



Improving Air Quality in Border Regions

A case study of effective implementation of a low emission zone in Maastricht

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The responsibility of the content of this research is that of the researcher only. This research does not express the opinion of the municipality of Maastricht or that of other organisations that have contributed to this research.

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Abstract

Air quality is an increasingly important topic. On many levels steps have been taken to improve air quality. The European Union has set air quality standards, the World Health Organization has created air quality guidelines and many governments, national as local, have been working on the creation of policies to improve air quality. Border regions have to find ways to effectively implement national policy goals on air quality. This is made difficult by the challenges border regions face, challenges which are mostly different from those of other geographical regions.

In this research the effective implementation of Dutch national air quality goals in border regions is investigated. This is done via a case study of the implementation of a low emission zone in the municipality of Maastricht. By using the theories of multi-level governance and policy diffusion and the creation of a model to analyse the effectiveness of the different available policy options, the effective implementation of a low emission zone is researched.

This research concludes that the alignment of national demands and local needs in the development of policy in border regions is essential in order to effectively implement national policy goals in border regions. Territorial cohesion is needed for effective policy implementation in border regions. Only in that way air quality in border regions can be effectively improved.

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List of abbreviations

ANPR	Automatic number plate recognition
COROP	Coordination Commission Regional Research Programme, Dutch: <i>Coördinatiecommissie Regionaal Onderzoeksprogramma</i>
EC	Elemental carbon
EC	European Community
ECs	European Communities
ECSC	European Coal and Steel Community
EEC	European Economic Community
EETS	European Electronic Toll Service
EU	European Union
IPO	Interprovinciaal Overleg
I&W	Ministry of Infrastructure and Water Management
LEZ	Low emission zone
$\mu\text{g}/\text{m}^3$	Micro(s) per cubic metre
MLG	Multi-level governance
NSL	National Air Quality Cooperation Program, Dutch: <i>Nationaal Samenwerkingsprogramma Luchtkwaliteit</i>
RIVM	Netherlands National Institute for Public Health and the Environment, Dutch: <i>Rijksinstituut voor Volksgezondheid en Milieu</i>
RVV	Regulations traffic rules and traffic signs, Dutch: <i>Reglement verkeersregels en verkeerstekens</i>
NO_2	Nitrogen dioxide
NUTS	Nomenclature of Territorial Units for Statistics, French: <i>Nomenclature des unités territoriales statistiques</i>
$\text{PM}_{2.5}$	Particulate matter with a diameter smaller than 2.5 micrometres (μm)
PM_{10}	Particulate matter with a diameter between 2.5 and 10 micrometres (μm)
VNG	Vereniging van Nederlandse Gemeenten
WHO	World Health Organization

1. Introduction

Since the 1970s the harmful effects of the burning of fossil fuels and influence of greenhouse gases on our climate, and the negative effects that particulate matter (PM), soot and other particles that are emitted as the result of incomplete combustion have on our health have become clear (Sawyer, 1972, p. 23). Research has concluded that the burning of fossil fuels and the emission of greenhouse gases has a direct effect on the rise of temperatures globally. Moreover, the emission of gases and particles as the result of combustion has proven to be harmful for people. Long exposure to particles such as soot and PM can lead to pulmonology such as COPD and asthma (Pope III and Dockery, 2006, pp. 730-731).

Although air pollution is not a phenomenon of the last decades, reports on air pollution dating back to the time of the Industrial Revolution suggest that air pollution in industrial centres was comparable or worse as in modern times, the issue of air pollution has moved up higher on the political agenda in the last decade (Brimblecombe, 1977; Brown, 2017). In recent years steps have been made to try to limit environmental pollution and global warming. This has been done on a global scale, via climate agreements such as the 2015 Paris Agreement, on a national level via agreements between governments, employers and trade unions and on a local level via initiatives of individuals and policies of local governments (United Nations, 2015; Sociaal-Economische Raad, 2013; Gemeente Maastricht, date unknown).

The results of these actions can be seen in the European Union (EU). Air quality in the EU has slowly been improving. Since the 1990s the emission levels of NO_2 , PM_{10} and $\text{PM}_{2.5}$ have been dropping (European Environment Agency, 2016). However the average level of $\text{PM}_{2.5}$ in the European Union was still above the EU Standards for air pollution in 2015 (Fleming, 2017). In the Netherlands a similar pattern can be identified. Both the levels of PM_{10} and $\text{PM}_{2.5}$ and the levels of NO_2 have been dropping since data was collected in the late 1970s. However, although the levels NO_2 have been below the EU Standards from 2005 onwards and the levels of PM_{10} and $\text{PM}_{2.5}$ since 2004, there are still areas in which emission levels are too high (RIVM, 2015). Urbanised areas, or industrial zones do still often breach the emission norms set by the European Union.

Importance of clean air

The World Health Organization (WHO) has estimated that air pollution years kills seven million people worldwide in 2017. Nine in ten people worldwide live in areas which are polluted, meaning they breath in polluted air each day (World Health Organization, 2018). In the last years many initiatives have been taken, on many different levels, to curb the emissions of polluting gasses and particles. However, it is important to discuss why these measures are necessary and what the effects of these gasses and particles are on human health.

Air pollution can consist of many different gasses and particles. For this research the focus will be put only on the gasses and particles that are most dangerous for humans, being NO_2 , PM_{10} and $\text{PM}_{2.5}$ (EC consists of a combination of particles and ultra-fine particles, it is therefore hardly impossible to be concrete about the effects of EC).

Long term research on the effects of NO_2 has proven that this gas has profound negative effects on public health. A 2016 report of the Netherlands National Institute for Public Health and the Environment (RIVM) shows that exposure in the Netherlands to NO_2 can cause a shorting of life expectancy by up to 13 months (RIVM, 2016). Besides this, research has shown that long exposure to NO_2 can have negative effects on cardiovascular diseases such as asthma. The higher the expose to NO_2 is, the larger number of

cardiovascular diseases are registered (Hoek, Krishnan, Beelen, Peters, Ostro, Brunekreef and Kaufman, 2013).

Particle matters (PM) also form a hazard to public health. These microscopical particles penetrate deeply into people's lungs causing cardiovascular diseases and increasing the likelihood of mortality by cardiovascular diseases. A 2013 WHO report on the effects of both PM₁₀ and PM_{2.5} showed the direct effects of these particles. The chances of mortality are raised by 0.2–0.6% per 10 µg/m³ increase of PM₁₀. Long-term exposure to PM_{2.5} is estimated to create an increase in the risk of mortality by 6–13% per 10 µg/m³ increase of PM_{2.5} (World Health Organization, 2013; World Health Organization, 2006; Samoli et al., 2008; Beelden et al., 2008; Krewski et al., 2009; Pope III et al., 2002).

It is therefore clear that these pollutants have a serious negative effect on public health. The origin of these pollutants varies. NO₂ is mostly caused by motor traffic as direct result of the combustion of (mostly) diesel fuel (ICOPAL, date unknown). PM₁₀ and PM_{2.5} are partly caused by motor traffic, but also find their origin in industrial productions and general combustion of fossil fuels.

Besides serious effects on public health, the exposure to gasses and particles such as NO₂, PM₁₀ and PM_{2.5} comes at high cost. A United Kingdom study has estimated that the minimum yearly costs of treatments of cardiovascular diseases and loss of life as a direct result of NO₂ emissions is 5.3 billion pounds sterling (Department for Environment, Food and Rural Affairs, 2015). Compared to the Netherlands in country size and population and NO₂ emissions, this could imply that NO₂ emissions cost at least 1.7 billion euros a year, or roughly 2.4% of the annual health care budget in the Netherlands (Ministry of Public Health, Welfare and Sport, 2016, p. 6).

Since the 1990s the emission levels of NO₂, PM₁₀ and PM_{2.5} have been dropping (European Environment Agency, 2016). This is not only the case in Europe as a whole, but also in the Netherlands (Van Zanten et al., 2015, pp. 4-5). Although the levels of these emissions have dropped significantly, the levels NO₂, PM₁₀ and PM_{2.5} are still high in urbanised areas. Looking at figure 1.1 it is clear that the area surrounding Maastricht has a high level of both PM (left) and NO₂ (right) in 2001. Although these levels have dropped since 2001, it is clear, certainly with the negative effects on public health of both pollutants in minds, that is important to lower the emission levels of PM₁₀, PM_{2.5} and NO₂.

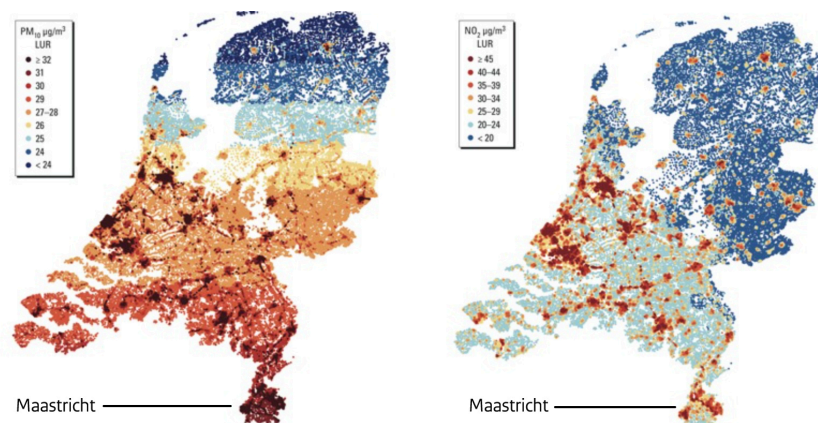


Figure 1.1: Levels of PM and NO₂ per µg/m³ in 2001 in the Netherlands (Fischer et al., 2015, p. 699)

Multiple measures have been taken over the years on different levels to lower the levels of NO₂, PM₁₀ and PM_{2.5}. These measures have had an effect on the air pollution in the Netherlands and urbanised areas. However there is still a vast room for improvement. Almost all areas in the Netherlands will comply with the European Union norms on air pollution in 2020, but these norms still allow a relatively high level air

pollution (Van Zanten et al., 2015, p. 78). It is therefore necessary that additional steps are taken to lower the levels of NO₂, PM₁₀ and PM_{2.5} further in order to comply with the more strict and therefore healthier WHO guidelines (World Health Organization, 2006). This is important as each step in the improvement of air quality will result in an improvement of life quality.

Cleaner cities

The Government of the Netherlands has set the goal to comply with the emission standards of the European Union as soon as possible. In order to do this, the Netherlands has created a list with over 100 possible measures that could improve the air quality in areas in which the air quality breaches EU standards. Besides these measures the State Secretary for Infrastructure and Water Management (I&W) Van Veldhoven stated that the Netherlands aims to comply with the stricter norms of the World Health Organization (WHO) (Rijksoverheid, 2018).

