricing policy implementation (Chapter 5). By studying road pricing policy solely in terms of different aspects of policy implementation this thesis increases the understanding of this subject.
- Gap 3: *Road pricing policy implementation has hardly been studied from a theoretical perspective which is why insights are lacking.*
  In this thesis a framework for factors affecting the willingness of a policy actor to adopt a transport policy instrument was developed and this framework was subsequently tested for road pricing (Chapter 2). In addition, six (theoretical) transport policy implementation frameworks were compared with each other and recommendations were given for the futher application of these frameworks in the analysis and support of road pricing policy implementation (Chapter 5).

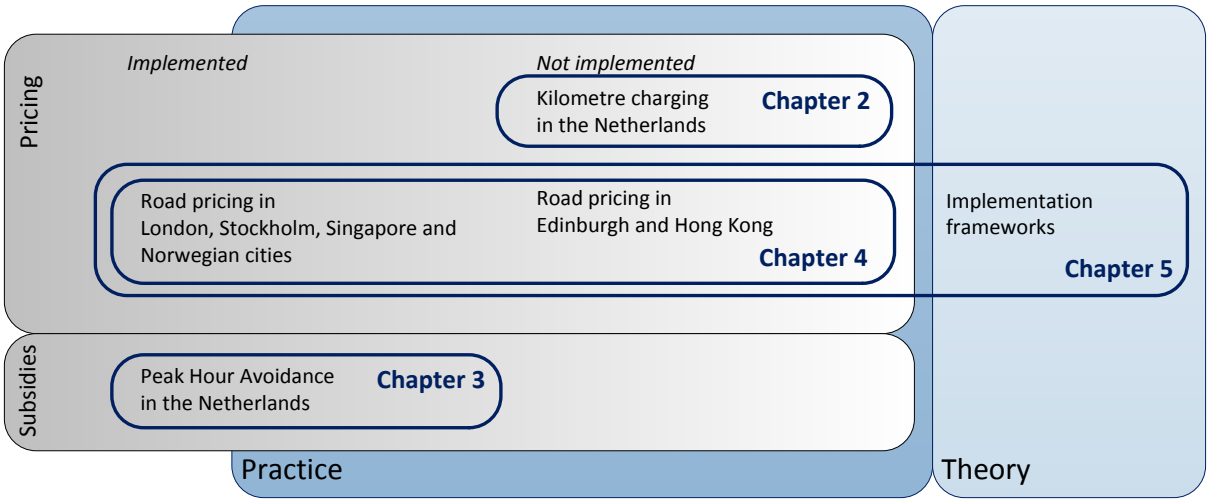

Figure S.1 Organisation of this thesis

Results and conclusions

This section presents the main results and conclusions of the four chapters alongside the overall conclusions. Also, the different methodologies used are discussed in brief.

Chapter 2: Kilometre Charging in the Netherlands: the policy implementation process

This chapter aims to give an overview of the implementation factors that affected the policy implementation process for kilometre charging in the Netherlands, from the proposal of the idea to implement road pricing by the Dutch government in 2004 up to the decision in 2010 by the successive government not to implement it. This case study is analysed using a conceptual framework which is presented in this chapter. The conceptual framework is based on the insights from Feitelson and Salomon (2004), Sabatier (1988), Kingdon (1984) and Koppenjan (1993). The kilometre charging case is evaluated using both scientific literature and policy documents.

The framework describes the factors affecting the willingness of a policy actor to adopt a transport policy instrument and consists of three main components:
A. The feasibility of a policy instrument (A1) and the appraisal of its feasibility (A2)
B. The need for a policy opportunity
C. The need for political decisiveness

Applying the conceptual framework to the kilometre charging case resulted in the following insights. First of all, kilometre charging was considered technically, economically and socially feasible by important policy actors. However, these factors were not undisputed and uncertainties remained. Studying the complete implementation process enabled insight to be gained in how the implementation factors developed over time. Political feasibility, for example, changed from broad consensus on the implementation of kilometre charging in 2006 to insufficient political support in 2010. The lack of actor support made it politically unfeasible. Another important barrier to the implementation of kilometre charging in the Netherlands seems to have been the lack of political decisiveness. The conceptual framework enabled the systematic description and analysis of the Dutch kilometre charging case and all the factors included had an impact on the policy implementation process for kilometre charging.

Chapter 3: Peak Hour Avoidance in the Netherlands: employer attitudes

This chapter studies a specific actor – employers – which has received little attention in the road pricing literature. The attitude of large Dutch employers (more than 100 employees) towards Peak Hour Avoidance (PHA) was investigated. Data were collected from 103 employers through a web questionnaire aimed at HR managers. A large variation was found in these employers' attitudes to PHA. Slightly more than one third (34%) of the respondents (mainly HR managers) perceived their organisations as willing to support PHA by offering flexible working times or places. Furthermore, the questionnaire gave quantitative insights into the current level of flexibility in working times and working places these employers are willing to offer their employees.

In addition, a Structural Equations Model (SEM) on employer support for PHA was estimated. When exploring the factors that influence this willingness to support PHA, SEM revealed that organisation size has only an indirect effect through the attitude of the HR manager. The sector (e.g., government, construction, education) has only an indirect effect through the strictness of working times. Results reveal that the highest willingness to support

PHA can be expected from organisations who feel responsible for influencing the commuting behaviour of employees, that have human resource managers with a positive attitude towards Peak Hour Avoidance, with flexible working times and that have already implemented mobility management measures.

