Low emission zone policy in the Netherlands

Learning and transferability from North-western European cases

Author: Roy Maternum

Student number: 2357259

Master Environmental & Infrastructure Planning

University of Groningen, Faculty of Spatial Sciences

Supervisor: Dr. Christian Zuidema

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Contact author: roy-maternum@outlook.com

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Preface

This document presents the thesis "Low emission zone policy in the Netherlands: learning and transferability from North-western European cases". The thesis compares foreign low emission zone policies to a few Dutch low emission zone policies. The thesis was written as the final piece for my graduation of the master programme Environmental and Infrastructure Planning at the University of Groningen.

The research process was not always easy, but it has been an interesting process. The guidance of my supervisor Christian Zuidema has had a significant effect in bringing this research to this final product. I am grateful for all the guidance and feedback that Christian provided.
In addition, I want to thank all the interviewees for the foreign cases: Stockholm, Copenhagen, Munich and London. Moreover, I also want to thank the interviewees for the Dutch cases: Utrecht and Rotterdam. Their input provided me with the necessary data for this research.
Last but not least, I want to thank my family and friends for the support and advice during the research process.

I hope you will enjoy the reading of my thesis.

Roy Maternum,

01-06-2017

Abstract

This research assesses the effectiveness of different low emission zone cases in North-western Europe. The aim of the research is to find possible transferable elements of the policy in order to improve the effectiveness of the low emission zones in the Netherlands. The low emission zone is an area with restricted access for certain vehicles due to their emissions. The theoretic framework is mainly based on the policy transfer literature as part of comparative research.

Information about the selected cases was gathered through the desk study and interview methods. Four elements of the low emission zone were identified as potentially transferable. These elements were: geographic scope, vehicles affected, strictness level and policy process and instruments. It turned out that there was no learning potential for the vehicles affected element. The reason for this that already many vehicle types are affected by the policy and the amount of vehicles types affected is higher than three of the four selected foreign cases.

Four improvements were identified. Firstly an extension of the geographic area. Secondly a tightening of the strictness level, with a division between heavy and light vehicles. Thirdly the development of the policy through adding a long term view. Fourthly the reduction of the policy's complexity by developing a national consistent policy and reducing the exemptions for the low emission zone. The conclusion is that abovementioned improvements would increase the effectiveness of the low emission zones. In addition, the transferability assessment differs per improvement from very high (heavy vehicles strictness level) to low (consistent national policy) based on the amount of issues regarding transferability.

Keywords:
Low emission zone, Netherlands, policy transfer, learning, transferability

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1. Introduction

Urbanisation in Europe is a long-lasting process which already started in Southeast Europe around 700 B.C. in the time of the ancient Greeks. Since the 19th century, urbanisation grew almost exponentially (Antrop, 2004). Because of this urbanisation, nowadays 80 percent of the people in most European countries live in urban areas (Zuidema & De Roo, 2009; Antrop, 2004). Under the influence of urbanisation, globalisation and largely increased mobilisation, cities have become the centres of civilization. These processes of urbanisation, globalisation and increased mobilisation resulted in increasing air pollution levels and therefore a decreasing air quality. The air quality in cities is consequently a concern (Kumar et al., 2015). It is even more concerning that 80 percent of the European population lives in those urban areas and this results in health risks for the people living in those areas.

The World Health Organization states that air pollution is the largest environmental health risk and traffic related air pollution is the major component of that risk (Dias et al., 2016; Urban access regulations, 2016). A lot of studies have stated that health is related to exposure to particulate matter (PM_{10} & $PM_{2.5}$) and nitrogen oxides (NO_X & NO_2) (Brunekreef & Holgate, 2002; Qadir et al., 2013; Fensterer et al., 2014), which are traffic related. The health concern is also shared by the European Union, making the urban environment one of the seven priority themes in the 6th EU Environment Action Programme. Air quality subsequently followed as sub-priority (CEC, 2001). There are many ways to improve the air quality in the urban environment, for instance stimulating public transport usage instead of cars or congestion charges (Urban access regulations, 2016). The low emission zone is another one of these measures and one of the most frequently chosen responses (Dias et al., 2016; Fensterer et al., 2014). In Europe, the first was established in Sweden in 1996 under the name Environmental Zone (Holman et al., 2015). The low emission zone is supposed to improve the air quality and with that the living environment and health of people living in cities. Health and environment are for both people and the planet itself really important.

1.1 Relevance

Low emission zones are a relatively new measure in environmental planning and research on this topic is rather scarce (Dias et al., 2016). There is some research on specific cases, multiple of these will also be used for this research. These researches focus on the effectiveness of the low emission zone in terms of changes in air pollution, but the reason(s) why are often underexposed. In addition, lesson drawing from one country to another is not touched upon in those researches. This shows the academic relevance of this research.

The societal relevance is illustrated by a recent study of the Dutch research institute TNO (2016). They published their report on the effects of the low emission zone in Utrecht on behalf of the municipality of Utrecht. This study shows

a substantial positive effect on different particulate matter components, for instance for PM_{10}. However, the results also show that this effect cannot be solely attributed to the low emission zone. It is most likely a combination of vehicle fleet turnover, changes in traffic intensity, meteorological differences and the establishment of the low emission zone. So the conclusion of the TNO research is that the low emission zone seems to have a positive effect, but that it cannot be proven that the measured effect is a consequence of the establishment of the low emission zone (TNO, 2016).
As a result, a lot of (political) discussion arose about the usefulness of a low emission zone. The article of Huisman (2016) discusses the political discussion, which eventually went to parliament. The newspaper Volkskrant added a poll with the article of Huisman (2016), with the statement: *"Low emission zones should be implemented in every city centre of the Netherlands."* The total of almost 3000 votes was divided in 53 percent in favour and 47 percent against. This suggests that opinions about this topic are really split in the Netherlands. The news article of Franck (2016) in Algemeen Dagblad focusses more on the local politics. The opponents of the low emission zone see the report of TNO as proof that it is not working well enough for the hindrance it brings. The opponents already see the low emission zone in Utrecht as a temporary measure which should be abolished as soon as possible (Franck, 2016).
The report of TNO and the two news articles illustrate that there is a lot of recent discussion about the effectiveness of the low emission zone and that the opinions are divided. Different writers state that the usage of the low emission zone is still disputed, including the effectiveness and consistency of the results of these zones (Boogaard et al., 2012; Dias et al., 2016; Morfeld et al., 2014).

1.2 Research objectives

This research will address the effectiveness of several European low emission zone cases. In addition, it will discuss the characteristic elements of these low emission zones and investigate which are transferable and to what degree.
The goal is to compare the cases and explore the possibility to transfer the in essence transferable success elements from the cases abroad to the Netherlands. In essence transferable elements are essentially transferable between places and are parts of the policy that can be changed by humans. By looking at these criteria it can be investigated whether or not Dutch low emission zones can be further improved. Assuming the low emission zones in the Netherlands can be further improved, this research could influence the debate about the low emission zone's effectiveness.

The main question used to investigate this is: what can be learned in the Netherlands from low emission zone policy choices in other European countries and to what degree could these lessons be transferred?

Sub-questions:

1. Which elements of the low emission zone policy are potentially transferable between cities and countries?
2. What are the differences between cities in Northwest Europe regarding these elements and why do these exist?
3. How do these differences and the reasons in the foreign cases relate to the Dutch cases?
4. Can the 'lessons' be transferred to the Netherlands or provide inspiration for improvement? And to what degree?

The next chapter, chapter two, will elaborate upon the low emission zone policy and the factors that should be considered in relation to the low emission zone policy. In chapter three, the theories used for this thesis will be elaborated upon. The methodology will be discussed in chapter four. This chapter will be followed by the results and analysis in chapter five. Chapter six will consist of the conclusions and recommendations for further research. And finally, chapter seven will reflect on the research process and outcomes.

2. The low emission zone

As stated in chapter one, the low emission zone's main goal is to improve the air quality and therefore the living quality of the city. They are implemented in areas with high air pollution levels and generally targeting diesel vehicles. The reason for this is that pollution from diesel vehicles has a relative large health impact (Urban access regulations, 2016). The incentive for the low emission zone is the European air quality Directive which was updated last in 2008: 2008/50/EC (Holman et al., 2015; Urban access regulations, 2016). This directive is a result of the 6th EU Environment Action Programme priority theme Urban environment (CEC, 2001). For areas that do fail to reach the pollution limits in time, an Action Plan must be provided by the Member State(s). The low emission zone is often a part of those action plans (Dias et al., 2016; Holman et al., 2015).

Holman et al. (2015) state that a low emission zone is an area with restricted access for certain vehicles because of the emission those type of vehicles produce. The EURO standards are used for this and range from EURO 1 to EURO 6 based on the technical conditions of vehicles (Morfeld et al., 2014). Because newer cars have to be cleaner, vehicles can be categorised in the EURO standards by manufacturing year (Urban access regulations, 2016). This also means that older vehicles are more effective to target, since this are more polluting vehicles. The European emission standards apply to a broad range of vehicles. These include passenger cars, vans, two- and three wheeled vehicles and heavy duty vehicles (mainly trucks). Each of those vehicles have different emission limits (Holman et al., 2015) and could be included when initiating a low emission zone. The EURO standards for trucks are usually indicated with roman letters instead of numbers. In this research the numbers are always used to display the EURO standard. Table 1 shows the division of the different types of vehicles in the EURO standards. The date in the table is the date that a standard was introduced.

EURO standards per vehicle class

Vehicle type	EURO 1	EURO 2	EURO 3	EURO 4	EURO 5	EURO 6
Passenger cars	July 1992	Jan 1996	Jan 2000	Jan 2005	Sept 2009	Sept 2014
Light commercial vehicles (≤1305kg)	Oct 1994	Jan 1998	Jan 2000	Jan 2005	Sept 2010	Sept 2014
Light commercial vehicles (others)	Oct 1994	Jan 1998	Jan 2001	Jan 2006	Sept 2010	Sept 2015
Trucks & buses	1992	1995	1999	2005	2008	2013
Motorcycles	2000	2004	2007	2016	2020	-
Mopeds	2000	2002	-	2017	2020	-

Table 1 Source: Urban access regulations (2016)

There are different aspects that have to be taken into account and influence the low emission zone. All these aspects will be summarized at the end of the chapter and form the set of elements of the low emission zones.

Ferreira et al. (2015) already introduces four reasons why low emission zones can differ. Firstly, the geographical scope may be different. Some extend to the full city and others contain a smaller area only, usually the city centre. Secondly, the period of operation could differ. The most operate 24 hours a day and 365 days a

year, but there are also ones that operate only on weekdays or during working hours. Thirdly, the affected type of vehicle may differ. Sometimes all types are affected, but it can also only include heavy duty vehicles or trucks. Fourthly, the strictness level may vary. This is dependent on the minimum EURO standard that is applied (Ferreira et al., 2015; Dias et al., 2016).

The size of an urban area affects the amount of emissions and possibly the effectiveness of the low emission zone. The municipality and population size is therefore the fifth element. Using the municipality size, a perspective to the geographic scope of the low emission zone can be provided. The population size provides an indication of the magnitude of population the low emission zone is located in. This is illustrated by Rapaport (2002), who states that the goal of the Swedish low emission zone is to protect sensitive environs. Sensitive environs are urban areas which have: *"...large amounts of housing, many pathways for pedestrians and cyclist, important and sensitive buildings and monuments, parks and green spaces that are sensitive to pollutants, and areas with existing high exposure to pollutant emissions and noise."* (Rapaport, 2002, pp. 214). The focus on urban areas with high population density can be witnessed especially because of the large amounts of housing in the description of what a sensitive environ is.

Sixth is the background concentrations in a certain area. Jensen et al. (2011) stated that the potential of the low emission zone is the difference between street site concentrations and (urban) background concentrations. Background concentrations are usually more stable than the street concentrations and need more time and effort to decrease. The background concentrations could provide the potential of the low emission zone policy. However, the background concentrations are not solely determined by traffic emissions, so the potential is most likely lower than the difference between street and background concentrations. Long distance transport of emissions and other sources like industry also influence the background concentrations (Massling et al., 2011). It is however definitely a factor regarding the effectiveness of the low emission zone policy.

The policy process and instruments is the seventh element of the low emission zone. This is a broad category that can include other policies that were implemented next to the low emission zone. Examples for this are charging schemes (Ellison et al., 2013). It can however also discuss the organisation of the policy or the implementation of this. There can be a national plan for the implementation (i.e. Germany) or more local schemes (i.e. London) (Cruz & Montenon, 2016). Another example are exemptions for certain vehicles. When this possibility is present, vehicles that would have been restricted can still enter a low emission zone (Agentschap NL, 2010). Moreover, the enforcement of the low emission zone is also part of this element.

The seven elements mentioned above influence the functioning of the low emission zone. The result of the low emission zone is then the low emission zone effects. Since the method of measuring differs per study, this is something that has to be accounted for in the analysis. The effects are mainly evaluated in emission levels. However, there are also some studies describing the effect of low emission zones on the vehicle fleet (i.e. Ellison et al., 2013). When this information is available, this will be utilized in the analysis. Therefore the potential effect of the low emission zone can be smaller than this difference. A lot of the low emission zone effect articles (see for example Boogaard et al., 2012 and Fensterer et al., 2014) state that meteorological conditions influence the particle concentrations levels. It can therefore also influence the measured effect of the low emission zones. Those effect studies correct their data usually with a meteorological reference station, the method used is not mentioned though. Moreover, changes in traffic intensity also influences the air pollutants concentration levels (Boogaard et al., 2012; Fensterer et al., 2014), since less traffic comes down to less pollution. Unless other pollution sources increase at the same time. So, the changes in traffic intensity not caused by the low emission zone would also influence the effect measurements of the low emission zone.

Figure 1 summarizes this chapter. There are seven factors mentioned above that affect the low emission zone. Then there are low emission zone effects and the meteorological conditions and changing traffic intensity influencing the effect measurements. In addition, because the effects are determined by the low emission zone factors, all the seven criteria can affect these effects.

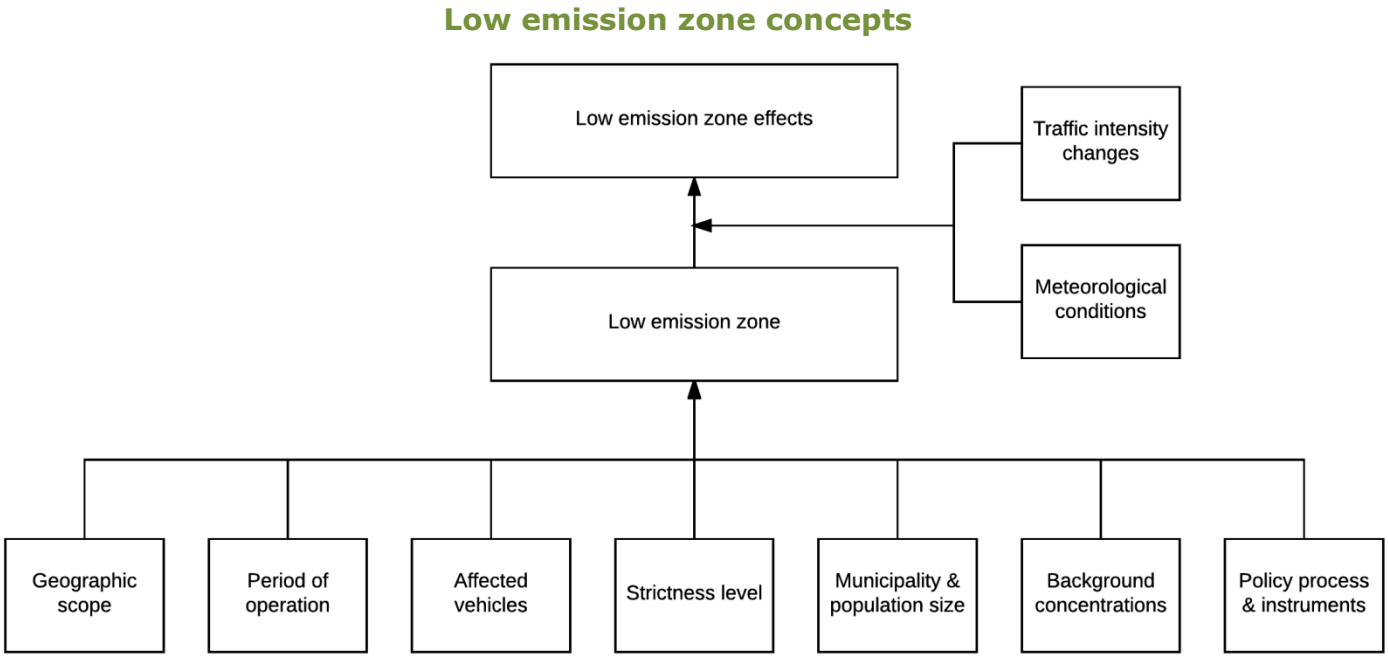

Figure 1

3. Theoretical framework

Comparing between countries in a research means that there are different factors that should be taken into account. The chapter starts off with comparative research as a broad frame for this research. Then, policy transfer is the smaller frame within comparative research that this chapter focusses on. Voluntary transfer or lesson drawing shows the more 'soft' side of policy transfer this research is focussed on. Further, planning systems and cultures give insights to differences between and within countries that should be kept in mind when comparing. Finally, the section on transferability of policies gives more depth to factors that should be accounted for when comparing in research. An overview of these theories will be provided in this chapter and summarised in the conceptual model (figure 2).

3.1 Comparative research

It is suitable to start with why comparing between countries is done in research. Comparative research of urban policy making looks for solutions to problems and is characterised by going beyond the finding of difference between places (Booth, 2011). Comparative research should examine how spatial planning policy and practice works, how it deals with problems, what actors are involved and their interests and the formal or informal arrangements that influence practice (Reimer & Blotevogel, 2012). The purpose of comparative research is discussed by Booth (2011) in his article. From a practitioner's point of view, it is desirable to undertake comparative research because: *"it is the desire to know how others make and implement policy and to see whether there are policies and practices that might be borrowed from other places."* (pp. 14). Spaans & Louw (2009) state that it is often debated whether planners in various countries can learn from each other. The practitioner's answer from Booth (2011) means in other words that comparative research is an instrument to improve practice. In this research, it is also the goal to improve the Dutch low emission zone practice by comparing it to other cases in the European Union.

There are some issues with comparative research. Booth (2011) states that major theoretical questions in comparative research relate to convergence and transfer. There is a discussion on planning cultures, implying that policy making and spatial planning are context dependent. Local policies are at least influenced by local circumstances and therefore partly context and culture dependent. This will also be elaborated upon when policy transfer and planning systems are discussed.
Because of the cultural embeddedness of planning, comparative research has to take culture and context into account (Booth, 2011). However, focussing too much on culture and context makes a comparative research vulnerable to not being able to compare cases in different cultures or contexts. Cases have to be regarded fairly structured and standardised for a proper comparison. Moreover neglecting the variety of planning action types to be found within a country could make

comparative research to some extent blind to planning practice on the one hand (Reimer & Blotevogel, 2012). On the other hand, the contextual richness is also essential to comparative research (Pierre, 2005). So there is a difficult relationship between generalising and context embeddedness and the right balance of these two needs to be found in a comparative research.

Next to the issues, comparative research also contains upsides. Booth (2011) argues that there is at least one good reason for a comparative study because studying other planning cultures: *"...offers the possibility of sensitising us to these largely implicit assumptions in our own planning activity. It opens up the possibility of insight into our own practice of planning, which may not be available in other ways."* (pp. 18). The idea that can be derived from this statement is that observing and analysing what others do, can teach you a lot about your own way of working. It can be used as a figurative mirror to reflect on how the low emission zone works in the Netherlands and possibly explain why it makes the policy a success or failure. There are various ways to reflect in comparative research. This will be discussed next.

Brenner (2001) identifies four strategies for doing comparative research:

- Individualising comparisons: the essence is to find the specific characteristics of a certain phenomenon by contrasting particular cases.
- Universalising comparisons: the idea is that every cases of a certain phenomenon follows basically the same rule(s).
- Encompassing comparisons: it aims to explain characteristics of different cases in the same system to the system as a whole by using their changing relations.
- Variation-finding comparisons: it examines systematic variations of cases by establishing a 'principle' of variation in the intensity and character of a phenomenon.

These strategies are usually implicitly included in research strategies (Booth, 2011; Brenner, 2001). The categories are not watertight, so research studies often use more than one strategy (Booth, 2011). So the determination of the used strategies is on a post-research basis according to Brenner (2001).
These strategies can however now already be used to explore what kind of differences this research is looking for. The most important strategy is the individualising comparison. This is the strategy that can be used to find specific characteristics or in this case, specific policy choices made and arguments for these policy choices. This strategy relates to sub-question two. The variation-finding comparison could also be of importance. A principle of variation could be the result of principally different choices and reasons for choices. For example choices for a low emission zone effect measurement method. Then it would be hard to transfer because different and possibly incomparable methods were used. This relates to sub-question four.

The other two are not chosen. The universalising comparison because it is searching for something structural and similar instead of differences. The encompassing comparison compares cases in the same system to the whole system. This research compares cases within the same system, however without comparing it to the system as a whole. So this research aims to find individualising differences and may also find variation-finding differences.
The next section will zoom in to a part of comparative research: policy transfer and lesson drawing.

3.2 Policy transfer and lesson drawing

The purpose of policy transfer discussed by Booth (2011) is to investigate whether policies could be borrowed from other places, as stated before. This purpose refers to policy transfer and/or lesson drawing. Policy transfer can be executed in three different ways. It can be done across time, within and across countries. It is unusual to directly copy policies, rather ideas are mutated (Stone, 2012).
Dolowitz & Marsh (1996) give a definition of both policy transfer and lesson drawing. Policy transfer and lesson drawing are both referring to: *"...a process in which knowledge about policies, administrative arrangements, institutions etc. in one time and/or place is used in the development of policies, administrative arrangements and institutions in another time and/or place."* (pp. 344). There are however different forms of policy transfer. The next section will elaborate on this.

3.2.1 Voluntary and coercive transfer

The term lesson drawing refers to 'voluntary' policy transfer. This occurs when policy makers in a country draw lessons from one or more other countries based on free choices of those policy makers (Dolowitz & Marsh, 1996). So it requires an active attitude of the recipient's planners and triggered by perceived necessity (Spaans & Louw, 2009). It is hard to find evidence of lesson drawing because there is a lack of a clear definition of lesson drawing (James & Lodge, 2003), especially in relation to policy transfer. Lesson drawing could also involve learning negative lessons in order to know what not to do. In this case, the result is no policy change. However, a negative lesson from a comparison could also trigger action to correct what is done wrong. In this way it implies a policy change of a correctional nature.
Policy transfer covers 'voluntary' and 'coercive' transfer (Dolowitz & Marsh, 1996; Spaans & Louw, 2009). The primary focus of policy transfer studies was initially on voluntary transfer, so basically on lesson drawing. In this process assumed rational policy makers examine whether implemented policies abroad can potentially be used in their planning system (Dolowitz & Marsh, 1996).
Lessons are utilised for a variety of reasons in various ways. One of these ways is that lessons are used by supporters and opponents of various policies to influence others in favour of their ideas (Dolowitz & Marsh, 1996). So, lesson drawing is in that sense a political instrument and can be of rather irrational nature. For

voluntary transfer, the primary stimulant is a problem or a form of dissatisfaction with the status quo. This dissatisfaction often comes from the perception of a government or the public of policy failure (Dolowitz & Marsh, 1996).

Dolowitz and Marsh (1996) state that coercive transfer means that one government or supranational institution pushes or sometimes forces another government to adopt a certain policy. Coercive transfer is split up in direct and indirect coercive transfer. Direct coercive transfer means that a government forces another to take up a policy. This type of policy transfer is rare. However, when it happens it is often because of supranational institutions or transnational corporations. The latter uses the threat to take their businesses elsewhere to force a government into policy transfer (Dolowitz & Marsh, 1996).
Indirect coercive transfer concerns the function of externalities or functional interdependencies. Interdependencies have the ability to push governments to solve problems by working together.

The factors influencing (in)direct coercive transfer are not the focus of this research. This research considers the transfer possibilities discussed in this research to be voluntary. As mentioned in the introduction, there is a discussion both societal and academic about the low emission zone. It is by some already a perceived policy failure. This is a motive for both the research and voluntary transfer. This research is therefore done based on the assumption of voluntary transfer for the policy transfer possibilities in this research.

3.2.2 Objects of policy transfer

There are different aspects of a policy which can be transferred. Dolowitz & Marsh (1996) elaborate upon these and they identify six objects of policy transfer. Stone (2012) identifies also these objects of policy transfer in more or less the same terms. These objects are:

- Policy goals, content and structure
- Administrative techniques or policy instruments
- Institutions
- Ideology
- Concepts, ideas and attitudes
- Negative lessons

These objects are going to be used to identify the objects that contain potential to transfer. Two of the objects of policy transfer contain definitely no transfer potential. These two are policy goals and ideology, because these are similar in all the cases. This will be explained further in the transferability of policies section (3.4).
The policy content is according to Bennett (1991) a good starting point. It can be a ‘blueprint’ that can be adjusted to the recipient’s situation. Thus the policy content includes the argumentations, reasoning and defence of the policy.

Because of this, the policy content is highly connected to the policy goals. It is therefore not likely that differences are found that fit this object, however this cannot be excluded completely yet.
The policy structure and institutions are related to each other. To transfer institutions similar structures are often created. Examples are a similar higher education system adoption, the Millennium Development Goals (Stone, 2012) and the transfer of public health objectives by reducing the amount of smokers from England to other UK countries (Cairney, 2009). It can be derived that the transfer of institutions is often done through the structure of a policy. Institutions can however also involve governments of organisations within a government (Kim, 2011).
The term institution therefore requires some extra attention. The reason for this is that an institution in planning theory is a really broad term. Buitelaar et al. (2011) provide a definition for institutions. Institutions guide and provide meaning to human interaction, as it are man-made structures. Institutions are split up in formal and informal institutions. Government rules that are enforced by the legal system, for example through constitutions, laws and ordinances are considered formal institutions. Informal institutions are less explicit rules that are the result of a more normative behaviour, for example taboos, moral values and traditions (Buitelaar et al., 2011). It can be derived from the description of Buitelaar et al. (2011) that the term institution is focussed on formal institutions here. The description of the informal institutions aligns more with the concepts, ideas and attitudes because of the normative behaviour and values.
The following group is the administrative techniques or policy instruments. These are often tools that are transferred. This is still a really broad term so a few examples from the literature are given to illustrate. An example from Dolowitz & Marsh (1996) is productivity measures which are transferred. Ladi (2011) uses the introduction of an Ombudsman's office in Greece, Malta and Cyprus to illustrate the influence of the EU on the way this was introduced in these countries.
Next are concepts, ideas and attitudes. Ideas are inputs to policy development, more than outcomes. These are difficult to register, but are intuitively known. The spreading of New Public Management ideas (Stone, 2012) and the development of privatization policies from Britain to France and the USA (Dolowitz & Marsh, 1996) are examples. Differences in concepts, ideas and attitudes could result from the interviews by different views of interviewees on a certain topic.
Negative lessons complete the objects of policy transfer. A negative lesson can occur in two ways. Firstly negative experiences in bad or failed policies or elements of those policies. Secondly the judgement that the proposed (part of a) policy to transfer does not fit well in the recipient's situation. An example is the American auto-emission standards from the 1970s, where Canadian policy makers decided not to transfer this standard. The reason for this was it would be unnecessary restricting (Dolowitz & Marsh, 1996). The lesson was that transferring the whole American standards would be too restricting in the Canadian situation. It was therefore undesirable to transfer those standards.

Negative lessons can also be used to correct mistakes as mentioned earlier. The differences found in this research can therefore be categorised as:

- Policy content
- Policy structure and institutions
- Administrative techniques and policy instruments
- Concepts, ideas and attitudes
- Negative lessons

The transferred elements can be within the range from really specific instruments to general concepts or ideas (Dolowitz & Marsh, 1996) as shown above. This means that there are different degrees of policy transfer which can include all elements of the abovementioned range.
Janssen-Jansen et al. (2008) and Rose (1991) are both addressing the different degrees of policy transfer. Janssen-Jansen et al. (2008) elaborate on three levels of transfer intensity. These levels are transplantation, learning and inspiration. Transplantation searches for specific conditions to enable the transfer of a policy from one planning context to another. For the learning degree, working together and knowledge exchange are considered essential. It involves adapting the collected information, also containing the underlying ideas, changes and obstacles of that information. Inspiration is concerned with the collecting of information and data of inventive experiences and practices (Janssen-Jansen et al., 2008).
Rose (1991) identifies five types of policy transfer considering the degree of transfer. The first of these five is copying. This means that the policy is taken over (almost) without any changes made. The second type is emulation, which contains taking over of a policy with making adjustments for the circumstances. The third and fourth type are hybridisation and synthesis. These types are rather similar, they consist of combining elements from different places. The difference is that with hybridisation the combination is made from two different places and with synthesis from three or more. The fifth is inspiration (Rose, 1991).
The degrees of policy transfer described by Janssen-Jansen et al. (2008) and Rose (1991) can be linked to each other. Even though they distinguish respectively three and five degrees, there are two degrees that can be directly linked. Firstly, the transplantation with copying because these are both transfers with limited changes to the transferred policy. Secondly, the inspiration degree because it is mentioned in both. The learning degree of Janssen-Jansen et al. (2008) can be linked to the other three of Rose (1991), because all of them contain making adjustments or learning from the donor policy or policies.
In exploring the transferability of certain parts of a policy, it is unlikely that transplantation or copying takes place. It is expected that the focus will be more on learning and inspiration.

3.3 Planning systems and cultures

This section will discuss planning systems more extensively. The similarity of planning systems is often considered to be related to the transferability of a policy.

In order to make a comparison between the European countries it is important to know something about the planning systems in those countries. Spaans & Louw (2009) state that the transfer of policies is generally easier in a group of comparable countries. In addition, to determine if and how a successful transfer can take place, the difference and similarities of countries need extensive consideration (Spaans & Louw, 2009). Fürst & Scholles (2008) define a planning system in Reimer & Blotevogel (2012) as containing all elements that serve the objective to safeguard, structure and develop the functions and usage of space. Planning can also be seen as a 'technology'. This means that the planning systems basically functions as an 'institutional technology' where formal and informal interactive processes are established. This means that strategies, policies, plans and projects are produced in these processes. The planning system is adapting continuously by mutual interaction and learning activities in the processes of plan development (Janin Rivolin, 2008).

Taking these two perspectives together, Reimer & Blotevogel (2012) give a definition that planning systems: *"...constitute dynamic institutional 'technologies' which prescribe legal and administrative structures for spatial order and structure, for securing land uses and for development"* (pp. 14). They add that this occurs at various scale levels. Planning systems have to provide the means to solve problems and to serve the 'general public interest' at the same time. For lesson drawing or policy transfer, the willingness of actors to learn and the planning system's capacity to learn are the main priorities (Reimer & Blotevogel, 2012).

Next to planning systems, Reimer & Blotevogel (2012) discuss planning cultures in their article. Planning cultures are formed because of the forms of planning action in a planning system. There is a variability and plurality of planning cultures within a planning system's framework of legal and administrative structures. The different planning cultures are a consequence of the involved actors, their interests, related action logics and available resources. The planning culture perspective can give insights in the inner worlds of the planning practice. These are usually formed at the micro level. The perspectives of planning system and planning culture(s) are considered to be closely intertwined (Reimer & Blotevogel, 2012). The rest of this section will discuss planning systems firstly. Then, the planning culture(s) are more extensively discussed.

The article of Nadin & Stead (2008) provides an overview of European planning systems classification. Spatial planning systems, as one component of the administrative and political system, are to a large extent embedded in their cultural, socio-economic and political context. This is the historical context that formed the particular type of government and laws in a country (Nadin & Stead, 2008; Reimer & Blotevogel, 2012). Familiarity with these structures and diversities

is a vital main condition to understand varying contexts in spatial planning. Most of the international public planning comparative studies are descriptive accounts of national planning systems concerning the administrative characteristics (Reimer & Blotevogel, 2012). The first categorisation overview (table 2) is based on social models. The second one is based on the models of planning (planning systems) and is shown in table 3.

Social models in Europe

Author(s)	Categorisations of social models					
Esping-Anderson, 1990	Social-democratic DK, FI, SE, **NL**	Liberal IE, UK	Conservative AT, BE, FR, DE			
Ferrara, 1996	Scandinavian DK, FI, SE	Anglo-Saxon IE, UK	Bismarck AT, BE, FR, DE, LU, **NL**	Southern GR, IT, PT, ES		
Bonoli, 1997	Nordic DK, FI, SE	British IE, UK	Continental BE, FR, DE, LU, **NL**	Southern GR, IT, PT, ES		
Korpi & Palme, 1998	Encompassing FI, SE	Basic Security DK, IE, UK, **NL**	Corporatist AT, BE, IT, FR, DE			
Sapir, 2006	Nordic DK, FI, SE, **NL**	Anglo-Saxon IE, UK	Continental BE, FR, DE, LU, AT	Mediterranean GR, IT, PT, ES		
Aiginger & Guger, 2006	Scandinavian/ Nordic DK, FI, SE, **NL**	Anglo-Saxon/ Liberal IE, UK	Continental/Corporatist BE, FR, DE, LU, AT, IT	Mediterranean GR, PT, ES	Catching-up CZ, HU	
Alber, 2006	Nordic DK, FI, SE	Anglo-Saxon IE, UK	Continental BE, FR, DE, AT	Southern GR, IT, PT, ES	New Member States CY, CZ, EE, HU, LV, LT, MT, PL, SK, SI	Other LU, **NL**

Table 2 Adapted from Nadin & Stead (2008)

It is important to note that the categorisations are ideal types so that the real social model can lie in between different ideal types. In addition, the variation of development patterns between countries in a single categorisation group can diverge quite a lot (Nadin & Stead, 2008). A reason for this could be that planning systems should be seen as flexible structures prone to continuous change and therefore not bound to a certain planning tradition (Farinós Dasi, 2007). Nevertheless planning systems seem inflexible and deterministic structures, bound to their historical context (Reimer & Blotevogel, 2012). Table 2 shows that some countries can always be found in the same categorisation group, for instance the Scandinavian countries. However, it also presents that countries can be difficult to place and that they therefore move between the different categories (Nadin & Stead, 2008). The Netherlands is an example of such a country. The different writers group the Netherlands three times with the Scandinavian countries and two times in the Continental group with a lot of central European countries. The

classification of countries in different groups is of course time-dependent (Nadin & Stead, 2008) and depends also on the categorisation terms used. Based on the criterion social model, the two groups mentioned before would be the most adequate comparison countries for the Netherlands.