Multiple large cities in the Netherlands are having problems to comply with the European Union Air Quality Standards. Cities such as Rotterdam and Utrecht still do not meet the requirements as set by the European Union, exposing citizens to unhealthy levels of both PM₁₀ and PM_{2.5} and NO₂ (Gemeente Rotterdam, 2017, p. 4; Gemeente Utrecht, 2016, p. 27). In these cities measures are therefore taken to improve air quality. Both the city of Rotterdam and the city of Utrecht have implemented a low emission zone (LEZ) in the city centre. It is prohibited to enter these zones in vehicles (cars, vans or lorries or a combination depending on the zone in question) that are registered before a certain date. In Utrecht it is for example prohibited to enter the LEZ in diesel cars registered before 1 January 2001 (Gemeente Utrecht, date unknown). In this way the most polluting vehicles are banned from the LEZ. The emission levels of both PM₁₀ and PM_{2.5} and NO₂ have dropped in the two cities since these low emission zones have been implemented. Besides these LEZs both cities have tried to lower emissions by improving traffic flows (Gemeente Utrecht, 2016, pp. 25-26), discouraging citizens to use cars (Gemeente Rotterdam, 2017, p. 27) and by promoting the usage of public transport and bicycles (Gemeente Utrecht, 2016, p. 25).

Both Rotterdam and Utrecht have seen improvements in air quality since the introduction of a LEZ. Although this improvement in its entirety cannot be contributed to each respective LEZ, it is clear that the introduction of a LEZ in both cities has resulted in an improvement of air quality. It is therefore not surprising that the new coalition agreement of the government Rutte III mentions LEZs as an effective measure to improve air quality in urban areas (Rutte, Van Haersma Buma, Pechtold and Segers, 2017).

The implementation of the LEZs in Utrecht and Rotterdam however have not been without opposition. Both in Rotterdam as in Utrecht multiple court cases have been started against the plans of the municipalities (DUIC, 2016; Amghar, 2017). These court cases show that both Rotterdam as Utrecht have found difficulties in aligning the goals that were set before the implementation of the LEZ with the concrete implementation chosen by both municipalities.

Maastricht

The air quality in Maastricht is better than that of Utrecht or Rotterdam. Since 2015 the city complies with the European Union Standards for the emissions of PM₁₀ and PM_{2.5} and NO₂ (Bouthoorn, Teeuwisse and Van der Pol, 2016, p. 13). Nevertheless the alderman of environment Van Grootheest asked in 2016 for a research to see if and how the air quality in Maastricht could be further improved. Three main questions were formulated. Firstly, which measures can the municipality take to improve the air quality in Maastricht? Secondly, what would it take to comply with the WHO guidelines on air quality? And finally, which measures can the municipality take to improve the air quality in the city centre of Maastricht? These questions have been investigated by Royal HaskoningDHV (Bouthoorn, Teeuwisse and Van der Pol, 2016, p. 5).

It is concluded in the report of Royal HaskoningDHV that the air quality and air pollution in Maastricht is for the biggest part the result of pollution abroad. Air pollution as a result of industrial activities and vehicle emissions from Belgium and Germany have an enormous impact on the air quality in Maastricht. As a result of this fact, the influence of the municipality of Maastricht to improve the air quality in Maastricht in the long term is limited. Royal HaskoningDHV states however that the air quality in the city can be improved in the short term (2-5 years from 2017 onwards) (Bouthoorn, Teeuwisse and Van der Pol, 2016, p. 2).

A large portion of the air pollution in Maastricht that can be influenced by the municipality of Maastricht is caused by motor vehicle emissions. These emissions are expected to drop from 2020 onwards. In 2030 the levels of PM₁₀ will have dropped by 30% in comparison to 2015, the levels of EC around will have dropped by around 40% and the levels of NO₂ by even more than 60%. These reductions in vehicle emissions are the expected results of increasingly stricter emission rules for motor vehicles in the European Union and the phase-out of older, more polluting vehicles over time (see *Euro emission norms*; chapter 4) (Bouthoorn, Teeuwisse and Van der Pol, 2016, pp. 12-13). It must be noted however that these are of course expected reductions. These can be influenced both positively and negatively over time by multiple factors such as political choices, foreign developments on air quality developments and technological developments.

The report suggests, looking at the fact that a large influential part of emissions in Maastricht are caused by motor vehicles emissions, and that these emissions will become less in the next 10 to 12 years, that the best way to currently limit the harmful emissions in Maastricht is via a low emission zone (LEZ) in the city centre of Maastricht (Bouthoorn, Teeuwisse and Van der Pol, 2016, p. 19). Such a measure could reduce the amount of NO₂ and EC produced by motor vehicles in the city of Maastricht by up to 35%. The levels of PM₁₀ and PM_{2.5} would be hardly affected by the implementation of a LEZ as these emissions in Maastricht are almost fully the result of background pollution (Bouthoorn, Teeuwisse and Van der Pol, 2016, p. 16).

By prohibiting the entry of older, more polluting vehicles (minimum of Euro IV[4]; date of first registration January 2006 or newer) in the city centre of Maastricht, the levels of NO₂ and EC in the city could be limited.

However this will only become reality if it is possible to implement a LEZ in the centre of Maastricht effectively. This means that vehicles that are not allowed into the LEZ should be kept outside the LEZ. In Utrecht, where a LEZ has been functioning with a great positive effect on the air quality since 2015, the enforcement of the LEZ is done via automatic number plate recognition cameras (ANPR). These cameras, which are placed at all the roads where the LEZ can be entered, register the number plate of each vehicle that enters the LEZ. The number plates are compared with a database of the Netherlands Vehicle Authority (RDW). This makes it possible to know the date of first registration of Dutch registered vehicle that enters the LEZ in Utrecht. If a vehicle is too old (date of first registration before 1 January 2001 for diesel cars in Utrecht (Gemeente Utrecht, date unknown)), the owner of the vehicle will automatically receive a fine for illegally entering the LEZ.

This system works very well in Utrecht. It has a high level of control, every vehicle that is registered in the database of the RDW can be checked and it creates no obstacle for the traffic flow or for motorists as they do not have to perform any action to enter the LEZ. However, Maastricht is different from cities like Utrecht in a key area. The city is located near the border of Germany and Belgium. This geographical location makes that many Germans and Belgians visit Maastricht. On busy shopping days the number of foreign registered cars in the centre of Maastricht can reach over 60% of the total vehicles in the city. The result of the fact that Maastricht is a border region makes that the enforcement of a LEZ in Maastricht has to deal with different problems than the enforcement of a LEZ in Utrecht. The enforcement method chosen for a LEZ in Maastricht should therefore take these differences into account.

Policy diffusion and Multi-level governance

Since 2015 a number of policy areas in the Netherlands have been delegated to municipalities. Topics such as elderly care, youth services and the support in finding work and income, have become decentralised. More decentralisations towards municipalities will take place in 2020 (Rijksoverheid, date unknown). The role of municipalities in creating policy for citizens is therefore growing in importance. Subsequently municipalities have become more important for the national government to achieve policy goals, in that way slowly changing the role that municipalities in the Netherlands have (Bovens, 't Hart and Van Twist, 2012, pp. 42-43).

Besides implementing decentralised policy, municipalities have an important role in creating policy on a wide spectrum of issues. From transportation policy to local environment issues or the care of the homeless. Whereas issues on these policy areas are visible in almost each municipality, the choices made vary among municipalities. Local differences and local issues sometimes ask for customisation of policy and enforcement. In order to achieve a policy goal efficiently and effectively it is, in some cases, necessary to create tailor made policy. When and how tailor made policy can be achieved however depends on the room of manoeuvre of a specific authority.

This room to manoeuvre is firstly strongly affected by the constitutional law of a country. The Netherlands is a decentralised unitary state (Bovens, 't Hart and Van Twist, 2012, pp. 38-39). Meaning that individual administrative entities within a unitary state have their own authorities. Municipalities in the Netherlands can therefore individually create policy on different policy fields, such as for example air pollution. However, these freedoms of individual administrative entities can be limited. This can be done by the national government, demanding certain policy, prohibiting certain policy or demanding a uniform policy, the constitution, existing legislation, the European Union or by existing international law and international treaties. At the same time, policy can be freely created by a local government, as the pre-set goal of the national government is reached by this policy. European Directives are a good example of these policy goals. If a municipality operates within an area that is partly occupied by other administrative entities and legislations, it has to manoeuvre within this space. Meaning that municipalities sometimes have all freedom to create their own policy, but sometimes only can implement national or European policies.

This '*room to manoeuvre*' is however not always clear. Municipalities can create so-called policy diffusion, deviating from the original policy implementation, in order to create a better fit between the policy goals and the local circumstances. By learning from other governments, experimenting with new policy solutions or changing policy to local situations, new diffused policy can be created (Shipan and Volden, 2008, p. 840). The influences of the multi-level governance (MLG) structure, in which local governments such as the municipality of Maastricht operate, influences the choices local governments can make (Hooghe and Marks, 2001a, pp. 4-5).

Effective policy in border regions

The goal of policy created on a local level is to be achieved in a most effective and efficient manner. This is not always possible due to the limitations local governments face from both national and European rules and regulations. It is therefore necessary for local governments to find solutions to these problems. In border regions, such as that of Maastricht, these problems are even more interesting. As described earlier, border regions often are confronted with issues that are a direct effect of their geographical location. These issues, such as the high number of foreign registered vehicles in Maastricht, are not present in areas which are not close to the border such as Utrecht. Municipalities, such as Maastricht, should therefore seek solutions for the effects of its geographical location in order to reach policy goals effectively and efficiently. The fact that border regions have to deal with other kind of problems (such as those of Maastricht) is not

always recognised or taken into account by national governments. It is therefore interesting as important for effective policy to research how border regions can effectively implement top-down policies and thereby how a balance or solution can be found for national, but also international and European, demands versus local needs.

By focussing on Dutch national policy goals on air quality and taking the municipality of Maastricht and their implementation of a LEZ as a case study, it will be researched how national policy can be effectively implemented in border regions. The main research question that will be answered in this thesis will therefore be as follows:

“How can Dutch national policy goals on air quality improvement be implemented effectively in border regions?”