Employers are an important stakeholder in PHA. This study found that almost half of the respondents (45%) feel that the employer is responsible for influencing the commuting behaviour of their employees. It is as yet uncertain how much effort these employers are willing to invest in translating their responsibility into concrete actions. The largest contribution to PHA that can be expected from employers is providing employees with flexible working times and encouraging employees to fully utilise this option as an alternative to driving in peak hours. This would not only be beneficial for PHA but for a wide range of mobility management initiatives as well.

Chapter 4: Six road pricing cases: implementation factors and policy implementation lessons
This chapter aimed to identify the most complete number of implementation factors that have affected the policy implementation processes of six empirical road pricing cases – Singapore, London, Stockholm, the Norwegian cities, Hong Kong and Edinburgh – and to systematically compare these cases on its implementation factors. Compared to most previous studies, this a relatively large number of cases. Content analysis was used to identify the implementation factors in scientific papers on these cases. This literature review included a large set of scientific papers per case (on average 27 papers per case, 106 papers in total), enabling thorough and detailed analysis of the implementation factors per case. An intercoder reliability test was performed to assess the reliability of the results of the content analysis.

In contrast to other studies, a large number of implementation factors was identified for each case (an average of 36 implementation factors per case). A total of 61 implementation factors were found across all six road pricing cases as some factors were present in multiple cases. The three implementation factors most often listed for each case account on average for 30%[13] of all the implementation factors listed in the cases. For each case a set was made of the most listed implementation factors (for an overview of the implementation factors in the six cases, the most listed implementation factors per case and a discussion of implementation factors that stand out in each case, see chapter 4).

Six implementation factors were identified as being common across and recurrent in each of the six cases (so-called generic implementation factors). In order of frequency listed in all the six cases together, these factors are “general political support”, “general public support”, “information campaign”, “various actor perceptions”, “characteristics of the transport system” and “marketing of the scheme”. However, the six generic factors account for on average only 27% of all the implementation factors listed. In addition to these similarities large differences were also found between the most important implementation factors for each of the six cases.

Each case included case-specific factors that were either not or infrequently present in the other cases. The most prominent case-specific implementation factor is the role of specific actors. A factor analysis tested whether clusters of cases could be identified, the hypothesis

[13] The number of observations (strings of text that refer to implementation factors) identified in the reviewed papers are content-based clustered into implementation factors. These implementation factors are presented as a percentage of the total number of observations for one case (with the sum of the percentages for all implementation factors in one case adding up to 100%) because the number of papers (and with that the number observations and implementation factors that were found) varies considerably per case.

being that the following clusters would be identified; Singapore and Hong Kong, a cluster of implemented cases and a cluster of non-implemented cases. The factor analysis demonstrated that no clusters of similar cases were found that resulted in policy implementation lessons. Furthermore, it was found that large differences are possible between cases in terms of the importance of implementation factors and the manifestation of individual factors. Policy implementation lessons to aid local and national authorities considering the implementation of road pricing are included in this chapter.

Chapter 5: Comparison of policy implementation frameworks

This chapter aims to assess how suitable transport policy implementation frameworks are for the analysis of road pricing policy implementation. Six transport policy implementation frameworks were selected from scientific literature, using a snowballing method. The selected frameworks are intended to be used to analyse transport policy implementation. In addition, frameworks were selected that were generic and that address multiple factors of policy implementation. Two comparative analyses were carried out. First of all, the transport policy implementation frameworks were compared to each other. Secondly, we looked at how much the frameworks (theory) have in common with the findings from the analysis of road pricing policy implementation in six real-world cases (practice).

There is little consensus among the implementation frameworks we analysed regarding which factors affect policy implementation. About half of all implementation factors included in any of the frameworks were only included in one framework. As a result, each framework will point to a different subset of implementation factors. In addition, there is little overlap between the implementation factors found in the frameworks and those found in practice. Most frameworks only cover an average of less than 10% of all the implementation factors found in practice. Even the combined set of implementation factors from all the frameworks has limited overlap with the implementation factors found in practice; about half of the implementation factors from the frameworks are not listed in practice. Furthermore, it turned out that there are some factors that seem especially important, as they were considered important in majority of implementation frameworks and included in the top ten empirical factors: “transport policy and supporting measures”, “general public support” and “general political support”. In addition, both acknowledge the role of actors and actor support. As far as the other implementation factors are concerned, the implementation frameworks and findings on implementation factors from empirical cases do not seem to agree on the importance of the factors.

This chapter therefore concludes that the transport policy implementation frameworks we analysed appear to be able to make only a modest contribution to the analysis of road pricing policy implementation. The consequences of these findings for road pricing policy implementation in practice are discussed in this chapter. Recommendations for the further application and development of transport policy implementation frameworks - including the checklist we developed using the insights of six transport policy implementation frameworks - in the analysis and support of road pricing policy implementation, are also included in this chapter.

Generic conclusions

Combining the insights from the four chapters resulted in the following generic conclusions on road pricing policy implementation:

- The generic implementation factors we found ("public support" and "political support"), as well as a broad set of implementation factors (conclusions of chapter 3), are supposed to be relevant to all road-pricing policy implementation processes.
- The implementation of road pricing requires continuous effort and flexibility, and can be managed using a checklist of implementation factors, to determine the implementation actions adapted to the specific road pricing policy and context.