When it comes to the categorisation of planning systems, there are two main approaches according to Nadin & Stead (2008). The first uses other classifications of the legal and administrative systems wherein planners operate. This first approach is represented in table 3 by Davies et al. (1989) considering the amount of planning control in five northern European countries and Newman & Thornley (1996), drawing on five legal families in Europe. Only four of the five are presented in table 3, because the legal family Eastern European included no countries.
The second applies wider criteria but provides nevertheless a similar ideal type division. Next to the legal family, six other variables were considered here. Two examples of these variables are the extent of national and regional planning and the relative roles of the private and public sectors. CEC (1997) and Farinós Dasi (2007) used the second approach (Nadin & Stead, 2008).

Planning systems in Europe

Author(s)	Categorisations of planning systems				
Davies et al., 1989		Common law England		Napoleonic codes DK, DE, FR, **NL**	
Newman & Thornley, 1996	Nordic DK, FI, SE	British IE, UK	Germanic AT, DE	Napoleonic BE, FR, IT, LU, **NL**, PT, ES	
CEC, 1997	Comprehensive integrated AT, DK, FI, DE, **NL**, SE	Land use regulation IE, UK		Regional economic FR, PT	Urbanism GR, IT, ES
Farinós Dasi, 2007	Comprehensive integrated AT, DK, FI, **NL**, SE, DE, BG, EE, HU, LV, LT, PL, RO, SL, SV	Land use regulation BE, IE, LU, UK, CY, CZ, MT		Regional economic FR, DE, PT, HU, LV, LT, SK	Urbanism GR, IT, ES, CY, MT

Table 3 Adapted from Nadin & Stead (2008)

As also stated with the social model categorisation, some countries stay in the same category and others switch between different ones. Nadin & Stead (2008) state that it is difficult to classify the planning systems. This becomes clearer in the recent classifications where countries appear in multiple categories at the same time. This implies according to Nadin & Stead (2008) that over time, European countries planning systems are converging because of continuous adaptation and learning between different countries in Europe. Concluding that there is a noticeable harmonisation in planning practice would however be a hasty conclusion. It would prevent a more open research perspective and possibility to get more sensitization for variations in culture (Reimer & Blotevogel, 2012). The

Netherlands is in this categorisation placed in two groups, Napoleonic and Comprehensive integrated, both two times. The Napoleonic group includes a lot of central European countries again. The comprehensive integrated group includes numerous European countries. For instance the Scandinavian countries and a lot of eastern European countries. So, considering the models of planning, the countries included in these two groups would be most suited to compare the Netherlands with. By comparing with countries that have a similar model as the Netherlands, the transferability chance gets higher.

Next to the political and administrative system, it is important to keep cultural aspects in mind as is argued by Reimer & Blotevogel (2012). Planning cultures manifestations are highly differentiated. These manifestations are assumed to be a reflection of the varying forms and traditions of different spatial planning sectors. Planning is not a homogeneous subculture of society in a stable state. It is rather a set of sectoral subcultures with rather specific action logics (Reimer & Blotevogel, 2012). These planning cultures are in that sense dynamic, established in specific contexts which influences the style of planning action. This style of planning action is usually structured rather complex and provides chances for creativity and independent initiative, because of the complexity of the situations that occur according to Reimer & Blotevogel (2012).

3.4 Transferability of policies

The planning systems and -culture literature already touches upon the transferability of policies a bit. It is used for the case selection in order to raise the chance of transferability between the cases. Because it is the assumption that kindred countries contain a higher transferability in relation to more different countries. Even though there might be subtle differences between similar countries (Williams & Dzhekova, 2014). A broad description of the case selection will be given in section 4.2.

There are also problems related to the transferability of policies. The barriers of policy transfer are often related to cultural, political and legal sensibility of planners. A literal take-over could be really complex when culture, legislation or economic structure diverge in a certain way. It becomes even more complex with the large variation of political and legal systems and of administrative structure and culture (Spaans & Louw, 2009). Marsden & Stead (2011) come back to the objects of policy transfer. They state that ideologies, ideas and policy goals are generally simpler to transfer than institution and policy instruments, especially when the abovementioned differences are considerable.

Dolowitz & Marsh (1996) state that the problems are related to the complexity of the policy which affects the transferability. Rose (1993) suggests six hypotheses to examine the transferability of policies. The hypotheses are:

- Single goal policies are better transferable than multiple goals policies
- Transfer is more likely the simpler the problem is

- The higher the directness of the relationship between the problem and the 'solution', the higher is the transferability
- Fewer regarded side-effects increases the possibility of policy transfer
- Better operational information of the policy increases the easiness of the transfer
- The easier the outcome predictions, the simpler the transfer is

Mossberger & Wolman (2003) propose a framework with criteria to assess the policy transfer process. The assessment phase is especially interesting and includes three steps: similarity of goals and problems, policy performance and differences in setting.
Differences in problems a policy tries to solve and the goals of policies have to be regarded in relation to the appropriateness of a policy transfer (Mossberger & Wolman (2003). This relates to the first two hypotheses of Rose (1993). The low emission zone policy cases contain two main aims. The first is reducing emissions and the pollution caused by these emissions. The second is improving the urban air quality and with that the health of the inhabitants. These two aims have a cause effect relation where the first leads to the second, so it is basically a single goal policy. The simplicity or complexity to solve the problem depends on the perception of the problem. The low emission zone aims to reduce emissions and pollution of traffic. In this sense, the problem is relatively simple. The low emission zone bans old and polluting vehicles to reduce the traffic emissions and pollution. One could however argue that to improve the air quality in a city, emissions and pollution have to be targeted overall. The problem then becomes really complex. Emissions and pollution which are unrelated to traffic can however not be solved by a low emission zone. So for this research the problem is considered relatively simple. This increases the transferability of the low emission zone policy, as stated by Rose (1993).
Then, the policy performance is executed to evaluate the successfulness of the policy the recipient would like to transfer or which elements of the policy were successful. This will be assessed later by performing an evaluation of the effects of the low emission zone, mainly changed concentrations of particulates and nitrogen oxides. It should also include assessing the pros and cons of variations of elements of a policy (Mossberger & Wolman, 2003).
The next step is touching upon differences in settings. This would include differences in the policy environment in the recipient cases in relation to the donor case. Mossberger & Wolman (2003) mention examples such as the public opinion, political- and social institutions. Differences in these factors are of importance for the outcomes and the implementation. These are factors that are difficult to change and can become arguments why certain parts of the low emission zone policy seem hard or easy to transfer.

Williams & Dzhekova (2014) developed a framework to evaluate the transferability of policy initiatives. They derived this transferability from Wang et al. (2006), who stated it is in the basis generalisability. The focus is on the outcome of the policy.

It raises the question whether the same result can be achieved in the recipient setting as in the donor setting (Wang et al., 2006). Williams & Dzhekova (2014) develop this by identifying factors and questions that should be asked. The three steps of Mossberger & Wolman (2003) which are described before show similarities with the factors of Williams & Dzhekova (2014). An overview of the factors and questions is given in table 4.

Assessing transferability of a policy

Construct	Factors	Questions to ask
Transferability (generalisability)	Issue proportion in recipient context	Is there a need present? Do other policies address it already? How often does the issue occur in the recipient context? How differs the issue occurrence between donor and recipient context?
	Policy objective	Does the policy target a similar main objective in the donor and recipient context?
	Range vs. cost effectiveness of policy	Does the policy largely 'cover' the recipient's issues? And with appropriate costs?
	Recipient context characteristics	Is it comparable to the donor country? Are differences in characteristics going to affect the implementation in the recipient context?

Table 4 Source: Williams & Dzhekova (2014)

A lot of these questions are relevant for the low emission zone policy transferability. Multiple questions have also already been addressed in this research, for example the presence of a need since the effect of the Utrecht low emission zone could not be proved (TNO, 2016). It seems that the low emission zone policy as a whole offers possibilities for transfer from a short assessment of these questions.

Next to the transferability, Wang et al. (2006) discuss the applicability of policies. The applicability is focussing on the process of the policy and whether it is possible to implement the policy in the recipient context. So this is basically the feasibility. The applicability contains factors political and social acceptability, existing institutional context, impact on affected stakeholders, available resources and barriers and implementation risks (Wang et al., 2006). These factors can be used to assess to what degree the transfer of certain elements of the low emission zone policy is possible. It therefore provides an indication of the transferability through the feasibility of the transfer.

3.5 Conceptual model

The conceptual model (figure 2) provides an overview of the chapters two and three. Comparative research is the broader frame for this research. From the four comparative research strategies, two were considered to find desirable differences for this research. This are the individualising and variation-finding comparisons. The green diamond shaped boxes are 'action' boxes. They represent the steps towards the research question at the bottom and show which theories are used for which steps. For example the top green diamond shows the two wanted types of

differences from the comparative research strategies should be found in the different low emission zone elements. The low emission zone elements are discussed in chapter 2. Policy transfer is the smaller frame in this research. This part includes different parts of policy transfer, specifically the objects of policy transfer, degrees of policy transfer and the transferability of policies. The corresponding methods (see chapter 4) for all the parts of the conceptual model are presented on the right side next to the conceptual model.

Conceptual model

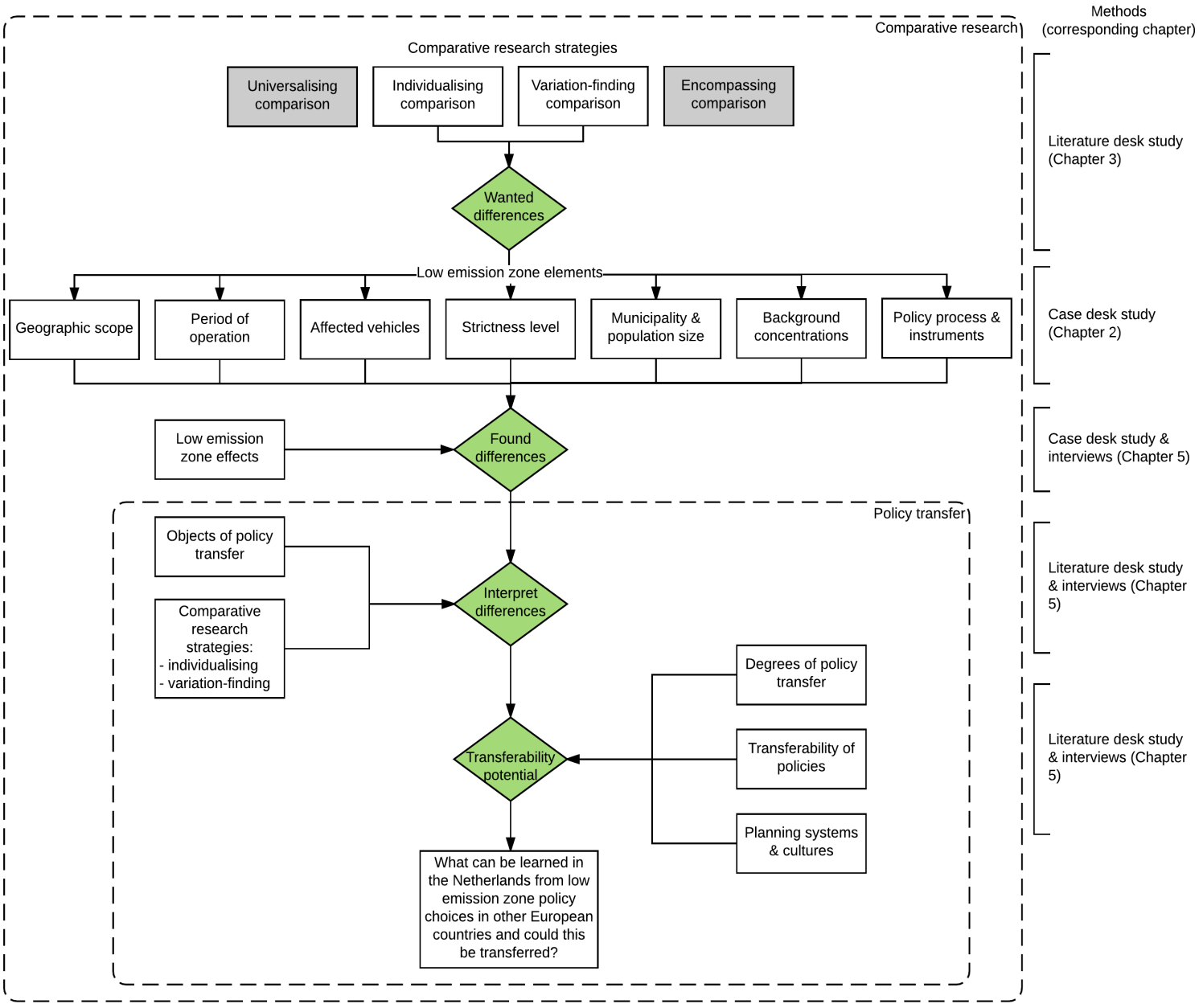

Figure 2

4. Methodology

The methods and the argumentation about the choices for these methods will be discussed in this chapter. Now, the research methods used will be discussed firstly. After this, the choices made to select cases to compare with and the comparison strategy will be elaborated upon.

4.1 Research methods

The research will consist out of three main methods: two different desk studies and interviews. The desk studies will have two focus points.
The first desk study is gathering and processing literature. This literature consists of the main topics comparative research, policy transfer and lesson drawing for the lens to 'look through' in this research, as is illustrated in the conceptual model by the square frames. The sources for this method are academic articles and books.
The second desk study is the case desk study. This is about the low emission zone cases to gather information about the effects and characteristics of the different low emission zones. The sources for this are also academic articles, policy documents and government studies, especially those focussing on the effects of the low emission zone cases. The explanation of this selection process is set out in the case study countries section (4.2.1).
The desk studies will be the backbone of this research because reading literature is essential for research, as also supported by Blaxter et al. (2010) in their book. Different kinds of documents or literature are an important part of this research, as explained before.
The third main method is interviews. More in depth information about low emission zone cases can be acquired from this. The in depth information is the major reason for interviews. In addition, there are also reason not to take other methods. About half of the interviews were executed in writing, this raises the question whether questionnaires would have been an appropriate method. These focus on extracting information from a population (Clifford et al., 2010). The information for this research does however not have to be derived from a population, the interviewees were selected as 'experts' about the respective low emission zone. For the Dutch cases, focus groups could also be considered. This would have the upside of the participants being able to react on each other (Clifford et al., 2010). However the focus group method is less appropriate for the limited amount of cases in this research. So interviews were considered more appropriate than questionnaires and focus groups.
The interviews are executed with officials from local authorities or researchers about the low emission zone cases. The main activities of the interviewees contain researching and advising about the low emission zone policy in their organisation. The local authority is often the implementing organisation for the low emission zone. To obtain information as objective as possible from the interviews, it was the goal to interview someone from both inside and outside the implementing

organisation. Therefore it was decided to interview local authority officials and researchers. The interview guide, list of interviewees and their organisations can be found in appendix 1. According to Clifford et al. (2010), there are three types of interviews: structured, semi-structured and unstructured. This refers to the way the interview is predetermined. A structured interview means that it is all predetermined. Unstructured is the exact opposite. The unstructured interview is unsatisfactory for this research because the setup of the interview is being chosen intentionally and the chance of an incomplete messy interview is present. A semi-structured interview includes a predetermined list of question but there is also a possibility to deviate from this list when necessary. Because of this, semi-structured interviews seem a bit more informal than structured interviews and have a conversational style (Clifford et al., 2010). This is the type of interview that will be used for this research. Semi-structured interviews are characterised by open questions rather than 'yes or no' questions (Clifford et al., 2010), this is ideal for the type of in depth information that this research aims to obtain. The informal and conversational tone should stimulate the interviewees in giving an open response. The analysis of the interviews is discussed in box 1 and the analysed transcripts can be found in appendix 5.

Interview analysis

After the interviews took place, the analysis of the interviews was executed. This analysis consisted of 2 steps: keyword scanning and thorough reading.

1. Keyword scanning: this step was performed to identify on which places in the transcripts, the core answers (green) could be found. There are two types of keywords. General keywords have value for at least more than one question. Question-specific keywords are related to a specific question and the corresponding question is shown after the keywords. General questions could be analysed with the general keywords and are therefore missing in the question-specific keywords.
   - General keywords: aspect, because, element, factor, important, reason, result.
   - Question-specific keywords: scope, size (3), affected, vehicles (4), strictness, EURO, standard (5), compliance, enforcement (6), fail, success (7), avoid, risk (9), decision, process (10), learn (12).
2. Thorough reading: in order to be certain that no answers were missed, the thorough reading of the transcripts has been used. In addition, other useful statements (orange) could be identified in this way.

Box 1

4.2 Cases

Firstly, an explanation will be given why multiple cases are chosen as a method. Case study analysis is often chosen as the method to study policy transfer (Marsden & Stead, 2011).

Cases are used to answer why and how questions for exploratory, explanatory and descriptive research (Rowley, 2002). Noticing differences is part of this, but the aim to explain why these differences exist and how lessons can be drawn. In addition, Marsden & Stead (2011) state that a low amount of cases is common and that it provides in depth information. This makes using cases a strongly qualitative method. Rowley (2002) elaborates upon a comparative case study with a number of different cases. It compares these cases in a systematic way to explore the researches issue(s). One of the most important strengths of case studies is looks at a 'phenomenon' in its context and in much detail. The case study method usually includes direct detailed observations, documents and interviews (Rowley, 2002). Documents and interviews are part of the research methods as explained in the previous section.
Because a lot of cases increase the robustness of findings, these are however in general more general and shallow. Fewer cases offer the opportunity of more in depth information, but increases the chance of coincidences. So there is a need to find a balance between robustness and more in depth information. The choice for the cases took this into account by selecting multiple cases instead of one foreign and one Dutch case, but still kept the amount of cases limited.
For the comparisons in this research it is needed to select the countries that are most suitable to compare with the Netherlands. After that, city cases need to be selected within the chosen countries. And finally, the comparison strategy will be elaborated upon.

4.2.1 Case countries

An appropriate basis for the country selection is the Mill's method of difference. The method considers cases with as many similarities as possible the most suited to compare to each other (Przeworski & Teune, 1970). Comparing countries are often neighbouring countries (Marsden & Stead, 2011) because of the transferability (see section 3.4 & figure 3).
Firstly, the selection of comparing countries will be limited to the European Union because of cultural considerations. The low emission zone became an frequently chosen measure in order to reach the European air quality Directive 2008/50/EC (Dias et al., 2016; Holman et al., 2015), again a reason to select within the European Union. This demonstrates that it is a common goal within the European Union, which makes it reasonable to choose between member countries of the European Union.
Secondly, comparing countries within the European Union are selected. The classifications of planning systems from Nadin & Stead (2008) will be utilised to determine this. Table 5 shows the countries that are grouped more than once with the Netherlands in the two classification tables and the times these countries are grouped together. To support this reasoning, Spaans & Louw (2009) state that the chance of successful transfer is higher between countries with a similar social model or planning system then between countries with different social models. They created a conceptual framework for the likelihood of transfer (figure 3). Since the focus for this research is on the inspiration and learning level it is more

likely to look abroad than within the Netherlands. The circle in figure 3 illustrates the position of this research.

Positioning research in transfer prospect conceptual framework

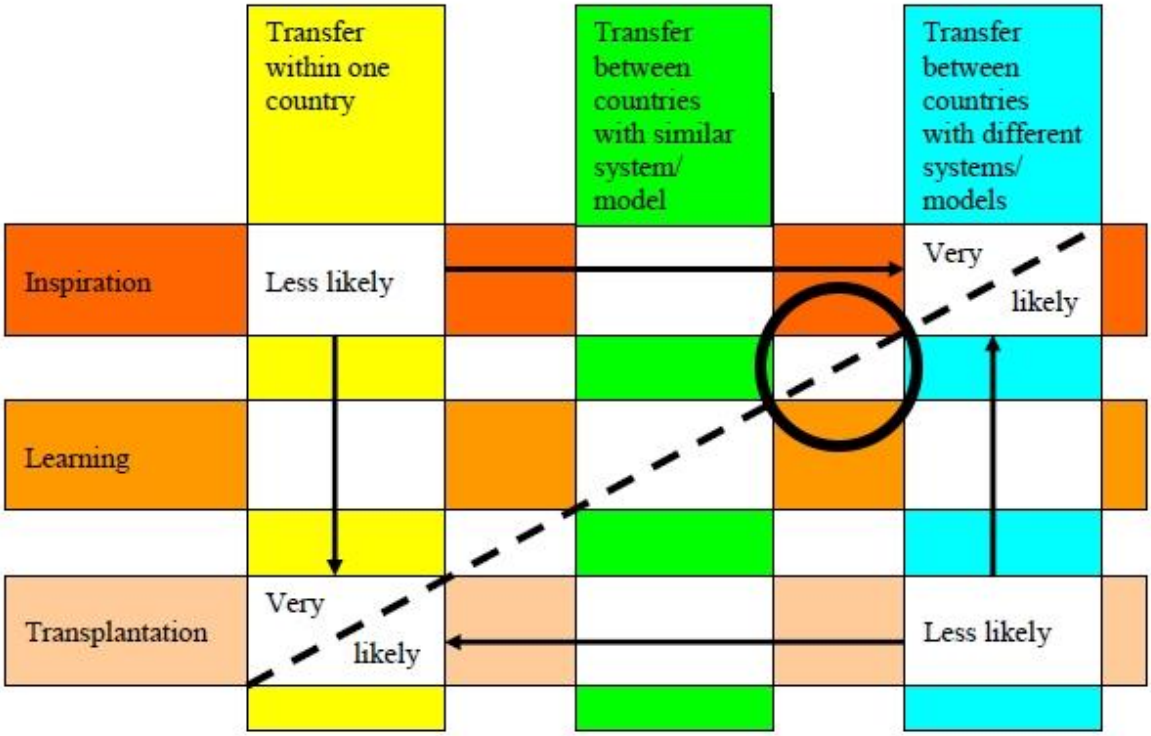

Figure 3 Source: Spaans & Louw (2009)

Denmark is the most suited country to compare with as is shown in table 5. Denmark is followed by Germany, Sweden and Finland on a shared second place. These countries will ideally be used to compare with.

The framework of Spaans & Louw (2009) shows that for inspiration it is very likely to look at a different spatial planning system. One contrasting case from a different planning system category will therefore be chosen. This country is the United Kingdom, which is a country often used in researches to compare differences with the Netherlands. The usage of cases from these countries is also dependent upon the availability, and quality, of literature describing the effects of those cases (Rowley, 2002).

Possible comparing countries

Country	Times grouped with the Netherlands
Denmark	7
Germany	5
Sweden	5
Finland	5
France	4
Luxemburg	4
Belgium	3
Austria	3

Table 5

4.2.2 City cases

The case study cities outside the Netherlands are chosen on basis of the described reasons in the previous section (4.2.1). The cases chosen are: Copenhagen, Stockholm and Munich. There is no Finnish case even though there is a low emission zone in Helsinki since January 2014 (Urban access regulations, 2016). This is a result of an absence of academic literature and policy documents or research reports. The contrasting case will be London. London is chosen as a case because it is one of the most portrayed low emission zones in the literature.
For the Netherlands, the cities of Utrecht and Rotterdam are two logical cases. They both started recently, respectively the first of January 2015 and 2016, with a low emission zone for cars. Therefore they are the frontrunners in the Netherlands. This means that it is likely that the most information concerning low emission zones in the Netherlands can be derived from these two cases.

4.3 The comparison

The comparative research strategies of Brenner (2001) provide an indication to the sort of differences this research tries to find. The main strategy, as explained in section 3.1, is the individualising comparison. The aim to find specific differences between the cases match with the goal of this research. The variation-finding comparison could also be of importance when the found differences are of a more principal nature and hard to transfer.
To find these more specific differences between certain choices and reasons in relation to the low emission zone, the elements of the low emission zone policy that could possibly contain these different choices and reasons should be selected. Background concentrations and municipality and population size are therefore excluded. These are elements that could influence the low emission zone, but the low emission zone policy cannot influence these directly. So the background concentrations and municipality and population size are not choices in the policy and are because of that not possible transferable elements. Since it is the aim of this research to assess learning and transferability, the comparing elements also need to be transferable or learning should be possible.
The five remaining elements are: geographic scope, period of operation, vehicles affected, strictness level and policy process and instruments. Of these five, the period of operation is according to the literature all year around for all the cases. This is already a maximized choice. Next to this is the starting date for most cases in 2007 and 2008. Some of the cases changed the rules later on, raising the strictness level or including more vehicles. The starting date is not a transferable subject so this does not offer a potential for improvement and transfer. The period of operation is still useful in relation to the measurements. The four elements that remain are the elements that will be assessed for differences in the case desk study and the interviews.
The derived results from the case desk study and the interviews will be reviewed with the objects of policy transfer and the comparative research strategies. The differences found can be categorised by doing this. Then various theoretical

themes: planning systems and -cultures and transferability of policies will be used to examine the transferability potential. This will offer insights in the degree that transfer is possible of these elements of the abroad cases to the Dutch cases. The degrees of policy transfer can also be useful for this part of the analysis.

The comparing strategy that is described above is visualised in figure 3. The fictive references to the low emission zone elements are A1 till C1. When it is derived from the case desk study or an interview that (parts of) elements are the same as in the Netherlands, then these are not of importance for this research since there is no potential for transfer. When there are differences the transfer question should be asked (green boxes). The exception to this is when it turns out from the interviews that elements that are considered fail factors in the abroad cases, are the same in the Netherlands. In that case there is a negative lesson (orange box) and can be assessed how this can be changed. This information can possibly be derived from, interviews of, the other cases or an own analysis.

Comparison strategy

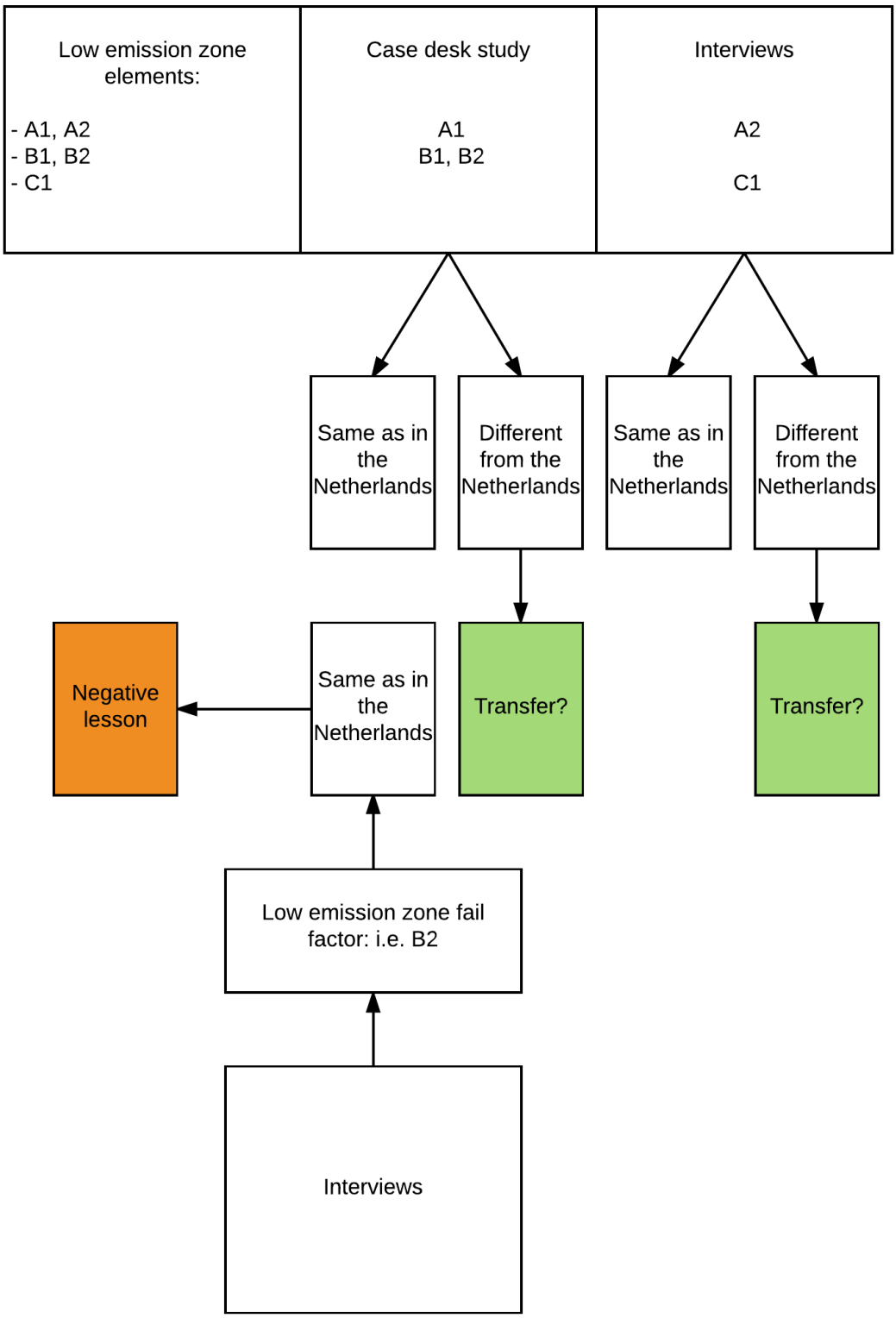

Figure 4

5. Results

This chapter will start off with discussing the low emission zone effects. After this the different low emission zone elements: geographic scope, vehicles affected, strictness level and policy process & instruments, will be successively discussed. Each of those sections will have the same structure following the steps of the conceptual model (figure 2). Firstly, the found differences will be discussed. Secondly these differences will be categorized. Thirdly, the transferability potential of the differences will be elaborated upon. It is useful to mention already that the transferability potential assessment will be an indication, this will not be a thorough assessment but an indication of the degree of transfer. More information about the interview references in this chapter can be found in appendix 1.

5.1 Low emission zone effects

In this section the effects of the low emission zone cases will be discussed. This is going to provide information about the effectiveness of the low emission zone cases. The goal of the low emission zone is to reduce air pollution from traffic. This would lead to a positive effect on the health impacts of traffic and the air quality in a city, as discussed in section 3.4 and also confirmed in a majority of the interviews. The effects on air quality are going to be discussed now. The available data is shown in table 6. A divide is made between particulate matter (PM_{10} & $PM_{2.5}$) and nitrogen oxides (NO_X & NO_2). The period in which the effect was measured is also added to the table.