This question will be answered by a both political and legal analysis of air quality improvement policy on both the national and the European level. The political analysis on both the European and the national level will focus on the possibilities that exist for policy on both levels. This analysis will as such create an overview of the options that are available on both levels. The legal analysis will focus on the limits of and the requirements on the European level, the national level and the local level. On the basis of this analysis the position of the different actors which are involved in the creation of this policy can be identified. With this knowledge the ‘room to manoeuvre’ and thereby the possible policy options for the municipality of Maastricht can be made clear. Upon the basis of this, the most effective enforcement method for a LEZ in Maastricht can be identified via an analytical model for effective enforcement. In doing this the following questions can be answered:

- What is the political context of air quality improvement policy on a European Union level?
- What is the legal context of air quality improvement policy on a European Union level?
- What is the political context of air quality improvement policy on a national level in the Netherlands?
- What is the legal context of air quality improvement policy on a national level in the Netherlands?
- How can a LEZ be implemented effectively in the municipality of Maastricht?

The concepts of policy diffusion and multi-level governance will be used to give a theoretical framework for the policy that is created on different levels, the influence these levels have on each other, and the reasons for which local solutions for local problems i.e. policy diffusion, exists. Via interviews with stakeholders, the usage of policy documents and an analysis of the most effective enforcement options for the municipality of Maastricht an overview of the possibilities and chances for border regions and the municipality of Maastricht in particular to effectively implement policy to achieve air quality improvements is created. In this way answering the main research question of this thesis. Simultaneously the role of the municipality of Maastricht in the multi-level governance arena will be analysed.

Readers’ guide

This thesis has the following structure. Chapter 2 covers the methodological choices that have been in this research. In this chapter the research methods and case selection are discussed and justified. In chapter 3 the concepts of multi-level governance and policy diffusion and other relevant concepts relevant to this research are explored and discussed. The role of multi-level governance in the creation of policy will be discussed. Furthermore the working of policy diffusion and the explanations for policy diffusion will be analysed. In this chapter the constitutional and administrative framework of the Netherlands will be introduced. In chapter 4 the legal and political analysis of air quality improvement policy of the European Union and the Government of the Netherlands will be discussed. In chapter 5 results of the interviews and analysis of the different enforcement options will be presented and the main research question will be answered. In chapter 6 the total research will be summarised whilst both the theory and the research in general will critically reviewed and suggestions for border regions to implement national policy effectively will be given.

2. Research Design

The creation of any research is the result of an accumulation of choices. Choices, varying from the main topic till the number of interviews conducted, shape every research. In this chapter these choices are explained together with the effects of these choices on this research. Besides these explanations, the general outline of this research is discussed in detail and the most important elements of the main research questions are made clear. Firstly the research in general is discussed, followed by the data collection and the analysis methods of this data.

Outline

Before moving forward with the research question of this research and the methods that are used, it is important to explain and justify the outline of this research. In this research the focus is put on the effective implementation of air quality improvement policies. This research is targeted on border regions and specified on the case of the municipality of Maastricht.

Firstly, in chapter 3, the theories used for this research are presented and discussed and the constitutional and administrative structure of the Netherlands is introduced.

Secondly the political and legal context of both the European Union and the Netherlands is shown in chapter 4. This context is visualised in order to explain the outer boundaries of both the EU and the Dutch government and to make clear where there is room to manoeuvre for the different stakeholders involved.

Subsequently the analysis of the data used in this research is presented in chapter 5, together with the analysis of the different enforcement options for low emission zones in Maastricht. Finally the conclusion of this research is given in chapter 6, together with a discussion and critical reflection.

The set-up of this research can be seen as a two-step analysis. In which first the context of this research is thoroughly examined to subsequently analyse the most effective implementation and enforcement methods for a low emission zone in Maastricht.

Methodology

The main part of this research design is explaining how this research is conducted and justifying why this path for this research has been chosen. In this paragraph the data that is used in this research and the way this data is analysed is discussed.

Research question

The goal of this research is to find an answer on the main research question. This research question, as introduced in the introduction is the following: *“How can Dutch national policy goals on air quality improvement be implemented effectively in border regions?”*. This question is the result of multiple considerations and choices.

The main research question consists of multiple elements. Firstly the choice has been made to only focus on the implementation of Dutch national policy goals. This choice is firstly based on the fact that this research only makes use of one case, the municipality of Maastricht, which is located in the Netherlands. This case therefore is bound to Dutch national policy goals, resulting in the choice to focus on Dutch national policy goals. National policy goals will be analysed as these can give an insight in the multi-level governance relationship between the European Union, national governments and local governments. Subsequently the focus is put on the effective implementation of these goals in border regions. Air quality

improvement policy is defined as policies that have as goal to improve air quality in an area. Effective implementation is an important element in the achievement of the goal of created policy. It plays a key role in the transformation from policy goals to the policy outcome. The final focus on border regions is made because border regions, such as the municipality of Maastricht, tend to require different strategies to achieve the same policy outcomes in comparison to non-border regions (see chapter 2: *Border regions*). These choices have therefore resulted in the earlier mentioned main research question.

It is important to note that the 'how' in this research question not only refers to enforcement methods or policy plans that can achieve or result in effective policies, but also refers to the process in which border regions achieve effective policy implementation.

The sub questions can be divided into two parts. Firstly four questions give answer to the political and legal context in both the Netherlands and the European Union of air quality improvement policies. Answering these questions gives insight into the playing field for local governments. Both the political and legal context gives an insight in the possible measures that can be taken and the limitations that exist both legally as politically.

The last sub question looks at the situation in Maastricht and the implementation of a low emission zone (LEZ) in Maastricht. This sub question is the result of the case study that is done in the municipality of Maastricht. Using an analysis framework (see *Framework Effective Policy*) the best methods to implement and enforce a LEZ in Maastricht can be researched. These conclusions are used for the main research question of this research.

It is important to mention that this research is focussed on the municipality of Maastricht but has a broader scope of all border regions in the Netherlands. These border regions are defined as all NUTS III areas that have a direct border (over land) with another country (see chapter 2: *Border regions*). In the Netherlands there are 16 NUTS III areas that conform to these requirements. Although the outcomes of this research are mostly focussed on the case in hand, the results can be generalised and used by other municipalities and areas. It is however always important that in doing this, the sometimes unique elements of the municipality of Maastricht, are taken into account. In this research most of these elements will be clearly mentioned, making mostly possible to identify their effects on the outcomes of this research.

The goal of this research is therefore not singular. Firstly, it is the goal to find the most effective implementation and enforcement method for a low emission zone in Maastricht. At the same time, the goal is to show the process in which this end goal is reached and identify the factors that play a determining role in this regard. Finally, it is sought to make these outcomes applicable for border regions in the Netherlands in general.

Data used

The data used in this research is qualitative in nature. The choice for this research method is made on the basis of the goal of this research. This research investigates how policy effectively can be implemented. In order to investigate this is important to know not only which choices in policy creation and implementation are made, but also why these choices are being made. In order to answer this 'why?' question the usage of qualitative data, in this research interviews, is most suited (Silverman, 2005, pp. 7-8).

Before starting this research multiple off-the-record interviews with policy advisors of different municipalities have taken place to get a grip on the topic in hand. This data is used to get an overview of the different issues and trends in the arena of air quality improvement and to see which hurdles other organisations had overcome to effectively implemented air quality improvement measures.

The data used in this research is retrieved from multiple sources. Primary in this research is the usage of existing literature on air quality and air quality improvement policies on the European Union, national and local level. These documents, together with expert reports on local situations and the specific effects of different air quality measures are used to create an extensive context sketch and to show which specific measures could be effective in border regions. These documents are gathered via primary sources such as government agencies and consultancy firms. Other specialised reports are collected via Google Scholar.

Prior to the analysis in chapter 4, the legal and political context of air quality improvement measures in the Netherlands and the European Union is visualised. This overview is developed by using legal texts and existing and constructed laws and regulations on air quality and air quality improvement measures. Subsequently data from the earlier mentioned off-the-record interviews and research reports and policy documents is used to create a complete overview of all relevant legal and political context.

This information is supported by interviews with stakeholders of the implementation of air quality measures. These stakeholders are involved in the process of air quality measure implementation at different levels (supranational, national, local) (see table 2.1). The total list of interviews creates an overview of the different actors involved in the implementation process and consists of supporters and opposition of this process. The interviews have a semi-structured set-up, meaning that all the interviews have the same set-up, but at the same time every interview has room for small alterations or other input by the interviewed (Silverman, 2012, p. 48; Bryman, 2012, pp. 470-472). These interviews are transcribed and analysed. In this analysis the focus is put on information that can explain choices made by the different stakeholders and other contextual information that can further state why stakeholders have chosen for certain positions or solutions and the views of the stakeholders on the different methods to enforce a low emission zone according to the model showed in figure 2.1.

Finally the information out of meetings with different stakeholders on air quality improvement measures is used as contextual information in this research. This data is used by analysing the documents used in these meetings and by making notes of each meeting that is attended.

Organisation	Occupation
1. Municipality of Maastricht	Alderman
2. Municipality of Maastricht	Senior Policy Officer
3. Ministry of Infrastructure and Water Management	Senior Policy Officer
4. Ministry of Infrastructure and Water Management	Senior Policy Officer
5. European Parliament	Member of the European Parliament
6. Sadler Consultancy	Consultant
7. Clean Air Maastricht	Member Public Interest Organisation
8. Buurtplatform Maastricht Centrum	Member Public Interest Organisation
9. Netherlands Vehicle Authority (RDW)	Policy Officer
10. Centrum Management Maastricht	Board member
11. University of Maastricht	Former Rector
12. Q-Park	Managing Director Innovation

Table 2.1 : List of respondents and their occupation and organisation

Validity and reliability

The validity and reliability is secured by several measures. Firstly this research makes use of data from multiple sources. Both in the usage of research reports, literature and interviews it's tried to derive multiple viewpoint to create a triangulation of data (Bryman, 2012, p. 392). Secondly, by gathering data before starting this research and speaking to experts, the analysis framework developed for this research could be made to fit the case that is researched properly.

The limitation of this research is the external validity. Being a case study research, the context of the investigated case study plays an important role in the development of the research. However, by clearly describing these contextual factors it is possible for readers to extract which contextual factors are applicable to their own city or municipality and which are not.

The reliability of this research is ensured by explaining the different steps that have been taken in the development of this research. Moreover the respondents, together with the interview questions are listed in this report in table 2.1 and the appendix.

Border regions

This research is focussed on border regions. In this paragraph the reason for this choice and the methodological choices that have been made to identify border regions are discussed.

Border regions are different from other parts of a nation state. Although the day-to-day effects of borders in the Schengen Area has been largely limited since the introduction of the Schengen Agreement in 1995, border still form hurdles even in the common market of the European Union (Kingdom of Belgium, the Federal Republic of Germany, the French Republic, the Grand Duchy of Luxembourg and the Kingdom of the Netherlands, 1985). In border regions the differences between countries on both side of the border can be seen most clearly.