Directions for further research

Some possibilities for further research are:

- There are some possibilities for studying other road pricing cases than those included in this thesis. Within the category of innovative road pricing cases, the options are limited. The implementation factors for PHA in the Netherlands or the proposal for nationwide road pricing in the United Kingdom could be studied, as well as other types of road pricing (e.g. truck tolling, HOT lanes and tolling schemes). Finally, additional research on specific road pricing cases may be relevant when road pricing is reconsidered, despite the fact that previous implementation attempts failed. This may be particularly true if the case has not yet been studied in detail or certain aspects were not considered (in detail) in previous studies.
- Another potential topic for further research is that of implementation strategies. Specifically, the design of a more diverse set of implementation strategies seems an advisable study subject (so far, most attention in road pricing literature has gone to the strategy of holding a trial, followed by a referendum). Secondly, I recommend examining whether different design choices are made if the consequences of policy implementation are included in the road pricing policy design.
- In the case of road pricing cases where little is known about policy implementation and especially for new implementation processes, there are opportunities for a more rigorous study of the implementation of road pricing policy. Further research could study the road pricing cases from the perspective of policy implementation, use a much wider variety of sources e.g. including the practical knowledge of policy-makers and other stakeholders involved, studying not only the scientific literature, but also other sources, and studying not only ex-post but also during the implementation process (e.g. participatory research).
- With regard to the theory on policy implementation, our study showed that there is very little consensus among the transport policy implementation frameworks we analysed about which factors affect policy implementation. Additional research could focus on the further validation of transport policy implementation frameworks (implementation factors, their importance and relations). While in this thesis, we focussed on road pricing, additional research could also test the suitability of transport policy implementation frameworks for other transport policies such as the implementation of Intelligent Transport Systems. Additional research may also shed more light on the desirability of developing a synthesis framework to replace a simple checklist and, if that is desirable, how such a framework could be drafted.

Policy recommendations

This thesis includes the following recommendations for policy-makers:

- The following recommendations are derived from the generic implementation factors identified in this thesis:
    - Investigating the attitudes of political actors and the public towards the road pricing measure, as this information can be used in the implementation process, for example to make sure that these actors are well-informed.
    - Performing an analysis of the parties involved ('stakeholder analysis') to bring all the relevant parties on board.
    - Not underestimating the role of the related factors in the information campaign and marketing of the scheme given the role these factors played in the analysed cases.
    - Taking on board the characteristics of the "current transport system" and "the overall transport policy and supporting measures", as they determine whether the road pricing policy falls on fertile ground.
- Regarding case- specific implementation factors, I recommend that policy-makers be alert during the road pricing implementation process, paying attention to the implementation factors throughout the implementation process and being flexible enough to deal with uncertainties and changes.
- In this thesis, we have developed a checklist using the insights from six transport policy implementation frameworks. I recommend using this checklist for the analysis and support of road pricing policy implementation, as this supports a structured analysis and may provide new insights, thereby increasing the proactivity and responsiveness of the actors involved in the road pricing policy implementation process. Note that this checklist should be used for inspiration and guidance, keeping in mind that it is not a one size fits all solution and should be tailored to each specific case.

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Samenvatting

Achtergrond

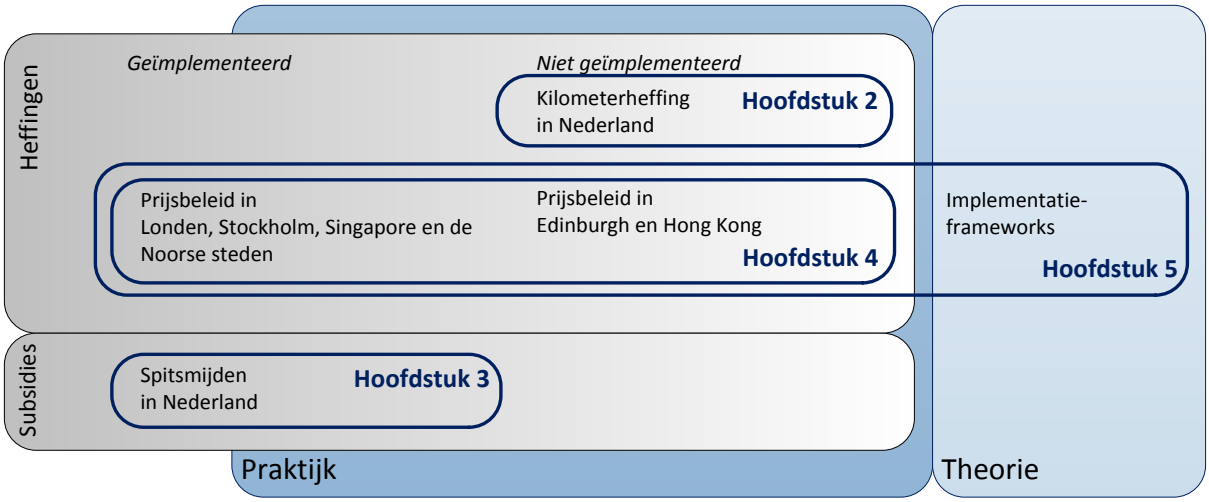
Stedelijke gebieden hebben last van negatieve externe effecten van wegtransport, zoals congestie op het wegennetwerk, luchtvervuiling en verkeersongevallen. Een maatregel om deze negatieve externaliteiten te reduceren is prijsbeleid, anders gezegd beleidsmaatregelen die direct het weggebruik beprijzen (Jones and Hervik, 1992). Sinds de introductie van prijsbeleid in de literatuur (Knight, 1924; Pigou, 1920a), "wordt de invoering van congestieheffingen decennialang bepleit door transporteconomen" (Santos et al., 2010a:34). Hoewel een aantal prijsbeleidsmaatregelen is ingevoerd, geldt voor veel prijsbeleidinitiatieven dat de invoering niet is gelukt.