Low emission zone effects on particulate matter and nitrogen oxides

Cases	Particulate matter (µg/m³)				Nitrogen oxides (µg/m³)			
	PM_{10} (% change)	Concentration change period	$PM_{2.5}$ (% change)	Concentration change period	NO_x (% change)	Concentration change period	NO_2 (% change)	Concentration change period
Copenhagen	-1,6 (-11%)[a]	2005-2007 -> 2008-2010[a]	-0,7 (-5%)[b]	2008-2010[b]	-	-	-1,0 (-4%)[b]	2008-2010[b]
Stockholm	- (-13%)[c]	1997 -> 2000[c]	-0,01 (-33%)[d]	2001 with-without LEZ[d]	- (-3%)[c]	1997 -> 2000[c]	-0,06 (-5%)[d]	2001 with-without LEZ[d]
Munich	-4,0 (-13%)*[e]	2006-2008 -> 2008-2010[e]	-	-	-	-	-1,0 (-)[f]	Yearly change[f]
London	+1,0 (+3%)[g] - (-1,7%)[h] -0,03 (-)[i]	2005-2007 -> 2008-2009[g]; 2008-2011[h]; -	-	-	+18,2 (+6%)[g] - (-1%)[h]	2005-2007 -> 2008-2009[g]; 2008-2011[h]	-0,12 (-)[i]	-
Utrecht	-0,04 (-)[j] -1,4 (-5,2%)**[k]	start-end 2015[j]; 2008 -> 2010[k]	-0,04 (-)[j] -3,4 (-21,3%)*[k]	start-end 2015[j]; 2008 -> 2010[k]	+0,1 (+0,1%)**[k]	2008 -> 2010[k]	-0,02 (-)[j] +1,4 (+2,9%)**[k]	start-end 2015[j]; 2008 -> 2010[k]
Rotterdam	-0,04 (-)[l]	2010 with-without LEZ[l]	-	-	-	-	-0,01 (-)[l]	2010 with-without LEZ[l]

Table 6 Sources: see appendix 2. Note: Some numbers have been calculated to make them comparable.
* = significant
**= not significant
rest= significance not assessed

There are a lot of different things that can be derived from table 6. First of all, there are almost no studies that assess both the particles and the nitrogen oxides. Because of this all cases miss parts of the data. Munich and Rotterdam are missing the most data and Stockholm and Utrecht are missing the least. The lack of data for Rotterdam can be explained by the recent establishment of the low emission zone for light vehicles and their focus on elemental carbon (EC) or soot and NO_2. The latter is a target because of exceedances of the limit values in some places. The focus on soot is more health related, since soot or EC are really small particles ($PM_{0.1}$ or smaller) and the health impact of those particles is larger. PM_{10} is also improved in this process (R1).
Secondly, most of the effect studies are done within a few years after implementation. This makes sense because the effect should be most noticeable in those years. It is stated that the effectiveness vanishes over time when the policy is not developed further (C1; C2). This is referred to that as a 'frozen' policy (C1). But this also means that the data from especially Stockholm is rather old. The evaluations are not only dated, but the quality of them can also be insufficient (S1; L1).
Thirdly, the significance of the data is often not touched upon in the studies. Only Fensterer et al. (2014) and Boogaard et al. (2012) do this, resulting in a significant PM_{10} for Munich and $PM_{2.5}$ for Utrecht. Next to this lack of significance assessments are there other external difficulties of the measurements and evaluation of the effectiveness of the low emission zone (M1). The method and equipment of measuring, weather and traffic intensity changes are examples of this. The 'evidence' of the success of the low emission zone is sometimes not robust because of these kind of external factors (L1). It is added that the introduction of other policies could be such a factor. When implemented around the same time, it is hard to determine with certainty what causes the effect measured. The truck transit ban in Munich (Fensterer et al., 2014), the introduction of sulphur free diesel in the UK (Jones et al., 2012) and congestion charging systems in Stockholm (S1) and London (L2) are examples of this.
Finally, the particulates demonstrate a decrease in all cases. That is logical because the primary goal of the low emission zone, at least in London, is reducing particulates (L2). Ironically the only exception is in London, where PM_{10} increased with 1 $\mu g/m^3$ in the research of Jones et al. (2012). This is even more remarkable because the data from the Department for Transport (2017) reveals a decrease in traffic intensity at this measuring site. The reason why this increase is witnessed is not assessed by Jones et al. (2012), it is therefore not possible to say with certainty what the cause of this is.
The nitrogen oxides (NO_x + NO_2) present a less clear result. The majority is also decreasing here. However half of the results for NO_x show an increase, one in Utrecht and one in London. The measurements that present a decrease are also generally lower than the decreases for particulates. The reason for this can be that between EURO 1 and EURO 5, the NO_x emissions have not been improved much in reality (L1). Results for NO_2 and NO_x emissions should not be expected unless the

low emission zone applies EURO 6 standard, which happens nowhere (L1). This basically means that the results for particles should be considered of more robust than the nitrogen oxides.

5.1.1 Interpretation of the differences & transferability potential

The previous subsection describes a lot of problems and difficulties in relation to the low emission zone effects. Factors like different measuring equipment, different measurement periods and lengths of this, lack of significance assessment etcetera provide confusing results. This research can therefore not use these results as robust evidence with certainty. It can however also not exclude the reliability of these results. It can only be stated that the significance of the measurements is apparently not a major issue in most of those researches.
It is an unsatisfactory situation because this would have provided information about which case would offer the most learning potential based on the actual results. It is however not a complete surprise because there is a lack of robust evidence of the low emission zone effectiveness (L1). In addition, the Stockholm low emission zone was introduced based on more qualitative arguments rather than quantitative (S1). The two statements derived from the interviews provide the explanation of the lack of robust quantitative evidence. The low emission zone effects obtained in the current manner present thus a 'principle' of variation, so it can be placed in the variation-finding comparisons. Variations between the cases based on the effects are indisputable. The reason for this is not necessarily because the low emission zone has a different effect, but there are many possible reasons in the methods to get to the results.
The lack of this robust evidence is a missed opportunity because the outcome of a policy, in this case the effects on air quality, is the most robust way to evaluate a policy. To be able to evaluate the low emission zone policy quantitatively in the future, the establishment of a common or standard effect measuring method is essential.

The transferability potential of a particular case based on the actual results of the policy becomes a possibility then. This section can, of course, not go into detail about the transferability potential, since the policy outcome itself cannot be transferred. The next sections will discuss this topic because those elements can possibly lead to an increased effect of the low emission zones in the Netherlands.

5.2 The geographic scope

This section discusses the geographic area of the low emission zones. The range of the different low emission zones is between 3.2 and 1580 km^2. All the low emission zones have an area which is smaller than 90 km^2 except for London, with 1580 km^2 many times larger than the rest. When this surface is compared with the municipality size, a share percentage of the low emission zone in the municipality can be calculated. For both Copenhagen and London this is about the

whole size of the municipality, respectively 91 and 99 percent. For Copenhagen, the municipality of Frederiksberg is completely in the low emission zone (Jensen et al., 2011) and therefore also accounted for in the size. This is a small municipality, 8.7 km^2, completely surrounded by Copenhagen. Stockholm and Munich have a percentage of 19 and 14 percent. The Dutch cases, Utrecht and Rotterdam, are clearly smaller with three and seven percent. The enormous size of the London low emission zone can be partly explained by the size of the urban area, with its over 8.5 million inhabitants and almost 1600 km^2 it is way more than all the other cases. It is remarkable that Copenhagen with the smallest municipality size has the second largest low emission zone.

Geographic scope of the cases

City	Size low emission zone (km^2)	Size municipality (km^2)	Low emission zone / municipality (%)
Copenhagen	86.4[a]	95.1[b*]	91
Stockholm	35.0[c]	188.1[d]	19
Munich	44.0[e]	310.7[e]	14
London	1580.0[f]	1594.7[g]	99
Utrecht	3.2[h]	99.2[i]	3
Rotterdam	22.2[h]	325.8[i]	7

Table 7 Sources: see appendix 2
*** = size of Copenhagen and Frederiksberg municipality together**

The low emission zones are typically located in the central area of a city. This makes sense because of the focus on the areas where the highest concentrations are, both population and pollutant concentrations (C1). A similar statement is that the low emission zone affects especially the local environment, the places where a lot of people live and work and pollutant concentrations are high have hence priority (S2). This is the same in Utrecht and Rotterdam according to all the Dutch interviewees (NL1; U1; R1). This is also a reason why the zone in Utrecht has not been extended. The low emission zone as it is now, even though really small, contains these highest concentrations and the argument is that the cost effectiveness will decrease with an extension of the zone (U1).
Even though the low emission zone affects especially the local environment, the effect of the low emission zone is larger than the low emission zone itself (NL1; R1). The vehicles that drive in the low emission zone will also drive outside of it and therefore also have an effect there. So the larger the low emission zone, the larger the magnitude of the effect will be. This is a reason why the area in London is so extensive (L1; L2). One of the geographic variants in Munich only included the city centre inside the inner ring road, was considered too small (M1). This is a risk that should be avoided. It is added that this is easier for the Stockholm case, since it is located on islands, than it might be in other contexts (S1). The importance of the size is stressed by both U1 and R1. It was a motive to extend the zone in Rotterdam from about the size of Utrecht's low emission zone, to the current situation (see table 7). Not only a geographical extension, but also in vehicle class and fuel (including gasoline) was executed then (more on vehicle classes and fuels in the next sections).

The natural borders in Stockholm make it easier to define an area that also has relatively low access points. Other cities might have more problems finding those clear boundaries that are easy to understand. This is often a ring road such as the middle ring road in Munich. It gives vehicles the opportunity to divert via the ring road and the city centre is still easily accessible with public transport. There are discussions now to extend it to the city border (M1). A reason to include the whole city in London was that it is easy to communicate and clear to everyone (L2). Both in interviews the NL1 and R1 this is stated as important. The usage of natural borders can be witnessed in Rotterdam, where the low emission zone border follows two highways (A16 & A20) and the river Meuse.
The only adjustment that has to be made to divert traffic is a modification of the boundaries of the low emission zone. In addition, when the geographic area is determined an effort has to be made to prevent traffic taking undesired routes, like smaller residential roads for example (M1; L2).
Remarkably, in Copenhagen people complained about not being in the original zone, it was therefore extended to a large part of the municipality (C1). A reason for the complains could be that the zone in Copenhagen only includes trucks and buses, so residents are not affected by this. This will be discussed more thoroughly in the next section. Related to this, the choice for a geographic scope is a political consideration (NL1). This can enlarge and diminish the zone, depending on both the political and societal support.

5.2.1 Interpretation of the differences

The focus on the highest concentrations is present in both Utrecht and Rotterdam. The fulfilling of the rest of the discussed topics presents a more mixed score between Utrecht and Rotterdam. Because the differences are choices rather than essential differences, these differences fall under the individualising differences.
Based on the data in table 7, the low emission zone in Utrecht is both in absolute and relative terms very small. This was mentioned as a risk that should be avoided (S1). The scale advantages, larger zone means larger effect, both inside and outside the zone are also minimal because of this small size. The small size results in traffic being able to relatively easy drive around and being able to get close to the city centre without going through the low emission zone. A relative short detour to avoid compliance to the regulation is more likely than a long detour (S1), the duration of a detour is of course dependent on the size of the low emission zone. Therefore vehicles are able to avoid compliance of the low emission zone rules, unless the city centre is their destination. Next to this, the usage of ‘natural’ borders in order to have a zone that is clear and easy to understand is considered important. This is not the case in Utrecht at the moment. In a research of Royal HaskoningDHV & TNO (2013) two alternatives were discussed. The first is an extension to the city ring and the second to the highway square (A2, A12, A27, N230). The two alternatives are respectively about 5 and 13 times larger than the current low emission zone, with their about 15 and 40 percent the two alternatives are suitable options to reach an appropriate size.

The size of Rotterdam's low emission zone, based on table 7, is already significantly better. It is still half the relative size of the Munich case though, the smallest among the abroad cases. In Rotterdam the natural border is much more present than in Utrecht. It is therefore harder to drive around and disobey the low emission zone's requirements if your destination is Rotterdam. The advice here is nevertheless still extending of the zone while sustaining a clear border as they have now. There are two options. Firstly including the south side of the river Meuse, preferably till the highways A15 and A16 to maintain the clear border. This would about double the size to about 15 percent. It was stated that the north side of city contained the largest air quality problem (R1) because of the most common wind direction (southwest) in the Netherlands and the density of the city. So the second option would be to extend on the north side. In order to do that and maintain a clear border, the neighbouring municipalities Schiedam and Capelle aan den IJssel could be included. Relatively this would not have a large gain, because the size of such a municipality should be included. An estimation is that the zone would end up between the current size (7%) and have a maximum of 13 percent when the territory of the neighbouring municipality is also accounted for. And more importantly, working with other government organisations would add organisational and operational complexity. There is one remark that has to be made regarding the size in Rotterdam. The above discussed size and corresponding percentages includes the size of the Port of Rotterdam, which contains about one third of Rotterdam's size. The adjusting of the size is a policy instrument and this improvement can therefore be placed in the administrative techniques and policy instruments group.

5.2.2 Transferability potential

The degree of transfer of the geographic scope element can be considered in the learning or emulation degree. The transfer of the geographic scope involves for the Dutch cases the extending of their low emission zones. The transfer of the size of the low emission zone includes the adjusting to the local situation for among others the clear and natural border.

This adjusting to the local situation is not as easy as it sounds though. This is illustrated by one of Rose's (1993) hypotheses that fewer side-effects increase the possibility to transfer. However, increasing the geographic scope has quite a few side-effects in different ways. First of all, a larger zone means that more people are affected because they become part of the low emission zone. Secondly the operational costs increase because of different reasons: more points of entry means more costs for enforcement and the municipalities of Utrecht and Rotterdam have scrapping arrangements linked to the low emission zone (more in section 5.5). So it costs the municipality and inhabitants a considerable amount of money. This statement is supported by the transferability literature. Wang et al. (2006) state that affected stakeholders and available resources influence applicability. Williams & Dzhekova (2014) add the transferability factor range versus cost effectiveness. The raising costs do not deduct that the effect of the low

emission zone will increase with extending the geographic scope. A solution could be introducing the changes in stages, first informing the people that are going to be in the low emission zone, so they can prepare. This spreads the cost to comply for the people. At the same time the municipality can prepare the low emission zone extension and spread their costs over a few years.
So the extending of the geographical scope seems relatively easy to implement at first. However the actual transfer is more complex. It can be applied but that depends on the political consideration (NL1) whether the costs are appropriate in relation to the effect it will have.

5.3 Vehicles affected

This section will review the vehicles that are affected by the different low emission zone cases. As also explained in section 4.3, most low emission zones were established in the years 2007 and 2008. The low emission zone cases are divided in three including cars which are Munich, Utrecht and Rotterdam. The other three: Copenhagen, Stockholm and London are targeting more heavy vehicles. Although London also included minibuses and vans. It also stands out that lighter vehicles are often added later on.

Starting date and affected vehicles

City	Starting date	Vehicles included
Copenhagen	01-09-2008[a]	Trucks and buses[a]
Stockholm	01-07-1996[b]	Vehicles over 3.5 tonnes (mainly trucks and buses)[b]
Munich	01-10-2008[c]	All vehicles except motorcycles[d]
London	Vehicles over 3.5 tonnes: 01-02-2008 Vehicles under 3.5 tonnes: 01-03-2012[e]	Vehicles over 3.5 tonnes, 1.205-3.5 tonnes & minibuses < 5 tonnes[f]
Utrecht	For trucks: 01-07-2007[g] Vehicles under 3.5 tonnes: 01-01-2015[d]	Trucks, vans and cars[d]
Rotterdam	For trucks: 16-09-2007[g] Vehicles under 3.5 tonnes: 01-01-2016[d]	Trucks, vans and cars[d]

Table 8 Sources: see appendix 2

From different interviews (C1; S1; L1) of the cases that target heavy vehicles, it was revealed that difficulties to implement is a reason to only include heavy vehicles. Including passenger cars has (perceived) political difficulties, because of what is asked of potential voters. This is confirmed in the article of Cruz & Montenon (2016).
Next to this, the benefits are relatively high when heavy vehicles are targeted (S1; S2; C2). This in combination with the relative large benefits of affecting old vehicles, makes the heavy vehicles extra attractive to affect. The emphasis on relative large benefits is also considered important in Utrecht (U1). However, the low emission zone was not limited to heavy vehicles, the relative polluting light vehicles were also included.
The availability of an alternative for heavy vehicles in the form of catalysts, by retrofitting the trucks could relatively easy become cleaner, was a reason to establish the low emission zone in Stockholm (S1). The view on alternatives is

understandable for heavy vehicles low emission zones. Nevertheless this view should be broader than solely technological when light vehicles are included. Then alternative transportation means become also important so people are still able to travel to the low emission zone (R1). Vans could be included in Copenhagen, however only when the limit value was exceeded and this was not the case (C2).
Including passenger cars and vans is important to make the low emission zones in respectively Copenhagen and Stockholm more efficient (C1; C2; S1). In Rotterdam the extending of the low emission zone to other vehicle classes was also considered important. From a kind of fairness perspective, it was decided to include vans and passenger cars. The transport sector already invested a lot for the original low emission zone and the low emission zone on the Maasvlakte. So to share the costs of compliance between different societal groups or stakeholders, the decision to include vans and passenger cars was made (R1). In contrast to this, S2 thinks the profits of including light vehicles would be marginal. His proposal is to focus on electric (heavy) vehicles in the future.

5.3.1 Interpretation of the differences

For the affected vehicles category, the Dutch cases are doing really well based on the data of the previous section. The differences above are policy choices again and therefore individualising comparisons. Including light vehicles is something that is considered important by multiple interviewees. The only possible improvement would be the earlier implementation of the low emission zone for light vehicles, since Munich already did this in 2008. On the other hand the including of light vehicles is an achievement in itself, since Munich is the only abroad case that also included passenger cars. In addition it is an achievement because it is often considered politically difficult. The earlier implementation is not an object of policy transfer though, so it cannot be placed in a category.
All cases affect the vehicles that are relatively polluting, only the extend of this differs. The Dutch cases are further with this than most abroad cases, as stated before. The availability of alternatives, especially other transportation modes, is also important for light vehicle low emission zones. These possibilities are sufficiently available in the Netherlands, especially in the cases Utrecht and Rotterdam. Still, it is a point of interest in relation to the low emission zone that these alternatives are available throughout the city.
Lastly, the proposal of interviewee S2 is an interesting idea. It can therefore also be included in the category concepts, ideas and attitudes of objects of policy transfer. From the interview R1 and the site of the municipality Utrecht can be derived that both municipalities are already working on electric vehicles in the cities.

5.3.2 Transferability potential

The transferability potential of the vehicles affected section is not present for the Netherlands. For this specific section the Dutch cases surpass the cases Copenhagen, Stockholm and London. These three cases could therefore learn

something from the Dutch cases and Munich on this topic. This is however not within the scope of this research and will because of this not be assessed.

5.4 Strictness level

The strictness level is determined by the EURO standard as mentioned in chapter 2 and an overview of the cases is given in table 9. Almost all cases have currently EURO 3 as the standard for the low emission zone. Stockholm has since the beginning of 2017 EURO 4 as the standard. The cases in Utrecht and Rotterdam have the EURO 3 standard for trucks and EURO 2 for vans and cars. Since Munich has EURO 3 for both trucks and lighter vehicles as vans and cars, it is stricter than the Dutch cases. The EURO standards in table 9 apply to diesel vehicles. Munich and Rotterdam have however also a standard for gasoline vehicles, which is EURO 0 in both cases (Urban access regulations, 2016). The often used EURO 3 standard means that trucks from before 1999 and vans and cars from before 2000 are not allowed in the low emission zone (see table 2). So vehicles of respectively 18 or 17 years and older are mainly banned from the zones. While with the introduction of most low emission zones in 2007 and 2008 (see previous section), this was around the 10 to 12 years. So the rules are nowadays generally less stringent. A positive example is Stockholm on this topic, they raised the standard the last two years to EURO 4.

Strictness of the low emission zones

City	Banned vehicles (EURO standard)
Copenhagen	EURO 2 or older Since 01-07-2010: EURO 3 or older[a]
Stockholm	Own classification Since 01-01-2007: EURO 2 or older Since 01-01-2016: EURO 3 or older Since 01-01-2017: EURO 4 or older[d]
Munich	EURO 1 or older Since 01-10-2010: EURO 2 or older Since 01-10-2012: EURO 3 or older[h]
London	EURO 3 or older[e]
Utrecht	Trucks: EURO 3 or older Vehicles under 3.5 tonnes: EURO 2 or older[d]
Rotterdam	Trucks: EURO 3 or older Vehicles under 3.5 tonnes: EURO 2 or older[d]

Table 9 Sources: see appendix 2

The strictness of the Copenhagen low emission zone was regarded as not very ambitious from the start off (C1). In addition, the regulations in London could have been more stringent (L1; L2). That the strictness is not as ambitious as would be desirable is likely due to political consideration. In Utrecht the advice of the executive board of the municipality was to also set EURO 3 as standard for light vehicles, however the city council decided that this was too strict and therefore EURO 2 was set as the standard. The city council did request a new strictness advice recently (U1).

For the different cases, the emphasis is put on different topics. The strictness level is expected to be a combination of the vehicle fleet present, the emissions of different vehicle types and then determining the best way to improve the air quality (S1). It is put in more abstract terms: a consideration of (political) feasibility, affected number of people, desired goal et cetera (NL1). The result of this consideration was for Utrecht EURO 2, as explained before. Including EURO 3 would increase the effectiveness of the low emission zone (NL1). The reason for this is that light vehicles till EURO 2 are considerably more polluting for particulates than EURO 3 or newer (NL1; U1). On the other hand, it affects more people and the affected are impacted (financially) harder because their cars represent more value (NL1; R1). Then as a result of this larger financial impact, the scrapping scheme of the municipality is highly affected. It would need more funding, the compensation per car should decrease or the scrapping scheme should be first come first serve based. All these options were unacceptable (R1).
The scrapping scheme then becomes a barrier of further development of the low emission zone's strictness. It is established to compensate people and companies that need to buy a new vehicle to comply and the limited funding for the scheme could not be sufficient for stricter rules (R1). It is considered a success though because over 3000 vehicles were demolished (U1; R1). An advantage of a strict low emission zone would be the extra stimulation of zero emission vehicles (NL1).
Both interviewee S1 and M1 focus on the most strict level. In Stockholm because it is their opinion they have come as far as they could get with heavy diesel vehicles. In Munich because only their most strict level (stage 3), that they have since October 2012, would make sense. The interviewee L1 puts emphasis on the right balance. Introducing too strict regulations will cripple a city. So finding the right balance to push the shift to cleaner cars as quickly as possible is key here, interviewee L1's indication is 70 to 75 percent already compliant before the introduction. This would increase after implementation to 90 to 95 percent. When the compliance before implementation is too low, a mode shift is more likely to happen. So the regulations should be as strict as possible without being too strict.
In Utrecht this was based on TNO (2012), the banning of the most polluting vehicles lead to two percent of vehicles being banned (U1). Interviewee R1 could provide a rough estimation of the percentage of vehicles that are affected by the low emission zone. This is about five percent (15.000 vehicles). It was also addressed that there is a problem that prevents Dutch cities to use the EURO standards directly. The registration of old cars is poor and incomplete, thus the date of first admission (in Dutch: datum eerste toelating) is used as closely to the EURO standards as possible.
Different interviewees also addressed the strictness over time. It is stated that developing the strictness level is important (C1; S1) and added that not updating the entry requirements should be avoided (C2; L1). The reason for this is an efficiency decline of a certain strictness level because of vehicle fleet modernisation, partly natural and partly because of policies like the low emission zone.

Otherwise the low emission zone policy becomes a frozen policy and the failing development of the policy is a problem for the Copenhagen low emission zone (C1) despite an update after two years (table 9; C2). This subject is already a setup for the next section, which will discuss this more extensive.

5.4.1 Interpretation of the differences

The differences described above are choices made in the policy and that makes them individualising comparisons. It can be derived from table 9 that the strictness level is not very ambitious anymore, most targeting vehicles of about 17 and 18 years old or older. That the strictness level is not stringent enough is seen as a fail factor. The regulations are nevertheless similar to the abroad cases. More stringent rules for trucks are present in Stockholm, for vans in London and for vans and cars in Munich. To determine the strictness level it is a consideration of as strict as possible, but also finding the right balance. In London it is considered optimal when compliance prior to the policy is about 70 to 75 percent, so the affected vehicles are about 25 to 30 percent. In Utrecht and Rotterdam this is about 2 and 5 percent respectively. So there is a considerable difference between those percentages. This would argue for increasing the strictness of the low emission zone in the Dutch cases. Moreover because updating the strictness results in maintaining of the effectiveness of the low emission zone. In addition, the advice in Utrecht was already to include EURO 3 in the regulations, but the city council deviated from this. The changing of the strictness level is a policy instrument and therefore it can be placed in the administrative techniques and policy instruments category of the objects of policy transfer.

5.4.2 Transferability potential

To change the strictness level of the low emission zone in Utrecht and Rotterdam, there are two solution approaches. Firstly increasing the standards for heavy vehicles or trucks. This would then include banning EURO 4 trucks as is done in Stockholm. This would contain a ban of trucks from manufacturing years 2000 to 2005. Operationally the transfer is relatively simple. The risks of implementation of Wang et al. (2006) are low, which increases feasibility of the implementation. In addition, Rose (1993) state that better operational information increases the easiness of transferring. For trucks this information is well documented and therefore available. The consequences of doing this depend on the share of EURO 4 trucks in the low emission zones and the effects replacing these trucks will have on the companies owning those trucks. Based on the vehicle fleet scan in TNO (2012) for Utrecht in 2015, the EURO 4 trucks had a share of 13 percent of all the trucks. This has probably already declined because of natural vehicle fleet renewal. The share in total traffic is not even a half percent (TNO, 2012). So the magnitude of the effect when EURO 4 gets included does not seem to be unrealistic. The degree of transfer for this would be transplantation (Janssen-Jansen et al., 2008) or copying (Rose, 1991). The reason for this is that the

strictness level change does not need adjustments to the local situation. It only has to be decided politically whether this should be implemented or not.
Secondly the including of EURO 3 for vans and diesel passenger cars or EURO 1 for gasoline cars. Including the EURO 3 would contain vans and diesel cars from 2000 to 2005 as is the case now in Munich. For gasoline cars the situation is different for Utrecht and Rotterdam. In Rotterdam it contains including EURO 1, which includes cars from 1992 to 1996. In Utrecht there is no standard yet for gasoline cars so the measure would include cars up to 1996.
The transferability of this second option is lower than the first one. The first reason for this is that the EURO standard change cannot be directly transferred. As mentioned before, the registration of EURO standards was really poor so the date of first admission is used in the Netherlands. Even though this requires a 'translation' from the EURO standard, the date of first admission offers also opportunities. Changing the EURO standard means a shift of 4 or 5 years of vehicles that are getting banned. The date of first admission can divide such a step in for example 5 steps to raise the requirements yearly with 1 year. This would immediately limit the second reason for a lower transferability. This reason is the impact this measure will have. Rose (1993) considers side-effects as decreasing the possibility of policy transfer. In addition, the applicability factors affected stakeholders and available resources (Wang et al., 2006) affect this as well. The affected stakeholders factor is a side-effect because the EURO 3 vehicle group for vans and diesel cars is larger than the EURO 0-2 group. So more people and companies will be affected by this change and because the vehicles are more recent, they are generally have a higher value. This leads to the available resources, the affected have to be able to purchase a newer vehicle. Moreover, the municipalities of Utrecht and Rotterdam have scrapping schemes as compensation for the affected. These limited funds cannot cope with large groups of people and companies applying for funding to replace their vehicle. The staged approach of the date of first admission would therefore be a diminishing element for this side-effect. Affecting more people and businesses could of course raise opposition among the affected. However, for the effectiveness of the low emission zone it is essential to update the requirements and a staged approach would minimize the negative effects. The degree of policy transfer for this option should be learning (Janssen-Jansen et al., 2008) or emulation (Rose, 1991). This would provide for adjustments to be made for the local situation. The adjustments contain different choices. These choices are option 1 or option 2, within option two different target groups, speed and order of implementation.
So changing the strictness level for trucks (option 1) seems the simplest option. However, the emphasis in section 5.4 was on a lack of ambition, strictness and development of the requirements. So the more ambitious option is the one for vans and cars (option 2). It can of course also be decided to implement both options.

5.5 Policy process and instruments

Even though low emission zones have similar goals, they are very differently implemented in countries and cities (S1). This stresses the importance of the policy process and other instruments of the policy. This section will discuss three topics. Firstly the low emission zone policy itself, what should be considered? Secondly, the public and statutory support for the policy and communication to the public. Thirdly the enforcement and compliance of the low emission zone policy.

The policy itself should contain clear rules, be fair and needs to have a right balance. This balance includes on the one hand the cost of compliance, which are the costs for the affected persons and companies to comply to the rules. On the other hand is the need to take action (L2). The necessity to create a policy that is fair and balanced is also stressed by interviewee R1. The remark is made that even though this is done, the effect on certain individuals can be substantial in a negative manner (U1). It is seen as success that the low emission zone policy is fair in the division of costs over different societal groups (NL1; U1; R1).
Furthermore, the systems complexity should remain low. So make clear requirements and do not include many exemptions etcetera (L2). That exemptions can add complexity is illustrated in the Rotterdam case by the exemption 'right to challenge', this includes the right of someone to prove that the car is clean enough despite the old age of the car. This has proven to be a difficult topic because it is very technical and the options are numerous (R1).
Developing the policy over time is important, so dynamics should be incorporated (C1; C2). A long term view on the low emission zone to develop the policy is missing in both Utrecht and Rotterdam, especially interviewee R1 sees this as a shortcoming.
For the implementation of the policy, it is mentioned that advocates (change agents) for the low emission zone are important for the adoption. In Copenhagen this was the minister of Environment (C1) and in Stockholm the early adoption thanks to planners in Gothenburg, then including Stockholm and Malmö in the establishment of the policy (Trafikkontoret, 2008; S1). Interviewee M1 states the implementation in Munich should have happened faster, even though the regulation was introduced 1.5 years after the possibility came into force on March 1, 2007 (Malina & Scheffler, 2015) and was updated twice after 2 years each. He also added that the low emission zone regulations should be consistent in a country or even in Europe. The implementation of the light vehicles low emission zones in Rotterdam and Utrecht contained a process of respectively 1 and 2.5 years. That the process in Utrecht took longer is understandable since it was the first low emission zone for cars and vans in the Netherlands. The speed of implementation of the initial low emission is not transferable and is of no influence of the effectiveness. The consistency of the low emission zone policy is a shortcoming of the Dutch low emission zones. Table 9 suggests otherwise because Utrecht and Rotterdam use the same EURO standard, but there is no national

regulation for the light vehicles low emission zones (NL1). This is something that should be avoided according to interviewee R1. Inconsistencies are currently that Rotterdam includes gasoline cars in contrary to Utrecht and the signage of the low emission zone: there is no national sign to indicate the light vehicles low emission zone. Consistency between Dutch low emission zones was an underlying reason for Rotterdam to maintain the current truck EURO standard (R1), so it can also affect the strictness level. On the other hand could a national policy have the same effect of course.

The next theme that was frequently mentioned in the interview is the support for and communication about the low emission zone policy. Getting political support is important (S2). The political support is considered a success factor in Rotterdam (R1). Next to this, it is considered important to inform the public or stakeholders (S2; L2; U1). With the public it is necessary to take them with you to let them understand the necessity of such a policy measure (L2). The public has been involved a lot in Munich (M1) and London (L2). The necessity is also shown by the lack of information or communication being identified as risks that should be avoided (S2; C1; U1). In Rotterdam the communication is seen as a success. An interesting tool used for this was an adaptation period in the first 4 months. No fines were given in this period but the number plates of incoming vehicles were checked and the compliance of their vehicle was communicated directly with a road sign and by mail to the owner (R1).
Interviewee S2 looked at the hauliers' acceptance of the low emission zone as a success. Even more because some companies started to use it as a marketing strategy that they complied. The public's awareness about the environmental impacts of their car increased, partly because of the media coverage (M1, U1). The increased awareness is considered a success. All foreign cases did not have a lot of appeal problems and related delays according to the interviewees. Even though Utrecht's decisions have been validated by different courts, the juridical durability of the policy is seen as a fail factor (U1). Despite the good communication in Rotterdam, a group of car owners discovered too late what the consequences of the low emission zone would be for them. This resulted in a still lasting appeal which however did not influence the implementation (R1).

The last theme is about enforcement and compliance. Enforcement is an important theme (C2; S1), it is added that the fines also are important to compliance (S1). There are two main methods for enforcement. Firstly manual checking by the police and or other municipal officials. The second method is with camera's that contain automatic number plate recognition (ANPR) technology. The first method is used by Stockholm, Copenhagen and Munich. Reasons used for this are privacy related and that cameras, the second method, are too expensive. The second is utilized by London. The costs, that is apparently an important reason not to do this, are mostly upfront capital costs (L2). However when installed, it is an effective system and it is easy to determine the effectiveness of the policy. Both

Utrecht and Rotterdam use the second method, camera's, as their enforcement method (NL1; U1; R1).
The manual enforcement in Stockholm is a fail factor because compliance is not regularly checked now (S1). So the effectiveness of the Stockholm low emission zone is unknown. Ineffective enforcement is a risk that should be avoided (C1; L1). The enforcement in Stockholm should be changed and the suggestion is to integrate the low emission zone in the congestion charge scheme that already is enforced with cameras (S1). In contrast to Stockholm, the Munich and London case have high compliance (M1; L2). This is not supported by data for Munich, London had a compliance of about 98.5 percent in the first half of 2016 (Transport for London, 2017). The compliance is high in Rotterdam as well with 99.9 percent for 2016 (R1). For all the other cases no data was provided. Related to the compliance are the fines. This is a potential fail factor for Utrecht since the amount of fines is too high (U1). The high compliance is partly because there are enough exemptions available. In total about 5000 daily and 300 long term exemptions (for list of exemptions see appendix 4) were granted in 2016. This is quite a lot considering 15.000 vehicles are banned because of the regulations (R1). The issues regarding the discussed above will be elaborated upon in the next section.

5.5.1 Interpretation of the differences

There are quite a few topics in this section that are well executed. The policy is fair and balanced, there is enough political support, the camera enforcement is efficient and the communication has been sufficient. The fact that there have been appeals in both Utrecht and Rotterdam does not seem to be founded in the lack of communication to the public and stakeholders. The differences found relating to this section can be identified with the individualising comparisons because of their specific differences between the cases.
From the policy itself, two themes need more attention: the systems complexity and the development of the policy. The two themes can both be placed under policy structure and institutions of the object of policy transfer because they are both part of how the policy is built up. The development of the policy is considered important for the effectiveness of the policy. In both Utrecht and Rotterdam there is no long term plan for the low emission zone and this is regarded as a shortcoming. The policy is evaluated yearly by Utrecht and a decision is then made on whether or not to change something about the policy. Even though the intention of this is good, to assess the need to improve, it also results in uncertainty for companies and people. In Rotterdam there are no specific agreements on evaluating or developing the policy which results in the same uncertainty.
The complexity should remain low by clear regulations and few exemptions (L2). Both these factors are not what they should be to keep the complexity low. The lack of a national regulation like in Germany (Cruz & Montenon, 2016) results in varying rules in different cities in the Netherlands. Examples of this are the varying vehicles that are affected, petrol cars are affected in Rotterdam and are

not in Utrecht, and the lack of national signage for light vehicles low emission zones.
The exemptions are an instrument used by the municipalities to adjust the low emission zone policy in certain situations. It can therefore be placed in the administrative techniques and policy instruments group. The exemption possibilities are much higher for the low emission zone cases that include light vehicles, then for the ones only including the heavy vehicles. It seems logical that there is a relation between the including of more vehicle groups and the amount of exemptions. Exemptions to a regulation increase the complexity of this policy though and decreases the effectiveness since vehicles are coming in the zone that do not comply with the rules. The reduction of the exemption possibilities should diminish the complexity. It is however not that easy to eliminate exemptions because especially the long term exemptions are necessary. A company's threatened continuity, emergency vehicles and cars adjusted because of medical reasons cannot be simply eliminated. These long term exemptions can only be removed over time. New adjustments because of medical reasons should not be executed in non-compliant cars anymore so the amount of those exemptions will not increase for example. The best opportunity is the focus on the daily and camper exemptions. The daily exemptions for Rotterdam have no conditions and allow non-compliant vehicles to enter 12 times a year. The camper exemption differs between Utrecht and Rotterdam, respectively 6 and 12 times per year per camper.