Before these differences are made clear, it is necessary to make clear what border regions are. A border region can simply be clarified as a district near the line separating two countries or areas (Oxford Dictionary, date unknown). Such a definition however makes it difficult to determine where border regions end. In the Oxford definition the concepts *district* and *near* are not further defined, making it possible for Utrecht to still be a border region, whilst it is significantly further from the nearest country border than for example the city of Heerlen. To make this distinction clearer this research will use the European Nomenclature of Territorial Units for Statistics, NUTS in short [French: Nomenclature des unités territoriales statistiques] level III to clearly limit the concept *region*. Border regions in this research therefore are:

NUTS III areas that have a direct border (over land) with another country.

In the Netherlands this means that of the 40 NUTS III areas, also called COROP regions (**Coördinatiecommissie Regionaal Onderzoeksprogramma**, literally the Coordination Commission Regional Research Programme), 16 can be identified as border regions¹ (Centraal Bureau voor de Statistiek, date unknown).

Border regions have to deal with different problems than other regions in the Netherlands. A prime example of these differences can be found in Maastricht, which is located in the border triangle with Belgium and Germany. The Dutch city of Maastricht is confronted with a large number of so-called 'drugs tourists', who visit the city only to buy drugs. The Netherlands, which is known for its *gedoogbeleid* [literally tolerance policy; non-enforcement of law] on small amounts of soft-drugs (such as marijuana), has a more

¹ Border region NUTS III regions in the Netherlands: Zeeuwsch-Vlaanderen, Overig Zeeland, West-Noord-Brabant, Midden-Noord-Brabant, Zuidoost-Noord-Brabant, Midden-Limburg, Zuid-Limburg, Noord-Limburg, Arnhem/Nijmegen, Achterhoek, Twente, Noord-Overijssel, Zuidoost-Drenthe, Oost-Groningen, Delfzijl en omgeving, Overig Groningen.

lenient drugs policy than the neighbouring countries of Belgium and Germany. As an effect of this, people are attracted that can cause nuisance to local inhabitants. This effect of a policy, which was introduced to limit the negative effects of drugs usage in small quantities, has as such very different implication in different geographical areas (Schiwy-Bochat, Bogusz, Vega and Althoff, 1995).

Examples, as described above, are not limited to large political differences between countries. Small policy changes can have a direct implication on local situations due to the close proximity of a border. The prices of petrol for example is in the Netherlands significantly more expensive than in Belgium and Germany. These artificial high prices makes it virtually impossible for Dutch border petrol stations to compete with their foreign neighbours (Paumen, 1990).

These examples make clear that it is necessary for policy to take the differences of border regions into account. By doing this the goal of creating effective policy can be achieved (Fukuyama, 2013, p. 3). This goal of effective policy can be reached by making policy inclusive or by making tailor made policy for border regions. It is however virtually impossible to create policy that takes all possible factors that could limit the effectiveness of policy in border regions into account, or to create policy that would satisfy all these regions equally. However, it is clear that it is necessary to take the influence of the proximity of borders in the 16 identified NUTS III regions on the effectiveness of policy into account in the creation of policy.

Case study

The size of and time for this research is limited. The number of border regions in the European Union or the Netherlands however is vast. In order to properly research this effective implementation of air quality measures in border regions it is therefore necessary to make choices. In this research the researcher makes this choice by picking one case. This makes it possible to focus on this one issue and to go in depth and fully analyse this issue.

The case selected for this research is the municipality of Maastricht. The choice is made to filter on a geographical area other than a type of air quality measure, as most (if not all) policy measures are limited on geographical or governance scope other than the type of measure. This filter chosen makes it possible to give a full overview of the policy implementation choices made in one policy creation process.

Why Maastricht?

The choice for Maastricht as case study for this research is the result of two important factors that make Maastricht unique. Firstly Maastricht has a progressive environmental policy. The alderman responsible for environmental policy has set out environmental and air quality goals which exceed the norms set by the European Union and the Paris Climate Agreement (Gemeente Maastricht, 2016). This makes the municipality of Maastricht an interesting case to research new measures that have a positive impact on the air quality in the city. It also shows that the local government is determined to make significant steps to improve the air quality in the city.

The second factor is that Maastricht has a large number of foreign registered vehicles that drive through and visit the city. The municipality of Maastricht is located in the south of the Netherlands, near to the border of both Belgium and Germany. Besides the close proximity of these borders Maastricht is also a popular shopping city in the region. The results of these factors is that the number of foreign registered vehicles in Maastricht is high. The number of cars that are foreign registered can make up to 50% of the total number of cars in the city centre (Bouthoorn, Teeuwisse and Van der Pol, 2016). Other large border cities in the Netherlands, such as for example Arnhem, do not have as high number of foreign vehicles in their city centres, making Maastricht more or less unique in the Netherlands. This large portion of foreign registered vehicles in Maastricht creates problems in the enforcement of air quality improvement measures, making Maastricht even more interesting to investigate.

These two factors make Maastricht a prime instrumental case study, as it is believed that Maastricht is highlighted example of why policy implementation in border regions is different from policy implementation in other geographical areas. A case study in Maastricht can make this point clear (Silverman, 2005, pp. 127-128). The literature and data collected in this research will be applied upon the case of Maastricht. The case study of Maastricht will be analysed via a model that can be applied on other cases similar to that of Maastricht. By mentioning the specific unique characteristics of this specific case study, it is tried to create results which can be applied to similar cases as well (Silverman, 2005, p. 128).

More information about the municipality of Maastricht can be found in table 2.3.

Framework Effective Policy

Central to this research is the main research question: “How can Dutch national policy goals on air quality improvement be implemented effectively in border regions?”. In order to give proper answer to this question it is necessary to define the key concepts that are present in this research question. In this paragraph this research question is further operationalised. The concept *effectively*, as used in the main research question, is firstly analysed. After this five ‘trade-offs’ that are of influence on the effectiveness of a low emission zone are introduced. These trade-offs form the framework in which the different options of enforcement of a LEZ in Maastricht are analysed.

Effective implementation

The concept of effectiveness is straightforward: how much positive causal impact does a policy have on the goals set in advance? Effectiveness therefore is not a goal on its own, it is a tool to measure the achievement of a goal (Schmelzle, 2012, pp. 2-3). The effectiveness of a government is often seen as a key instrument in determining the quality of governance (Fukuyama, 2013, p. 3; Graham, Plumptre and Amos, 2003, p. 3). In this usage it is important to note that effectiveness is a *hollow* concept. It is as a concept fully dependant on the objectives it is used for (Schmelzle, 2012, p. 3).

Effectiveness is hollow but not isolated. In organisations, and even more in governance, it has an important influence on other concepts that determine the success of policies. Schmelzle uses the simple virtuous circle model of Levi and Sacks (2009) to demonstrate the relationship between effectiveness, legitimacy and compliance. These three concepts form a circle that follows the movement from legitimacy towards effectiveness. This relationship is simple: as more people perceive the domination of government over people as binding, in other words legitimacy (Schmelzle, 2012, p. 5; Hermann, 1983), the more people will comply with policies and rules. This compliance will result in more effectiveness. Effectiveness however will not per se lead to more legitimacy. This relationship is more complex.

To achieve effectiveness it is therefore important to realise that legitimacy plays an important role in achieving this effectiveness. In a multi-level governance system it is thereby essential to keep this relationship in mind whilst developing policy, and even more whilst enforcing policy (Schmelzle, 2012, pp. 14-16).

Legitimacy

The concept of legitimacy is an important element in the realisation of effectiveness. It not only plays a role in the creation of effectiveness but in a government policy it also gives answer to the question according to whom policy is effective. Legitimacy is composed of three parts: input legitimacy, output legitimacy and throughput legitimacy (Schmidt, 2013, p. 2; Scharpf, 1970). Stated simple, input legitimacy is legitimacy by the people, output legitimacy is for the people. Throughput legitimacy is seen as the legitimacy with the people.

Input legitimacy is therefore the legitimacy given by citizens to institutions. This can be done explicitly via voting but also implicitly via consent. Output legitimacy is determined by the effectiveness of the policy outcomes. Throughput is seen as the accountability and transparency of institutions in the policy process (Schmidt, 2013, p. 2).

Although the concepts of input, output and throughput legitimacy are in essence simple and clear concepts, the increased influence of the European Union on policy making at all levels and the resulting multi-level governance structure that has evolved as result of this increased influence has made these concepts more difficult to grasp. Input, throughput and output can all take place at different levels. Therefore, the differences between input and output, and the accountability in the development of policy can still lead to legitimacy problems at the implementation of policy. It is therefore important that the different moments of legitimacy creation (input, throughput and output) are clearly examined in a multi-level governance structure and that close attention is given to the different populations that provide legitimacy at these different moments. The differences in views, opinions and viewpoints between these populations can result into legitimacy problems in the process of policy making (Schmidt, 2013, pp. 19-20).

Framework low emission zone Maastricht

Essential to the analysis of an effective measure to ensure air quality improvement in the municipality of Maastricht is the creation of a framework in which the different implementation and enforcement options can be tested. This framework concerns the development of the concept 'effective' and the effects of the proposed implementation and enforcement options in the light of this. Three factors have been identified to analyse the different enforcement options: equal treatment, free movement and policy effectiveness. These three factors have been chosen because of their effect on output legitimacy and effectiveness. All three factors combined therefore give an overview of the most important factors that can create the most effective implementation and enforcement of a low emission zone in Maastricht.

Policy Effectiveness

The first factor is 'policy effectiveness'. With this factor the policy effectiveness of an enforcement option is determined. This goal is the lowering of air pollution. This is done via a low emission zone by preventing that polluting vehicles enter a low emission zone. The main method for achieving this is imposing a fine upon vehicles that are most pollutant. Effectiveness is therefore measured in how many people change their behaviour as a result of the 'real' threat of a fine. The term 'real' is most important, as there is a distinction that can be made between the probability of being caught for illegally entering a LEZ and the personal perceived probability of being caught. Moreover the amount of the fine has influence on the probability of people breaking the law (a higher fine will lead to less offences).

On the other side of the coin the costs of enforcement must be in line with the number of offences. It is possible to lower the number of offences to a minimum, but it is reasonable to expect that this would result in high enforcement costs. These costs will become increasingly higher for every single offender an institution wants to prevent. Therefore a balance between enforcement costs and law obedience must be found (Faure and Visser, 2004).

At the same time, the enforcement method must be capable of reaching the goal of the measure. The factor effectiveness is therefore double sided. Moreover, it is important to note that finally the quick implementation of a LEZ will lead to a higher effectiveness, as the effect of a LEZ on the air quality in Maastricht will diminish over time as the vehicles entering the zone will become cleaner over time as a result of the fade out of older vehicles and the innovation in newer vehicles (Bouthoorn, Teeuwisse and Van der Pol, 2016). Time is therefore another important element to the factor effectiveness.