De belangrijkste barrières bij de invoering van prijsbeleid "zijn typisch het gebrek aan publiek en politiek draagvlak" (Santos et al., 2010a:34). Daarnaast bestaan ook andere factoren die de implementatie kunnen belemmeren, zoals het gebruik van de heffingsopbrengsten, uitzonderingen en privacy-issues (Banister, 2004; Borins, 1988; Santos and Shaffer, 2004) en factoren die kunnen bijdragen aan de implementatie. Slechts een beperkt aantal studies geeft inzicht in hoe prijsbeleidmaatregelen in de praktijk wél (kunnen) worden geïmplementeerd. De meeste van deze studies bespreken slechts één of enkele factoren en komen daarom niet tot een integraal inzicht. In dit proefschrift analyseer ik daarom de rol van alle tot nu toe bekende implementiefactoren in prijsbeleidimplementatieprocesssen. In dit proefschrift wordt met beleidsimplementatie bedoeld: "de acties bij publieke of private individuen (of groepen) die zijn gericht op het bereiken van de - in eerdere beleidsbeslissingen - geformuleerde doelen" (Van Meter and Van Horn, 1975:447).

Doel en de inhoud van dit proefschrift

Het doel van dit proefschrift is om inzicht te vergroten in de factoren die een rol spelen in prijsbeleidsimplementatie, en op welke wijze ze aan de implementatie bijdragen. Hiertoe heb ik vier studies uitgevoerd, opgenomen in de hoofdstukken 2 tot en met 5 van dit proefschrift. Per hoofdstuk neem ik één of meerdere praktijkcasussen als uitgangspunt(en) (zie Figuur S.1) en adresseer ik een aantal kennislacunes. De geadresseerde kennislacunes zijn:

- Kennislacune 1: *In de prijsbeleidliteratuur zijn niet-geïmplementeerde en/of innovatieve prijsbeleidscasussen onderbelicht en daarom is daarover weinig kennis beschikbaar.*
  In dit proefschrift heb ik drie expliciet niet-geïmplementeerde casussen opgenomen, namelijk de kilometerprijs in Nederland (Hoofdstuk 2), het prijsbeleid in Hong Kong en het prijsbeleid Edinburgh (Hoofdstuk 4). Ook heb ik twee innovatieve Nederlandse casussen bestudeerd; de kilometerprijs (Hoofdstuk 2) en Spitsmijden (Hoofdstuk 3). De eerste casus beschouw ik als innovatief beschouwd vanwege de nationale schaal, de scope die zowel personen- als goederenvervoer omvat en de gedifferentieerde prijsprikkel. De tweede casus betreft een beloning als prijsprikkel en is in de praktijk geïmplementeerd, wat nog niet eerder is gedaan. Daarom merk ik ook deze casus aan als innovatief.
- Kennislacune 2: *Weinig prijsbeleidstudies richten zich alleen op de implementatie-vraagstukken waardoor hierover weinig bekend is over het gehele implementatieproces.*
  Dit proefschrift richt zich specifiek op beleidsimplementatie van prijsbeleid, waarbij ik verschillende aspecten heb bestudeerd. Zo is de kilometerprijs in Nederland volledig bestudeerd vanuit het perspectief van beleidsimplementatie, wat bij mij heeft geleid tot een grondiger begrip van het gehele implementatieproces (Hoofdstuk 2). Ook is één specifieke implementatiefactor, namelijk draagvlak van werkgevers, geanalyseerd (Hoofdstuk 3). Verder geef ik in hoofdstuk 4 een overzicht en een analyse van implementatiefactoren, die gedeeltelijk achterwege zijn gelaten of onderbelicht zijn gebleven in bestaande studies naar prijsbeleidscasussen. Tot slot heb ik de potentiële bijdrage bepaald van beleidsimplementatieframeworks aan de analyse van prijsbeleidimplementatie (Hoofdstuk 5). Dit proefschrift draagt bij aan het begrip van beleidsimplementatie van prijsbeleid door verschillende aspecten hiervan te bestuderen.
- Kennislacune 3: *Prijsbeleidsimplementatie is nauwelijks vanuit theoretisch perspectief bestudeerd waardoor de hieruit volgende inzichten ontbreken.*
  In dit proefschrift is een framework ontwikkeld dat factoren beschrijft die van invloed zijn op de bereidheid van een beleidsactor om een transportbeleidsinstrument te omarmen. Dit framework is vervolgens getoetst op de kilometerprijs in Nederland (Hoofdstuk 2). Daarnaast zijn zes transportbeleidsimplementatie-frameworks geanalyseerd en zijn aanbevelingen gedaan om de ontwikkeling en toepassing van dergelijke implementatieframeworks te verbeteren (Hoofdstuk 5).



Figuur S.1 Structuur van dit proefschrift

Resultaten en conclusies

De belangrijkste resultaten en conclusies van de vier hoofdstukken, evenals de overkoepelende conclusies beschrijf ik hierna. Daarnaast belicht ik kort de variëteit aan gebruikte methodes.