5.5.2 Transferability potential

The introducing of follow-up steps to develop the policy are in the essence not that hard to transfer. However since they should be adapted to the local situation, the learning/ emulation degree of policy transfer of Janssen-Jansen et al. (2008) and Rose (1991) is most suitable. Moreover because differences in characteristics affect the implementation which decreases transferability (Williams & Dzhekova, 2014). By determining follow-up steps for a certain moment in time the uncertainty decreases and a development of the policy is guaranteed. Flexibility of the policy is however removed at the same time. The effect range of the step is uncertain and for that reason also the cost effectiveness, this decreases the transferability (Williams & Dzhekova, 2014). In addition, a city council could become more cautious with decisions because of this uncertainty. The considerations made are usually broader since the improving of the air quality contains a whole package of measures. However since the focus of this research is on the low emission zone policy's effectiveness, the issue proportion or need for the development of the policy is present, increasing the transferability (Williams & Dzhekova, 2014), to increase or at least maintain the effectiveness of the low emission zone policy.

The complexity of the policy has to be reduced. Solution approaches are mainly policy consistency in the Netherlands and the reduction of exemptions. The lack of

consistency makes the policy harder to understand for the public. Solving the lack of consistency is however not easy and therefore the transferability decreases (Rose, 1993). The inspiration degree of policy transfer (Janssen-Jansen et al., 2008; Rose, 1991) should be applied here. To produce a consistent policy requires inter-governmental cooperation, political support in all those government organisations and legal issues regarding responsibilities of the local and national government. Uniformizing the policy nationally has also one major downside, the flexibility and ambition of a municipality is removed. So the consideration is between consistent and clear rules for the user and a tailor-made local policy. A compromise could be to uniformize the policy for light vehicles the same way as is already the case for heavy vehicle low emission zones in cities. So when a certain vehicle group is included, at least the same rules would apply in all cases in the Netherlands. It is beyond the scope of this research to thoroughly assess the possibility of this uniformization. Nevertheless based on this initial assessment, the transferability seems unlikely.

The minimizing of exemptions is the second approach. The directness of problem and solution relationship is higher for the exemptions than for the policy consistency, so transferability is higher (Rose, 1993). Even though the transferability is higher, the applicable degree of policy transfer is also inspiration (Janssen-Jansen et al., 2008; Rose, 1991). The reason for this is the high dependency on the local situation. In other words the exemptions are very case specific. It is not for every exemption easy to eliminate them, because there is a reasonable necessity for these exemptions, for example emergency vehicles. The daily exemption in Rotterdam is however an exemption that does not possess this necessity so this is an exemption that could be removed. The same can be stated about the camper exemption. Despite that those exemptions are lacking the urgency of for example an emergency vehicles exemption, the elimination of those exemptions will not be a popular or easy measure. Because people got used to it and the almost 5000 daily exemptions handed out in 2016 (R1) illustrate this. Rotterdam should therefore gradually reduce the daily exemption possibility. For the campers Rotterdam should at least reduce the possibility to Utrecht's level. It might be a good idea for Utrecht and Rotterdam to reduce this exemption even further to 4 or 2 possibilities. This would mean that people with an old camper can go on 2 or 1 vacation a year and pack their camper inside the low emission zone. By reducing the exemption to this level it will stimulate people to buy newer campers and results in that the exemption can be removed eventually. From a range versus cost effectiveness point of view, this is a rather good measure and therefore increases transferability (Williams & Dzhekova, 2014). Not having to process the exemption applications saves budget and this will probably be needed for the scrapping scheme for car and camper owners which want to use this to upgrade their vehicle and the range or effectiveness increases.

The most likely improvement seems to be a long-term plan for the development of the policy. The complexity reduction by a more consistent policy and reducing exemptions will especially be hard for the consistent policy factor. The reduction of the exemptions seems more likely.

5.6 Discussion

The themes Dutch low emission zone cases can learn from to improve the effectiveness of the low emission zone policy have been elaborated upon in the previous sections. These themes are summarised in table 10.

The improvements have been discussed mainly apart from other low emission zone elements, although these are of course interrelated. The geographical area and strictness level strengthen each other. Both increase the amount of affected people and companies. The development of the policy in the form of a long term view can structure these two and the exemptions reduction. The long term view should propose the steps that are going to be taken in order to synchronize the different improvements. A staged approach comes back in all the improvements except for the consistent national policy. It is a fitting approach since too large changes at once results in disproportionate impact and because of this, it will raise resistance. A staged approach subdues the impact at once and therefore also the resistance. The consistent national policy stands more on its own, even though it can also have an effect on the strictness level, development of the policy and exemptions if a national policy on low emission zones would be established. This is also however the improvement that is really hard to transfer, resulting in a low transferability. All these transferability estimates are based on the assessment of the transferability in their respective section.

Comparing the improvements with the objects of policy transfer, it can be witnessed that the improvements are found in two categories: the administrative techniques & policy instruments and policy structure & institutions. So these are the categories that were performing the worst. The degree of policy transfer illustrates the importance of the local context. Almost all improvements got learning or inspiration degree because of the amount of adjustments that have to be made for the specific situation. Only the strictness level for heavy vehicles got transplantation since there are limited affected stakeholders and it basically only requires a decision to implement it. The transferability is scaled based on a consideration of the transferability potential sections.

Improvements for Dutch low emission zones

Improvement themes	Sort of improvement	Objects of policy transfer group	Degree of policy transfer	Transferability
Geographical area	Extension	Administrative techniques & policy instruments	Learning/emulation	High/moderate
Strictness level	Tightening	Administrative techniques & policy instruments		
- Heavy vehicles			Transplantation/ copying	Very high
- Light vehicles			Learning/emulation	High/moderate
Development of policy	Addition	Policy structure & institutions	Learning/emulation	High
Policy complexity reduction	Simplification			
- Consistent national policy		Policy structure & institutions	Inspiration	Low
- Exemptions reduction		Administrative techniques & policy instruments	Inspiration	Moderate

Table 10

6. Conclusion

This chapter will present the conclusions of this research. It was presumed that Dutch low emission zones could learn from low emission zones abroad in chapter 1. The academic and societal relevance is also discussed in that chapter. The academic or theoretical relevance of this research consists of three factors. Firstly this research provides insight in qualitative factors of the low emission zone, which are underexposed in research about low emission zones so far. These researches focus on the quantitative effects. The second contribution is the determination of shortcomings in the quantitative evaluations of these researches. The third contribution is the transferability assessment between the different cases, which has not been executed before for the low emission zone policy.
The societal or practical relevance is divided in two factors. Firstly this research has provided concrete improvements for the Dutch low emission zone practice (table 10). This in combination with the improving of the evaluations (factor 3 of academic relevance) can contribute to the acceptance of the low emission zone policy. This leads to the second factor: the disputed effectiveness and consistency of the results of the low emission zone policy. Improving the low emission zones and the evaluations of the low emission zones could lead to a decrease of the discussions about the effectiveness and actual results of the low emission zone policy. Consensus about the usefulness of the policy would stimulate the strive for healthy air quality in the cities.
The elements of the low emission zones have been identified in chapter 2 to assess possible learning and transfer directions. Chapter 3 provided subsequently the theoretical foundation of this research. In particular for the case selection and transferability assessment. The concluding remarks will be discussed on the basis of the sub-questions and lastly the main research question.

6.1 Concluding remarks

The first sub-question was related to which low emission zone elements are potentially transferable between different cases. After identifying the low emission zone elements from the literature, a selection was made in chapter 4 to divide the elements in potentially transferable and not transferable elements. That resulted in four potential elements: geographic scope, affected vehicles, strictness level and policy process & instruments.

The second and third sub-question can be discussed together. The second focusses on the differences between the cases of the potentially transferable elements and why these differences exist. The third is directed at the relation of the abroad cases to the Dutch cases. A lot of differences were identified and an exhaustive overview is given in chapter 5. Examples are the geographic scopes of the cases, based on densities of population and pollution and often natural borders, and the vehicles affected by the low emission zone, there was a clear difference between cases focussing on heavy vehicles (Copenhagen, Stockholm

and London) and also on light vehicles (Munich, Utrecht and Rotterdam). The vehicles affected element is a special element since it was the only element of the four that did not contain improvements for the Dutch low emission zones. This also indicates that three of the four elements actually did contain points of improvement. The improvements derived from this are summarized in table 10 in section 5.6, containing four main improvements.

These improvements lead to the fourth sub-question, relating to whether these 'lessons' could be transferred or provide inspiration for improvement. An indication of the degree of transferability was provided in addition. It turns out that the improvements found can be transferred to the Netherlands if adjustments are made to let them fit in the local context. Based on the adjustments that probably should be made, the degree of policy transfer from Janssen-Jansen et al. (2008) and Rose (1991) resulted often in learning or inspiration. This was exactly the positioning of this research in Spaans & Louw's (2009) framework for transfer prospect (figure 3).

The main research question was: *"what can be learned in the Netherlands from low emission zone policy choices in other European countries and to what degree could these lessons be transferred?"*
There are four themes for improvement as mentioned before. These themes are the geographic area, strictness level, development of the policy and policy complexity reduction. Various articles (Wang et al., 2006; Rose, 1993; Williams & Dzhekova, 2014) address the transferability potential of the improvements. It is generally the case that the improvements can best be introduced in stages, to minimize negative impacts of the measures. For the same reason all the improvements should not be introduced at the same time.

- The geographic area improvement is an extension of the zone in both Utrecht and Rotterdam. Both the zones are small, relatively and absolute, in comparison with the other cases. Especially the low emission zone in Utrecht could be improved much. It does not follow a natural border yet in contrast to Rotterdam and is smaller than in Rotterdam. The transferability is high/ moderate, leaning more towards high in Utrecht and to moderate in Rotterdam.
- A tightening of the regulation is the improvement for the strictness level. For heavy vehicles this is really straightforward. It only needs to be decided to implement this. For light vehicles this is more complex. The date of first admission offers however an opportunity in comparison to the EURO standards. The transferability is therefore still high/moderate for both Utrecht and Rotterdam.
- The development of the policy is an addition since this is not present yet in both cases. A long term view provides clarity and certainty for stakeholders. It can also include and structure the two previous improvements, the extension of the geographic area and the tightening of the strictness level. It is also regarded a shortcoming in Rotterdam (R1). The transferability is high, because

a city can custom make this long term view. So there is an extent of flexibility that increases the transferability of this measure.

- ➢ The simplification through a complexity reduction is the last improvement. It consist of establishing a national policy for increased consistency and exemptions reducing. Establishing a national policy will probably be really difficult though. There are quite a few barriers for this and therefore the transferability of this option is ranked low. The exemptions are ranked moderate. Light vehicles low emission zones need more exemptions than the ones only including heavy vehicles. It is however still the point of view of this research that there are gains for reducing the amount of exemptions.

So to conclude, there are possibilities for Dutch low emission zones to improve their effectiveness as the four themes presented in this research illustrate. In addition these improvements can be transferred to the Netherlands, as long as adjustments are made for the local context.

6.2 Suggestions for further research

The low emission zone effects are measured in different ways. Developing one effect measuring method in order to be able to compare effects would be the first suggestion. This would provide the opportunity to compare different low emission zones on their actual effects.

A few other directions for further study are the more in depth assessment of the transferability of the in this research found improvements. The learning for the Netherlands is based on the findings for the cases in this research, Utrecht and Rotterdam. It can be investigated whether the results of this research do also apply to other Dutch cities. Furthermore can be assessed whether possible improvements in other cities are also found in the same objects of policy transfer groups. That could provide insights about the sort of objects cities would need to learn from to improve their low emission zones.

Further research could also assess the significance of other air quality improvement measures in relation to the low emission zone. Since there are many ways to improve the air quality it might be that other policy measures prove more effective than the low emission zone. Next to other policies, there are developments towards other fuels like electric, nitrogen and bio-gas vehicles. The speed of these developments could affect the low emission zone. For further research, it could be assessed how the low emission zone policy could be used in relation to these kind of vehicles. It might be a tool to fasten the introduction of these vehicles. It might also be the next step after the current EURO standard, but questions about the how this can be done and what is the best way are questions that should still be answered.

7. Reflection

This chapter will reflect on the research in two ways: the process and the outcomes.

7.1 Research process

The research started off with the search for relevant literature. This went quite well because the researcher was familiar with several relevant theories. The reading of policy transfer and comparative research theory steered this research to a focus on learning and inspiration rather than direct transfer. The major shortcoming concerning this research presented in the methods and empirical part. A lack of strategy led to a lot of wasted time and eventually it became apparent that the original research question could not be answered. After changing the research question and guidance of the supervisor towards a strategy, the rest of this process developed much smoother.
The gathering of the data through the interviews proved to be hard sometimes, nevertheless a result was reached of 10 out of 11 gathered interviews. Quite some interviewees preferred answering the questions in writing, this was not ideal. The interviews that were gathered in this way were significantly shorter and it has been tried through sending follow-up questions via email to get more information from these interviewees. This often succeeded. The preference of written answers was understandable because 7 of the 10 interviews were international interviews. The researcher preferred written information over no information and the written interviews have proven useful.
As also mentioned in the methodology chapter (Ch4), the usage of other methods for data gathering could also be advocated. The questionnaire and focus groups method could have been chosen. It is however the author's opinion that the right choices have been made regarding the methods. The most important reason for this is the main aim of this research to go into a relative small number of cases to derive in depth information. Other reasons are already provided in chapter 4.

7.2 Research outcomes

This research assessed the effectiveness of the low emission zone policy and tried to base this on the actual effects of the low emission zones in the selected cases. The literature available possessed various problems, amongst others different measuring methods, equipment and accounting for external factors. It was therefore, unfortunately, not possible to use the effects of the low emission zones in the envisioned manner. Now the improvements have been derived in a qualitative manner without the quantitative base.
Even though it is the researcher's opinion that the improvements suggested in this research are convincing and logical in relation to the researches aim, there are a few remarks to be made. Firstly, the focus on the low emission zone as an independent policy is of course not reality. Numerous policies are available and

used to improve air quality, as also stated in several interviews. So reality is more nuanced than might seem in this research. In addition, the transferability assessment is rather limited and could turn out to be different in a more thorough assessment in comparison to the initial one in this research. It is used here to provide an indication of transferability and mainly used to relativize transferability between the improvements.

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Appendices

Appendix 1: interview guide and interviewees

This appendix will first elaborate upon the interview guide. Then it will show the list of interviewees and their codes. Afterwards the interview elaborations are presented.
The interview guide provides structure for the interviews. The questions are intentionally placed in this order to since it is considered to be the most optimal way to derive unbiased information from the interviewees. After deriving their ideas some questions are asked to obtain the reflections of the interviewees on findings from the literature. This interview guide will be provided in English and Dutch for the reason that interviews are executed in both English and Dutch.

Questions:
- What are important elements of low emission zones in general? And why?
- What are important elements of the (case) low emission zone? And why?
- Why is the choice for the current geographic scope made?
- Why are …. affected by the low emission zone in (case)?
- Why is the strictness level chosen as it is now in (case)?
- What was the method for enforcement? And why?
- What do you consider successes and failures of the low emission zone? And why?
- What is the most important aspect for a successful low emission zone in (case)? And why?
- What are risks for a low emission zone that should be avoided?
- How did the decision making process go?
- Would you have / do you think there should have been decided otherwise when you now look back at the decisions made?
- What can others learn from (case)?

Vragen:
- Wat zijn belangrijke elementen van milieuzones in het algemeen? En waarom?
- Wat zijn belangrijke elementen van de (casus) milieuzone? En waarom?
- Waarom is de keuze voor de huidige grootte van de milieuzone gemaakt?
- Waarom heeft de (casus) milieuzone betrekking op ….?
- Waarom is de keuze voor dit striktheid niveau gemaakt in (casus)?
- Wat is de handhavingsmethode? En waarom?
- Wat zijn volgens u succes- en faalfactoren van de milieuzone? En waarom?
- Wat is volgens u het meest belangrijke aspect van de milieuzone in (casus)? En waarom?
- Wat zijn risico’s die voorkomen zouden moeten worden bij een milieuzone?
- Hoe verliep de besluitvorming?

- Denk je dat er andere besluiten gemaakt hadden moeten worden als je terugkijkt op de gemaakte beslissingen?
- Wat kunnen anderen leren van (casus) volgens u?

Below is the reference table of the performed interviews for this thesis. The referencing in the text is for example interview S1 or interviewee S1. The interviews have been anonymized and the names can be requested from the author or the thesis supervisor. The interview transcripts can also be requested from the author.

Case	Interview code	Interview date	Role	Organisation
Stockholm	S1	13-03-2017	Researcher	Stockholm university / municipality
	S2	07-03-2017	Local authority official	Trafikkontoret
Copenhagen	C1	06-03-2017	Researcher	Aarhus university
	C2	19-04-2017	Local authority official	Municipality
Munich	-	-	Researcher	-
	M1	07-04-2017	Local authority official	Municipality
London	L1	28-03-2017	Researcher	Brook Cottage Consultants
	L2	17-03-2017	Local authority official	Transport for London
The Netherlands	NL1	19-04-2017	Researcher	TNO
Utrecht	U1	01-05-2017	Local authority official	Municipality
Rotterdam	R1	19-04-2017	Local authority official	Municipality

Appendix 2: low emission zone tables

Sources table 6:

a. Wåhlin (2008) & Massling et al. (2011)
b. Jensen et al. (2011)
c. Trafikkontoret (2008)
d. Rapaport (2002)
e. Fensterer et al. (2014)
f. Stern (2013)
g. Jones et al. (2012)
h. Ellison et al. (2013)
i. Urban access regulations (2016)
j. TNO (2016)
k. Boogaard et al. (2012)
l. Agentschap NL (2010)

Sources table 7:

a. Fröhlich (2011)
b. Statistics Denmark (2016)
c. Browne et al. (2005)
d. Statistics Sweden (2016)
e. Morfeld et al. (2014)
f. Cruz & Montenon (2016)
g. London datastore (2016)
h. Own drawing on daftlogic.com
i. CBS (2016)

Sources table 8 and 9:

a. Jensen et al. (2011)
b. Trafikkontoret (2008)
c. Morfeld et al. (2014)
d. Urban access regulations (2016)
e. Ellison et al. (2013)
f. Cruz & Montenon (2016)
g. Agentschap NL (2010)
h. Qadir et al. (2013)

Appendix 3: textual effect description

Jensen et al. (2011) focus on traffic contribution in Copenhagen of both exhaust (tail-pipe) and non-exhaust (i.e. tire wear) emissions. A $PM_{2.5}$ reduction 0.7 µg/m^3 or 12% was found. Modelled results in 2010 for $PM_{2.5}$ and PM_{10} are respectively 0.2 µg/m^3 and 0.3 µg/m^3. The study of Massling et al. (2011) uses the result of Wåhlin (2008) for the period 2005 to 2007 to investigate the difference of concentration level of PM_{10} in the years 2008 to 2010. The difference with the urban background site is a decrease of 1.6 µg/m^3 at the street site (Massling et al., 2011). The NO_2 concentrations in 2010 had decreased with about 1.0 µg/m^3 while the modelled result was 2.0 µg/m^3 (Jensen et al., 2011).
In Stockholm Rapaport (2002) used models to find the effects of differences in vehicle fleet change with and without low emission zone. The average difference in $PM_{2.5}$ concentrations is 0.01 µg/m^3 in 2001. The average effect for NO_2 is 0.06 µg/m^3. This is an average difference of respectively 33 and five percent. Important note is that it is the difference between with and without low emission zone, so not the difference in concentrations (Rapaport, 2002). The calculations made in 2007 resulted in thirteen to nineteen percent reduction of PM concentrations and three to four percent for NO_x compared to an alternative without a low emission zone (Trafikkontoret, 2008).
Fensterer et al. (2014) executed measurements in Munich in two periods, before and after the implementation of the low emission zone and the truck ban. Average PM_{10} levels decreased by 5.4 µg/m^3 (19.6%) in summer and 2.1 µg/m^3 (6.8%) in winter at the street site. This was 1.1 µg/m^3 (5.7%) in summer and 0.7 µg/m^3 (3.2%) in winter at the urban background location in the low emission zone. Stern (2013) witnessed a PM_{10} much smaller decrease of 0.2 µg/m^3 of the annual average. The effect found for NO_2 concentrations was a reduction of 1.0 µg/m^3 of the annual average (Stern, 2013).
According to Ellison et al. (2013), a clear negative trend for the annual PM_{10} concentrations in London was found at all measuring locations between 2003 and 2013. This reduction was larger within the low emission zone than outside, about three percent inside and one percent annually outside. The NO_x concentrations declined at all locations between 0.5 and 1.5 percent per year (Ellison et al., 2013). The average PM_{10} and NO_2 concentrations on 'polluted streets' were reduced by respectively 0.03 µg/m^3 and 0.12 µg/m^3 (Urban access regulations, 2016). Jones et al. (2012) found contrasting results in their research about the introduction of the low emission zone and 'sulphur free' diesel. The average roadside concentrations of PM_{10} and NO_x increased with 1.0 µg/m^3 and 18.2 µg/m^3 respectively from the first (before) to the second period (after). The urban background contrastly decreases (Jones et al., 2012).

The two street sites in Utrecht witnessed a reduction of 1.7 and 1.1 µg/m^3 for PM_{10} in 2010, this was less than the urban background site. Reduction of $PM_{2.5}$ at the street sites was 3.7 and 3.1 µg/m^3, this was larger than at the urban background. The NO_2 measurement show contrastingly an increase at both sites of 2.5 and 0.3

$\mu g/m^3$. NO_x had mixed results with a decrease of 3.6 $\mu g/m^3$ and an increase of 3.8 $\mu g/m^3$ at the street sites (Boogaard et al., 2012). In 2015, a reduction of 0.04 $\mu g/m^3$ on both PM_{10} and $PM_{2.5}$ concentrations was found. The effect on NO_2 concentrations was even smaller, a reduction of 0.02 $\mu g/m^3$. This means the traffic contribution to the particle concentrations of PM_{10}, $PM_{2.5}$ and NO_2 decreases with respectively 3.5, 7.2 and 0.3 percent (TNO, 2016).
A decrease of 0.04 $\mu g/m^3$ is the average change in Rotterdam for PM_{10} concentrations. The changes range from a decrease of 0.08 $\mu g/m^3$ to 0.02 $\mu g/m^3$. An average NO_2 decrease of 0.01 $\mu g/m^3$ was witnessed. The variation has a range from a decrease of 0.04 $\mu g/m^3$ to an increase of 0.06 $\mu g/m^3$ (Agentschap NL, 2010).

Appendix 4: list of exemptions per case

Copenhagen exemptions granted when:

- Unsafe or technically impossible to install particle filter;
- A special-purpose unique vehicle or excessive costs to install particle filter (Ministry of Environment & Food of Denmark, 2017).

Stockholm:

- No exemptions found.

Munich exemptions for:

- Two-wheeled and off-road vehicles;
- Vintage cars;
- Police, fire brigade and other emergency vehicles (Cyrys et al., 2014).

London exemptions for:

- Agricultural and construction machines which might occasionally use the roads;
- Vehicles of the Ministry of Defence and historic vehicles (manufactured in 1972 at the latest) (Urban access regulations, 2016).

Utrecht & Rotterdam exemptions:

- 6 (Utrecht) & 12 (Rotterdam) in-/unpack exemptions for camper owners;
- Long term exemptions when:
  - Company's continuity is threatened because of the requirements
  - Vehicle is adjusted for medical reasons
  - Vehicles are needed for traffic safety and emergency services
- For oldtimers: vehicles of 40 years or older (R1; Utrecht municipality, 2017).

Exemptions for Utrecht only:

- Long term exemption because of special situation: there is a necessity to use your car in the low emission zone and you cannot use alternative modes of transportation (Utrecht municipality, 2017).

Exemptions for Rotterdam only:

- 12 daily exemptions unconditionally;
- Right to challenge;
- Hospital visit (R1).

Appendix 5: interview transcripts

Interview Stockholm 1 (S1)

I will begin with my first question now. These are to confirm from the literature, basically what I found and I want to see what you have to say about that so that I can like reflect on what was in the literature and the first question is:
1. What are important elements of the low emission zones in general and why?
Yeah the important thing is that they are suppose to reduce emissions exhaust, air pollutants in central areas. So cities where people are most exposed in order to reduce the health effects on the general population and also to promote the renewing of the vehicle fleets, preferably both light duty vehicles and heavy duty vehicles. So that we get a newer fleet with lower emissions in the future. And also to improve awareness, promote awareness among the public about this issues of air pollution exposure and being aware of this when you buy a new car or whatever.

2. Okay and do you also have specific elements about the Stockholm low emission zone that you think that are important?
Originally we had the aim also to reduce noise. This has not been evaluated to my knowledge or the effect of that on how efficient the low emission zone in Stockholm has been to reduce noise, but that was what was said to be an aim as well. And of course if newer vehicles have lower noise emissions, than that would also be a good thing. But I'm not sure how important that is. Otherwise I think that… I mean it's similar, all the low emission zones I think have similar aims. Except that they are very differently implemented in different countries and different cities.
2.1 Okay so do you think that the argument to reduce noise was made to convince people that it is a good idea? Because if you don't evaluate it that's kind of strange right?
Yeah but even the air quality in Stockholm, I think the evaluation has not been very good or not maybe deep. Even in terms of air quality, I mean there has been some evaluations but not very much. So I don't know if there was an expectation among the public. Also it is that, there should be hence detailed evaluations or anything. It was just stated that this will improve noise, this will improve air quality etcetera. I don't know what people actually expected. As a result of this, everyone probably thought it was a good way to do it. I don't think, at least there were no pre calculations on what efficiencies or effects to expect of the introduction of the low emission zones in Stockholm, Gothenburg and Malmö neither in terms of air quality nor in terms of noise. Maybe there was a pre calculations in terms of emissions not quite sure about that either. So there were just introduced on the basis of more qualitative arguments rather than specific quantitative estimates of the effects.

3. And why do you think the choice for the current geographic scope was made?
Geographic scope… you mean the geographic extent of the low emission zone?
3.1 Yes exactly.
So I think in Stockholm especially because we have… Stockholm is situated on islands as you know and so we have a very sort of natural borders in terms of traffic going into and out of the city centre. It's a… you can when you look at the

roadmap of Stockholm, you can identify relatively few places where you can enter and exit from the city centre. I don't know any arguments to make it bigger or larger than it was originally but now we have the congestion charge, congestion tax. It's exactly the same borderline as the low emission zone and I think it is quite a good borderline.
3.2 Yes so because it was a natural boundary it's somehow a logical choice to choose that area.
Yes exactly.

4. Okay and, why are only heavy vehicles affected by the low emission zone in Stockholm because you said that the ideal situation is both heavy duty vehicles and light duty vehicles.
That's also a question about the history that I cannot answer really. I mean it was really complicated to introduce the environmental zone as it was called. At all because of the European legislation, maybe you heard of this in the other interview because it was actually Gothenburg that was the city, or planners in Gothenburg that were sort of the most active in trying to enforcing this low emission zone in Sweden. Stockholm was part of this but there was a lot of struggle to get this implemented. Even it was, the truckdriver companies and many other complained and it was taken to court I think, to the European court. And finally it was decided that we could have this in Sweden. So maybe that was the sort of… one of the reasons why also the light duty vehicles were not included, because it was complicated already with the heavy duties. Another thing was… I think maybe important was this discussion on the catalysts for heavy duty vehicles that were coming, so there were sort of cleaning technologies in the market ready to be implemented on heavy duty vehicles. So then you could sort of put some legal constraints on the heavy duties, because of the possibilities for truckdriver companies to relatively easily retrofit their vehicles with this new catalysts.
4.1 I heard in the other interview with the person from the municipality that in Stockholm there was only one appeal from the hauliers organisation. But you said that there were a lot of appeals.
Well I don't have that history right now but there is a report, maybe it is in Swedish, but there is a report quite detailed on this history. But probably Lars-Göran knows that better since he was more involved in that. I have been involved only from the air quality side, not from the not so technical aspects of the implementation and things like that. I was not involved in the discussions when the low emission zone regulations was discussed.

Okay well, I might have some questions then still that would be a bit hard to answer but just give your view on what you think then. That is I think the best way possible to do this then.
5. Because my next question was whether you know or what you think was the reason why the strictness level was chosen as it is now in Stockholm and Sweden?
No I don't know that indeed. But I presume that they were looking at how does the vehicle fleet look like today and what is the emission from the different vehicle types, heavy duty vehicle types. And how could you speed up the change of the fleet. That must be sort of the basic factors that you have to consider when you make the regulation.
5.1 So if that would be probably the basic way they looked at it. Did they also have like reviewed them again because it was established in 1996, so that's already quite a while ago… 20 years. So have they reviewed then those requirements already? Have they updated it basically?

Yes they have been updated I think a couple of times, but again I dont have the years they were updated. This is easy to find in the report.
5.2 Yeah I think I also read something about it that there were first the Swedes had their own classification system and they changed it later to the common European system right?
Yes exactly.

6. Do you know what the method of enforcement was and why they chose it to do it that way?
Yes I think it has been the same as the law enforcement and that is that the police can do or should do controls of vehicles inside the zone. Whether they fulfill the requirements of a low emission vehicle or not. So there are no automatic enforcements, like with cameras or anything. It's just the police that checks that vehicles have the correct... fulfill the requirements.
6.1 Yes so they didn't consider cameras because that is like more…. then there is no way going around it like with policemen you just need to coincidently see it.
Yes I don't know at that, at that time we didn't had any systems like that operating in Sweden that I know of, so then it would probably be quite expensive to do it like that. But now today, I mean we have now installed cameras for the congestion tax controls and it also are automatic numberplate recognition cameras so that you… it would be relatively easy to actually also include the low emission zone regulation into the congestion tax system.
6.2 Yeah but they didn't have done that yet?
No they didn't so I mean the congestion tax was permanently installed in 2007. So but since 2007 we could have the low emission zone control in the same way I think. But still this hasn't happened which is very unfortunate I think.
6.3 Could you also say maybe why they haven't done this for the low emission zone because it would be like expensive but they have done it for the congestion tax. I think it would also be logical then if you just do it for the congestion tax that you would also include the low emission zone immediately.
Yes so why they haven't done it I don't know… in Sweden we have the same low emission zone regulations for several cities and I don't know if it would be complicated if you have just number plate recognition systems in Stockholm. You could have it also in Gothenburg because they have the same congestion tax system or cameras as we have in Stockholm. Other cities, they don't have that so they would have to install such systems which costs a lot of money. But I don't know if this has at all being discussed but I think it should be discussed. It would be as I said easy to do in Stockholm.
7. What do you consider successes and failures of the low emission zone and why? First in general.
I think… I mean in the beginning in 1996 it was, probably, efficient in terms of reducing emissions of PMx source and somewhat also for NOx because we had a very old heavy duty fleet and the regulation was a sort of... improving the fleet quite a lot at that time. But now, I think the regulation is not as efficient anymore, it has at least not been quite evaluated. So I think it was good in the beginning but now it is less good so that's sort of on the good and bad side of it. A very important problem I think is the enforcement that we have this manually enforcement by the police and the police haven't done a lot of controls. I think very few vehicles have been legally banned from the low emission zones. I don't have the statistics of that. And also there has been not so much control of the... how well the regulation has been followed. We have... the environmental department here in Stockholm have been doing controls manually going out on

the streets and looking at registration numbers just to see what is the percentage of legal and illegal vehicles driving in the zone. Before it has been a few percent up to maybe 10 percent or something like that, illegal vehicles driving in the zone. But this has not been continued so now I don't know if anyone is doing these kinds of checks anymore. So I don't know this is the problem I mean, how efficient are the low emission zones in the Swedish cities? It has not been clearly evaluated and I think that is a pity because if we know that then we could also see how we could improve or make it more efficient.
7.1 Yes exactly it was also the question I wanted to ask next if you knew what the enforcement rate kind of was, because I couldn't find it as well. But you also say already that it's not consistently done or something so...
As I said in the beginning when the zone was introduced in the 1990s, we did do manual controls of the enforcement, how many illegal vehicles that were driving in the city centre but this has not been continued now. So now we don't know, at least I haven't seen any report on the control of... or how many legal or illegal vehicles driving in the city centre.
7.2 Okay yes that's a bit unfortunate.
Yes.

8. What is the most important aspect do you think for a successful low emission zone in Stockholm? Or what was the most important aspect and why?
I think it's a… that we need… I mean the most important is the enforcement method and of course the legal framework, what is the… which heavy duties are banned. And also the enforcement and then also how much is the payment or the punishment if you drive in the city centre without fulfilling the requirements. And also the information about the existence of the low emission zone to all truck drivers and all bus companies that drive in the city centre. But now I think we need also to include the light duty vehicles in this. And also for them use automatic numberplate recognition cameras and have automatic fees or charges on the illegal vehicles driving in the low emission zone.
8.1 It was... Lars-Göran who said to me when I asked him about why only heavy vehicles were affected, he said that including light vehicles would be difficult with enforcement but if it would be included in the congestion tax that wouldnt be a problem and he said it would probably have low profits in terms of the air quality. But I get the feeling that you're not really thinking the same about that.
No I don't think that. I think it's important to include light duty vehicles and this is because of the NOx emissions of diesel cars which is quite important. And this has increased in Stockholm, the importance of diesel emissions. Here the light duty vehicles contribute a lot.
8.2 Yes because they are also a large part of the vehicles driving in the city right?
Yes exactly.