Equal treatment

The second factor in this framework is 'equal treatment'. The method chosen to enforce a LEZ in Maastricht should most preferably treat each 'user' equally. This means that each user should have the same probability of being caught and that equal cases should be treated equally. There should therefore be no legal inequality between users or (negative) discrimination of users. This factor is tied to possibility to enforce a LEZ on all its users. If this is not the case, equal treatment of these users is not possible. The factor equal treatment is therefore closely tied to the factor effectiveness but also to the legitimacy of the measure taken.

Free movement

The final factor of this framework is free movement. In order for a method that will be chosen to enforce a LEZ in Maastricht to be effective, it should not hinder existing movement into the city. If this is not the case, the impact of the measure on the city, other than the lowering of air pollution in the city of Maastricht, could hinder existing activities in the city and lead to negative economic effects if Germans and Belgian (but possibly also Dutch visitors) less frequently visit Maastricht as a result of introduction of a LEZ. The enforcement of a LEZ should therefore create the lowest possible barriers for the users of the LEZ to limit the external effects of the LEZ.

These three factors can be summarised with their explanations and indicators in table 2.2

Factor	Explanation	Indicator
Effectiveness	Ability to limit non-allowed to enter the LEZ	<ul style="list-style-type: none">- probability of being fined- costs of enforcement method- when LEZ can be enforced (time)
Equal treatment	Equal treatment of users of the LEZ	<ul style="list-style-type: none">- equal chance of being fined- equal action needed for entering a LEZ
Free movement	The limitation that the enforcement method creates	<ul style="list-style-type: none">- possibility of free access

Table 2.2 : Factors, explanations and indicators for an effective enforcement of a LEZ in Maastricht

Legitimacy and Trade-offs

These three factors are related to one another and form a radar chart in which the different options can be analysed. In this radar chart the trade-offs between the factors policy effectiveness - equal treatment, policy effectiveness - free movement and equal treatment - free movement can be seen. The optimal enforcement method for a LEZ in Maastricht is the enforcement method that spans all three factors, resulting in a high level of policy effectiveness, equal treatment and free movement (see figure 2.1).

The model shows, apart from a clear method to analyse the different methods to enforce a LEZ in the municipality of Maastricht, the manifestation of output-legitimacy for the decision to create a LEZ in Maastricht. If the method chosen is effective in accordance with the goal of the policy, and is most optimal to the factors described above (see figure 2.1), it can be assumed that the output-legitimacy for this decision is high (Schmidt, 2013, p. 2).

With this model it is possible to analyse the data on the different options for the enforcement for a LEZ in the municipality of Maastricht. In the analysis of this research the different options can be compared

accordingly, making clear which enforcement option is the most optimal and thereby the most effective in case of Maastricht.

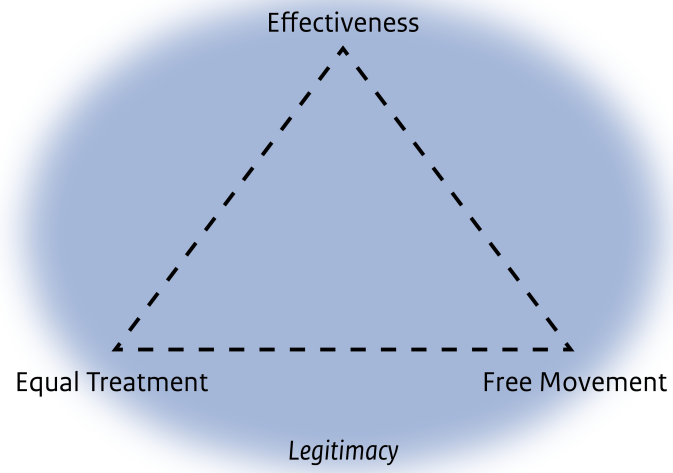


Figure 2.1: Model framework effective enforcement LEZ in the municipality of Maastricht

Case Description (Sources: Maastricht.nl, 2018; Bouthoorn, Teeuwisse and Van der Pol, 2016)		Municipality of Maastricht	
Geography			
Country	The Netherlands		
Province	Limburg		
Area (km ²)	60,03 km ²		
NUTS 3 area	Zuid-Limburg		
Demography			
Population	122.716 inhabitants		
Population density	2.139 inhabitants per km ²		
Air quality			
NO ₂	23 µg/m ³ (2015)	EU Limit: 40 µg/m ³	
PM ₁₀	22 µg/m ³ (2015)	EU Limit: 40 µg/m ³	
PM _{2.5}	14 µg/m ³ (2015)	EU Limit: 25 µg/m ³	
EC	0.3 µg/m ³ (2018)	No EU Limit	
Municipal council (39 seats)			
Christen Democrats CDA)	5 seats		
Senior Party (Seniorenpartij)	5 seats		
Green Party (GroenLinks)	5 seats		
Democrats (D66)	5 seats		
Social Democrats (PvdA)	3 seats		
Conservative liberals (VVD)	3 seats		
Socialists (SP)	3 seats		
Party for a safe Maastricht PVM)	3 seats		
Maastricht Open, Fair and Democratic (MO:ED)	2 seats		
Party for Freedom (PVV)	2 seats		
Socially Active Citizens Party (SAB)	1 seat		
Senior Party (50 PLUS)	1 seat		
Coalition (2018-2022)	CDA, Senioren Partij, GroenLinks, D66, VVD and SP		

Table 2.3: Case description of the municipality of Maastricht

3. Constitutional and Theoretical Framework

The creation of policy is complex. In the formation of new policy many different choices have to be made. Every stakeholder of the policy subject has other wishes and propositions. Besides these different views on the width, depth, focus and other elements of policy, there are also many different ways upon how policy can be enforced and policy goals can be researched. Subsequently, as discussed earlier, policy can be created by different levels of government, creating gaps and incompatibilities between policy and policy goals and the implementation and enforcement of policy.

In this chapter the formation of policy and the development of these policy gaps is discussed. This is done by focussing on the policy gaps existent in border regions. By looking at multi-level governance in the Netherlands and the European Union and the relation between national government and local government, the arena in which these policy gaps come into existence can be made clear. This overview, together with the analysis of the concept of policy diffusion will create a theoretical backbone which can be used in the analysis of the case study in the municipality of Maastricht.

Together with this theoretical framework the constitutional framework of the Netherlands is visualised. In this framework the role of municipalities in the Netherlands is discussed. In this part the relationship between the national government and the local government is described and the responsibilities of municipalities is made clear.

Multi-Level Governance

Policy is created in a larger arena than only the national arena. The influence of other nation states on policy as well as the influence of international organisations on policy has grown during the twentieth century and is still increasing. This trend could be followed back to the Treaty of Westphalia of 1648 (Gabriela, 2013, p. 309). Since the establishment of the European Coal and Steel Community (ECSC) the influence of European institutions has grown even stronger. From the ECSC the influence of 'Europe' increased via the European Economic Community (EEC), the common market, geographical growth, the Single Market, the European Communities (ECs) into the current European Union (European Union, 2018). The result of the growth in importance of both international organisations, and the European Union in particular, has led to a re-allocation of authority. This re-allocation is further fuelled by the transition from government to governance and the subsequent increased influence of non-public entities on policy making (Hooghe and Marks, 2001a, p. 1). National decentralisations in many countries have led to further dispersion of national authority to subnational levels. Hooghe and Marks as such remark that authority is moved upwards (to the supranational level), downwards (to the subnational entities) and sideways (to non-public organisations) (2001a, pp. 3-4). Policy is therefore no longer created in a single level of government, but instead in a system of multi-level governance.

Before this new concept of multi-level governance can be further explored, it is important to see why this concept has developed. A most common explanation according to Hooghe and Marks (2001a, p. 4) is the search for efficiency in a system where problems have become more complex. Governance has to operate with complex problems with externalities that stretch far beyond one level of government. Issues such as air quality or global warming ask for cooperation between multiple levels, both on a vertical as a horizontal axis. The development of multi-level governance should therefore be seen as an answer inclusively and effectively deal with complex problems.

The German political scientist Fritz Scharpf as such sees the concept of multi-level governance as an 'plurality of simpler concepts'. Multi-level governance is, according to him, the conceptualisation of the effects of European governance being mutual adjustments, intergovernmental negotiations, hierarchical directions and joint decisions (2010a, p. 75).

Organisation of Multi-level governance

In a system of multi-level governance, such as described by Hooghe and Marks (2001 a), three main levels can be identified. Firstly the supranational level: the European Union, composed out of the European Parliament, European Commission, European Council, the Council of Ministers and finally the European Court of Justice as the most important institutions (Bache, George and Bulmer, 2011). The second level is the national level. This is in this research the Netherlands. The Netherlands is a Member State of the European Union and is represented by their national government. The organisation of the decentralised unitary state the Netherlands will be discussed by the segment 'Playing field' (chapter 3). The final level in the multi-level governance theory, in this research, is the level of the municipality of Maastricht. Together these three levels form a hierarchical division of authority. This authority is divided vertically, meaning that there is a downloading and uploading of authority between the national government, the European Union and municipalities respectively.

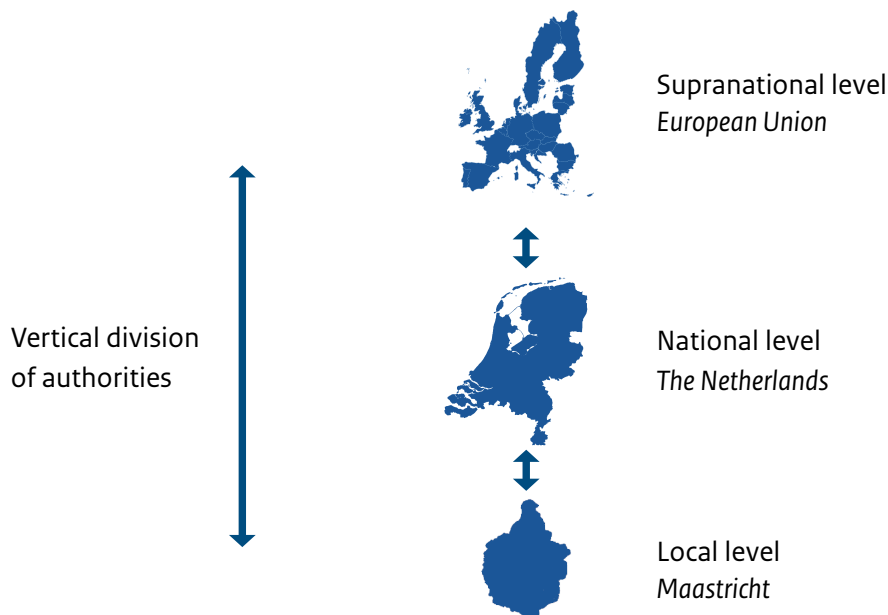


Figure 3.1: Multi-level governance in the Netherlands (European Union, the Netherlands, Maastricht) (Hooghe and Marks, 2001a).