<u>Hoofdstuk 2: Kilometerprijs in Nederland: het beleidsimplementatieproces</u>
Het doel van dit hoofdstuk is een overzicht geven van implementatiefactoren die van invloed zijn geweest op het implementatieproces van de kilometerprijs in Nederland. Het beslaat de periode 2004, toen de Nederlandse overheid met het idee kwam om prijsbeleid te implementeren tot 2010, toen de regering besloot om de kilometerprijs niet in te voeren. De casus is bestudeerd met een conceptueel framework dat in het hoofdstuk wordt beschreven. Het conceptueel framework is gebaseerd op de inzichten van Feitelson and Salomon (2004), Sabatier (1988), Kingdon (1984) en Koppenjan (1993). Voor de evaluatie van de casus heb ik gebruik gemaakt van wetenschappelijke literatuur en beleidsdocumenten.

Het framework beschrijft de factoren die van invloed zijn op de bereidheid van een beleidsactor om een transportbeleidsinstrument te omarmen en bestaat uit drie hoofdcomponenten:

A. De haalbaarheid van een beleidsinstrument (A1) en de beoordeling van die haalbaarheid (A2)
B. De noodzaak van een kans om beleid op de politieke agenda te krijgen
C. De noodzaak van politieke daadkracht

Het toepassen van het conceptuele framework op de kilometerprijscasus heeft geresulteerd in de volgende inzichten. Ten eerste werd de kilometerprijs technisch, economisch en sociaal haalbaar geacht door belangrijke beleidsactoren. Echter, deze factoren waren niet onomstreden en bleven niet zonder onzekerheden. Doordat het gehele implementatieproces is beschouwd was het ook mogelijk om vast te stellen hoe implementatiefactoren zich door de tijd ontwikkelden. De politieke haalbaarheid veranderde bijvoorbeeld van brede consensus over de invoering van de kilometerprijs in 2006 tot onvoldoende politiek draagvlak in 2010. Door het gebrek aan draagvlak onder actoren bleek de kilometerprijs in 2010 politiek niet haalbaar. Het gebrek aan politieke daadkracht lijkt een andere belangrijke barrière in de implementatie van de kilometerprijs in Nederland. Het framework heeft geholpen bij het

systematisch beschrijven en analyseren van de Nederlandse kilometerprijscasus; alle factoren uit het framework hebben invloed gehad op het beleidsimplementatieproces van de kilometerprijs.

Hoofdstuk 3: Spitsmijden in Nederland: attitudes van werkgevers
Dit hoofdstuk bestudeert een specifieke actor die in de prijsbeleidliteratuur weinig aandacht heeft gekregen, namelijk werkgevers. De attitudes van grote Nederlandse werkgevers (met meer dan 100 werknemers) ten aanzien van spitsmijden zijn onderzocht. Data over 103 werkgevers werd verzameld via een webenquête gericht op Human Resource (HR) managers. Het bleek dat er een grote variëteit bestaat in de attitudes van werkgevers ten aanzien van spitsmijden. Iets meer dan een derde (34%) van de respondenten verwacht dat hun organisatie bereid is om het mijden van de spits te faciliteren door het bieden van flexibele werktijden en -locaties. Dit onderzoek gaf ook kwantitatief inzicht in het niveau van flexibiliteit in werktijden en werklocaties die werkgevers op dat moment bereid waren te bieden aan hun werknemers.

Via een ‘Structural Equations Model’ (SEM) is verkend welke factoren bepalend zijn voor de mate van bereidheid van werkgevers om spitsmijden voor hun werknemers mogelijk te maken. Het SEM-model laat zien dat de factor ‘organisatiegrootte’ een indirect effect heeft via de attitude van de HR manager. De factor ‘sector’ (zoals overheid, bouw, onderwijs) heeft een indirect effect via de striktheid van de werktijden. De resultaten laten zien dat de hoogste bereidheid om spitsmijden te ondersteunen, kan worden verwacht van organisaties die zich verantwoordelijk voelen voor het beïnvloeden van het woon-werkgedrag van hun werknemers, die beschikken over HR managers met een positieve attitude ten aanzien van spitsmijden, die al flexibele werktijden hebben en, tot slot, die al mobiliteits-managementmaatregelen hebben geïmplementeerd.

Werkgevers zijn een belangrijke stakeholder bij spitsmijden. Deze studie toont aan dat 45% van de respondenten vindt dat de werkgever verantwoordelijk is voor het beïnvloeden van het woon-werkgedrag van hun werknemers. Het is nog onzeker in welke mate werkgevers bereid zijn te investeren in het vertalen van deze verantwoordelijkheid in concrete acties. De grootste bijdragen aan spitsmijden die van werkgevers kan worden verwacht, is het bieden van flexibele werktijden aan werknemers en het stimuleren van werknemers om deze mogelijkheid volledig te benutten als alternatief voor het autorijden in de spits. Hiervan kunnen spitsmijden én een breed scala aan mobiliteitsmanagementinitiatieven profiteren.