9. My next question is what are risks for low emission zones that should be avoided when you want to establish one?
You saids risks?
9.1 Yes.
Ah okay. Of course, I mean there are risks like if you have a zone which you can drive around easily you might have increases in traffic in other areas for example. So that's… even though you have lower emissions in the city centre you can have increased traffic around and then you… or even like vehicles driving longer because they need to turn around or so. So they have higher emissions because of longer… it costs longer to drive. That's also a risk. And thus such effects are very

easy… difficult to evaluate if this is happening. But this could be a risk with a low emission zone that you have such effects.
9.2 I was wondering, do you think that you can avoid the risk that people take a route around the low emission zone? Because I think it's quite difficult to avoid such behavior if people want to do that.
Yes so it depends on the road network and the you know geographic extent of the low emission zone. This is one of the advantages of Stockholm, you cannot pass through south to north or north to south without actually going through. There is only one bypass, essentially that is outside the low emission zone and if you include that in the low emission zone as well, then you cannot pass because their is water around. So if you want to pass Stockholm avoiding the low emission zone you have to go very far away and people wouldn't do that. So in our case it's quite fortunate, it can't be avoided. But I mean I have seen in Augsburg for example in Germany, they have a low emission zone and its very small in the city centre and I imagine that it's very easy to just drive around that. So I think it's different it's… you cannot say in general you have to look at each specific city and there could be possibilities to avoid this problem. Maybe for most cases it's difficult to avoid it I think. But in Stockholm I think we can avoid it.

10. Okay yes. Do you know anything of importance about the decision making process that influenced the decision making a lot?
What are you thinking of more specifically? What decision making?
10.1 You could think of was it from the national government down or the other way around, appeals or anything else. The appeals that we already discussed a bit.
I mean in this case the history was that there were a few persons in Gothenburg that were actively working to introduce low emission zones and I think it was because of that that this actually happened so fast in Sweden or so early compared to other cities. This worked and they then got collaboration with other cities like Stockholm and Malmö and then it got up to the national level and it was sort of implemented as a national legislation.
10.2 For instance something like public opinion, did that affect it or was it because it was only for heavy duty vehicles that wasn't really a problem?
No exactly it was not a public issue, it was an issue of the driving companies, truck drivers and bus companies etcetera so.
10.3 So that's maybe also why they then didn't include light vehicles, because then you would have to deal with public opinion about this.
Yeah sure definitely.

11. Do you think there should have been decided otherwise when you look back at the decisions made? So if you evaluate it now basically, do you think there should have been other decisions made regarding the low emission zone?
Yeah I mean, I think this is what we have been talking about, that the enforcement method should have been… could have been discussed more. Or at least I mean… what we know now, the enforcement method is very important for the regulation and for the fulfillment of the… if you want to have 100 percent soon.

12. Okay and my last question is, what can others learn from Stockholm? So then we probably come back to the enforcement method I guess.
I mean London, when they introduced their zone they looked very much on how it was done in Stockholm. Stockholm is not the best example of a low emission zone

in Europe. There are many good examples, Stockholm is one but I don't think it is the best example. But Stockholm was the first to do this in Europe I think and this was important. An important step probably for the first cities in Germany and elsewhere to actually do it also or introduce this. But I don't know if there were… how much Stockholm was a template for their system or not. I cannot say much more about it.
Okay then thank you for the interview and the time.

Interview Stockholm 2 (S2)

1. What are important elements of low emission zones in general? And why?
The most important element of environmental zones is to reduce air pollution in environmentally sensitive areas, that is where many people live and / or work. The environmental zone is about the local environment, the direct negative impact of particulates and nitrogen oxides.
2. What are important elements of the Stockholm low emission zone? And why?
What is important in the implementation of environmental zones is to first have the statutory support to implement it, also it must have a surface that shows the environmental benefits one can get, another aspect is to inform hauliers and stakeholders well before the introduction.
2.1 The surface that shows the environmental benefits you talk about, what do I have to think about? A website or folder? Or something else?
We have a map of the environmental zone over here; http://foretag.stockholm.se/Tillstand/Trafik/MIljozon1/. There are also frequently asked questions and the answers to these questions there.

3. Why is the choice for the current geographic scope made?
The area was determined from a natural boundary called the inner service area, colloquially "inside duties." And within that area is crammed with jobs and accommodation.
3.1 So the inner service area is the environmental zone as it is now and it is understandable to use the city centre for such a zone. I am however wondering that extending the zone to other areas around the current zone could strengthen the effect, has this ever been considered? And then why was it decided to only select the inner service area for the environmental zone?
We thought some of incorporating Hammarby Sjöstad and Djurgårdsstaden in the environmental zone. These areas are new urban areas, Hammarby Sjöstad is only a few years old, while Royal Seaport is under construction. But at present there is no decision on how it will be. Otherwise, it has not been reflected in other areas. The inner area is where the tightness between jobs / housing is the highest. In addition, this area stays very busy and it's easy to demarcate this area.

4. Why are only heavy vehicles affected by the low emission zone in Stockholm?
The regulations have since the possibility of introducing environmental zones were only focused on environmental zones for heavy trucks and large buses. Given that the traffic volume of heavy vehicles is only 5% of the total traffic, while environmental disturbances from these 5% are high, the benefits are great if you manage to improve these vehicles
4.1 I understand that heavy vehicles have relatively high emissions and that the regulations focussed on that. However, passenger cars are by far the largest group of vehicles in a city, so wouldn't the benefits be much greater when

passenger cars would also be included? So do you think Stockholm would consider to include cars if this would be possible? Why or why not?
In the current regulations it is only possible to restrict heavy vehicles. There is now a review of the regulation where the proposal is also to regulate cars with environmental zone rules. We do not know now when or if such a change becomes effective. If there is a possibility of introducing environmental zones for light vehicles it is not impossible that Stockholm do it, but it's up to politicians to make that decision.
4.2 Do you think that including passenger cars and vans in the environmental zone (independent of the legal possibility) would increase the result significantly? Why or why not?
If you have an environmental zone even for light vehicles under 3.5 tons, then there is only a risk that enforcement of the regulations will not be good. Under the proposal is concerning light vehicles is about to base rules even for light vehicles on a vehicle's environmental classification. Individuals know very seldom the environmental classification of their vehicles. I think profits will be marginal but the cost is very high for those who still follow the rules.
5. Why is the strictness level chosen as it is now in Stockholm?
Earlier on, municipalities could themselves decide what the maximum age that would apply to vehicles within the environmental zone would be. Now it comes from the national traffic rules which vehicles are allowed for the municipalities that have an environmental zone.
5.1 The national rules are of course the rules a municipality has to follow. My question is here, when Stockholm could choose for themselves, would they want another strictness level? And why or why not?
In Stockholm we think it is good that there are the same rules in the country. It is problematic if the rules are different in different Swedish cities. We already have problems with different rules in different cities in Europe regarding Environmental zones.
5.2 Do you think the rules for the Swedish environmental zones should be stricter than they are now?
I think we have come as far as we can when it comes to diesel-powered heavy trucks and heavy buses. The focus in the future will be on getting more electric-powered heavy vehicles. Unfortunately as it is now, heavy vehicles and most preferably heavy trucks, are still diesel vehicles.

6. What was the method for enforcement? And why?
For the rules to be respected, it is part of the police monitoring to ensure compliance with the rules.
6.1 With police monitoring I assume that you mean manually? And I can understand that it is done this way, because a camera system is expensive. Has it been considered to use other methods? And if so, which methods and why didn't you choose them?
Police checks whether the environmental zone rules are respected or not in combination with other regulations controls for heavy traffic compliance, for example, the driving and rest periods and possible overloading. The police has a heavy traffic group that looks at all aspects of the heavy traffic. In contacts with the police, there have not been mentioned other proposals on checking compliance with environmental zone.

7. What do you consider successes and failures of the low emission zone? And why?

In the beginning hauliers had a resistance to the introduction of the environmental zone, but they accepted it after a few years. Some even had it as a marketing ploy to tell me that they met environmental zone requirements. In an evaluation conducted in 2000, there were significant environmental benefits with environmental zone compared to if we had not had any.

7.1 You state that there were significant environmental benefits, has it also been assessed in this evaluation why this result was observed? Was it the geographic scope, enforcement or something else?

The assessment is an estimate / calculation of what the air pollution in 2000 would have been without environmental zone and with the environmental zone. The 'with' scenario includes the installation of particle filters and the purchase of more environmentally classified vehicles that takes place before the environmental zone and without the environmental zone.

7.2 Did you or the environmental zone evaluation assess possible reasons why the environmental zone had an effect? Was this only vehicle replacement? Or maybe also something like changed routes, switching to smaller vehicles (i.e. vans) to deliver goods in the environmental zone?

Why the environmental zone had an effect very much depends on the installed emission control on old vehicles. Engine replacement improved the environment class of vehicles and transport companies bought new vehicles earlier than they would have done otherwise. Since it was important that the police handled the monitoring of the environmental zone rules. The monitoring of the rules were handled hardly at all in the beginning, but became better when I was with them and verbally informed them. In the beginning it was tried to change the routes, but it is something that does not work for a long time, sooner or later they have to transport into the environmental zone and then it is best to have miljözons approved vehicles. Driving more shipments with less vehicles will also be difficult in the long run as transportation becomes more and the cost will be higher in time.

8. What is the most important aspect for a successful low emission zone in Stockholm? And why?

It is important to inform, happy to have reference groups with participants from åkeribranscen with. There has been a smooth transition when there is informed in time and when trucking companies are able to adapt their fleet of vehicles for the environmental zone rules.

8.1 My question here is rather simple, what is åkeribranscen? Is it some sort of organisation?

The haulage industry is the organizing hauliers but you can also say that there are also those companies that are not in the organization, that is all as fleet owners. The organization that we have had much contact with the AB-skiers, that Haulage Association for trucking companies in the Stockholm area. Their website is http://www.akeri.se/.

9. What are risks for a low emission zone that should be avoided?

Lack of information and that they must be able to demonstrate the environmental benefits an environmental zone causes.

9.1 You state that 'they' must be able to demonstrate the environmental benefits, my first question here is: who is they? And my second question: is this a risk that should be avoided? It sounds like you say that it must be avoided to demonstrate the environmental benefits, I guess that is not what you mean? Or if you do, I would like to know why?

The city will introduce environmental zone and must show to their taxpayers that the city is in need of an environmental zone and that it will bring profits. The

environmental zone is a cost for haulage companies, communities and ultimately consumers, it must therefore be a clear need to introduce environmental zones. The municipality can demonstrate that the benefit outweighs the cost is rarely criticized by the general taxpayer, while hauliers might look more to their own benefit than societal benefits. The municipality must simply produce a report showing that the air is so bad that there is a great advantage to introduce environmental zone.

10. How did the decision making process go?

First 1992 amended text of the law so that the municipality was able to introduce environmental zones. In spring 1993 the City Council decided that it would work to ensure that all diesel vehicles that did not meet the Swedish environmental class 1 would be banned from 1997. In spring 1995, a decision was made that the environmental zone would be introduced 1 April 1996. The decision was appealed and environmental zone was introduced instead of 1 July 1996.

10.1 You said the decision was appealed, I am curious why? Was it the environmental zone in itself, the strictness or something else?

The haulage industry appealed simply because they are a cost to hauliers when they have to invest in particulates filter or new vehicles. They did not like the introduction of the environmental zone.

11. Do you think there should have been decided otherwise when you now look back at the decisions made?

12. What can others learn from Stockholm? (answered together)

I think we largely made it in the right way, but there will always be issues addressed that become a surprise. But in the large lot you have to be satisfied with the process of facing environmental zone in Stockholm. We have in our engineered materials, eg evaluation of environmental zone in Stockholm 1996-2007, the historical event how the whole process went and the issues that arose.

12.1 The issues you talk about that become a surprise, can you give examples of that in the case of Stockholm?

There were a lot of problems that we did not expect to appear; at that time it was not allowed to install particle filter on a vehicle and then give an exemption to the vehicle based on vehicle cleaner emissions (some rules may be a bit bad, considering that the particle assembled particles reduced by 90%). We then got in 2006 to phase out the possibility to upgrade vehicles with particulate filters.

Interview Copenhagen 1 (C1)

I read of course some literature about the low emission zones and these first questions are more a bit like to verify if what i found in the literature is also coming back in the interviews, so my first question is:

1. What are, according to you, important elements of low emission zones in general? And why?

I think in general it's an opportunity that the European Union gave the member states in controlling air pollution in hotspots you could say, because in the directives it's referred to as non-technical measures that member states and cities can implement. So I guess that the idea is that the EURO standards and so on and all the enforcement and control you have on the vehicles and fuels and the industry and all that, that should provide for a generally good air quality and in hotspots and street canyons and so on, you could have elevated concentrations and you kind of need a more geographic tool to take care of that is the low emission zone. This is one way of doing that. So it's an exact method for member

states to have this kind of control even though it's a hindrance for the free movement of goods and all this. So i think they should be seen in this context.

2. What do you think is important about the Copenhagen low emission zone? And why?

Well I think in Copenhagen, the emission zone is only targeting trucks and buses so heavy traffic and… So I think even at that time it was not that ambitious because like in Germany they have more stricter low emission zones. But it was a good start you can say. I mean, we implemented it at a time when it was so new… you saw it before in Sweden also but I mean we were maybe a little late with that but I'm pleased we did it. But I think if we look at it today, it's actually not very effective anymore today, because what we require is a EURO 4 at least or if its a EURO 3 you have to have a particle filter. But as you know, the new vehicles are EURO 6 today and so on, so I mean that the effect of the low emission zone today is vanished. Of course we had a higher effect when it was introduced but since there is no... it's not like the requirements changed in years and things like this, so it's more like a frozen low emission zone. So of course when the years pass the impact will be lower and lower due to replacement of vehicles.

2.1 So you're actually not that content about the way they implemented it because you think it could have been more ambitious than it is?

Yeah I think maybe at that time you could say it was something new and it can also be difficult to implement because we have had discussions later on to have extend or it has actually been extended in geography once in Copenhagen but there have also been studies looking into if passenger cars and vans should also be included and we had this study where we looked into what the possible impacts would if we did the same thing as was done in Berlin, they also have not only requirements for heavy duty vehicles but also for passenger cars and vans. So I think if you look at it today it's not very ambitious also if you look to low emission zones in Sweden. They have requirements to the number… or the age of the vehicles so they say something like: 'it must not be more than 8 years', something like this, I can't recall the exact figures. But I mean it's more dynamic in that sense, so it's always as time goes it does diminish the effect of the low emission zone. We have done calculations that as you know in 10 years from when it was implemented in 2008, so it is more or less now that in a few years that then there will be no remaining effect because of the replacement of vehicles.

2.2 Copenhagen also looked into affecting passenger cars but why then hasn't they decided to do so? Was it to controversial or something or what were the reasons not to include passenger cars?

It has been considered a few years ago to extend the low emission zone to include passenger cars and vans and basically have the same low emission zone. I think you know if you regulate passenger cars and vans, then you actually influence a lot of cars. You are asking a lot of potential voters and small businesses and you are also targeting older cars. So this is not the richest part of the population. Part of it was, it affects too many people, small businesses and maybe less strictness, that would not be actually that great. So that is what I think of it but I mean, you have to ask the policymakers themselves you know why they finally decided not to do it. It is my interpretation right.

Yes of course, I understand that you're not from the municipality so I'm just asking for your view on why you think they haven't chosen the way they did.

3. Could you maybe say what you think why is the choice for the current geographic scope was made? As far as you know.

I think the original geographic extent didn't followed the municipality borders of the municipality of Copenhagen. There were some complaints about this and then they changed it to the municipality's borders of Copenhagen. So it was a kind of, I don't know, internal thing in the municipality of Copenhagen that some of their citizens were not included in this low emission zone and some were. So it was not a big change but it was extended.

3.1 So some of the citizens in Copenhagen wanted the low emission zone to be the whole municipality's size?

Yeah.

3.2 Okay I think that is quite interesting, because in your answer before it's like that passenger cars were not included because it would affect a lot of potential voters so it is a lot of a political decision then. But they are also asking to extend it when it's only for trucks and buses. So, I think that's interesting.

You also have to remember that in Denmark it's the state that made the legislation for the low emission zones. So they have made a legislation where it's an opportunity for the 4 biggest cities to make these low emission zones and some regulations cause what you can do and how you should do it so it is not up to the municipality to actually… I mean they can not decide: now we just want to have a more ambitious low emission zone. That's a decision on the national level. You understand this?

3.3 Yeah I have read that it's a national legislation and that there is not a lot of room to vary on what you can do.

No, there is absolutely no flexibility. It is only in the matter of the implementation and on when exactly to be implemented.

3.4 Yeah and like the area that would include the low emission zone right?

Yeah I think. Then I have to reread the law but it is something like the four biggest cities and the geographic area. I mean it's not specified exactly what this area should be. So it is actually also up to final approvement from the national level you know what's actually defined this geographic areas because I think it is only because the municipality of Copenhagen is just an entirely built up area and where it is for the most cities that also have these low emission zones. They have the city then kind of in the centre and the you have a bigger municipality around it, so there you have to decide… you have the low emission zone more or less a central part of the city.

3.5 Yes that's the case in the Dutch low emission zones, in general it is only like a really small part of the city which is concentrated in the city centre.

I think some of the original arguments were that you know, you should focus on where the concentrations were highest and you had the highest population density. So you had the highest exposure. So that's the reason why you have a generally small geographic extent of these low emission zones.

4. Why are only trucks and buses affected by the low emission zone in Copenhagen? (Answer in 2.2)

5. My next question is why is the strictness level chosen as it is now? But as I heard from you earlier it's more a national decision.

Yeah because actually the municipality of Copenhagen has been very much in favor of... I mean extending the low emission zones to also passenger cars and vans. So it was actually a government decision not to do this.

Because you… I mean if you look at a map of the Greater Copenhagen area, then okay you have Copenhagen and some quite small other municipalities. Copenhagen is a quite small area and then… so you have a lot of people who are

using their cars and living in the outskirts of this maybe Greater Copenhagen area and then driving into the municipality of Copenhagen right. And then when they all spread they go home and of course that are the people who are being affected you could say because you have many people in Copenhagen that don't have cars. Because you know you have good public transportation, use a bicycle and so on. It is really a pain in the ass to have a car in Copenhagen. So you can say a low emission zone would be… I mean the benefits would be for people who live in Copenhagen and some of the disbenefits would be for people who are from outside. You know it's restricted in the access to Copenhagen or they have to buy a newer car, something like this right. So it's, I don't know, it's logical that like the municipality of Copenhagen would be in favor of such a policy measure.
5.1 Because they get the advantages as you said already.
Yes.

6. My next question is what was the method of enforcement? And why did they choose this method?
I think… I can look this up, we haven't really been much into this because it's the municipality of Copenhagen which has the authority for enforcement. And I think they… I mean... you know you have to have like a sticker you put in your windscreen and then I think it was… they worked together with parking, it's not police, you know the people who control that you park correctly and I think they were told to look after parked trucks you know and if they didn't have this correct sticker then they report it to the police, something like this.
6.1 Okay yes so manually not with cameras or something?
No not with cameras.
6.2 I can guess why they didn't chose cameras, but asking it… the method of enforcement. Because I can understand that such a system is quite expensive, especially when it is only for trucks and buses, it would be inappropriately expensive probably.
Yes.

7. What do you consider successes and the failures of the low emission zone? And why?
Well I think it's relatively effective actually to target the heavy duty vehicles because okay that is not a lot of them, but they have high emissions. So of course it's logical to control them. Also, I mean it has been… if you look at the way it has been implemented and the information about it. There has been enforcement about it, so it has also worked in reality. We have also documented some benefits, of course it is not going to change the world but I mean… I think we saw more than 10 percent reduction of NOx, just from targeting you know… I mean if you look at heavy duty vehicles, they are not more than like 4 to 5 percent of traffic. So that was better now. So you can say of course maybe countries have low emission zones but at least we have one, it's not like we don't have one, so I guess that is also a success. But where we have been unsuccessful is that we haven't really developed it. So like we haven't extended it to like older cars, for passenger cars and vans and of course you should also have a more dynamic system, where you know you should regularly change the requirements otherwise it doesn't have an effect in the long run.

8. And what do you think was the most important aspect for a successful low emission zone in Copenhagen? And why?

Yeah but I think it has been successful in the way that we actually have one and it is also targeting some of the traffic that pollutes the most. But it's just that also at that time it was not that ambitious and it has failed to be developed.

9. If you establish a low emission zone, what do you think are risks that should be avoided?

Of course it's very important that if you decide on a low emission zone that you also enforce it. So there should be effective enforcement. Then I think also I mean of course communication is a very important aspect you know... I mean it can potentially affect a lot of people so you really have to be very good in informing these people about what is going to happen, anything like this. And then also I think if you're considering a new low emission zone you should also think to have it in a dynamic way so the benefits will not just vanish you know in 5 to 10 years, something like this.

10. Do you know something more about how the decision making process went? Was it like an easy process or was it contested a lot?

Actually at the time it was a conservative government. Yeah it was part of the government and it was of a conservative party. They actually came up with this proposal. I think actually internally in this conservative party there was some opposition but at that time they had a quite strong minister. She was the minister for environment and she was very strong, she also became later commissioner in the EU commission. It's Connie Hedegaard, I don't know if you know her?

10.1 I don't recognize the name now.

Anyway, I think… I mean at that time we had problems with exceedances of the limit values of particles and also for NO2. Of course there was also I mean… people doing transport etcetera, those were affected of course, some of them were also annoyed about it. But on the other hand, you also had the representatives from the… what do you call this… like trade organisations for transport that actually saw this as a way that the trade could improve their image in the population you know, because you regard the trucks and this pollution and all this noise and whatever, and you know by being part of this you could say they could improve their image in the population.

11. We have touched upon the next question I have already a bit, but do you think there should have been decided otherwise when you look back now at the decisions made regarding the low emission zone in Copenhagen?

Yeah I think at that time, we actually were only discussing more or less this initiative for heavy duty vehicles. So it was not that there was a lot of discussion about a lot of other things. It was very new at that time so you more or less discuss what's on the table. But then, what is it, like two years ago there was a renewed debate you know to improve the low emission zone. So we have discussed about this and it failed, so to say. So the problem is more that we haven't been able to develop it. That's the problem in my point of view right?

Yes of course.

12. And what can others learn from the low emission zone in Copenhagen?

I mean they can learn that there is an effect. We have documented that for particles and also for NOx. So definitely there is an effect, of course the more vehicles that are affected the higher the positive effect, that is obvious. And I think what you should learn that you should not choose a frozen policy or at least… I mean if you know, you should built in either some kind of evaluation of this or some dynamics, like you know tightening of the requirements in coming

years or something like this. Make some kind of stage 1, stage 2, stage 3… something like this to continue to improve the zone.
(end note) Okay that were all the questions I had. So thank you very much.

Interview Copenhagen 2 (C2)

1. What are important elements of low emission zones in general? And why?
The objective of establishing a low emission zones in general is to improve citizen's health by reducing particle emissions from heavy-duty diesel-powered vehicles. In order to address this problem, the Danish Parliament passed in 2006 an act allowing the four largest cities in Denmark to introduce low emission zones (LEZ). LEZ apply to all diesel-powered trucks and buses over 3,5 ton. The vehicles must either meet Euro 4 standard (or newer) or be retrofitted with an effective particle filter. Particle filters must remove a minimum of 80% of particles in the diesel engine exhaust.

2. What are important elements of the Copenhagen low emission zone? And why?
As mentioned above the important elements of Copenhagen LEZ is to reduce particle pollution in order to improve citizens health. The LEZ requires that diesel-powered trucks and buses are equipped with effective particle filters. The LEZ was introduced into stages. From September 2008 all trucks and buses with the Euro emission standard II or older have to meet the requirements and from July 2010 also Euro emission standard III is included.

3. Why is the choice for the current geographic scope made?
LEZ covers whole of Copenhagen, and is in operation 24 hours a day, every day of the year. City of Copenhagen can only determine about Copenhagen geographically.

4. Why are only trucks and buses affected by the low emission zone in Copenhagen?
The Danish Environmental Protection Agency has assessed that heavy-duty diesel-powered vehicles were responsible for approximately half of the harmful particle pollution in the largest cities in Denmark.

5. Why is the strictness level chosen as it is now in Copenhagen?
As I mentioned above the parliament has defined what vehicles are included in LEZ. It needs to change the law if the City of Copenhagen wishes to expand the LEZ in order to include other vehicles. In June 2010, the parliament adopted a number of changes and additions to the Law on low emission zones. The new law means that the municipalities in Denmark, which has already introduced an environmental zone, will now be able to strengthen the rules in the zones. This applies not only buses and trucks, but also vans. Vans can be included in LEZ, if the limit values for particulate matter were exceeded. This is not a case in Copenhagen. The city of Copenhagen has tried in 2013 to implement a Clean Air Zone, which is a similar with the LEZ in Berlin. But unfortunately the Ministry of Environment didn't wish that.

6. What was the method for enforcement? And why?
According to the law the enforcement should take a place by the parking wardens and the Copenhagen Police, which is the only authority that can stop illegal vehicles. The enforcement is devised between Copenhagen Police, The City of Copenhagen and the Danish EPA. Municipal parking wardens keep an eye on the parked vehicles whether they comply with the law and they got a valid LEZ mark, and the police control driving vehicles. EPA is responsible for cases concerning waivers. It has been essential from both police and the municipality that this monitoring/supervision work must be managed and coordinated by a key employee in order to ensures uniform processing concerning police declarations and monitoring procedures, as well as the municipality can keep statistics on the number and types of violation of law.

7. What do you consider successes and failures of the low emission zone? And why?
LEZ has been a big success in Copenhagen. The objective was to install particle filters on the most polluted heavy-duty diesel-powered vehicles, and it has succeeded. A report shows that effects of the LEZ on particle emissions (Tailpipe emissions from heavy-duty vehicles) were reduced by 60% in 2010. It is as a result of Euro 3 and older vehicles being retrofitted with particle filters and some being replaced with newer Euro 5 vehicles which have lower emission standards. Although reduction of NOx emissions is not the primary objective of the low emission zone, these emissions are also reduced due to a shift in emission classes of the heavy-duty vehicles. Total NOx emission from heavy-duty vehicles is reduced by 25%. Primarily used opacity method for checking whether the particulate filter is working or not. The control method is big challenge because it a control of a emissions niveau and can't detect malfunctioning filters.

8. What is the most important aspect for a successful low emission zone in Copenhagen? And why?
The environmental requirements should include all vehicles and not only heavy duty vehicles, which account for a small share of Copenhagen´s vehicle fleet.

9. What are risks for a low emission zone that should be avoided?
I think that requirements in LEZ should be dynamic and in step with technological development. The dynamic LEZ will hopefully ensure that the requirements are up-to-date to the cleanest technology all the time and without requiring the parliament approval.

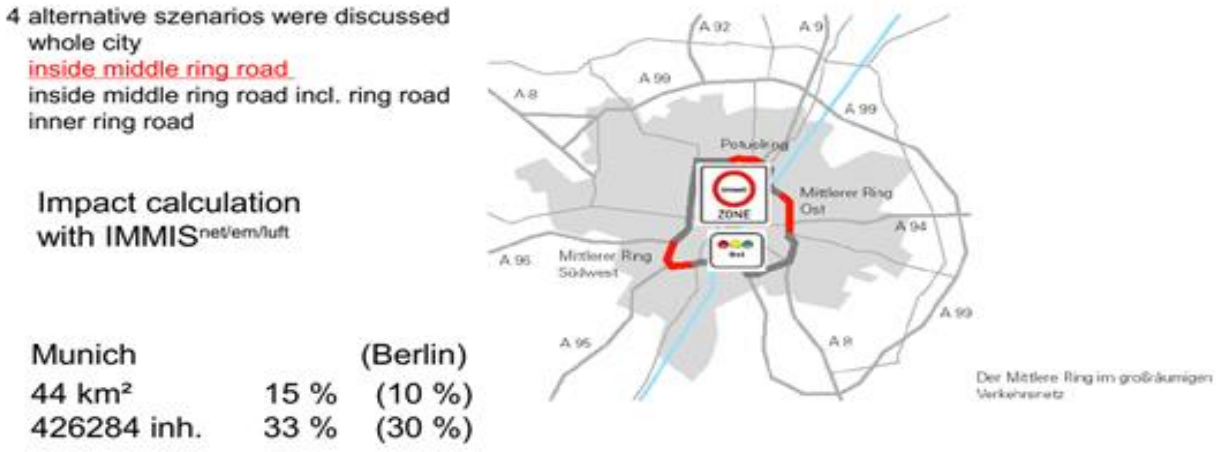
10. How did the decision making process go? Problematic situations?
11. Do you think there should have been decided otherwise when you now look back at the decisions made?
12. What can others learn from the low emission zone in Copenhagen?
Below cover the last three questions 10, 11 and 12:
Generally the decision was based on a dialogue between EPA, the police and The City of Copenhagen. We didn't have big challenges in introducing the LEZ, but the problem we must focus on is the vehicles become cleaner and cleaner and the effect of LEZ decreases by time. There is a need for the requirements of LEZ should be updated in order to ensure that the LEZ constantly updated compared to cleanest technology option.

Interview Munich 1 (M1)

1. What are important elements of low emission zones in general? And why?
   To avoid high emission cars in cities (renew the car fleet) –> to lower the emissions in cities.

2. What are important elements of the Munich low emission zone? And why?
   See above.

3. Why is the choice for the current geographic scope made?
   Four different scopes were discussed. The City Council voted for the scope which gives the chance to avoid the LEZ without problems (inside our middle ring road) and to use public transport.
   3.1 You talk about four different geographic alternatives, what are the scales of the other (not chosen) options? For example the whole city or smaller area. And what were the most important downsides to these choices?
   The whole city (grey area): traffic displacement to suburban areas
   Incl. middle ring road: traffic displacement to smaller roads
   Inner ring road: area too small
   We are discussing at the moment incl. Middle ring road and the whole city



4. Why are almost all vehicles affected by the low emission zone in Munich? This is not the case in most other countries, so why is this the case in Germany?
   This is due to the sticker system in Germany/Munich, which is due to PM.
   4.1 What is the reason that cars are included in Germany and therefore also in Munich?
   There was no discussion about this in Germany.
5. Why is the strictness level chosen as it is now in Munich and Germany? Why not stricter or less strict?
   Only the strictest level makes sense. We had three stages to realize the highest level, only green stickers are allowed now inside the LEZ. The sticker system allows no stricter level.
   5.1 How does the possible new blue sticker fit in the 3 stages system, will this add a 4th stage?
   It is a 4th stage for extra clean vehicles, maybe EURO 6/VI emission standard. But nobody knows at the moment, because we would need a lot of exemptions.
6. What is the method for enforcement? And why?

To create a new sticker for cleaner diesel (passenger) cars, we have to lock out dirty diesel cars.

6.1 If I understand it correctly, the enforcement is done by the police. Why aren't camera systems used?

The police can control the flowing traffic and the parked cars, the municipal traffic supervision only the parked cars. No cameras: this is due to privacy protection.

7. What do you consider successes and failures of the low emission zone? And why?

People should be aware of the emissions of their cars and that works only with restrictions and headlines in newspapers. At the moment with ongoing court decisions in Germany and Munich incl. headlines in the newspapers people are asking what car they should buy or lease in the future.

It is very difficult to evaluate the effectiveness of a LEZ because you have to exclude all other influencing factors, e.g. weather, traffic density, car fleet. In Munich we do not exceed the limit values of PM_{10} since 2011.

7.1 What you are saying about the court decisions and newspaper headlines, is this a success or fail factor?

This is my private opinion: without court decisions and headlines we would have had (maybe) no low emission zone or HDV ban in Munich or much later.

8. What is the most important aspect for a successful low emission zone in Munich? And why?

Almost all cars do have a green sticker, but you have to control it by the police and the local municipal traffic supervision.

9. What are risks for a low emission zone that should be avoided?

There are no risks.

10. How did the decision making process go? For example resistance or heavy discussions?

In Germany the 'Länder' are responsible for the Air Quality Plans in which a LEZ must be determined. The plans should define a LEZ together with a city and involve the public, especially the stakeholders at an early stage. The City of Munich spend some money for a public campaign.

10.1 Have there been appeals or other difficulties before the low emission zone policy was implemented?

We did a public campaign (200.000 €) before implementing the low emission zone and published a handbook of exemptions, so not many appeals or difficulties occurred.

11. Do you think there should have been decided otherwise when you now look back at the decisions made?

11.1 Do you think that the right decisions have been made regarding the low emission zone? Or do you think the decisions should have been different?

We had 3 stages implementing the now existing low emission zone, this could have happened faster.

12. What can others learn from Munich's low emission zone and the German low emission zones in general?

A compatible sticker system is needed at least for a country (or Europe).

Interview London 1 (L1)

1. What are important elements of low emission zones in general? And why?

a. Large area – to stop non-compliant vehicles driving around the LEZ and to influence concentrations over a large area (the background component in city centres can be large).

b. Source apportionment – how much of the emissions come from road vehicles – if only a small amount then the benefits of a LEZ will be marginal.
c. Entry requirements – are the right vehicles being targeted? In London originally only HGVs and therefore the only measureable impact occurred on those roads with a high proportion of these vehicles, which was outside the city centre where concentrations were the highest. Also the emissions criteria were not stringent enough. If 90% of the vehicles on the road meet the requirement, the benefit of a LEZ will be small. The idea behind LEZs is to accelerate the rate of fleet turnover. I.e. accelerate the proportion of cleaner vehicles.
d. Enforcement – best done by automatic number plate recognition (ANPR) cameras, but this is expensive to establish.