Type 1 Governance and Type 2 Governance

The categorisation of multi-level governance as displayed in figure 3.1 suggests that the concept of multi-level governance is clear and structured. However, this distribution of authority and responsibilities does not capture the complex dynamics that occur in the policy and decision making process (Hooghe and Marks, 2001a, p. 3). There is strong interaction and dependence between different levels, both of which are not fixed but dynamic in their nature (Hooghe and Marks, 2001a, p. 3). It is also important to mention the influence of informal relations between the three entities (Riker, 1987).

Hooghe and Marks suggest that there are two main types of multi-level governance systems: type 1 and type 2 governance. These two systems not only form the ways in which governance should be organised

according to Hooghe and Marks but also forms a categorisation for governance forms.

Type 1 Governance is characterised by a structured system in which there is a limited number of jurisdictional levels, which have responsibility over multiple tasks and policies. Type 2 Governance on the other hand is more fluid and complex, with many jurisdictional levels and a flexible jurisdictional system (see table 3.1) (Hooghe and Marks, 2001a, p. 4). In this system therefore more jurisdictional levels can be found, making that more authorities are active, which have a more task specific approach and therefore have the responsibility over less tasks per jurisdiction in comparison to Type 1 Governance.

Type 1 Governance	Type 2 Governance
Multi-task jurisdictions	Task-specific jurisdictions
Jurisdictions with mutually exclusive territorial boundaries	Territorially overlapping jurisdictions
Limited number of jurisdictions	Large number of jurisdictions
Limited number of jurisdictional levels	Many jurisdictional levels
Quasi-permanent jurisdictional system	Flexible jurisdictional system

Table 3.1: Main elements Type 1 Governance and Type 2 Governance (Hooghe and Marks, 2001a, pp. 4-9).

The basis for type 1 Governance can be found in federalism. In this mode of government power is concentrated among a limited number of entities. These entities have clear boundaries, making them not overlap. Each government therefore has clear tasks (Hooghe and Marks, 2001a, pp. 5-6). Type 2 Governance is characterised by *polycentric* decision making. This concept introduced by Vincent Ostrom (1999a; 1999b) to describe the many centres of decision making present in type 2 Governance. Type 2 Governance is identified by fluid policy creation processes in which multiple governments, but also organisations, are involved.

Type 2 Governance, as described by Hooghe and Marks (2001a, pp. 5-6), fits the Dutch government structure and devision of powers. In the Netherlands a large number of jurisdictions and multiple jurisdictional levels can be identified. The overlap between different levels, the national government, provinces, municipalities but also the European Union and waterboards can be seen (*see chapter 3: Playing field*). It is important that the distinction between Type 1 Governance and Type 2 Governance is made, and that the Netherlands is categorised as Type 2 Governance, as this not only can possibly explain the relations between different jurisdictions in the Netherlands and the relationship between these jurisdictions and the European Union, but also because this categorisation can help in identifying how problems for border regions in the alignment of local needs with national demands can arise.

Effects of Multi-level Governance

The emergence of different levels of government makes that the focus of power on the national government becomes smaller. In the European Union, the territorial segmentation of governments is no longer the dominant mode of power. Kenneth Waltz sees that, instead of the national focus on internal issues, the new challenges that have led to the birth of multi-level governance, created a system in which governance is an interplay of different levels (1979). The development of other levels, both supranational and local, has created a strong interdependence between levels. A multi-level governance system therefore is dependent on multiple levels to create policy, making the influence of one level smaller (Zürn, 2010, pp. 85-86). The response to this development is therefore *mutual adjustment*. However, this system, in which mostly strategic cooperation is created, leads not only to a reduction of problem-solving effectiveness, it also raises questions on the subject of institutional legitimacy, of mostly national elected governments as

their influence is reduced (Scharpf, 2010a, pp. 69-70). In order to overcome this reduction of problem-solving effectiveness, Member States of the European Union have shifted from mutual adjustment towards a centralised approach in which the lead role is taken by the level of the European Union (Scharpf, 2010a, p. 70). The most important effect of multi-level governance in that way is the movement of power from national governments towards the European Union (Scharpf, 2010a, p. 71). Simultaneously the influence of local governments has grown, certainly since the completion of single market in the 1990s (Guderjan, 2012, pp. 105-106). The growth of the European Union is therefore not only a one-way ordeal. Although the European Union is leading in the downloading of policies towards both national and local governments, the EU itself is also influenced by the uploading of policies by other stakeholders (Fleurke and Willemse, 2006, p. 85). For local governments this influence is of great (new) added value, as it can vastly increase their influence on important topics (Guderjan, 2012, p. 107).

Focussing on the role of the municipality of Maastricht it is therefore interesting to analyse if this shift, in which local governments and the European Union have become more important in the development policy, can be identified in the case of Maastricht, and if thereby the role of the Dutch government has been more limited in the creation of new air quality improvement measures. The development of policy in a border regions such as Maastricht could be done, as a response to the effects of multi-level governance, via *mutual adjustment*. However, Scharpf (2010b) suggests that the problems of mutual dependency can be overcome via a European centralised approach. In the case of Maastricht, and in the development of a LEZ in Maastricht, the local government, national government and European Union are all, in the different ways, involved. It is therefore important to see how each of these three levels are involved in the development of a LEZ in Maastricht and how all levels interact and respond to each other.

Fusion theory

The emergence of multi-level governance has led to the partial shift of policy making influence from national governments towards both supranational and subnational levels of government (Hooghe and Marks, 2001b, p. 77). This change creates new questions on the development of policy (Wessel, 1997, p. 275). Does the MLG development lead to the Europeanisation of local policy making, or does the increased influence of local governments on the EU lead to the municipalisation of the European Union (Guderjan and Miles, 2016, p. 638)?

According to Guderjan the development of multi-level governance type 2 governance (see table 3.1) will be most relevant for local governments. In this form of MLG not a shift of power between different levels will take place as in type 1 governance, but a “complex set of overlapping and nested systems of governance involving European, national, regional and local actors, and networks” will come in existence (Loughlin, 2001, p. 20; Guderjan, 2012, p. 108).

In this type 2 governance networks are created amongst governments and other stakeholders. In this pattern of *loose coupling* (Benz and Eberlin, 1999, p. 332) barriers between different levels and levels are overcome, creating a system of fusion. In this approach, developed by Wessels (1992; 1997), the distinctions between political and functional divisions is blurred. Different arenas (e.g., European arena, local arena) become interconnected. As a result of this blurred system it is possible for local governments to bypass national governments and operate in the fusion arena that is created outside of the national boundaries (Hooghe and Marks, 2001b, p.4; Guderjan, 2012, p. 109).

In this fusion theory of policy making the hierarchical division of power, in which the national government is central and lower governments come second or later, is replaced by a cooperation between the national government, local governments and social actors (Benz, Fürst, Kilper, and Rehfeld, 2000, p. 19; Guderjan, 2012, p. 108).

The European Union is complex. It is therefore, certainly for smaller organisations such as local governments, difficult to effectively use the fusion arena. At the same time, even with the effects of MLG, the national government remains dominant in most unitary states. However, local governments do find possibilities to bypass their national government and directly address the European level (Guderjan and Miles, 2016, p. 648). This form of bypassing *paradiplomacy* works most effectively when used with *cooperative paradiplomacy* with the central government (Guderjan, 2012, p.111; Tatham, 2010, p. 77). These options make that local governments no longer only cooperate in a vertical relationship but also cooperate in horizontal relationships with other local governments in the European Union. Incorporated organisation such as the European Committee of the Regions and non-incorporated networks such as EUROCITIES are prime examples on how this horizontal cooperation in MLG has increased (Guderjan, 2012, pp. 111-112).

Local governments such as the municipality of Maastricht therefore have the possibility to directly influence European Union policies and to by-pass the national government. This increased influence of local governments can be used to find centralised European solutions for border regions problems, which are mostly the result of differences of rules and regulations between countries. The increased impact of local governments, and the effects of *paradiplomacy* and *cooperative paradiplomacy* can therefore be used to align differences in border regions and to align national demands with local needs.

Implementation gap

The alignment problems in border regions can possibly be solved by the emergence of multi-level governance and fusion. However, Hill and Hupe (2003) see that the development of a multi-level governance system can also create new implementation gaps. The emergence of multi-level governance has created a system in which the arena of policy creation has become more diffuse. Hill and Hupe describe in their 2003 paper that this lack of clarity can create problems between policy creation and policy implementation. Other than the implementation deficit that was introduced in the well known book *Implementation* of Pressman and Wildavsky (1984), which describes the differences between policy created on a central level and the implementation on a local level, Hill and Hupe discuss the implementation gap that can occur between the different levels and layers of policy creation and policy implementation (Hill and Hupe, 2003, p. 480).

Hill and Hupe made the distinction between the locus and focus in the creation and implementation of policy. It is important to separate the *what* and the *how*. Besides the distinction, Hill and Hupe see that policy is created and implemented on different layers and levels². Layers are the political institutions, in this case the European Union, the national government and the local government. Levels on the other hand are the distinct parts that form a policy cycle. These three levels of choice are the constitutional choice, the collective choice and the operational choice (Kiser and Ostrom, 1982). The level of constitutional choice refers to the creation of institutions, the level of collective choice to the creation of policy and the level of operational choice to the implementation of policy (see table 3.2) (Hill and Hupe, 2003, p. 481).

² Hill and Hupe (2010) refer to levels as distinct parts in a policy cycle, Hooghe and Marks (2001a) however see levels as parts of government on a vertical axis. To limit confusion between these two concepts the term 'levels' will be used in this research for the vertical distinctions between governments, in line with the usage of Hooghe and Marks (2001a).

Levels	Constitutional choice	Collective choice	Operational choice
Layers			
European Union		Formation of policy A	
National		Formation of policy B	
Local		Co-formation of policy B	Implementation of policy A Implementation of policy B

Table 3.2 : Layers and levels in implementation research (Hill and Hupe, 2010, p. 482).