Hoofdstuk 4: Zes prijsbeleidscasussen: implementatiefactoren en beleidsimplementatielessen
Het doel van dit hoofdstuk is een zo compleet mogelijke set aan implementatiefactoren te identificeren die van invloed zijn geweest op de beleidsimplementatieprocessen van zes empirische prijsbeleidscasussen. Dit zijn Singapore, London, Stockholm, de Noorse steden, Hong Kong en Edinburgh.Een tweede doel is deze casussen systematisch te vergelijken op de implementatiefactoren. Vergeleken met de meeste voorgaande studies, omvat deze studie een relatief groot aantal casussen. Systematische analyse (‘content analyse’) is toegepast voor het identificeren van implementatiefactoren in wetenschappelijke papers over deze casussen. Deze content analyse omvat een groot aantal wetenschappelijke papers per casus (gemiddeld 27 papers per casus, 106 papers in totaal) hetgeen grondige en gedetailleerde analyses van de implementatiefactoren per casus mogelijk maakte. Een betrouwbaarheidstest van de coderingen van de codeerders (‘intercoder reliability test’) is uitgevoerd om de betrouwbaarheid van de resultaten van de analyses (‘content analyses’) te beoordelen.

In tegenstelling tot eerdere studies, is een groot aantal implementatiefactoren (gemiddeld 36 per casus) geïdentificeerd. Over het totaal van zes de prijsbeleidscasussen samen zijn in totaal 61 implementatiefactoren aangetroffen. Hiervan komt de meerderheid van de factoren voor in meerdere casussen. De drie meest genoemde implementatiefactoren voor elke casus nemen gemiddeld 30%[14] van alle implementatiefactoren van die casus voor hun rekening. Voor elke casus is de set van meest genoemde implementatiefactoren opgesteld (zie hoofdstuk 4 voor een overzicht van de implementatiefactoren in alle zes de casussen, de meest genoemde implementatiefactoren per casus en de bespreking van de meest opvallende implementiefactoren per casus).

Er werden zes implementatiefactoren geïdentificeerd die in elke casus voorkwamen , de zogenaamde generieke implementatiefactoren. Deze factoren zijn (in volgorde van hoe frequent ze zijn genoemd) 'het algemene politieke draagvlak', 'het algemene publieke draagvlak', 'de informatiecampagne', 'de verschillende actorpercepties', 'de kenmerken van het transportsysteem' en 'de marketing van de maatregel'. Deze zes generieke factoren vertegenwoordigen echter slechts gemiddeld 27% van alle genoemde implementatiefactoren. Er zijn dus ondanks de overeenkomsten ook grote verschillen gevonden in de implementatiefactoren die belangrijk zijn in deze zes casussen.

Elke casus bevatte dus casusspecifieke factoren die niet of zelden voorkomen in de andere casussen. De meest prominente casusspecifieke implementatiefactor is de rol van specifieke actoren. Er is een factoranalyse uitgevoerd om te toetsen of clusters van casussen geïdentificeerd konden worden. De hypothesen betroffen het bestaan van een cluster van de Singapore en Hong Kong casussen, een cluster van geïmplementeerde en een cluster van niet-geïmplementeerde casussen. De factoranalyse toont aan dat er geen clusters van vergelijkbare casussen zijn gevonden die resulteren in beleidsimplementatielessen. Bovendien is gebleken dat er grote verschillen mogelijk zijn in het belang van implementatiefactoren en hoe individuele implementatiefactoren zich manifesteren tussen de casussen. Beleidsimplementatielessen ter ondersteuning van lokale en nationale overheden die de implementatie van prijsbeleid overwegen zijn opgenomen in dit hoofdstuk.

Hoofdstuk 5: Vergelijking van beleidsimplementatie-frameworks

Het doel van dit hoofdstuk is beoordelen hoe geschikt transportbeleidsimplementatie-frameworks zijn voor de analyse van prijsbeleidsimplementatie. Uit wetenschappelijke literatuur zijn zes transportbeleidsimplementatie-frameworks geselecteerd via een sneeuwbalmethode. Deze geselecteerde frameworks beogen de analyse van transportbeleidsimplementatie te ondersteunen. Ook zijn deze frameworks generiek en bevatten ze meerdere beleidsimplementatiefactoren. Vervolgens zijn twee vergelijkbare analyses zijn uitgevoerd. Ten eerste zijn de transportbeleidsimplementatie-frameworks onderling vergeleken. Ten tweede is bekeken hoeveel de frameworks (theorie) overeenkomen met de bevindingen uit de analyse van prijsbeleidsimplementatie in zes praktijkcasussen (praktijk).

De geanalyseerde implementatie-frameworks vertonen weinig consensus in de factoren die beleidsimplementatie beïnvloeden. Ongeveer de helft van alle implementatiefactoren uit alle

[14] De geïdentificeerde observaties (delen van tekst over implementatiefactoren) in de geanalyseerde papers zijn op onderwerp geclusterd in implementatiefactoren. De implementatiefactoren zijn opgenomen als percentage van het totaal aantal observaties voor één casus (waarbij het totaal van de percentages voor alle implementatiefactoren in een casus optelt tot 100%), omdat het aantal papers (en daarmee het aantal geïdentificeerde observaties en implementatiefactoren) behoorlijk varieerde per casus.

frameworks samen kwam slechts in één van de frameworks voor. Elk framework wijst dus op een verschillende subset van factoren. Ook is weinig overlap gevonden tussen de implementatiefactoren uit frameworks en uit de praktijk. De meeste frameworks dekken gemiddeld niet meer dan 10% van de alle implementatiefactoren uit de praktijk af. Zelfs de gecombineerde set van implementatiefactoren van alle frameworks samen kent een beperkte overlap met de implementatiefactoren uit de praktijk; ongeveer de helft van de implementatiefactoren uit de frameworks werd niet genoemd in de praktijk. Wel is gebleken dat een aantal factoren in het bijzonder van belang blijken omdat deze zowel in de meerderheid van de frameworks belangrijk wordt gevonden als in de top tien empirische factoren voorkomt. Dit zijn 'transportbeleid en ondersteunende maatregelen', 'het algemene publieke draagvlak' en 'het algemene politieke draagvlak'. Daarnaast erkennen beide de rol van actoren en draagvlak onder actoren. Over het belang van de andere implementatiefactoren, lijken de implementatieframeworks en de bevindingen ten aanzien van implementatiefactoren uit de empirische casussen het niet met elkaar eens te zijn.