2. What are important elements of the London low emission zone? And why?

a. There is little robust evidence that the London LEZ zone has been effective at improving air quality. It was largely aimed at reducing PM emissions; London complies with the EU ambient air quality directive for this pollutant. The LEZ entry requirements are not very stringent.
b. Ambient PM_{10} comes from many different sources with secondary PM playing an important role. Source apportionment shows that the contribution from the exhaust emissions of local traffic is relatively small, and as this is the only component that is affected by a PM LEZ, it has a limited ability to result in a material improvement to air quality. Euro V/5 vehicles have diesel particle filters filters and this has been more effective than the LEZ which restricts only pre-Euro IV HDVs /pre euro III vans.
c. For NO_2, the EU limit value is widely exceeded in London, but there was little improved mention real world NOx emissions from diesel vehicles between Euro 1 and Euro V/5. It has only been with Euro VI/6 that the emissions have substantially reduced. Therefore one would not expect any NO_2 LEZ to have been effective unless it applied to Euro 6 vehicles (I am not aware of any LEZ that use this as an entry criteria yet; mandatory for all new cars only from September 2015).

3. Why is the choice for the current geographic scope made?

See comment in 1a above.

4. Why are passenger cars not affected by the low emission zone in London? And why a lot of other vehicles (trucks, vans) are?

The new ultra low emission zone in central London will apply to all vehicles including cars as follows:

- *Euro 3 for motorcycles*
- *Euro 4 for petrol cars, vans and minibuses*
- *Euro 6 for diesel cars, vans and minibuses*
- *Euro VI for lorries, buses and coaches*

The last Mayor of London said this would apply in a small area of central London from 2020; the new Mayor may implement it earlier and over a larger area.

There are [perceived] political difficulties in restricting the use of passenger cars. When a previous government increased fuel prices by 5% above inflation each year (to reduce CO_2 emissions) there were large demonstrations around fuel distribution centres, which lead to a fuel shortage, and a political reluctance to address pollution from cars.

5. Why is the strictness level chosen as it is now in London?

See answer to 4 above regarding the new ULEZ which may be introduced from 2018 or 19.

6. What was the method for enforcement? And why?

ANPR cameras – most effective means, especially for a large LEZ such as London's (I believe it covers 1,800 km2).

7. What do you consider successes and failures of the low emission zone? And why?

See answers above.

8. What is the most important aspect for a successful low emission zone in London? And why?

There is no robust evidence[1] available it has been successful for reasons given above. However I believe the ULEZ should be more effective than the current LEZ, because of the real world emissions from Euro VI/6 vehicles are lower than from previous generations but its effectiveness will decline over time.

9. What are risks for a low emission zone that should be avoided?

a. Targeting the wrong vehicles (do good source apportionment before setting up the LEZ)

b. Not setting the entry requirements sufficiently stringent.

c. Not updating the entry requirements frequently to keep up with the changing fleet composition.

d. Poor enforcement.

10. How did the decision making process go?

Pre-LEZ studies informed how the design of the LEZ, then political decision making, consultation, finally implementation.

11. Do you think there should have been decided otherwise when you now look back at the decisions made?

Answered above.

12. What can others learn from London's low emission zone?

Answered above.

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[1] Some studies of the London LEZ (and other LEZs) have failed to adequately account for the confounding factors including the weather and other policy interventions that occurred at the same time.

Interview London 2 (L2)

So my first question is basically to verify a bit what I have read in the literature or just if you would say other things than I have read.

1. And my first question is, what are important elements of the low emission zones in general? And Why?

Okay so… before I will answer your question, maybe I should give you a summary of where TfL and London is at in terms of low emission zones. Just in case you're not fully up to speed. So at the moment we have a London wide low emission zone… I think the largest in Europe or the world. It was implemented in 2008 and gradually tightened up. After the interview I can send you information you know, reports and stuff like that if that's helpful just so you can dig into the details. And that was designed primarily to tackle particulate matter so you know PM10s and 2.5, and was applied to heavy vehicles so lorries, coaches and buses. That was gradually tightened over time so to begin with… it was I think it might be a EURO 2 or EURO 3. But the stuff I send you will clarify. And then over the years, we tightened the standards and included more vehicles, so now it includes large vans

which I think have to be EURO 3 and all the heavies have to be EURO 4. I take you understand that EURO standards of vehicles?
1.1 Yes I understand that.
So but now you may have seen from sort of a literature we've under the last mayor Boris Johnson, he agreed… approved the ultra low emission zone which is in central London. The same area as the congestion charging. So I think it's about 20 to 30 square kilometres, the central area. And that is due to come into force in September 2020. And that sets standards for NOx emissions so London is largely compliant now with… suddenly the last time differed. The department for Environment, Food and Rural Affairs who is responsible for reporting compliance or not with the EU directives of the air quality, reports that we're compliant with the PM limits. But we're not compliant with NO2 concentrations, nitrogen dioxide, due to be compliant in 2010 and I think last time the report was done it wasn't till 2025. So the ultra low emission zone in central London is to target that where the concentrations are highest and that was forecast to have quite an impact reducing emissions from heavy transport, for NOx by about 50 percent. But then we have had an election last year in may and we got a new mayor, Sadiq Khan, who… it was a big part of his manifesto pledge because there is obviously a growing interest, a lot of media coverage around the air… (sound was cut off). So since he has been elected, we've undertaken two consultations about his proposal. And also he is in favour of the congestion charge, which is like a stepping stone scheme just like a scheme which we are introducing this year ahead of the ultra low emission zone which is targeting pre EURO 4 vehicles again all the… if I said new stuff ring a bell, but that's now been agreed ahead of introducing the ULEZ in central London sooner, in 2019, and expand, getting it to cover a wider area so again that will be in the report… kind of the thinking around that. So that's where we're at in terms of the low emission zones. So shall I get back to your question now? Unless there is anything else you want to ask me on that.
1.2 Yes one short question maybe because the last thing that they wanted to expand the ultra low emission zone I haven't read yet. So is there already an agreed geographic extent or something? Or still to be decided?
There has been a public consultation, two of them actually. They're not, they haven't been statutory consultations so they have been opinion gathering, you know seeking views on his ideas. But later this year we'll have the statutory consultation required to make the actual changes. And in the reports I'll send you that will all be detailed. So the ultra low emission zone, his idea and summary is: in central London introduce it in 2019 instead of 2020 and also expand it to go up to the north/south… what we call the inner... is the ring road North/South Circular. So I think just to memory this central London congestion charging area, which is where ULEZ was originally planned to cover, is about 20 to 30 square kilometers and I think the inner London area is getting to about 350 square kilometers and he wants to expand it to cover that area. But then, he also wants to expand it even further just for heavy vehicles London wide. Because in outer London actually the high concentrations of NO2 follow the strategic roads where the… you know, where there are a lot of lorries and heavy vehicles. So that's why he's not proposing to extend it London wide for all vehicles because that is not necessary and you have to balance that against the cost of the camera infrastructure and costs of people complying. So it's kind of… we can end up with potentially with 3… like a central area and then 2 other ones going out but in the report that's public, it shows graphics and stuff of all this. You can understand a lot easier. But that's not confirmed. We're doing this, actually consultations this year to potentially put that in place subject to consultation

1.3 Okay clear.
So do you want me to go back to the questions then?
1.4 Yes let's do that.
Okay so what are important elements of the low emission zones in general and why? Well, I think for us the important thing is understanding the impacts that you have in terms of health benefits. So you know the driver for improving air quality is health. There is a lot of evidence about the health impacts of particulates and NOx, but it's also about finding the right balance of when you introduce the zone, what charges you use in order to encourage people to switch to cleaner vehicles and what vehicles it applies to. So our general approach with low emission zones is: we want people to switch to cleaner vehicles, not just pay the charge, if they're paying the charge you know it raises revenue which you can potentially invest in sustainable transport etcetera but that's not primary objective of the scheme. We're trying to clean the air. So you need to… for example if you make your standard too strict (sound shortly cut off) started coming out in 2015. So if you... it's been out one or two years now. If we were to introduce a… the ultra low emission zone now, there would be a minority of vehicles that would actually meet that standard. So most people will be forced to pay the charge, so effectually you have the congestion charging effect which isn't the objective of the scheme. So you have to look at the fleet evolution over time... we have to understand our vehicle fleet and how it is going to evolve, how the EURO standard will start to filter through and finding the right point in which to implement the scheme to get that switch. With the ULEZ it was for memory again around about 70 / 75 percent of the vehicles would already be compliant in 2020 when the scheme is coming in… but with the scheme you get that up to say 90 / 95 which we think is about the right place to pinch it. If you introduce it too early you just end up with people having to pay the charge. They don't have a choice or you get the modal shift to several modes which maybe the objective of the scheme as well and that is fine, but certainly with these schemes so far it's been about getting people into cleaner vehicles. We did work, doing stated preference surveys to try and understand which charge level is most likely to get people to make the choice in trying them to make in terms of upgrading their vehicle. The other thing with low emission zones which I think is a real benefit in terms of balancing the costs. We have to think about not just the costs of implementing the scheme, but the cost of what we call the cost of compliance so the cost of the public of either having to upgrade their vehicle or pay the charge. And what I like about low emission zone schemes where you pay a daily charge for example as opposed to say a ban on all the polluting vehicles which is a whole other story about… we don't have powers to implement that in London in the same way that other countries have... are proposing to do, putting aside the effectiveness it might actually have in those countries. With people who are travelling a lot into the zone, after a while it costs them so much that it's more cost effective for them to switch to a cleaner vehicle. But then say you are coming once or twice a year, you can afford... you know it's cheaper to pay the charge and I think that's okay. Rather than forcing everyone to upgrade their vehicle, those who come in very infrequently are not having a big impact anyway so I think it's fair to allow them to come in and pay the charge. The frequent drivers who are having a big contribution to the emissions, it will start to cost them so much that they are changing. So we actually look at when that tipping point might be to try and understand the effectiveness of the scheme that were proposing.

1.5 That is clear. I think we already touched upon a few of the next questions but let's just continue and then go more into detail probably when that's question comes up.
Maybe yes, so question 1 is question 2... is similar, one is in general and two about London. I suppose the other thing I would say about low emission zones and certainly in London would be: I think you should apply anywhere is, you need to have… they need to be well enforced. I think the schemes are quickly undermined if people think they don't have to pay the charge or they're only caught occasionally and you need to make it easy for people to pay the charge as well so we have autopay in London with the congestion charge and with low emission zone and that's what we will have with the ULEZ when that comes in. So people can sign up and they have an account and they don't have to actively go to the shop and buy a pass for the day or go on the internet. We will detect their vehicle through their number plate and they're already registered and then they are charged the appropriate amounts. So you just… you make it as easy as possible for people to comply with the scheme and you give them confidence that the scheme is enforced and everyone is doing their part. I think that's quite important.
1.6 Yes I think that is a good point. (question 2 is also answered in this part)

3. So you already mentioned in your... kind of introduction about the low emission zone, that the size is like the largest. So I was thinking why did they choose in london to let it include like the whole city? Because most of the cities take like the city centre.
With the low emission zone, and this was before my time, but we were targeting heavy vehicles that come in on the strategic roads. So right across London we would have had problems with particulates obviously often more intensive in the central area but only with the London wide low emission zone is targeting heavier vehicles using the strategic roads that's where the cameras are focussed. So there's a cost effectiveness there so if you have a London wide scheme that's targeting cars you would need a lot more cameras, you would need cameras and signage on roads where there isn't even an air pollution problem, so residential roads and stuff in outer London. London is a huge city it's very different on the outer than compared to the inner and central... I mean, you pass outer London you feel like you are in the countryside it can be you know so not very densely built up. But with the actual geographical boundary, so obviously you want to target it in the areas where you have a problem and where you can understand that through the upgrading of the vehicles that's going to deal with that problem. So that's why we're guided heavily by our own modelling of the concentration we have an extensive network of monitoring stations, we often argue some of the most honest monitoring of other cities… some other cities don't report having such a bad problem but then they have their monitoring locations not necessarily right next to the road I mean I wouldn't name any names but I think we have quite an honest approach to what the actual problem is and I think we're also world leading in terms of our modelling do you know and testing the vehicles to understand the difference to being the official test cycles and the copa emissions factors if you're aware what those… are used to model the emissions of traffic and seeing what… we use our own London drive cycles impact. So you really have to understand where the pollution problem is, what's contributing to it and try to estimate as robust as possible what will be the impact of your policy and will it deal with the problem. But also on a more local level you have to think about how people… we often have some boroughs, so London is made up out of 33 boroughs… well 32

boroughs and the City of London, their boundaries are really... they follow little residential roads, they go down the central road etcetera. Some of them were calling for the boundary to go around their actual borough but if you are a driver you don't know where those boundaries are most of the time. So you have to have a boundary that's easy to communicate. So having it… okay it's London wide, I get that covers all of London… that's easy. Having it, the congestion charging area has actually become well understood because it's a congestion charging area and it has been well signed so that wasn't.. so there was some element of being an actual road boundary but not entirely, but people have got used to it so that has become well known. And then the North/South Circular is also quite an easy boundary to understand. So you have to… again it is about making it easy for people to comply with the scheme. You don't want them to accidentally drive into the area not realise it and you want them to be able to easily plan their route. But also you need to give them an option to divert if they approach the zone and they realise that you know… I coming to the low emission zone, ow yes I'm not compliant I need to get around it. So we try to follow the Greater London Authority area as much as possible with the low emission zone, the London wide one, but we had to also modify the boundaries so that people had the opportunity to turn back. So there's big signs that say… you know in a mile you are going to be approaching the LEZ, turn of on the next turning to avoid it… basically. So you have to think about that as well so there's all sorts of factors that are going to determine the actual geographical area. But you know as I was saying in my introduction, with the outer London it's really along the strategic roads so you're thinking about what vehicles it applies to, well the heavy vehicles. But in inner London it's you know much bigger problem in terms of concentrations and several vehicles that are contributing. So you're targeting all vehicles there.

3.1 Yes so if I understand it correctly it's the strategic roads are often roads are often used by heavy vehicles so you wanted to include that. The city centre is more in general a problem. So to make it a consistent and clear policy they decided to let it contain the whole Greater London area? Or at least almost the whole Greater London area.

Kind of... I didn't explain myself very well. So when the low emission zone came in, it was London wide, we were targeting heavy vehicles. They're coming into London along these strategic roads, you want to get them to turn back as soon as possible. You want to deal with the problem that we have right across London with particulates. So that's why they covered London wide. When it comes to the ultra low emission zone, we're dealing with pollution being the most intense in central London. So that's why we under the last mayor applied the scheme there. Also there are concentrations in inner London and outer London but just along the strategic roads. So that's why the new mayor said: well I want to make the central London area bigger, I want to expand it to inner London… up to the North/South Circular for all vehicles because all vehicles are contributing, cars etcetera etcetera. But I also want it to go London wide but just for heavy vehicles. So in outer London under the ULEZ the proposal is that cars, vans and motorcycles wouldn't have to comply with any standards for the ultra low emission zone. And that's I think the right approach because what you will be doing there is targeting heavy vehicles who predominantly use the strategic roads and that is where the concentrations are highest. So if you clean those vehicles who are already having quite a large contribution to emissions along those roads in outer London, you would help deal with your problem there.

3.2 And a question I just thought of; is the congestion charging staying in the central London area then with the ULEZ coming?

Yes so the congestion charge, there are no proposals to expand the congestion charging in London. The objective of that scheme… and it charges everyone, there are discounts and exemptions but generally everyone is charged on the basis that they contribute to congestion, so it doesn't matter whether you're in a clean vehicle or not. However we have used that scheme to try and encourage the uptake of ultra low emission vehicles. So there is a 100 percent discount for ultra low emission vehicles with that scheme already and that's vehicles that emit less than 75 grams per kilometer CO2. But you know we're always keeping these schemes under review and as London… the mayor is producing a new transport strategy… we have to think longer term what's the right approach to managing congestion and emissions and how will all these schemes interact with each other, because at the same time we've got charges that are proposed for one of our tunnels that crosses the Thames, the river that goes through the middle of London, and a new tunnel that we're looking to build. And so you end up with a lots of different charges all lying on top of each other. We work with local authorities if they want to introduce their own local charges. So we need to think about where do we want to go and I think it's likely to be distance based charging in the longer term, where you rapple this stuff up together and you no longer need to worry about what zone lies on top of which. You just have a device where you can plan your journey and it will tell you how much that journey will cost. Based on where you're driving, what vehicle you're driving and it becomes a kind of way to tackling emissions and congestion at the same time. I think that's longer of but to begin with certainly, the congestion charging will remain in place. There is no plans to expand or remove it at the present time.

Okay so I think I'm going to adjust my next question a bit because I wanted to ask why passenger cars are not affected but they are going to be as you said.

4. So then it's more why did the mayor choose it to do that now and how is it received because it affects the people in London way more than when it was only heavy vehicles of course?

Yes so I think that is a good question. It has been a combination of things. The public awareness of the air pollution problem and the impacts on health is constantly in the news now. The EU infraction proceedings which were started against the UK and their court case we had Broadwire, a charity client who took the government to court saying that the plans to tackle the problem wasn't good enough, raise a profile as well. So public support for action has grown because certainly when you get an issue that affects people personally, you get a lot more I think support for taking action. But also in London certainly in central and inner London the majority of people don't drive. So it's getting the people that don't drive and wouldn't have to pay the charge anyway speaking in support of the intervention. As oppose to just those who would be disadvantaged by... shouting the loudest. It's quite often I mean… driving and vehicles... is very a motive, subjects... its given people a lot of freedom and it's seen as a to some extend as a kind of human right of a personal right to be able to drive wherever. As you know there is a lot of externalities associated with driving: climate change impacts, air pollution, traffic accidents, noise, taking space from other modes; walking and cycling in general, amenity in... quality of the urban environment is really impacted but alongside the air pollution impact on health this new mayor and some work we did before the mayor, looking at health and the link with transport. There has been a lot of growing awareness there so you know the obesity problem, people being overweight from being inactive and benefits of more active

modes and the kind of impacts of generally an urban environment which is dominated by loud moving vehicles how that leads to depression, heart disease and stuff like that… a lot of evidence and a lot of that narrative is grown and really the new mayor has… it really pushed that agenda and a lot of the public got behind it again because it is about making people healthier and it has really helped shift the conversation from you drive and we want to take that away from you to there are all these vehicles and it's making London as unhealthy, we want to encourage a more healthier approach to transport, part of that is emissions but also its about as I say the way the urban realm is used and how London operates can make you, Londoners, a lot healthier. And people are I think really starting to get that now. But obviously there's still… you still need vehicles in London, you can't operate without them. But it's about trying to make difficult choices about what vehicles do we have and how do you encourage that shift and how do you get people to naturally choose the right mode of transport? It's a combination of thing like the congestion charge, making it easier for people to walk and cycle, making public transport excellent, accessible and affordable and the mayor has come in and frozen TfL fares to try and help with that. So that people naturally make the right choice and they're doing so not just because it's more convenient and the public transport is quicker but also they get that it's better for them and makes them healthier. So I think that's how it has all changed and how it now is. When we consulted on these proposals it was overwhelming in favor of introducing them and doing it as quickly as possible. So it has been a real change and I think it's a different administration as well. The previous mayor was a lot more nervous about restricting vehicles and certainly starting his administration wanting to do more to smooth traffic flows he described it, that's basically providing more for vehicles. And it was towards the end I think he started to realise that that is kind of a game you'll never win. The more capacity you provide for vehicles, the more vehicles use up that capacity. You need people to make efficient choices about the best travel and transport to use.

Yes clear.

5. So why is the current strictness level chosen in London?

Okay so this goes back to a bit that I explained before, we shall just quickly recap upon. You don't want to cripple London, you know you could deal with our air pollution problem by banning all vehicles tomorrow if that's possible or charging everyone a 1000 pounds a day to drive a vehicle, you would deal with your air pollution straight away but you would cripple London and you would cripple Londoners. So you have to find the right balance in getting that shift to cleaner vehicles as fast as you can push it based on the vehicles that are available to buy in the first place, on how effective the different charge levels are and the city actually did a survey to try and find that out, how effective the EURO standards are so for example we have chosen for ULEZ a standard of petrol vehicles must be at least EURO 4 and diesel vehicles must be at least EURO 6 and the reason for that is the primary objective of the ULEZ was to tackle NO2 concentrations, the standards for the EURO 4 petrol are the same as the EURO 6 diesel so it's an element of being fair to the two different technologies there. You know some people have said why didn't you choose EURO 5 for diesel for example that means we bear that some older vehicles that would be more affordable. But the trouble is that actually for many EUROs 5 diesel cars their NOx emissions in the real world were worse than EURO 4 diesel cars so that's why we kind of said, it's going to be EURO 6/EURO 4. EURO 6 is definitely seeing a reduction in NOx emissions in the real world. It could be a lot better as we know. You know in the real world they

emit a lot more than they do under test conditions but various things have been put in place to improve that such as on road verification, conformity factors… the European Commission are finally starting to respond to this problem and deal with it. And also they are cleaner in the real world, even if they're not meeting the standard of the emissions that they should do as part of the official limits.

5.1 I wanted to ask something… so you said before it's about the balance because you can start with too strict regulations. So do you have some kind of indication of what the balance should be of vehicles that are not compliant when you start and vehicles that are compliant? What is about the right divide?

So as I mentioned earlier we think if you're trying to encourage a switch to cleaner vehicles and you're not trying to just discourage people from driving at all doing congestion charging. We reckon if you want to introduce a scheme when without the scheme in place the baseline forecast is about 70/75 percent of vehicles would be compliant so that you then get that up to 90/95 percent compliance. So you certainly wouldn't want to introduce a scheme when only 20 percent of vehicles is compliant. Unless your objective of the scheme is also to encourage mode shift and adds to congestion charging because that many people who aren't compliant you know you won't get all of them wanting to switch to cleaner vehicles. Quite often because it would be the case that the vehicles they have to switch to would be very new, whereas ULEZ when it comes into force you could get a compliant diesel vehicle that is say 3 or 4 years old, 5 years old if it came in 2020 and a petrol vehicle up to like 13/14 years old. Not everyone can afford to buy a new car so you need to have an element of people to being able to get a second hand car that is compliant if you want to encourage everyone to switch or as many people as possible.

6. And the next question is what was the method of enforcement and I think you said cameras right? And I think I have also read that, but that's generally really expensive, especially when the zone gets larger and more entry points following that. So why did they choose for cameras?

So we're on enforcement yeah? Okay so camera's, the cost have come down a lot over time. We've got all the back office systems in places in case to expanding those economies of scale building on the system we've already got. We're looking at new technology, distance based charging: we're always looking at that. If you're relying on people and mobile phones, how do you know they've got them with them. You still need a photo of the vehicle driving, where it… if you were to apply a charge I think you certainly need some evidence that vehicle was actually there.

6.1 But at first when you started with the low emission zone of course the camera system wasn't in place yet so it must have been quite expensive I guess, especially for such a large zone to install that kind of technology?

Yes although we were only targeting strategic roads so it wasn't as bad as all the roads in London. You needed cameras on the main roads coming in as oppose to all of them which is one of the ways the London wide one works. The central ULEZ makes use of the congestion charging cameras which are already there. The congestion charge itself raises revenue to pay for the costs of operating the scheme. But we do need to look at the costs and what's the right approach to expand it so I think certainly at the moment and in the near future we're still going to need cameras. But were looking at alternatives.

6.2 Okay because most of my other cases are using policemen to manually check the vehicles and I mean that's of course much cheaper but also less reliable.

Exactly so I'll leave it to your own research, but you can see from those schemes that you know it's quite often hard to get the evidence but certainly we know when we have conversations with colleagues from other cities about the reality of how effective they are, they're not as effective as they should be and therefore they're not having the health benefits as it should be. So it is all very well having a cheap system using stickers or getting the police to do it but if most vehicles are getting off… what we want is a system where people know if they drive in and their vehicle is not compliant, they will be getting a bill. You have a much bigger behaviour change when that is the case as opposed to I can take the risk driving in I may get caught by a policemen but the police are under resourced etcetera etcetera. So it's an effective scheme, it's more expensive to operate but on the other hand it raises more revenue in order to pay for the costs of operating it. So it's more of an upfront capital cost, the schemes are not designed to raise revenue, but we do consider how much income you get and how much the offsets and costs of operating the scheme.

Okay that's clear.

7. What do you consider successes and failures of the low emission zone and why?

Well generally speaking the frustration you always have is, what you really want is you want to know exactly what everyone is doing, where they're going, what's in their vehicle and why, what their vehicle is, who they are and their ability to pay; so that you can have a finally balanced scheme that is as fair as possible. This is the challenge with these schemes, there is always an element of them being blunt to some extent and there are always cases where someone is like, well you know I can't really afford to pay this or you know it's unfair on me and our vehicles aren't quite as available as these others. So you're always trying to find this right balance of a scheme that is very clear and simple to communicate: it's this charge for everyone, it applies to all vehicles but in order to try and deal with these negative consequences of such a blunt… no let me use the word derogatory but I mean is it fairly blunt scheme and you start applying discounts, exemptions then the scheme becomes much more complex and harder for people to understand and therefore harder for people to comply with. So the downsides of these schemes is that they're unable to go to the full extent of making it 100 percent as fair as possible. But in reality it is… you don't know what everyone is doing, you can't track everyone and you don't know why they're doing it, what's in their vehicles, you don't know exactly where everyone's vehicle that they might use is. So you have to do something. So it's better to put a scheme in and try to make it as fair as possible and make it generally affordable on a net basis. There's a lot more positives to the scheme than there are negatives. Otherwise you wouldn't do anything and therefore you wouldn't deal with the air pollution problem and have the health benefits. And the upside to them is, this is obvious, is they bring around significant health benefits and there is a lot of evidence that they do. So yes you know that's the balance basically.

8. And what do you think is the most important aspect of the London low emission zone which made it successful I think?

Well… evidence that it was going to be effective and robust modeling to back that up, the right balance between the cost of compliance for people and the need to take action. A lot comes down to the work you do bringing stakeholders with you, bringing the public with you… the engagement exercises you do, the communications, the way you do your consultations. You have to educate people at the same time, this is often a challenge with air quality, it becomes very

technical very quickly and very complex. So it's not like something like say if you had a policy as a government and you were going to say we're going to increase income tax by 10 percent, so we have some more money to build some stuff. That's generally quite easy to communicate. As soon as you start trying to introduce a low emission zone and you're starting to try and make it fair, so it becomes quite complex, and you're talking about EURO standards… not just dates and vehicles because as we know there's early adopters and there's this transition period so you can't say every vehicle from this day will be compliant, this is not the case. As soon as you're trying to say we're doing EURO 4 for petrol EURO 6 for diesel, you're having to tell people what an EURO standard is in the first place. So you have to do a lot of educating in order to… so that people have an informed response to your consultation. That's what makes... the scheme is successful in that it's effective in improving air quality for the reasons we talked about, we've got robust enforcement and were not just relying on the policemen to have time. But also it's successful in that we got support to implement it by all the work you do leading up to and during the consultations.

9. And what do you think are risks that should be avoided for low emission zones, especially maybe when you want to establish one or also in the operation of one?
Well I suppose it's the opposites of all the things I said. Don't in my opinion… not base it in evidence, don't do your work to gain support, I suppose one of the challenges rather than risk is in this country anyway (sound is shortly gone) but they hold the data of vehicles when you register… when a vehicle is registered, the date is incomplete and we have to build our own data setup from various sources to determine whether vehicles comply or not. So I think that's one of our biggest challenges is having sufficient data and also making it easy for the public to understand whether they're compliant or not. So we built our own compliance checkers so people can put their vehicle number plate in on the website and they'll be told whether they comply or not. So that I would say is our biggest challenge around these schemes is that. And also another thing you want to minimize is the complexity in terms of discounts and exemptions, giving people what we call sunset periods, more time to comply, different charge levels… the more complex you make the scheme, the more expensive and difficult it is to operate in the back office you know we have millions of vehicles which are captured a day by this (sound is shortly gone) penalty charge notice. We're also… all of that complexity in the scheme not only makes it more difficult for you to operate, it makes it more difficult to communicate to the public what the scheme is and whether they comply or not. So this is where it comes back to what we we're saying about the balance between a scheme that's easy to understand, easy to operate but also you're trying to deal with this unfairness with pros and cons by giving and taking here and there so our general principle is when we start with these scheme: no one get a discount or exemptions and then you start to look at the problems and whether someone really needs one. You want to minimize them and we're quite open about that in the consultation you know we say: we want to minimize discounts and exemptions but this group they really need one.

10. And do you know maybe how the decision making process went?
So to start with… we've a huge range of schemes, we talked about the primitives, what vehicles it applies to, what charges, what areas, what date to introduce it and you can play tunes on all of those and create a huge plot and in fact this is in one of the consultation materials and it shows you these different schemes like on a high level, how much it would reduce NOx emissions or what the cost of

compliance is and then you're trying to find that sweet spot where you're maximizing the emissions saving and minimizing the cost of compliance, the cost of people paying the charge or upgrading their vehicles. So that's your kind of early optioneering till you get down to a few schemes and then it's working with stakeholders, briefing… talking through the options and the ideas, working with the administration, building evidence, quite often having what we call a policy consultation first... where it's not like we've got a variation order that is actually being consulted on, it's just here are our ideas, here is some of the data and evidence and get the feedback… then that informs statutory consultation where if the mayor confirms after that consultation, the variation order with or without verifications… the scheme will actually come into place and we can operate it. So we're now in a 2 year process really, 18 months at best. But the decision making process… the formal decision is made publicly. We have huge extensive consultations, where people can see how we've responded to all of the consultation points that were made. It's a very open process and I think that's important. You provide a lot of evidence that you've listened to people and you've considered their responses and you've made adjustments where necessary. You've given a very clear justification based on the evidence and why you implemented the scheme. So that the mayor who ultimately makes the decision, can make the decision in confidence that it was the right decision. So the decision making of the mayor is public and you can see it online. You need to have the evidence that the decision was made for the right reasons and that people had an opportunity to comment you know it's standard stuff there… every city and administration would do I'm sure. But there's often a mean the biggest challenge for us in terms of the people developing the scheme is last minute decisions. So we try to think about what are the key decisions we need the administration to make or steers they need to provide. The things we think are going to what might… the public might start complaining or certain groups might be upset about… you need to start to brief them early about the pros and cons and the different options they might want to consider. So you can take them on a journey so that you… when you get into the point where you're really starting to develop the scheme you've a lot of detail and you're doing the consultation and you're writing the consultation report and you're about to make a decision. You don't get a last minute change which means you then delay your whole program, you got to go back and make sure you have the right evidence to make sure that new decision was the right one etcetera etcetera. So taking the public with you but also taking the administration with you and having some foresight into what might be those difficult topics that you want to start talking about early rather than waiting until they all come out of the wash. That comes from experience, having done the schemes we know the things that are going to cause problems and are going to be difficult and difficult decisions for the administration to make so you want to start warming them up to… and certainly getting them to think about those decisions before they ultimately have to make them. So you're giving them early steers and stuff.

10.1 So have there been any appeals and therefore delays? Or did this extensive public consultation process make it go well?

No so on the low emission zone I don't think we've had anything. On the ultra low emission zone we have, I think this is probably coming… ability for people to ask for an additional review. But the important thing about that is additional review is on the process that was taken. So it's not about whether you agree… if you don't agree with the decision you can't then take the mayor to the court and go I don't agree with this. You can take the mayor to court and say this decision was made for the wrong reasons and it was misinformed or you didn't follow process. So

we're working very closely with our lawyers to make sure the process that we're going through is right and we get advice from barristers and Queen's Counsels about… on our reports that we're doing in the public domain, on the consultation material that we're doing in the public domain just to make sure there isn't an opportunity for somebody to make a legal challenge because of something we've missed or something we haven't made the right decision on. So that's why our consultation reports which I will send you are so big, because we go to great lengths to go through all of those responses and show that we've listened to everyone and we've responded and given a reasoned argument because if you've done that and it's always a balance… these decisions. There is always winners and losers but if the mayor makes the decision and it's informed sufficiently to make the right decision then there… it's very difficult to launch a legal challenge.

Okay clear.
11. So do you think the decisions around the low emission zone policy have been very good or should have been decided otherwise?
No I think they are good… I think given where we are now with the public support perhaps the previous mayor could have been bolder is what I would say. But I think the decisions have been made for the right reasons and have been balanced decisions. So I don't think there's much of it criticized, about the decisions.

12. Okay and then finally: what can others learn from London's low emission zone?
Well everything I just said.
12.1 Yes I was already thinking like okay good public consultation and etcetera etcetera.
Yes so I think just basically all of the above but what I will do, I will send you material if that's helpful and if you have any more question I'm happy to help.

From here on are the Dutch interviews.