It is important to keep the phases of policy creation (collective choice level) and policy implementation (operational choice level) separate. In order to create effective policy the differences between creation and implementation should be recognised, by doing so policy can be implemented effectively by local governments on a local level. At the same time it is essential that policy is both created and implemented at the right layer. If this is not the case implementation gaps can appear, making policy not effective. It is as such important that in the development of policy these two factors are taken into account.

Thirty years after the publication of Pressman and Wildavsky's *Implementation* it is necessary to take into account the impact of multi-level governance in the research of policy creation and policy implementation. With the correct vision on the different levels and layers however it is possible to use the findings of Pressman and Wildavsky into the changed system of multi-level governance (Hill and Hupe, 2003, pp. 486-487).

Compartmentalisation

The possible risks that are brought with the movement towards MLG also brings chances to tackle existing problems in the creation of policies, most notably in the Netherlands. Policy is created by experts who understand the complexity of certain policy areas. These civil servants, mostly working in ministries or other government institutions, communicate with experts in the same field. In the Netherlands, this has led to the development of different vertical compartments which sparsely communicate with other departments. This development creates the risk that combined policies become less effective because there is limited communication between different departments affected by challenges (Deetman, 1990, p. 32). Air pollution is such a challenge that affects different departments such as the Dutch Ministry of Infrastructure and Water Management, the Ministry of Economic Affairs and Climate Policy and Ministry of Health, Welfare and Sport. The development of MLG and the movement from strict vertical power relationship towards more flexible vertical and horizontal relationships can help to reduce the risk of compartmentalisation in the Dutch political system. In this way more inclusive policy and instruments can be created that takes into account all aspects of complex policy such as that of air quality improvement.

SUMMARY:

With the growth of the European Union the political and policy creation arena in the Netherlands has shifted towards a multi-level governance system. Hooghe and Marks (2001a) have researched MLG extensively and identified two main forms: type 1 governance and type 2 governance. The effects of MLG on policy making is the reduction of the influence of the central national government and the increase in the importance of the EU and local governments. This, together with the shift to horizontal and vertical power relationships instead of solely vertical relationships, brings chances for local governments to have more influence on complex policy problems.

Playing Field

The Netherlands is a decentralised unitary state (Bovens, 't Hart and Van Twist, 2012, pp. 38-39). Meaning that administrative entities within the Netherlands have their own autonomy. In the Constitution for the Kingdom of the Netherlands the division between the national government and the councils of both the provinces and the municipalities in the Netherlands is mentioned, making a distinction between autonomy (*autonomie*) and co-management (*medebewind*) of the national government on both provinces and municipalities (Raad van State, 2013, p.9; The Constitution of the Kingdom of the Netherlands, 2002, p.28). In the case of autonomy the room to manoeuvre of both municipalities and provinces is large, as they can withdraw from most influence of the national government. Within this broad room to manoeuvre, municipalities and provinces can give substance to policy (Raad van State, 2013, p. 9). In the case of co-management the role of the national government is much more prominent. In this form the national government sets out the central rules, whilst still leaving some room for tailor made policy making at the lower level for both the provinces and municipalities (Raad van State, 2013, pp. 9-10). The relations between the different levels of government is regulated in more detail by the Municipality Act (*gemeentewet*) and the Provinces Act (*provinciewet*) (Raad van State, 2013, p. 10).

In a vertical relationship therefore three entities can be distinguished: the national government (*Rijksoverheid*), the 12 provinces in the Netherlands (*provincies*) and the 380 municipalities (*gemeenten*) (Centraal Bureau voor de Statistiek, 2017). Together with the Water Boards (*waterschappen*) these three entities form the main government bodies of the Netherlands. The relationship between these three main entities and the Water Boards has been reviewed in four inter-administrative relations reports by the Dutch Council of State between 2006 and 2016 (Raad van State, date unknown).

Since 1987 onwards Cabinets have made administrative agreements with representatives of both provinces [IPO; *Interprovinciaal Overleg*] and municipalities [VNG: *Vereniging van Nederlandse Gemeenten*]. These agreements are based on the concept of autonomy (see earlier paragraph on autonomy and co-management), legal certainty, proportionality and the goal of decentralisation (Raad van State, 2006, p. 13). The goals of these agreements have changed over time, but central has always been portraying the policy goals of the national government and improving the relationship between the national government and provinces and municipalities (Raad van State, 2006, p. 14). In 2004 these agreements were supplemented by a Code in which the rules of the game and the mutual relations were explicitly described. By streamlining the relations, and preventing poor policy execution, double work or misalignment of the three entities is mostly prevented (Raad van State, 2006, pp. 15-16). Three pillars are central to this code:

- The Municipality Act (*gemeentewet*³) and the Provinces Act (*provinciewet*⁴) form the basis of inter-administrative relations.
- Administrative entities should be in the service of social issues. Financial arrangements should follow up on administrative choices.
- Leading is the principle of 'decentralised where possible, centralised where needed' (Raad van State, 2006, p. 16).

Although it seems from pillars and principles that there is a hierarchy amongst the three entities, no such hierarchy exists in the Netherlands (Raad van State, 2006, p. 35). There is a hierarchy of rules, but no hierarchy of entities. Laws, general administrative measures and Ministerial regulations are leading in comparison to both provincial and municipal regulations (Raad van State, 2006, p. 35). Besides this hierarchy, the financial reliance of both provinces and municipalities on the national government, makes that tensions can arise in situations where centralised and decentralised entities must cooperate (Raad van State, 2006, pp. 35-36). It is important to highlight this hierarchy of rules. As a result of this hierarchy local

³ Gemeentewet (1992). Retrieved from: <http://wetten.overheid.nl/BWBR0005416/2018-01-01> (2018, April 3rd).

⁴ Provinciewet (1992) Retrieved from: <http://wetten.overheid.nl/BWBR0005645/2018-01-01> (2018, April 3rd).

governments can be both forced or prohibited to initiate certain legislation or implement certain instruments. It is therefore crucial that the air quality improvement measures are implemented at a local level, are aligned with existing national laws, administrative measures and Ministerial regulations. Also this means that existing air quality improvement measures on a local level can be prohibited by national laws, administrative measures or Ministerial regulations.

Since 2007 the decentralisation of tasks to both provinces and municipalities has strongly increased (Raad van State, 2009, pp. 16-17), changing both the nature and number of tasks that most notably municipalities have to deal with. This change, together with the increased influence of the European Union on the national government but also on provinces and municipalities, makes that the traditional inter-administrative relations have become pressured (Raad van State, 2013, p. 6).

In these changing relations it is most interesting to see how municipalities react. It can be expected that, with the increased responsibilities delegated from the national government municipalities are inclined to follow their own path more, as a counter movement to the heightened meddling of the national government in local policy making. The Dutch Council of State sees this as one of the problems that could emerge. The Council of State points out that the delegation of tasks and the distinction between responsibilities should in those cases be respected as most as possible. Do not intervene when this is not necessary (Raad van State, 2016, p. 6).

It is at this time difficult to give an overview on the effects that the changing responsibilities of municipalities have (had) on the relation between the national government and municipalities. With new decentralisations imminent, it will most likely take some years for this to become clear (Rijksoverheid, date unknown). Whatever this outcome will be though, the goal will remain the same. No matter which authority will create, implement or enforce policy, the goal will remain that policy needs to be effective (Fukuyama, 2013, p. 3; Graham, Plumptre, and Amos, 2003, p. 3). It is therefore on a meta-level important to keep this ideal of good governance in mind whilst policy is created (Fukuyama, 2013).

SUMMARY:

The Netherlands is a decentralised unitary state, meaning that administrative entities have autonomy from the central government. Municipalities, together with the national government and the provinces form the main public entities in the Netherlands. These entities are equal amongst each other. National laws however are leading in comparison to both municipal and provincial regulations. The role of municipalities is changing due to recent decentralisations of tasks from the national government to municipalities.

Policy diffusion

The Netherlands is a decentralised unitary state. Earlier in this research, the detailed consequences of this polity organisation in the Netherlands has been discussed. From this explanation the creation of policy by local governments may seem simple. The reality however is more complex. Lower or local governments sometimes choose to deviate from the proposed path and choose for a different or altered path instead. This process is referred to by scholars as policy diffusion (Riise, 2016; Shipan and Volden, 2008; Shipan and Volden, 2012).

Concept of Diffusion

Diffusion is the result of an interaction between multiple actors. Diffusion can therefore not develop in an empty space, as there is need for a proposed plan or policy to diffuse from. Diffusion can best be defined by the widely used definition that was created by Strang. He defines diffusion as:

“Any process where prior adoption of a trait or practice in a population alters the probability of adoption for remaining non-adopters” (Strang, 1991, p. 325).

Looking at this definition *diffusion* deals with the process of the change of policy, that influences the behaviour of other actors. Policy diffusion is therefore broader than the change of policy itself, it has, as mentioned earlier, influence on the context in which policy is developed and altered. The focus of policy diffusion is therefore put on the process and not on the outcome of diffusion (Riise, 2016, p. 3).

This outcome of policy diffusion can be called *policy innovation*. This concept, used by Shipan and Volden (2008) focusses on the final result of the process of policy diffusion, in which behaviour and policy is altered by non-adopters and new policy is changed in a learning process (Shipan and Volden, 2008, p. 841).

Mechanisms of Diffusion

The major question is how policy diffusion is created, and which factors contribute to policy diffusion. Börzel and Risse (2009; 2012) have created a scheme in which they identify the most important factors in the process of policy diffusion. The first distinction made is that of *direct influence* and *indirect influence* or *emulation*. Direct influence is present when an institution or actor actively promotes that plans, ideas or policies can be changed or alternated. The source of the idea is in this case influencing the policy diffusion. The indirect diffusion is identified by Börzel and Risse is diffusion that starts at the receiving end of plans, ideas or policies.

The other two variables used by Börzel and Riise are the *Logic of Consequences* and the *Logic of Appropriateness/Arguing*. Both variables can be seen as an answer to assessment to uncertainty. The *Logic of Consequences* assumes that actors are self-interested and rational in their choices. Moreover these actors have fixed preferences based on calculations on the expected returns of the choices they make. The *Logic of Appropriateness/Arguing* on the other hand assumes that actors make decisions based on social norms (Balsiger, 2016).

These four variables create a scheme (see table 3.3) in which seven different diffusion mechanisms are identified. In the first quarter the variables direct influence and logic of consequences is used. These variables lead to strong direct influence on policy outcomes via coercion and positive incentives and negative sanctions. By legal action (coercion) and/or (non)financial assistance actors are moved into the direction that the creator of policy wants these actors to go.