Dit hoofdstuk concludeert daarom dat de geanalyseerde transportbeleidsimplementatie-frameworks slechts een bescheiden bijdrage kunnen leveren aan de analyse van prijsbeleidimplementatie. In dit hoofdstuk worden de consequenties van deze bevindingen voor prijsbeleidimplementatie bediscussieerd. In dit hoofdstuk zijn ook aanbevelingen opgenomen, inclusief de checklist die we hebben ontwikkeld voor het verder toepassen en ontwikkelen van transportbeleidsimplementatie-frameworks voor de analyse en ter ondersteuning van prijsbeleidimplementatie.

<u>Generieke conclusies</u>
Het combineren van de inzichten uit de vier hoofdstukken heeft geresulteerd in de volgende generieke conclusies over prijsbeleidimplementatie:

- Vermoedelijk zijn de gevonden generieke implementatiefactoren – 'het algemene publieke draagvlak' en 'het algemene politieke draagvlak' – alsook het aantreffen van een brede set van implementatiefactoren (conclusies uit hoofdstuk 3) relevant voor alle prijsbeleids-implementatieprocessen.
- De implementatie van prijsbeleid behoeft continue aandacht en flexibiliteit. Het managen hiervan kan worden ondersteund door een checklist voor het bepalen van implementatieacties toegespitst op een specifiek prijsbeleidmaatregel en implementatiecontext.

Richtingen voor vervolgonderzoek

Een aantal richtingen voor vervolgonderzoek is mogelijk:

- Het is mogelijk om casussen te bestuderen die niet in dit proefschrift zijn opgenomen. In de categorie van innovatieve prijsbeleidscasussen zijn de opties echter beperkt. Het is mogelijk om alle implementatiefactoren van spitsmijden in Nederland, het voorstel om een nationaal prijsbeleid in het Verenigd Koninkrijk in te voeren of andere vormen van prijsbeleid (bijvoorbeeld tolheffingen voor vrachtverkeer, carpoolbetaalstroken en tolsystemen) te bestuderen. Ook kan additioneel onderzoek naar specifieke prijsbeleidscasussen relevant zijn indien eerdere poging(en) om prijsbeleid in te voeren niet zijn gelukt maar prijsbeleid wordt heroverwogen en deze casus tot dusver nog niet uitgebreid is bestudeerd of bepaalde aspecten in eerdere studies onderbelicht zijn gebleven.
- Een ander onderwerp voor vervolgonderzoek zijn implementatiestrategieën. Met name het ontwerp van een gevarieerdere set van implementatiestrategieën lijkt een zinvol

onderwerp van studie (tot dusver besteedt de prijsbeleidliteratuur vooral aandacht aan de strategie van het houden van een proef gevolgd door een referendum). Daarnaast wordt aanbevolen om hierin mee te nemen of andere keuzes gemaakt zouden worden in de vormgeving van het prijsbeleid als daarin de beleidsimplementatieconsequenties al worden meegenomen.

- Voor prijsbeleidscasussen waarvoor geldt dat er weinig kennis is van de beleidsimplementatie, en specifiek voor nieuwe prijsbeleidimplementatieprocessen, liggen er kansen om prijsbeleidsimplementatie grondiger te bestuderen. Vervolgonderzoek kan zich richten op het bestuderen van de prijsbeleidscasussen vanuit het beleids-implementatieperspectief; het kan een bredere variëteit aan bronnen meenemen, zoals het gebruik maken van de praktische kennis van beleidsmakers en andere betrokken stakeholders; vervolgonderzoek kan niet alleen de wetenschappelijke literatuur maar ook andere bronnen meenemen en het kan zich niet alleen richten op ex-post-evaluatie maar ook op evaluatie tijdens het implementatieproces (bijvoorbeeld door participatief onderzoek).
- Ten aanzien van de theorie over beleidsimplementatie laat dit proefschrift zien dat transportbeleidsimplementatie-frameworks onderling weinig consensus vertonen over factoren die beleidsimplementatie beïnvloeden. Aanvullend onderzoek kan zich richten op het verder valideren van transportbeleidsimplementatieframeworks (implementatie-factoren, hun belang en de relaties). Dit proefschrift richt zich op prijsbeleid; in vervolgonderzoek kan de geschiktheid van transportbeleidsimplementatie-frameworks voor ander transportbeleid zoals de implementatie van Intelligente Transport Systemen ook worden getest. Vervolgonderzoek werpt wellicht ook meer licht op de wenselijkheid van het ontwikkelen van een synthese-framework om de eenvoudige checklist te vervangen en, indien gewenst, hoe een dergelijk framework zou moeten worden ontwikkeld.