Interview the Netherlands 1 (NL1)

1. Wat zijn belangrijke elementen van milieuzones in het algemeen? En waarom?
Nederland moet, net als alle andere Europese lidstaten, voldoen aan de Europese luchtkwaliteitseisen. Rond 2009 zou de concentratie van onder andere fijnstof (PM10) en NO2 onder bepaalde limietwaarden moeten liggen. Nederland kon hier niet aan voldoen (zoals bijna alle lidstaten) en kwam als enige met een uitgebreid plan (NSL) hoe dit dan wel gerealiseerd zou worden. De Europese commissie heeft dit plan geaccepteerd en derogatie verleend. Lokale overheden moesten aan de Nederlandse overheid rapporteren wat de status van de luchtkwaliteit in de steden was en welke maatregelen ze namen om de luchtkwaliteit te laten voldoen aan de Europese eisen. Zodoende zijn steden aan de slag gegaan en hebben pakketten aan maatregelen gedefinieerd om de luchtkwaliteit te verbeteren.
Milieuzones zijn ingesteld met als doel de meest vervuilende auto's te weren en zo de luchtkwaliteit (en daarmee de gezondheid van de inwoners) te verbeteren (en ook te voldoen aan de Europese eisen). Inmiddels worden deze Europese eisen in de meeste steden, op nog een aantal knelpunten na, globaal gehaald.
Echter het voldoen aan de Europese luchtkwaliteitseisen betekent nog niet dat de lucht ook gezond is. Ook onder de gestelde grenswaarden treedt nog gezondheidsschade op (zie ook WHO). Steden streven tegenwoordig naar een

aantrekkelijke leefomgeving (vestigingsklimaat bedrijven en medewerkers), waarbij een schone lucht een van de belangrijke parameters is.
Belangrijke elementen zijn dus:
- Verbeteren luchtkwaliteit
- Weren van de meest vervuilende voertuigen

2. Wat zijn belangrijke elementen van de Nederlandse milieuzones? En waarom?
Wat betreft de doelstelling is er geen verschil tussen binnen- en buitenlandse zones. De toegangseisen zijn verschillend, het doel is gelijk.
3. Waarom is de keuze voor de huidige grootte van de milieuzones gemaakt?
Dit is afweging van een aantal zaken waaronder:
- *Waar liggen locaties waar de luchtkwaliteit door verkeer flink belast wordt/ waar mensen wonen die blootgesteld worden*
- *Praktische zaken zoals mogelijke handhaafbaarheid. Vaak is een gebied binnen een ring etc. handig. Verder spelen vele details vaak ook een factor. Op detailniveau kan je te maken hebben met eenrichtingsverkeer (je kan er maar aan één kant uit….) etc.*
- *Politieke afwegingen*
- *Milieuzones hebben ook een "uitstralingseffect". Dat wil zeggen dat het wagenpark ook buiten de milieuzone schoner wordt door de invoering van een milieuzone (denk aan het verkeer dat de zone in en weer uit rijdt)*

4. Waarom hebben de Nederlandse milieuzones betrekking op bepaalde voertuigen, veelal vrachtwagens? En waarom niet overal ook op auto's en busjes?
Dat heeft er mee te maken dat het geen landelijk beleid is voor milieuzones. Steden bepalen vaak (noodgedwongen) zelf of een zone al dan niet gewenst is en hoe deze eruit dient te zien. Het gevolg is ook dat er verschillende afwegingen en keuzes gemaakt worden. Veel steden kennen een zone voor vrachtverkeer, enkele ook voor bestel- en personenvoertuigen.
5. Hoe is de keuze voor het striktheidsniveau gemaakt in Nederland?
Dit is een afweging tussen haalbaarheid (politiek), aantal getroffen autobezitters, gewenste doel etc…

5.1 Het striktheidsniveau is gedeeltelijk afhankelijk van het aantal getroffen autobezitters, is er dan volgens u ook een minimum en maximum (percentage) voor getroffen voertuigen? Want met weinig getroffenen blijft het effect relatief klein, maar met veel getroffenen worden de kosten voor die personen/bedrijven hoger en daarmee waarschijnlijk ook de weerstand.
Dieselvoertuigen zonder roetfilter zijn voor wat betreft de uitstoot van fijnstof grote boosdoeners. Dat betekent dat je voor het verlagen van de fijnstof uitstoot liefst alle dieselvoertuigen zonder gesloten roetfilter (af-fabriek gemonteerd) zou willen weren. Maar in de praktijk is lastig vast te stellen welke voertuigen precies met roetfilter geleverd zijn (RDW data is niet 100% betrouwbaar), dat begint ergens rond EURO 4 a EURO 5. En daarmee ook lastig te handhaven.Daarom is gekeken naar gemiddelde uitstoot per voertuig, die is voor EURO 0, 1 en 2 voertuigen aanzienlijk hoger dan vanaf EURO 3 diesel (voor fijnstof!). EURO 3 is ook nog best vervuilend en daar rijden veel voertuigen van in de stad. Het weren van Euro 3 zou de effectiviteit van de zone verhogen, maar je zou daarmee ook veel meer voertuig bezitters raken. Én de waarde van EURO 3 dieselvoertuigen (ca. 2000 t/m bouwjaar 2005) is ook duidelijk hoger dan die van EURO 2 en ouder. Daarmee zou je de mensen ook financieel harder treffen. Wil je dat financieel compenseren, wordt gaat dat flink in de papieren lopen. In Stuttgart denkt men na over het weren van dieselvoertuigen van EURO 5 en ouder (dat zou bijvoorbeeld ca. 2013 en ouder betekenen).
6. Wat is de handhavingsmethode? En waarom?

Kenteken camera's: hiermee kan automatisch gehandhaafd worden
Daarnaast wordt ook gebruik gemaakt van ambtenaren.

6.1 U heeft het over camera's als handhavingsmethode, ik ben benieuwd welke steden dit in Nederland gebruiken? Aangezien ik dit nog nergens heb kunnen vinden.

In de grote steden wordt in ieder geval met camera's gecontroleerd, Rotterdam, Utrecht, in ieder geval. Amsterdam denk ik ook, als het er nu nog niet is, dan wel binnenkort als de milieuzone ook van kracht wordt voor bestel, taxi's etc.
In de kleinere steden (Brabant etc..) wordt denk ik alleen met ambtenaren gecontroleerd.

7. Wat zijn volgens u succes- en faalfactoren van de milieuzone? En waarom?

Succes: weren van oude, relatief sterk vervuilende, voertuigen zorgt voor betere luchtkwaliteit in steden. Daarvan profiteren de inwoners en bezoekers van de steden. Steden worden als woonomgeving aantrekkelijker.
Strenge zones kunnen ook een stimulans vormen voor versnelde introductie van "zero emission" voertuigen, vaak elektrisch, maar alternatieven als waterstof zijn ook denkbaar.

8. Wat is volgens u het meest belangrijke aspect van de Nederlandse milieuzones? En waarom?

Zie vorige vraag.

9. Wat zijn risico's die voorkomen zouden moeten worden bij een milieuzone?

Er zijn mensen die onevenredig hard getroffen kunnen worden. Denk aan speciaal omgebouwde voertuigen voor invalide mensen of bussen met veel apparatuur voor buurtprojecten etcetera. Deze kunnen eigenlijk altijd gebruik maken van een hardheidsclausule.

10. Hoe verloopt zo'n besluitvorming?

- *Normaal gesproken wordt eerst vastgesteld of een milieuzone nuttig en effectief is (afhankelijk van situatie in de diverse steden)*
- *Vervolgens wordt een plan voor de omvang en de toegangseisen gemaakt*
- *Deze worden met veel belanghebbende partijen (bedrijven, autobezitters, belangenverenigingen etc etc) afgestemd*
- *Check op haalbaarheid / politiek / handhaafbaarheid etc.*
- *Vervolgens worden de plannen verfijnd en aan een gemeenteraad voorgelegd. Na de nodige discussie wordt besloten een zone al dan niet in te voeren*
- *Definitieve plan aangekondigd,*
- *Invoering (na een aanlooptijd)*

Vraag 11 en 12 zijn niet beantwoordt.

Interview Utrecht 1 (U1)

1. Wat zijn belangrijke elementen van milieuzones in het algemeen? En waarom?

Milieuzones zijn bedoeld om de luchtkwaliteit, en daarmee de gezondheid van onze burgers en bezoekers, te verbeteren. Daarnaast moeten we de Europese grenswaarden voor luchtkwaliteit halen. Uit onderzoek door TNO en RHDHV[1] is gebleken dat een milieuzone voor een gemeente de meest (kosten)effectieve maatregel is om de luchtkwaliteit te verbeteren. Verschonen van de bussen scoort hoger, maar daarop heeft de gemeente een beperkte invloed (de busconcessie valt onder verantwoordelijkheid van de provincie). Overigens hebben we in overleg met provincie en Qbuzz ook gezorgd voor verschoning van de bussen: een groot deel is EURO VI en een belangrijke buslijn door de stad wordt binnenkort volledig elektrisch.

2. Wat zijn belangrijke elementen van de Utrechtse milieuzone? En waarom?
   Utrecht was de eerste stad in Nederland die een milieuzone voor personen- en bestelauto's instelde. De milieuzone weert een deel van het wagenpark dat in de stad rijdt: tot en met diesel EURO 2/DET 1-1-2001. Deze auto's veroorzaken, naar verhouding, een groot deel van de luchtverontreiniging (zie het RHDHV/TNO onderzoek). M.a.w., door het weren van een relatief klein deel van het wagenpark, bereiken we naar verhouding, een grote verbetering van de luchtkwaliteit.
   Daarnaast is de omvang van de zone van belang: we hebben gekozen voor het limiteren van de toegang tot de binnenstad, een deel van het Jaarbeursterrein, en enkele toeleidende wegen. In dit gebied bevonden zich de meeste luchtkwaliteitsknelpunten en de zone leidt ook tot vermindering van het (vervuilende) verkeer naar de zone (m.a.w., een uitstralingseffect over de grenzen van de zone).
3. Waarom is de keuze voor de huidige grootte van de milieuzone gemaakt?
   Zie het antwoord hierboven. Een relatief kleine zone bleek een groot effect te hebben. Er zijn destijds diverse varianten doorgerekend (zie het aanvullende onderzoek door TNO en RHDHV). Daarnaast is er sinds 2007 al sprake van een milieuzone voor vrachtverkeer, we hebben ervoor gekozen om dezelfde grens aan te houden.
   3.1 Laat ik vooropstellen dat ik het logisch vind dat de vrachtverkeer milieuzone en de personenauto's/bestelbus milieuzone dezelfde grens hebben en dat ik snap dat de milieuzone niet op zichzelf staat, maar onderdeel is van een pakket van maatregelen. De milieuzone in Utrecht is in vergelijking met mijn andere casussen ook relatief klein (3% van de gemeente), de andere kleine, maar toch al een stuk grotere, milieuzones zijn Rotterdam (7%) en München (14%). Er is ook een TNO onderzoek geweest dat er in het jaar 2015 geen effect is geweest op de luchtkwaliteit wat direct kan worden toegewezen aan de milieuzone. Daarnaast heb ik vaak gehoord dat 'natuurlijke grenzen' goed zijn om aan te nemen als grens voor de communicatie, zoals bijvoorbeeld een ringweg. Denkt u niet dat een veel grotere milieuzone het effect van de milieuzone ook duidelijk zou vergroten?
   In het Uitvoeringsprogramma Gezonde Lucht voor Utrecht hebben we over de begrenzing het volgende gezegd: "Het effect van de vergroting van de milieuzone zal beperkt zijn op de meeste risicovolle locaties, omdat die gelegen zijn in het voorgestelde milieuzonegebied. Anderzijds neemt de kosteneffectiviteit af omdat aanzienlijk meer inwoners in aanmerking komen voor de compensatieregeling."
   In het aanvullende onderzoek van RHDHV en TNO is het effect van varianten berekend, dit is niet makkelijk in een paar zinnen samen te vatten. Uit de tabel op pagina 5 blijkt dat het effect op de luchtkwaliteit van diverse varianten niet zoveel verschilt, maar de kosten verschillen aanzienlijk. Uit het TNO onderzoek dat u aanhaalt blijkt inderdaad dat het moeilijk is om de verbetering van de luchtkwaliteit direct aan de milieuzone toe te rekenen, TNO geeft aan dat de verbetering het resultaat is van een totaalpakket aan maatregelen, waarvan de milieuzone onderdeel uitmaakt (TNO zegt niet dat er geen effect is, alleen dat het effect niet direct is toe te rekenen).

4. Waarom heeft de Utrechtse milieuzone nu ook betrekking op auto's?
   Uit het hierboven genoemde onderzoek van TNO en RHDHV, en uit de daaraan voorafgaande scan van het wagenpark dat door Utrecht reed (door TNO) bleek dit deel van het wagenpark (tot en met EURO 2/DET 1-1-2001) een naar verhouding groot effect op de luchtkwaliteit te hebben. RHDHV/TNO adviseerden overigens een milieuzone tot en met EURO 3/DET 1-1-2006 in te stellen, echter, dit vond de gemeenteraad destijds te ver gaan. Er is inmiddels door de gemeenteraad wel

opdracht gegeven om hier opnieuw een advies over te maken. Onderzoek (door RIVM) in dat kader is gaande, resultaten verwachten we in de loop van het jaar.

5. Waarom is de keuze voor dit striktheidsniveau gemaakt in Utrecht?
   Zie boven: het geweerde deel van het wagenpark veroorzaakte, naar verhouding, veel luchtverontreiniging.
   5.1 heeft u ook een inschatting van hoeveel voertuigen, absoluut en percentage van het totaal, er op dit moment geweerd worden vanwege de milieuzone? Als ik in de wagenparkscan kijk kom ik uit op zo'n 2 procent.
   De onderbouwing was dat door juist de meest vervuilende wagens te weren, een (naar verhouding) groot effect op de luchtkwaliteit wordt bereikt. De meest vervuilende wagens zijn maar een klein deel van het totale wagenpark, het kwam inderdaad op circa 2 procent uit.
6. Wat is de handhavingsmethode? En waarom?
   Er wordt met een sluitend cameranetwerk gehandhaafd. Camera's staan langs de toeleidende wegen op de milieuzone grens. Automatische handhaving is ook het meest kosteneffectief. Auto's die door de camera's niet herkend worden (buitenlandse kentekens) lopen de kans staande gehouden te worden door onze toezichthouders op straat.
7. Wat zijn volgens u succes- en faalfactoren van de milieuzone? En waarom?
   Het succes van de milieuzone is dat de auto's die we wilden weren, ook daadwerkelijk geweerd zijn, zo is uit onderzoek van TNO gebleken. TNO geeft aan dat het totale pakket aan maatregelen, waarvan de milieuzone deel uitmaakt, een aantoonbaar effect op de luchtkwaliteit heeft. Het effect van alleen een milieuzone zou wel beperkt kunnen zijn (daarom is de milieuzone onderdeel van een totaalpakket aan maatregelen).
   Een kanttekening bij het instellen van de zone is dat de zone weliswaar de gezondheid van allen verbeterd, maar op individueel niveau een groot effect kan hebben. Zone-bewoners met dieselauto's tot en met EURO 2/DET 1-1-2001 kunnen daarmee de zone niet meer inrijden, en eigenaren die buiten de zone wonen mogen de zone met hun auto niet meer in. Daarom hebben we als tegemoetkoming een subsidieregeling voor sloop en vervanging ingesteld. Hiervan is veel gebruik gemaakt: het aantal auto's dat we graag gesloopt zagen, is ook gesloopt (meer dan drieduizend). Daarnaast bieden we beperkt mogelijkheden voor ontheffing: bijvoorbeeld dagontheffingen voor ondernemers die af en toe in het gebied moeten zijn, en ontheffingen voor gehandicapten.
   Een 'faalfactor' is de juridische houdbaarheid. Echter, dit is tot aan de Raad van State getoetst, en Utrecht is in het gelijk gesteld t.a.v. de bevoegdheid van een lokale overheid tot het instellen van een milieuzone.
   Wat een faalfactor kan worden is het aantal boetes: als dit niet zou dalen, dan blijven mensen dus met hun vervuilende auto in de zone rijden. Het gaat ons natuurlijk om naleving van de zone, niet om het aantal boetes.
8. Wat is volgens u het meest belangrijke aspect van de milieuzone in Utrecht? En waarom?
   Het verschonen van de luchtkwaliteit, en daarmee de gezondheid. Het stadsbestuur vind dit van groot belang.
9. Wat zijn risico's die voorkomen zouden moeten worden bij een milieuzone?
   Bijvoorbeeld het buitensporig treffen van gevoelige groepen. Daarom hebben we een ontheffingssysteem in het leven geroepen. Daarnaast is het van belang om helder te communiceren over het beleid en de gevolgen daarvan, zodat mensen weten dat er een zone geldt en dat er boetes uitgedeeld worden voor overtredingen. We willen zoveel mogelijk voorkomen dat mensen een boete krijgen.

10. Hoe verliep de besluitvorming?
Na het collegebesluit van de zomer van 2012 om de raad voor te stellen een zone in te stellen hebben we het najaar van 2012 gebruikt voor een uitgebreide raadplegingsronde (bewonersgroepen, bedrijvenkoepels, milieuorganisaties). Samen met de resultaten daarvan is het voorstel nogmaals aan het college voorgelegd, zodat het voorstel vervolgens in de formele inspraak kon. Na de inspraak is in mei 2013 het voorstel- inclusief de resultaten van de inspraak - door het college vastgesteld en ter besluitvorming aan de gemeenteraad gestuurd. Tijdens de behandeling in de raadscommissie is verzocht om aanvullende berekeningen op gebied van de omvang en toelatingscriteria van de zone, en op gebied van het verwachtte effect op de gezondheid. Na een tweede behandeling in de commissie (zomer 2013) is het voorstel in de gemeenteraad behandeld, en is het – geamendeerd – aangenomen. Er is even sprake geweest van 'vertraging' van de behandeling omdat er een referendum initiatief speelde t.a.v. de zone voor personenverkeer. Dit referendum heeft niet plaatsgevonden: onvoldoende handtekeningen. De amendementen betroffen onder andere de toelatingscriteria: de raad is afgeweken van het advies van het college om tot en met EURO 3/DET 1-1-2006 te weren (inclusief benzine euro 0) – er is besloten een zone voor uitsluitend diesel EURO 2/DET 1-1-2001 in te stellen. Daarnaast heeft de raad besloten dat de toelatingscriteria voor de zone jaarlijks (in het kader van de jaarlijkse Monitoringsrapportage Luchtkwaliteit) tegen het licht gehouden moeten worden, en zonodig kunnen worden bijgesteld. Na het raadsbesluit zijn nog diverse malen schriftelijke vragen door raadsleden aan het college gesteld, bijvoorbeeld over het handhavingsregime en over het effect van de zone.

11. Denk je dat er andere besluiten gemaakt hadden moeten worden als je terugkijkt op de gemaakte beslissingen?
Als ambtenaar heb ik daar geen mening over: ik werk in opdracht van het stadsbestuur. Ik kan hooguit zeggen dat er in politieke besluitvorming vaak sprake is van compromissen, waardoor het effect van een maatregel minder groot kan worden (hetgeen niet wil zeggen dat het effect daarmee niet meer voldoende is).

12. Wat kunnen anderen leren van Utrecht volgens u?
We hebben onze ervaringen gedeeld met met name Rotterdam, waar inmiddels ook een milieuzone van kracht is. Daarnaast hebben we ambtelijke contacten met de andere (grote) steden in het land, maar ook bijvoorbeeld met Antwerpen en Gent. Op die manier delen we onze ervaringen. Wat voor een milieuzone voor personen- en bestelauto's van groot belang is, is heldere communicatie naar burgers, bezoekers en ondernemers. Het is belangrijk om zo duidelijk mogelijk te informeren over de zone en de gevolgen daarvan. Niet in de laatste plaats om zo weinig mogelijk overtredingen te krijgen, maar daarnaast natuurlijk ook om mensen bewust te maken van de gevolgen van luchtverontreiniging op de gezondheid, en op wat de overheid doet om die effecten te verkleinen. Daarnaast vind ik het belangrijk dat maatregelen gedegen, en het liefst wetenschappelijk, worden onderbouwd. Dat hebben we in Utrecht door RHDHV en TNO laten doen.

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[1] zie voor de diverse onderzoeken het kopje 'naslag' achterin dit document.

Naslag:

- Uitvoeringsprogramma Gezonde Lucht voor Utrecht: hierin wordt een maatregelenpakket voorgesteld waaronder de milieuzone.

- Onderzoek door RHDHV/TNO naar luchtkwaliteitsmaatregelen voor Utrecht. Hierin wordt (o.a.) de milieuzone onderbouwd).
- Aanvullend onderzoek door RHDHV/TNO naar diverse varianten van de milieuzone.
- Aanvullend onderzoek door RHDHV/TNO naar gezondheidseffecten van de milieuzone: deze zet ik op de mail.
- Effectmeting van de milieuzone door TNO.
- Wagenparkscan (voorafgaand aan het advies om een milieuzone in te stellen) door TNO: deze zet ik op de mail.
- Onderzoek naar gezonde leefomgeving door RIVM (dit onderzoek is gaande).
- Uitspraak Raad van State.

Interview Rotterdam 1 (R1)

1. De eerste vraag die ik heb, die komt vooral voort uit wat ik uit bepaalde literatuur heb gehaald dus ik gebruik deze vragen, de eerste 2, vooral om te kijken of er een beetje dezelfde dingen uitkomen. Dus de eerste vraag is wat zijn belangrijke elementen van de milieuzones?

Ja wat bedoel je precies met elementen?

1.1 Ja ik wil niet teveel al zeggen om t antwoord te sturen maare…

Om die vraag goed te kunnen interpreteren.

1.2 Ja ik bedoel in t… het milieuzone beleid en de milieuzone is opgebouwd uit verschillende elementen, bijvoorbeeld hoe streng je bent. Dat soort dingen en dan wat zijn daar de belangrijke elementen in?

Ja oke. Rotterdam is al begonnen in 2007 of 2008 met de invoering van de milieuzone voor vrachtverkeer. Het betrof toen een vrij kleine zone, echt het kernwinkelgebied omdat toen ook al discussies liepen om luchtkwaliteit en met name ook de relatie tussen bestemmingsplannen en milieu eisen. Luchtkwaliteit was vooral 2007-2008, toen was het heel… een hot issue omdat misschien bestemmingsplannen niet door konden gaan omdat de luchtkwaliteit niet goed genoeg was. Rotterdam had toen grote ambities met de verdere verdichting van de binnenstad. Het nieuwe centraal station was er nog niet, de hele gebiedsontwikkeling daar was wel in de maak. Nou als dat zou stranden als gevolg van eisen luchtkwaliteit dan had Rotterdam een groot probleem. Dus toen is al een begin gemaakt met echte maatregelen voor de verbetering van de luchtkwaliteit, de milieuzone vrachtverkeer was daar een goed voorbeeld van. Toen zijn er op wel meer plekken in Nederland milieuzones voor vrachtverkeer ingesteld. Er is ook een convenant afgesproken tussen gemeenten, rijksoverheid en brancheorganisaties. Dat werd toen ingevoerd en dat verliep prima. De jaren daarna zijn we door blijven gaan met het verbeteren van de luchtkwaliteit met maatregelen, maar je ziet de laatste jaren wel een beetje een verschil tussen een hele juridische invalshoek, dat we de luchtkwaliteit maar moeten verbeteren zodat bouwplannen niet in gevaar komen. Een verschuiving naar meer waar het eigenlijk om zou moeten gaan: een gezondheidskundige invalshoek. Het gaat om het verbeteren van de gezondheid van de Rotterdammer want die leeft gewoon korter dan een gemiddelde Nederlander, we hebben gewoon vieze straten in de stad. Dus veel meer gezondheid gerelateerd. En als je dan kijkt naar luchtkwaliteit en gezondheid, dan gaat het niet over de PM10, ik neem aan dat dit een bekend begrip is: PM10, maar voor de schadelijkheid en ook indicaties wat is nou de oorzaak voor de verslechtering van de gezondheid, dan gaat het om veel kleinere deeltjes… en in Rotterdam hebben we echt nadrukkelijk gekozen voor een ambitie op het gebied van roet, elementair koolstof EC noemen we dat ook wel. Dus dat

zijn echt de allerkleinste deeltjes die ook wel binnen de PM10 vallen maar zijn PM0.1 of nog kleiner. Dus die dringen echt heel ver door in je longen en in je bloed, dat zijn ook deeltjes die vrijkomen bij de verbranding van fossiele brandstoffen, die zijn ook echt gewoon hartstikke schadelijk. Dus ze zijn en klein en schadelijk dus dat is een veel betere gezondheidsindicator dan die andere stoffen. Dus toen is in die Koersnota Luchtkwaliteit in 2015 echt ambities geformuleerd op het gebied van elementair koolstof (EC) of roet, zijn allemaal andere namen voor hetzelfde begrip. Maar het heeft dus minder met die wettelijke eisen te maken, minder met een juridische achtergrond. Rotterdam heeft echt gekozen voor elementair koolstof (EC). In de slipstream van maatregelen die we daarvoor treffen daar verbeter je ook wel de PM10 concentraties maar we focussen echt op de gezondheid van de Rotterdammer dus elementair koolstof. Tevens blijven we werken aan verlagen van de NO2 concentraties om overal aan de wettelijke normen te gaan voldoen. En toen zijn er… verschillende maatregelen hebben de revue gepasseerd en de afweging tussen geld dat je hebt, het effect wat je wil bereiken en de getroffenen zeg maar. Dat heeft er uiteindelijk toe geleid tot verschillende maatregelen, eentje daarvan is het uitbreiden van de toen bestaande milieuzone,... dus alleen vracht... toen wilden ze uitbreiden naar andere voertuigcategorieën. Dus niet alleen vracht maar ook gewone en bestelauto's, ook naar verschillende brandstoffen: de milieuzone voor vracht was het alleen voor diesel vrachtauto's, maar de uitbreiding van de milieuzone was ook naar personenauto's en bestelauto's op diesel maar ook op benzine. Dus dat is een 2e aanscherping… de voertuigklasse, brandstof en ook een geografische uitbreiding. Dus niet alleen het kleine kernwinkelgebied maar eigenlijk het hele gebied tussen de ringwegen op Rotterdam Noord. Dat zijn denk ik de elementen waar je op doelt. En het 4e element is welke toegangseis stel je dan, EURO 2, EURO 3, EURO 4, EURO 5… en die mix van toegangseis en ook welke EURO klasse in relatie tot welk type voertuigen en ook op welke brandstoffen, maar ook hoeveel mensen tref je daarmee? In Rotterdam hadden we ook een sloopregeling als een tegemoetkoming en dat was een beperkt budget. Dus die hele mix aan elementen, als ik het goed begrijp doel je daarop, heeft uiteindelijk geleidt tot de variant die we nu hebben. Er zijn ook andere varianten gepasseerd, bijvoorbeeld dat we de personen en bestelauto's op minimaal EURO 4 zetten, zodat EURO 3 er niet meer in mocht, maar dat trof opeens een veel grotere groep waardoor bedrijven echt last zouden kunnen krijgen, dat ze echt gewoon failliet zouden gaan en de sloopregeling zat dan te weinig geld in om mensen tegemoet te komen. Die varianten zijn wel de revue gepasseerd maar we hebben ook echt een switch gemaakt of uitgebreid met voertuigcategorieën, niet alleen vrachtverkeer maar we hadden ook bijvoorbeeld allemaal EURO 6 voor het vrachtverkeer kunnen eisen. Dat was misschien ook wel een groot effect geweest, maar omdat die milieuzone voor vracht die hadden we al een aantal jaren... nu zijn ook andere groepen zeg maar… waren aan de beurt. Nou dus dat hele palet van sloopregeling, geld wat erin zat, aantal getroffenen, te bereiken effect… is uiteindelijk de milieuzone eruit gekomen zoals ie nu is.

Ja ik denk dat we daarmee al redelijk wat van de volgende vragen ook al enigszins aangestipt hebben. Gaan we zo dan nog wel wat uitgebreider op in.
2. En de 2e vraag was specifiek over Rotterdam maar dat hebben we ook al wel redelijk gehad.
Antwoord in vraag 1.

3. Dus laten we doorgaan met iets meer over het geografisch gebied dus waarom de huidige grootte gemaakt is? Je noemde het net al kort met verschillende varianten, maar kan je daar wat meer nog over vertellen?
De DCMR Milieudienst Rijnmond, die heeft voor ons allerlei berekeningen uitgevoerd naar uitstoot en concentraties van roet, aandelen van verschillende bronnen daarin: naar wegverkeer, scheepvaartverkeer, industrie, huishoudens, wat er binnen komt waaien in het gebied en dat ook op de plattegrond van de stad gelegd. Dus dan heb je... staat ook in de Koersnota, mooie staartdiagrammetjes met die aandelen van verschillende bronnen in verschillende plekken van de stad. Nou dan zie je dat met name op de noordoever, die kant van de stad, dat daar sowieso de concentraties het hoogst zijn en je hebt op Noord te maken met de heersende windrichting vanuit het industriële gebied hierachter he: de Maasvlakte en de Europoort en de Botlek noem maar op. Dan ligt letterlijk Rotterdam Noord wat meer onder de rook dan Rotterdam Zuid. Dus daar is de problematiek ook ernstiger en zie je ook dat het aandeel, dat is wat dichter bebouwd, dat ook het aandeel wegverkeer in het totaal aantal concentraties is daar ook soms wel 50 procent. Dus de problematiek was daar wat groter en er is wel een motie geweest in de gemeenteraad in 2015 om de milieuzone ook uit te breiden naar Rotterdam Zuid, maar nogmaals de problematiek is daar kleiner, wat minder concentraties en we hadden gewoon te weinig geld om mensen op Zuid, die echt getroffen zouden worden om ze ook financieel tegemoet te komen door de sloopregeling. Dus daarom is gekozen uiteindelijk alleen voor Noord maar wel inclusief de 3 oeververbindingen, de Willemsbrug, de Erasmusbrug en de Maastunnel. Die zitten wel in de milieuzone, dus dat betekent dat al het verkeer dat van Zuid naar Noord gaat en andersom, dat rijdt wel door de milieuzone. Dus we hebben wel een groot uitstralingseffect op de situatie in Zuid. En waarom dan daar is gekozen op Noord… waarom dan dat gebied in Noord? Ja dat is ook weer de afweging geweest tussen hoeveel mensen wonen er, hoeveel auto's staan daar geregistreerd, hoeveel geld zit er in de pot zou maar zeggen, hoeveel mensen worden er getroffen en welk effect willen we uiteindelijk bereiken. Nou zo zijn we tot die geografische afbakening gekomen. En de ring is natuurlijk een hele mooie natuurlijke afbakening eigenlijk ... van binnen de ring, dat is voor iedereen makkelijk te begrijpen, dat snapt iedereen en dat zie je ook op veel meer plekken in de wereld als je een grote ringweg hebt, dat er binnen die ring een milieuzone geldt.

Ja klopt, dat heb ik inderdaad al meer gehoord.
4. Waarom is echt die keuze om ook auto's en bestelbussen erbij te betrekken? Je zei: ze zijn aan de beurt.
Nou de transportsector, die kunnen zich op zich goed vinden in de milieuzones voor vrachtverkeer, hebben er ook fors in geinvesteerd. Ook in de Rotterdamse situatie, de EURO 6 zone op de Maasvlakte voor vrachtauto's. Ja en vanuit een soort eerlijkheid, misschien niet helemaal het goede woord, die hebben hun ding gedaan. Ze hebben flink geïnvesteerd in die EURO 6 vrachtwagens, die zijn echt aantoonbaar stukken beter dan de oudere vrachtauto's. Het aandeel van die zware vrachtwagens is ook wat kleiner in de binnenstad, wil je effect bereiken dan moet je er of super streng in zijn of ook naar andere doelgroepen kijken. Bij die overweging is ook gekozen om in ieder geval bestelverkeer mee te nemen en ook de personenauto's mee te nemen, om ook zoveel mogelijk de last te delen. Voor hetzelfde geld, voor hetzelfde effect maar dan geen personenauto's weren… ja dan had je dus de toegangseisen voor het bestelverkeer flink moeten opschroeven… naar EURO 4 of naar EURO 5. Dan staat dat ook weer teveel neer op die ene

doelgroep: de loodgieter, de timmerman, het transportbedrijf dat met een bestelbus rondrijd. Dus het is gewoon gekozen naar een soort… dat de getroffenen zo goed mogelijk verspreidt is over de verschillende doelgroepen in de stad.
4.1 Want die investeringen van de transportbedrijven, dat is dus veelal gelijk naar EURO 6 gegaan terwijl de norm EURO 4 is?
Je moet minimaal EURO 4 hebben. Ja we zullen… de investering voor EURO 6 is met name op de Maasvlakte, daar geldt een EURO 6 zone. Maar het is nu ook zo, als je nu een nieuwe auto… een nieuwe vrachtwagen koopt dan moet die EURO 6 zijn. Dat is vanaf 2014 al het geval of 2013 maar ik geloof 2014. Als je toen een nieuwe vrachtwagen kocht, dan moest die al EURO 6 zijn. Dat was Europese regelgeving voor die vrachtauto's. Dus je ziet dan wel een geleidelijke verschoning van het wagenpark en zo'n milieuzone is eigenlijk niets meer dan een versnelling van die verschoning. Maar ook vanwege de uniformiteit met andere steden zijn we vast blijven houden aan die EURO 4 norm voor vrachtauto's.