Beleidsaanbevelingen

Dit proefschrift bevat de volgende aanbevelingen voor beleidsmakers:

- De volgende aanbevelingen volgen uit de generieke implementatiefactoren die zijn vastgesteld in dit proefschrift:
  - Het onderzoeken van de attitudes van politieke actoren en de bevolking ten aanzien van een prijsbeleidmaatregel aangezien deze informatie ook gebruikt kan worden in het implementatieproces om bijvoorbeeld te bewerkstelligen dat alle betrokken partijen goed zijn geïnformeerd.
  - Het uitvoeren van een analyse van de betrokken partijen (‘stakeholderanalyse’) om alle relevante partijen in het vizier te krijgen.
  - Het niet onderschatten van de gerelateerde factoren informatiecampagne en marketing, gezien de rol die deze factoren spelen in de geanalyseerde casussen.
  - Neem de kenmerken van ‘het huidige transportsysteem’ en ‘het algehele transportbeleid en ondersteunende maatregelen’ in ogenschouw omdat deze in belangrijke mate lijken te bepalen of prijsbeleid in transport in vruchtbare aarde valt.
- Ten aanzien van de casusspecifieke factoren worden beleidsmakers aangeraden om gedurende het prijsbeleidsimplementatieproces alert te blijven op en aandacht te schenken aan implementatiefactoren gedurende het implementatieproces, en om flexibel genoeg te zijn om onzekerheden en veranderingen in het implementatieproces mee te nemen.
- In dit proefschrift hebben we een checklist ontwikkeld gebruikmakend van de inzichten van zes transportbeleidsimplementatie-frameworks. Het gebruik van deze checklist wordt

aanbevolen voor de analyse en ter ondersteuning van prijsbeleidimplementatie, aangezien de checklist kan bijdragen aan een gestructureerde analyse en mogelijk nieuwe inzichten verschaft waardoor pro-activiteit en responsiviteit van de betrokken in het prijsbeleidsimplementatieproces kan toenemen. Deze checklist dient alleen ter inspiratie en voor enig houvast te worden gebruikt.

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About the author

Diana M. Vonk Noordegraaf was born on the 24th of May 1983 in Gouda, the Netherlands. In 2001 she started her study Systems Engineering, Policy Analysis and Management at the faculty of Technology, Policy and Management of Delft University of Technology. Her Bachelor specialization was in Transport, Infrastructure and Logistics and she further specialized in the Master on Transport. During her Bachelor she also completed several Business Administration courses the Erasmus University in Rotterdam and undertook an internship at the United Fire Department in the port of Rotterdam, investigating the logistics required for firefighting open top floating roof tanks. Her Bachelor project estimated a stated choice model of the competition among egress transport modes. She worked as a student assistant at the same faculty during her Master, including research activities into the Peak Hour Avoidance and was a member of several committees of the student association S.V.T.B. Curius. In her Master thesis project, executed at TNO, she investigated the behaviour responses of Dutch shippers and freight carriers to road pricing. She received her Master's degree with honour.

In May 2007 Diana started working as a consultant at TNO and as a researcher at Delft University of Technology. In January 2008 Diana commenced her PhD research at Delft University of Technology, at the faculty of Technology, Policy and Management, at the Transport and Logistics department. The focus of the research was on road pricing policy implementation. She studied four different implementation aspects of road pricing policy implementation, being kilometre charging, employer support of Peak Hour Avoidance, 3 implementation factors in six road pricing cases and the suitability of policy implementation frameworks for the analysis of road pricing policy implementation. The vast majority of this PhD project was funded by Delft University of Technology, including a Transumo grant, supplemented by one year of funding by her employer TNO.

As senior consultant Smart Mobility at TNO, at the department of Sustainable Urban Mobility and Safety, she focuses on policy design, policy implementation and monitoring and

evaluation of innovative mobility measures. Diana maintains a broad interest in the field of Smart Mobility ranging from mobility management, traffic management to connected and cooperative mobility as well as the governance, policy and behavioural aspects. She develops and participates in various mobility projects where she connects technological, policy and process aspects. Diana is capable of developing, facilitating and managing multidisciplinary projects and processes with complex policy and multi-actor settings.

Examples of her TNO projects are research projects into congestion and shockwaves, the Sensor City Mobility project and the development the City Dashboard for the municipality of Rotterdam. She also worked on several TNO projects into road pricing being the evaluation of Peak Hour Avoidance projects, the Peak Hour Avoidance in the train project, the implementation of kilometre charging for trucks in Belgium and a project into the technology options for road pricing. Diana works on projects for TNO as well as for DITCM Innovations, the open innovation organisation in which government, industry and knowledge institutes work together on the successful introduction of cooperative systems to sustainably support mobility and accessibility. Examples include the NDW data fusion pilot, the project on precompetitive public private partnerships in the ITS domain, the ITS Round table Human Behaviour and the SimSmartMobility project.

Diana has presented at various international and Dutch conferences, chaired sessions and wrote journal papers as well as a variety of conference papers. She contributes to education by supervising students and through guest lectures. She is board member of the Dutch annual conference on Traffic Behaviour and member of research school TRAIL.

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Summary

Road pricing – policies that impose direct charges on road use – is a potentially effective measure to reduce (the negative effects of) road transport. However, road pricing policy implementation is often challenging. This thesis increases the understanding of which implementation factors can play a role in road pricing policy implementation and in what way. The analyses of real-world cases, such as kilometre charging and Peak Hour Avoidance in the Netherlands, are the core of this thesis.

About the Author

Diana M. Vonk Noordegraaf performed her PhD research at Delft University of Technology, faculty of Technology, Policy and Management. She is also senior consultant Smart Mobility at TNO with a focus on the implementation of innovative mobility measures.

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