Ja dat klinkt wel logisch.
5. Dus dat is al gedeeltelijk waarom het striktheidsniveau gekozen is in Rotterdam. Voor vrachtwagens vooral om het gelijk te houden met andere steden en dan voor de bestelbusjes en personenauto's, die zijn iets lager geloof ik?
Ja we wilden aanvankelijk ook een toelatingsregime op basis van EURO klasse 3, EURO 3 mag er wel in dus, EURO 0, 1 en 2 mag er niet in. Maar als je dan kijkt naar je handhaving, waar je ook iets over hebt… we willen ook zoveel mogelijk automatisch handhaven, met camera's… dus dan heb je voertuiggegevens nodig als je het kenteken hebt en welke voertuiggegevens horen daar dan bij, ze kijken in het register van de RDW. Dan zie je dat daar bij de oudere auto's, het vastleggen van de EURO klasse heel onvolledig is. Dus voor de meeste oude auto's is de EURO klasse niet vastgelegd. Dus dat was het probleem rond die toegangseisen en toen zijn we dus min of meer noodgedwongen overgestapt naar toegangseisen op basis van Datum Eerste Toelating (DET), die heeft een relatie met de EURO klasse. De EURO klasse is Europese regelgeving, vanaf een bepaald moment is alleen nog maar EURO 2, EURO 3, EURO 4 verkrijgbaar met een bepaald overgangsregime. Dus hebben we toen de datum gekozen, de Datum Eerste Toelating, die zo dicht mogelijk recht doet aan de invoeringsdatum voor de EURO 3 voor personenauto's en bestelauto's. Daarom is de toegangseis voor bestelauto's en personenauto's is Datum Eerste Toelating en voor benzine is dat 1 juli 1992, toen werd de EURO 1 norm voor benzines van kracht, en 1 januari 2001 voor de diesels… toen werden die van kracht. Voor vrachtwagens zijn het wel EURO klasse omdat gewoon altijd en overal geregistreerd is. Dus zo zijn we op die DET gekomen.
5.1 Maar 2001 voor dieselauto's en 1992 voor benzineauto's, dat zijn vrij oude auto's toch? Want geloof niet dat heel veel mensen hun auto zolang gebruiken dat ze…
Toen we hieraan begonnen hadden we bepaald op basis van die voertuigregistratie van de RDW dat binnen het gebied van de milieuzone ongeveer 5.000 auto's daar niet aan voldoen en buiten de milieuzone 10.000, bij elkaar 15.000 ongeveer. Maar je moet niet vergeten dat hoe ouder de auto, hoe meer de uitstoot. En dan is misschien het relatieve aandeel is dan laag, maar de relatieve bijdrage aan de uitstoot is weer heel hoog. TNO heeft in 2012 voor ons een wagenparkscan gedaan, we hebben op een aantal plekken in de stad een week lang gemeten van welke auto's rijden er nu langs, van elke auto het kenteken opgeschreven, gekeken bij het RDW welke EURO klasse hoort daarbij en toen hebben ze een hele mooie grafiek gemaakt waarin ze zeg maar het aandeel in het aantal kilometers

en ook aandeel in de uitstoot hebben aangegeven. Dus dan kan je op een gegeven moment een optimum zoeken op hoeveel mensen tref je door een milieuzone en wat effect heb ik? Wat is het aandeel in het verkeer? Natuurlijk hoe strenger hoe groter het effect, maar als je 100 oude auto's hebt en 100 nieuwe auto's, ja die 100 oude auto's die stoten veel meer uit en dat kan een factor 4 à 5 schelen. Weliswaar minder in aantal, maar omdat per auto de uitstoot veel hoger is heeft dat best nog wel een groot effect.
5.2 Die 15.000 auto's, wat is dat ongeveer qua aandeel, weet je dat percentage ongeveer?
Moet ik even denken, Rotterdam heeft 600.000 inwoners… zeg 300.000 a 250.000 auto's geregistreerd… 10 procent zou 30 zijn.
5.3 Dus dat is ongeveer 5 procent.
Ja in die orde grootte.
5.4 Ja maar m'n vraag was ook vooral nu… 2001 en 1992 zijn vrij oud, zou het niet ook wat verder omhoog gezet kunnen worden?
Ja die afweging hebben we gemaakt he omdat we nadrukkelijk hebben gezegd voort wat hoort wat, we hebben een sloopregeling met dezelfde toegangseisen. Als je de toegangseisen… als we die zouden moeten opschroeven naar dus minimaal EURO 4, dan had de sloopregeling ook opengesteld moeten worden voor de EURO 3 en dat is opeens zo'n grote toename, of wie het eerst komt wie het eerst maalt en de pot is op een gegeven moment op, of het bedrag per auto hadden we flink omlaag moeten brengen of we hadden elders geld vandaan moeten halen. Al die opties waren geen reële opties. Dus toen is dit eruit gekomen en dat is weer het evenwicht tussen voort wat hoort wat, eisen prima en gekoppeld met een sloopregeling.
5.5 Dat is in de toekomst misschien weer iets wat overwogen kan worden dan.
Ja dat weet je maar nooit, dat is natuurlijk ook aan de raad. We hebben wel op het gebied van stedelijke distributie een Green Deal, ik weet niet of je dat wat zegt, een Green Deal zero emission stadsdistributie (GDZES) en daar staat in dat de ambitie is om vanaf 2025 met nulemissie stedelijke distributie te bedrijven. Dus dat betekent voor stedelijke distributie, zeg maar de bestelauto markt en vrachtauto even bot gezegd, zou er vanaf 2025 met nulemissie moeten gebeuren. Hoe dat is enkele jaren geleden in een convenant… de Green Deal gesloten dus een aantal gemeenten in Nederland, het Rijk en de transportsector. Maar dat wordt nu zo langzamerhand wel spannend van ja… hoe serieus nemen we dat nog steeds met z'n allen en is het een lovenswaardig streven of gaan we daar keihard aan vasthouden en door dat in te gaan zetten vanaf 2025, dat is over 7,5 jaar ongeveer. Dus eigenlijk komt dat heel dichtbij en zijn er al wel besprekingen gaande met verschillende niveaus, vooralsnog houden wij er als gemeente gewoon aan vast, in 2025 nul emissies distributie. Maar dat is ook iets voor het volgende college van hoe gaan we dat dan effectueren want opzich kunnen we dat prima handhaven, het is gewoon de business rules van de handhaving van de milieuzone. Dat scherpen we wat aan want alle bestelauto's moeten dan gewoon elektrisch zijn, vrij eenvoudig in te stellen. Gaan we dat werkelijk doen, dat is een opgave voor de komende jaren hoe we dat gaan doen.

6. Ja oke en wat is de handhavingsmethode op dit moment van de milieuzone?
Nou we hebben dus die zone getekend op de kaart en bij elke ingangsweg van die zone staat een verkeersbord met een bord dat je er niet in mag en achter elk bord staan 1 of meer camera's, ANPR (Automatic NumberPlate Recognition). Die kijken op elke invalsweg, dus het is echt een gesloten systeem, die checkt de voorkant van een auto en die leest daar het kenteken en zet dat om in een digitaal bericht.

Dat bericht komt binnen bij de gemeente Rotterdam, we hebben een applicatie gemaakt waarmee we... er komt een bericht binnen, die applicatie checkt bij de RDW via een directe verbinding wat zijn de voertuiggegevens van het voertuig? Die checkt ook bij onze eigen ontheffingen database want we hebben ook een ontheffingen systeem en als ie daar… en als eruit komt dat ie niet voldoet en hij heeft geen ontheffing, dan krijgt ie een boete. Beter gezegd, dan bieden we die… dat kenteken plus een aantal gegevens bieden we aan bij het CJIB (Centraal Justitieel IncassoBureau), die dan de boete verstuurt naar de eigenaar. En als die auto wel oke is dan slaan we alleen de passage op voor monitoringsdoeleinden, maar daar doen we dan verder niks mee. Dus het is een volledig geautomatiseerd proces, in totaal staan er iets van 32 camera's in dat kordon die per dag ongeveer 180.000 waarnemingen doen. Die komen binnen in die applicatie, dus 180.000 keer wordt gecheckt of die voldoen en dat gaat dan naar het CJIB.

6.1 En de ontheffingen, zijn dat er… waarvoor krijg je over het algemeen een ontheffing?

We hebben eigenlijk 3 soorten ontheffingen. Dat is de dagontheffing, die is 24 uur geldig dus als je 'm om 3 uur 's middags aanvraagt dan is ie tot de volgende dag 3 uur 's middags geldig, 12 keer per jaar zonder enige restrictie. Dat kan iedereen aanvragen voor een auto die niet voldoet. Voor eigenaren van campers die in de stad wonen en een auto in de stad hebben, die hebben we 12 in-/uitpak ontheffingen per jaar er bovenop. Voor zo'n in-/uitpak ontheffing mogen ze 3 dagen de stad in om hun camper in te pakken of uit te pakken. Dus met 12 ontheffingen zou je 6 keer op vakantie kunnen, 3 dagen in de zone om in te richten en weer 3 dagen om uit te pakken. Dus de in-/uitpak regeling voor campers, dat is de tweede. En de derde categorie zijn de zogenaamde langdurige ontheffingen en dat is ook een heel rijtje. Die staan ook wel allemaal op de website, maar het belangrijkste daarvan is: als je aan kunt tonen dat jouw bedrijf failliet gaat door die eisen. Je hebt een oude bestelauto en aan de hand van jaarverslagen laat je zien dat jouw bedrijf dusdanig slecht gaat dat je geen nieuwe auto kunt veroorloven. Dan kan je voor een jaar een ontheffing krijgen. We hebben een ontheffing voor auto's die om medische redenen zijn aangepast, bijvoorbeeld iemand mist een been dus heeft ie… is z'n auto aangepast. We hebben een ontheffing voor als je naar het ziekenhuis moet, het Erasmus MC als hele belangrijke regionale of zelfs landelijke functie. Als je daar naar toe moet kan je een ontheffing krijgen. Als jij kunt aantonen dat jouw auto ondanks dat ie te oud is, maar toch schoon genoeg is… er zijn oude auto's die volledig naar elektrisch zijn omgebouwd, dan krijg je ook een ontheffing. Dat is de zogenaamde right to challenge. Maar het komt ook voor dat er heel vaak… we hebben een aantal auto's dat wordt geïmporteerd uit Duitsland. Daar staat dan op het import bewijs… het document dat erbij zit dat er een geregelde katalysator bijvoorbeeld onder zit van die oude benzineauto's. Nou en de geregelde katalysator brengt al een heel snel op EURO 1 uitstoot van schadelijke stoffen. Bij is dan EURO 0 maar bij een geregelde katalysator staat dat dan niet geregistreerd bij de RDW. Dus als de eigenaar niks doet sturen we het kenteken naar de RDW, we krijgen terug: ja hij is te oud. Als de eigenaar kan aantonen: ja maar ik heb wel een geregelde katalysator d'r in en dan is ie toch schoner dan op basis van de RDW registratie mag worden verwacht. Dan krijgt ie ook een ontheffing omdat z'n auto aantoonbaar schoner is. Dat is ook een ontheffingsgrond. Dan hebben we nog een aantal wettelijke taken voor verkeersveiligheid, nood- en hulpdiensten. Even kijken welke langdurige… volgens mij ben ik nu redelijk compleet met de langdurige ontheffingen. Misschien mis ik er een paar maar goed die moet je maar

teruglezen op de website gezondereLucht.nl. Daar staan alle ontheffingsmogelijkheden op.
6.2 En zijn dat er dan ook veel per jaar, die ontheffingen?
Ik heb toevallig voor… even het evaluatierapport erbij. Het is nog een concept… even kijken, ontheffingsaanvragen… ontheffingsverleningen, het is onder embargo omdat het rapport nog niet uit is. In 2016 zijn bijna 5.000 dagontheffingen verleend. In heel 2016 moet je er wel rekening mee houden dat de daadwerkelijke beboeting startte in mei 2016. Dus eigenlijk de meeste mensen vragen wat tijd omdat ze anders een boete krijgen. De zone is wel van kracht geworden op 1 januari 2016, maar de beboeting pas in mei 2016. Maar heel in 2016 bijna 5… 4.978 dagontheffingen en 321 langdurige ontheffingen zijn er verstrekt. De meerderheid daarvan bedrijfseconomische redenen, 300 in 2016. Ja is dat veel of weinig, ik weet het niet… duidt het maar, het is zoveel het is. We verwachten wel dat dat natuurlijk afloopt. Ow ja dit was ik nog vergeten om te zeggen over de ontheffingen van oldtimers, dat zijn auto's die bij het passeren ouder zijn dan 40 jaar. Die zijn ook toegestaan, dus een auto die… wat is het vandaag voor dag? 19 april dus 19 april 1977 die wordt vandaag 40 jaar, die mag er vanaf vandaag in, gisteren niet. Dus als die er gisteren in had gewild dan had ie een dagontheffing aan moeten vragen. Maar vanaf vandaag mag die er voor eeuwig en altijd in. Dus in tweeduizendzoveel zijn alle auto's toegestaan, 1992 plus 40 jaar is 2032, dan zijn alle benzineauto's ouder dan 40 jaar en mogen ze er allemaal in.
6.3 Ervan uitgaande dat de milieuzone dan nog nodig is.
Ja dus dat zijn de ontheffingen. Je hebt ook nog een autonome verschoning he, je hebt gewoon een verschoning van het wagenpark. Dus dat is ook een reden waarom we denken dat het aantal ontheffingen af gaat nemen in de loop der jaren. Maar we zullen zien in welke mate zich dat voor gaat doen.

7. Oke duidelijk. Wat zijn volgens u succes en faalfactoren van de milieuzone?
De sloopregeling natuurlijk, dat is wel een hele belangrijke geweest. Dat ook andere groepen dan alleen de transportbedrijven hiermee geconfronteerd worden. Dat is de tweede succesfactor. Ook een derde is toch dat iedereen wordt getroffen zou ik maar zeggen en dus niet 1 doelgroep maar meerderen en daardoor is ook het aantal per doelgroep relatief laag. Als we alleen maar personenauto's hadden geweerd, dan hadden we heel veel personenauto's moeten weren en daar dus ook heel veel protest gekregen. Dus het is een beetje de last over verschillende doelgroepen verspreiden als succesfactor. Wat ook een hele goede is geweest, dat is echt wel een… heeft met de invoering van de milieuzone te maken. Hij is op 1 januari van kracht geworden en vanaf 1 mei is de beboeting gestart en in die eerste 4 maanden stonden op een aantal belangrijke invalswegen van de stad stond een kentekenpaal die van naderende auto's de voorkant bekeek. In die kentekenpaal staat een blacklist met kentekens die niet toegestaan zijn en dan kregen mensen gelijk te zien dat ze de milieuzone eigenlijk niet in mochten en we hebben ook elke maand een mailing uitgedaan naar de eigenaren van die voertuigen die waargenomen zijn met: goh wist u dat er vanaf 1 januari een milieuzone geldt, beboeting start op 1 mei… nu volgt er geen boete maar let op, vanaf 1 mei start wel de beboeting. In de communicatie is dat heel goed gegaan. Ja en gewoon de pakkans is heel hoog. We zitten nu op een overtredingspercentage van 0,05 procent, dus dat betekent dat 99,95 procent van de passanten… die 180.000 passages, die voldoen gewoon. Dat is gewoon, het is qua dat gewoon een groot succes.
7.1 Daar zijn de camera's natuurlijk ook belangrijk voor, camera's die merken ze altijd op terwijl als je met politie of met andere ambtenaren dat doet, dan heb je

kans dat ze gewoon dat ze er gewoon door kunnen rijden zonder dat ze gepakt worden.
Ja dat klopt.
7.2 En trouwens ook even over de effecten, ik heb qua echt metingen niet zo heel veel kunnen vinden. Wel van de vrachtwagens, daar is in 2010 geloof ik… is een groot onderzoek van geweest. Maar misschien van de personenauto's, staat dat dan ook in dat evaluatierapport? Maar dat moet nog uitkomen natuurlijk.
Ja en we hebben in begin november vorig jaar… heeft de wethouder een brief gestuurd naar de gemeenteraad met de tussenresultaten. Maar volgens planning, zoals het er nu naar uitziet sturen we dit rapport met de effecten van de milieuzone in zulk soort grafieken, afname en verbetering van de uitstoot. We sturen op 10 mei… dan wordt het openbaar. Dus of je moet zelf de pers in de gaten houden of je neemt na 10 mei weer even contact op en dan kan je gewoon het hele setje krijgen. Dat gaat in op de effecten op… minder uitstoot van roet, NOx en er wordt ook ingegaan op: en wat betekent dat dan voor de concentraties? Evenals de uitstoot in de concentraties? En dat rapport gaat op beide in en ik kan wel een sluier oplichten dat we behoorlijk goed op koers liggen om de ambitie uit de Koersnota te realiseren dus het gaat gewoon echt de goede kant op.
7.3 Zijn er dan ook nog dingen die minder gaan? Ik noem het faalfactoren maar dat is misschien een beetje harde term maar ja.
Een ding dat heel lastig is gebleken is die right to challenge ontheffingsmogelijkheid. Er zijn zoveel mogelijkheden om je auto te verschonen: met katalysatoren, met import wat ik net al zei of omdat de registratie niet volledig is, dat we daar gaandeweg heel veel in hebben geleerd. Eigenaren zelf zijn ook op zoek gegaan naar allerlei verschoningsmogelijkheden, roetfilters en weet ik wat allemaal. Dat is een weerbarstige materie, elke auto is weer anders en dat hadden we ook niet allemaal kunnen voorzien. Dat gaf af en toe wel wat wrevel tussen de eigenaar en de aanvraag van ontheffingen en aan onze kant, het moet wel getoetst worden of die verschoning inderdaad wel een realistische verschoning is. We hebben adviezen ingewonnen bij een Bovag en bij TNO: nou iemand komt met dit verhaal en is dat een geloofwaardig verhaal dat je auto inderdaad schoon genoeg is om toegelaten te worden. Dus dat was een hele lastige, die right to challenge, om dat goed te doen. Wat ook een lastige is geweest is… eigenaren van zogenaamde oldtimers noemen we dat dan, vooral van benzineauto's voor 1992 maar die nog niet 40 jaar zijn. Een deel daarvan zijn gewoon mensen die een hele oude auto hebben en die hebben dankbaar gebruik gemaakt van de sloopregeling omdat ze dan hun oude auto kwijt konden raken. Maar een deel daarvan zijn ook gewoon trotse eigenaren van op zich hele mooie auto's, alleen niet toegestaan in de milieuzone en zoals ik er tegenaan kijk zijn ze pas vrij laat, nadat de Koersnota al was aangenomen… de gemeenteraad had vastgesteld: dit zijn de maatregelen, dit is de milieuzone… toen zijn zij zich pas gaan realiseren van hé wacht is even, wij mogen zodadelijk met onze auto niet meer de stad in, waren ze eigenlijk te laat want in het half jaar daarvoor heeft de Koersnota al in de consultatiefase, inspraakfase en noem maar op. En die zijn pas eigenlijk echt gaan realiseren wat dat betekent voor hun auto's toen de gemeente eigenlijk al had besloten. Toen in november 2015 is het verkeersbesluit genomen en toen hebben ze wel bezwaar aangetekend en eind maart liep er een zitting bij de rechtbank voor de beroepsprocedure. Dus dan zie je dat je in een juridisch traject terecht komt, wat je eigenlijk helemaal niet wil. Het had eigenlijk eerder gemoeten, maar goed dat geeft gewoon veel onvrede bij die groep autobezitters, wat begrijpelijk is maar aan de andere kant, democratie heeft gesproken: dit zijn de toegangseisen.

Wat ook wel een succesfactor is, dat het een integraal beleid is geweest. Je hebt dus de milieuzone, de sloopregeling en wat we ook gedaan hebben is de parkeervergunningen die afgegeven zijn voor te oude auto's, die zijn ook ingetrokken. Enerzijds is dat heel vervelend voor die mensen natuurlijk, maar ze mochten toch al niet met hun auto de zone in. En we hebben ook gekeken voor zover dat mogelijk was of er buiten de zone ergens een wijkstallingsgarage of een parkeergarage is van de gemeente waar ze dan wel hun auto konden stallen.

8. Ah oke. En wat is volgens u dan het meest belangrijke aspect van de milieuzone in Rotterdam? En waarom?
Ja wat bedoel je? Bedoel je om het project te realiseren of doel je dan meer op de effecten? Of bedoel je meer…
8.1 Mag allebei wel.
Wat was je vraag ook alweer?
8.2 Wat het meest belangrijke aspect is van de milieuzone hier.
Nou dat we in een relatief hele korte tijd tussen… in mei 2015 is het besluit genomen in de gemeenteraad van er komt deze milieuzone en ongeveer een half jaar later is het van kracht geworden. En met het verkeersbesluit en de bebording en we hebben bewust een bepaalde periode gedaan om wel te handhaven maar niet te beboeten. In mei 2016 is de beboeting gestart en dat is een ontzettend gecompliceerd proces, binnen een jaar hebben we dat weten te realiseren. Daarvan vind ik wel dat het heel goed gegaan is. Ook de sloopregeling, dat vind ik een hele goede. En we boeken gewoon goede resultaten, maar goed dan loop ik al een beetje vooruit op de evaluatie. Maar het heeft gewoon echt effect waardoor de gezondheid van de Rotterdammer, waar je het eigenlijk voor doet, die is er echt mee geholpen. Dat zegt de GGD ook van ja, die milieuzone en ook andere maatregelen uit de Koersnota. Niet alleen de milieuzone maar ook het stimuleren elektrisch rijden, het stedelijk verkeersplan, dus veel meer. Dat leidt ertoe dat de gezondheid voor de Rotterdammer echt is verbeterd.

Ja dat lijkt me wel vrij belangrijk.
9. En wat zijn de risico's die voorkomen zouden moeten worden bij een milieuzone? Kun je denken aan voor het invoeren of ook bijvoorbeeld tijdens dat ie er is.
Nou het risico is met die right to challenge, dat is een hele lastige materie gebleken omdat dat van origine heeft de gemeente niet zoveel kennis in huis om autotechniek. Maar daar krijg je hierbij al heel snel mee te maken, geregelde katalysatoren en met een regelklepje en een drukventiel en APK metingen. Dus dat hele technische aspect en roetfilters en gesloten en open… dat is wel een lastige. En wat ik ook… dat is meer vervelend, weet niet of dat een risico is maar voor de milieuzone vrachtauto's hadden we een landelijk convenant van dit zijn de toegangseisen, die gelden voor elke stad. Nu zie je dat er een milieuzone in Amsterdam, Utrecht en Rotterdam is uitgebreid naar bestelauto's en soms ook personenauto's, maar die criteria zijn niet hetzelfde. Utrecht die heeft voor diesel personenauto's en bestelauto's maar weer niet voor benzine. Amsterdam heeft 'm ook voor bestel maar kent een DET van 2000, dus die is wat soepeler. Maar ook niet voor personenauto's en ook niet op benzine. Dus het is jammer dat het niet gelukt is door diverse oorzaken, dat er niet tot diezelfde uniformiteit hebben kunnen komen als bij de vrachtauto's het geval was. Het had ook te maken met de lokale omstandigheden dat een gemeenteraad uiteindelijk beslist over de toegangscriteria. En ja, de gemeenteraden in de 3 steden zaten toch anders in elkaar, de politiek is verschillend. Rotterdam zit op het gezondheidsaspect, andere

steden wat meer de juridische kant. Maar dat vind ik wel jammer, dat dat niet gelukt is met die uniformiteit. En het risico voor invoer… ja dat er een beetje een lappendeken ontstaat voor de gemiddelde automobilist in Nederland.
9.1 Ja dus dat het een beetje complex wordt om alles te begrijpen van waar mag ik wel in met m'n auto en waar niet?
Ja klopt en dan is ook de bebording niet overal exact hetzelfde dus dat is ook nogal een lastige.
9.2 Ja dat kwam van de minister af toch, heb ik geloof ik wat over gelezen. Dat er voor auto's en bestelbussen geen verkeersbord voor zou komen.
Nou het ligt iets genuanceerder. Vanaf 2007 was er een speciaal verkeersbord voor de milieuzone voor vrachtauto's, het zogenaamde bord C22a. En het staat ook in de wet omschreven wat de toegangseisen zijn als je bord C22a gebruikt. Toen ging in 2014 Utrecht flink aan de slag met de uitbreiding naar personenauto's en die hebben toen heel erg gelobbyd om de reikwijdte van het bord te verruimen zodat er ook andere voertuigcategorieën eronder zouden vallen. Rotterdam liftte daar op een gegeven moment op mee. Maar politiek in de Tweede Kamer was ook verdeeldheid over het al dan niet faciliteren van milieuzones door gemeenten en heeft het uiteindelijk een stemming opgeleverd en een motie in de Tweede Kamer waardoor de verruiming van de reikwijdte van bord C22a, wat een Rijks bevoegdheid is, heeft met de wet te maken, niet te doen. Dus de betekenis van het bord C22a beperkt blijft tot milieuzones voor vrachtauto's. Maar de minister zei toen ook al als reactie van ja prima, die motie neem ik over. Maar nog steeds staat het gemeenten vrij, dat is een gemeentelijke verantwoordelijkheid, om milieuzones in te voeren. Wij maken nu gebruik van bord C6, geslotenverklaring voor alle voertuigen met meer dan 2 wielen, met een onderbord die dan de toegangscriteria aangeeft. Dus ja dan zie je een beetje een spanning tussen een Tweede Kamer die iets wel of niet, maar ook aan de andere kant de gemeentelijke bevoegdheden en wat de problematiek op gemeentelijk niveau is. Uiteindelijk is het weer een gemeentelijke bevoegdheid om dit te doen en we hebben het ook gedaan. Dus het ligt iets genuanceerder dan het onmogelijk willen maken. Het heeft meer met die motie te maken die door de Tweede Kamer is aangenomen maar dat de minister ook zegt: het is uiteindelijk wel de bevoegdheid van de gemeenten om een milieuzone al dan niet in te voeren. Volgens Schultz zijn er andere betere maatregelen, maargoed het is wel een gemeentelijke verantwoordelijkheid om het te doen zoals we het doen.

10. Oke duidelijk. En hoe verliep de besluitvorming? Dan vooral dus het proces. Je zei al, er was een bepaalde groep met voornamelijk oude auto's die er eigenlijk een beetje te laat achter kwamen dat dat invloed had op hun, terwijl het hele besluitvormingsproces zo'n beetje al doorgaan was waardoor dus uiteindelijk nog wel juridische stappen ondernomen werden door die groep. Verder nog iets?
Ja dat besluitvormingsproces is eigenlijk vrij soepel gegaan. Toen we een ontwerp van die Koersnota hadden met varianten van de milieuzone, die is in januari 2015 verschenen, toen zijn we ongeveer de consultatie fase ingegaan en verdere scenario's gemaakt. Toen kwam het uiteindelijk in de commissie en de raad en bij de stemming in de raad voor die Koersnota inclusief maatregelpakket, heeft alleen de VVD tegen gestemd. Verder was de raad er helemaal voor. Dus eigenlijk nagenoeg unanieme steun voor de Koersnota maar ook de maatregelen waaronder de milieuzone zoals die nu is. Dus een ontzettend groot draagvlak bij de raad maar ook in het college natuurlijk, maar ook in de raad voor die milieuzone. De VVD die bleef steeds tegen de milieuzone de afgelopen jaren. De PvdA die zat meestal op de wip, op zich zijn ze wel voor de milieuzone, maar naar

hun oordeel is het te snel ingevoerd. Mensen hadden langere tijd nodig om eraan te wennen en om alternatieven te zoeken. Dus die zaten enerzijds wel voor de maatregelen maar te snel ingevoerd. Maar verder waren de partijen allemaal voor. En vorig jaar was er ook een raadsdebat over de milieuzone, toen werd er een motie ingediend door Groenlinks over dat in 2025 de hele stad nulemissie moest zijn voor auto's en die heeft het op 1 of 2 stemmen na net geen meerderheid gekregen in de gemeenteraad. Dus dat is eigenlijk wel een bevestiging dat de gemeenteraad best wel ver wil gaan in het versneld verschonen van het wagenpark. Dus dat politieke proces, bestuurlijke proces is eigenlijk best wel goed gegaan.

10.1 Ja want dus ook geen vertragingen opgelopen door de beroeps aantekeningen, jullie zijn wel gewoon begonnen.

Nee, juridisch is het zo: het verkeersbesluit hebben we genomen in november 2015 dat op 1 januari 2016 de zone van kracht wordt. En op zich dat iemand in bezwaar gaat heeft geen opschortende werking op het verkeersbesluit. Als iemand vindt dat ie ondanks z'n bezwaar en beroepsperiode dermate ernstig geraakt wordt door het verkeersbesluit met onoverkomelijke bezwaren, dan kan hij bij de rechtbank in die proceduretijd een voorlopige voorziening aanvragen. Dan had hij voor 1 januari moeten zeggen: dit heeft zo'n impact op mijn situatie, onomkeerbaar met onevenredig grote gevolgen. Ik vraag de rechtbank het verkeersbesluit op te schorten. Dat is niet gebeurd dus dat er bezwaar is aangetekend heeft geen opschortende werking voor het verkeersbesluit. De bezwaarperiode is geweest, dat heeft uiteindelijk geleid tot een nieuw besluit van het college in april waarin ze de milieuzone opnieuw bevestigen met kleine aanpassingen, toen is ook die camper ontheffing gekomen. Toen zijn er ook een aantal mensen in beroep gegaan. Er zijn 15 partijen in beroep gegaan bij de rechtbank, de zitting is 27 maart geweest jongstleden. De rechtbank zal binnen 6 weken moeten ze officieel uitspraak doen, maar het kan ook nog wel later zijn. Als de rechtbank besluit ten positieve van de gemeente Rotterdam, verwacht ik dat een aantal mensen in hoger beroep gaan. Dan kom je bij de Raad van State terecht en de Raad van State kan uiteindelijk ook beslissen dat die appellanten gelijk krijgen. Dat is afhankelijk van de beroepsgrond en wat de uitspraak is en wat voor gevolgen dat heeft voor het verkeersbesluit. Maar dat moeten we afwachten maar we zien het met vertrouwen tegemoet, zoals dat dan zo mooi heet.

11. Denk je dat er andere besluiten gemaakt hadden moeten worden als je terugkijkt op de besluiten die gemaakt zijn? Kan zowel eerst voor de vrachtwagen milieuzone als voor nu de aanpassing naar bestelbussen en auto's.

Nou misschien 1 ding, maar dat is natuurlijk ook een bestuurlijk verhaal, dan is het lastig er iets van te zeggen. Antwerpen heeft ook een milieuzone ingevoerd onlangs. En wat ik het mooie van Antwerpen vind is dat ze duidelijke stappen… een gefaseerde aanpak hebben gedaan. Nu geldt EURO 3 geloof ik als toegangseis. In 2020 wordt ie aangescherpt naar iets en in 2025 wordt ie ook aangescherpt naar iets. Dat is gewoon heel duidelijk van dit is wat we gaan doen. Zoiets had ik ook wel mooi gevonden als dat in Rotterdam was gebeurd. Zo van milieuzone met deze toegangscriteria vanaf 1 januari 2016, vanaf 2021 doen we dit. Dus een langere termijn perspectief en daar door kunt. Die vragen krijgen we ook van goh wordt de milieuzone aangescherpt? Het is een beetje onzekerheid over wat er hierna gaat gebeuren.

11.1 Ja in Duitsland hebben ze dat ook en dan zelfs nationaal met 3 verschillende fases en dan elke keer iets strenger.

Ja althans die stickers worden op die manier gemaakt, maar of die uiteindelijk worden toegepast is aan de gemeente zelf. Stuttgart heeft aangekondigd dat ze ook de blauwe sticker willen gaan invoeren vanaf 2018 meen ik, München niet tenminste niet dat ik weet.
11.2 Nog niet maar ze waren er wel over bezig toen ik dat interview had.
Ja dat is ook volgens mij kun je bijna nergens meer in met de gele sticker, misschien nog 1.
11.3 Ja bijna alles is al naar fase 3, wat dus de groene sticker is.
Ja precies, dus daar zie je ook wel die aanscherping in de tijd.

12. En wat kan er in andere gevallen van Rotterdam geleerd worden volgens u?
Nou dat we in de projectfase gewoon heel goed met alle verschillende disciplines van de stad hebben samengewerkt: met de communicatiemensen, de ict mensen om die applicaties te maken voor toezichthouding en om ontheffingen aan te vragen, de aanbesteding van de camera's en de afstemming daarop, gelijk ook de handhavers erbij want ik ken ook voorbeelden van steden waar de beleidsmakers en de projectmedewerkers nooit praatten met de handhavers. Dat is heel raar vind ik, maar bij ons zaten de handhavers die uiteindelijk de naleving en handhaving moeten doen vanaf het begin af aan in het project. En een goede projectjurist voor het ontheffingsbesluit en het verkeersbesluit, een goede projectleider erop. Dus dat stond gewoon goed, de projectorganisatie stond gewoon heel goed. Binnen een half jaar hebben we die milieuzone ook uit de grond gestampt. Dus dat is wel een hele goede geweest. Nou en het bestuurlijke draagvlak, maargoed dat kan je niet altijd sturen. Maar het helpt natuurlijk wel. Ja en ook gewoon dat we werkelijk het doen, nu met die sloopregeling erbij en de intrek van de parkeervergunningen in de milieuzone, het koppelen van de maatregelen. Samen met de andere maatregelen uit de Koersnota: het verkeersplan, elektrisch rijden. Ja het is gewoon het totaal pakket.
12.1 En naast het bestuurlijke draagvlak, was dus het draagvlak onder de bevolking ook vrij goed?
Ja, wat ik zeg. De groep die zich het meeste roert dat zijn er wel een aantal maar ook geen duizenden. Dus in die zin is het relatief beperkt. En verder met de ontheffingverlening komen de meeste mensen kennelijk wel weg of ze hebben hun auto gesloopt of op een andere manier komen ze naar de stad. Ja dat blijkbaar, bedoel de hel is niet losgebarsten.
12.2 Ja zolang er alternatieven zijn...
Ja die zijn er gewoon goed in de stad natuurlijk.
12.3 Ja in Rotterdam helemaal: metro, tram, bus…
Ja Rotterdam investeert ook flink in de fietsvoorzieningen, dat zie je ook in het fietsgebruik dat toeneemt de laatste jaren en we blijven doorgaan. Dus de alternatieven die zijn er ook. En we hebben gewoon goede ontheffingsmogelijkheden.
12.4 En de ontheffingen ja, die heb je ook nog.
Ja.

Oke dat was het geloof ik wel.