When direct influence is met with the logic of appropriateness, the effects are expected to be norm socialisation and persuasion. The direct influence will in this case focus on the social expectations of an actor to in that way tries to achieve the goals of the creator of policy plans. An important element in

persuasion and socialisation is the arena in which both take place, as socialisation and persuasion is influenced by the relation with other actors in the arena (Riise, 2016, p. 4)

Other than direct influence, also indirect influence or emulation can be used as a mechanism to achieve policy diffusion. Firstly via the logic of consequences this can lead to competition or lesson drawing. Competition is a one-sided adjustment to create better policy for the actor or than the creator of policy. Lesson drawing is based on learning from institutional solutions which have been found by other actors, also to create better policy (Riise, 2016, p. 4).

Finally indirect influence or emulation can be found in combination with the logic of appropriateness. This combination leads to normative emulation and mimicry. Normative emulation is based on social relations. Actors want to mimic other actors for non-rational reasons to improve policy. Secondly mimicry is the imitation of social habits that will lead to the convergence of policies (Riise, 2016, p. 4).

	Logic of Consequences	Logic of Appropriateness/ Arguing
Direct influence	<ul style="list-style-type: none"> • Coercion • Positive Incentives and Negative Sanctions 	<ul style="list-style-type: none"> • Norms Socialisation and Persuasion
Indirect influence/Emulation	<ul style="list-style-type: none"> • Competition • Lesson Drawing 	<ul style="list-style-type: none"> • Normative Emulation • Mimicry

Table 3.3 : Diffusion Mechanisms (Börzel and Riise, 2009; Börzel and Riise, 2012; Riise, 2016, p. 3).

With the use of the scheme above (table 3.3) it is possible to analyse policy diffusion and detect the development of policy diffusion. The policy diffusion mechanisms of Börzel and Riise (2009; 2012) can therefore be used to explain the working of policy diffusion and thereby show how policy diffusion is important to achieve good and effective policy.

Effects Policy Diffusion

Three distinct outcomes of policy diffusion as a process can be identified. Firstly adoption/convergences: convergence of institutional models and policies in regional cooperation, limiting the differences between regions and thereby limiting the difference between centrally designed policy and local circumstances. Secondly adaptation/transformation: the change of institutional designs and policies in order to make them fit with local contexts, also called *localisation of policy*. Finally resistance: rejection or obstruction of institutional models or policies (Riise, 2016, p. 5).

Because policy diffusion is a process, it is hard to make point out which of the elements from table 3.3 have let to certain outcomes of policy diffusion or to say anything about the likelihood that one of the above outcomes will occur in a certain situation. It is therefore nearly impossible to determine when this process starts or what the null hypothesis of this process is (Riise, 2016, p. 6; Acharya and Johnston, 2007; Gilardi, 2012). Even though it hard to predict the outcome of the process of policy diffusion, these three outcomes that are identified by Riise (2016, p. 5) make it possible to categorise these outcomes.

The theory of policy diffusion can possibly explain the policy choices of the municipality of Maastricht in the implementation of Dutch national policy goals on air quality. The different diffusion mechanisms (see table 3.3) can further explain, if policy diffusion takes place, under which influences policy diffusion has occurred.

Policy entrepreneur

Using the literature of Riise and others the process of policy diffusion is explained. In this process it is however not yet described how local governments can broker this change. The outcomes and mechanisms of policy diffusion are meaningless if no actor or coalition steps up to create this change. These advocates for policy change are often referred to as *policy entrepreneurs*.

Although many actors are involved in the policy process of policy making and policy influencing, policy entrepreneurs distinguish themselves by wanting to make a significant change to existing or developing policy that fits their interest (Mintrom and Norman, 2009, p. 650). In this definition, a policy entrepreneur could be both part of a government, as an outsider, elected or non-elected. It is key that policy entrepreneurs want to invest resources, hoping to benefit with the outcome of change (Mintrom and Norman, 2009, p. 650; Shipan and Volden, 2012, p. 788).

It is important for policy entrepreneurs to maximise their influence in order to create change. This can be done in multiple ways. Firstly it is important to take advantage of a *window of opportunity*. These are moments in which due to internal or external events or pressures change is most likely to occur (Brückner and Ciccone, 2011, pp. 923-924). Secondly building coalitions with likeminded actors can promote change and make the work of policy entrepreneurs more impactful. Finally it is important for policy entrepreneurs to understand the “ideas, motives and concerns of others in their context” (Mintrom and Norman, 2009, p. 652) and have the capacity to respond to these ideas, motives and concerns.

These skills are helpful in achieving the goal of a policy entrepreneur and helpful in achieving policy diffusion and subsequently more effective policy. The municipality of Maastricht operates in a changing arena, in which policy diffusion could take place. It is therefore important to see if the municipality can play the role of a policy entrepreneur and if it can support a change of policy. It is clear that it should therefore make use of a window of opportunity. Therefore it is important to see if this window of opportunity is available and if the municipality of Maastricht is able to make use of this window of opportunity.

SUMMARY:

Policy diffusion is the process of prior to adoption that alters the probability of adoption. This process can be influenced in different ways as can be seen in table 3.3 and has three most likely outcomes: adoption/convergences, adaptation/transformation and rejection or obstruction. Policy entrepreneurs try to broker policy diffusion by making use of a window of opportunity.

Multi-level governance and policy diffusion in Maastricht

In this chapter an overview of the theories relevant to this research has been given. The focus of these theories is the theory of multi-level governance (MLG) and the influence of this theory on policy development and implementation. This research will therefore not only focus on the theory of multi-level governance, but will take the possible results of multi-level governance into account as well.

Local governments, and municipalities in particular, are seen as the lowest government in the Netherlands. It is expected that the increased influence of the European Union on nation states and municipalities will influence the top-down, vertical relationship between the national government and local governments, increasing the influence of local governments, both at the national and the European level. It is also expected that the strict vertical relationship will fade into a more vertical and horizontal relationship in which both downloading and uploading of policies is present.

The role of municipalities in this changing policy arena will therefore most likely change. It is however unclear if this will lead to more policy diffusion. According to the policy diffusion theory this will be

dependent on the possibility to find suitable solutions for the alignment between problems and solutions between municipalities and higher levels of government (national or European). Finally, it is possible that new areas will be developed in which municipalities will seek to find solutions for their local alignment problems, moving from vertical relationships towards horizontal relationships.

4. Legal and Political Context

Both in the European Union and the Netherlands many choices have been made on air quality measures over the years. These choices have led to the current legal and political context in which new measures are taken. Some measures are not possible due to legal constraints; others simply lack the political support to become reality.

In order to know how national policy goals on air quality improvement can effectively be implemented in border regions, it is important to have an overview of both the legal and political context on both the European Union as national level. In that way it is possible to know which options are viable and which are not. In this chapter not only choices that have been made and the current legal and political situation will be explained, also the developments that are visible in both the EU as in the Netherlands will be discussed.

European Union

Over the years the European Union increased its influence on different policies. Where the competences of the European Coal and Steel Community and subsequent organisations were quite limited, the capabilities of the EU have grown over the years. With the growth of competences the political influence has grown as well. In this part an overview of the legal and political context of the European Union on air quality measures will be visualised.

Competences of the European Union

The European Union can only act within the limits of the competences that are conferred upon the EU by the Member States of the EU. This is the so-called principle of the conferral. The competences of the EU are defined in the Treaties of the European Union. There are three forms of competences: exclusive competences, shared competences and supporting competences. In articles 3, 4 and 6 of the Treaty on the Functioning of the European Union these different competences are explained. In an exclusive competency only the European Union can legislate and approve binding acts. Member States can only approve acts if they are empowered by the European Union to do so. In a shared competence the legislative power and power to adopt binding acts is shared amongst the Member States and the European Union, but Member States can only legislate or create binding acts on areas where the EU does not exercise its competence. Finally in a supportive competence the European Union can only support or coordinate amongst Member States (European Union, 2007, pp. 51-53).

Environment is a shared competence of the European Union. This therefore means that the European Union can legislate and approve legally binding acts and that Member States can only do so if the European Union does not exercise its competence. This as such forms the legal basis for the creation of directives, decisions or regulations (European Commission, 2018a). The difficulty of air quality measures however is that the scope of these measures is not always limited to the competence of the environment. Measures such as low emission zones influences transport. Other air quality measures can influence energy production or industrial production. It is therefore important that for each measure a clear legal basis is present.

Ambient Air Quality Directive

The European Union (then EEC) has been working on tackling air pollution since the 1990s via Directives that set standards for air quality and provide protection from pollution to European citizens. This was firstly done by the Air Quality Framework Directive 96/62/EC that set standards for a broad range of particles and gases such as ozone, particulate matter (PM₁₀ and PM_{2,5}) and nitrogen dioxide (NO₂). In 2008 this Directive 96/62/EC was replaced by a more comprehensive framework of measures called the Ambient Air Quality

Directive (Council and European Parliament Directive, 2008/50/EC, 2008). This Directive provides the ceiling that is currently used as the limit of air pollution in the European Union. (European Commission, 2018b)

It is important to note that the Ambient Air Quality Directive is a Directive. It sets the limits of air pollution in the European Union and is binding on the results that need to be achieved. Member States themselves have to create concrete measures (if needed) in order to comply with the limits set in the Ambient Air Quality Directive.

Apart from the European Union, the World Health Organisation (WHO) has also created their own set of guidelines for air pollution. These guidelines have been designed to “offer guidance in reducing the health impacts of air pollution” (World Health Organization, 2006, p. 5). The guidelines of the WHO are not legally binding. Therefore, they should be interpreted as goals which, once achieved, should ensure a health air quality that ensures clean air without negative effects on the health of citizens. The guidelines of the WHO are stricter than the standards of the EU. Meaning that in order to comply with the guidelines of the WHO the air in a city or region should be cleaner than the standards set by the EU, as can be seen in table 4.15.

Pollutant	European Union Standards	WHO Guidelines
NO ₂	40 µg/m ³ (year average)	40 µg/m ³ (year average)
	200 µg/m ³ (hour average)	200 µg/m ³ (hour average)
PM ₁₀	40 µg/m ³ (year average)	20 µg/m ³ (year average)
	50 µg/m ³ (24 hour average)	50 µg/m ³ (24 hour average)
PM _{2.5}	25 µg/m ³ (year average)	10 µg/m ³ (year average)
	No 24 hour average standard	25 µg/m ³ (24 hour average)
EC	No standard	No guideline

Table 4.1: European Union emission standards and WHO emission guidelines in µg per m³ (Council and European Parliament Directive, 2008/50/EC, 2008; World Health Organization, 2006)

European emission standards

Apart from standards on air pollution the European Union has also created limits on the emission of vehicles. These Euro norms set limits on the emission of different gasses and matters⁶. In six successive Directives⁷ from 1992 onwards the maximum emissions that can be produced by motor vehicles has been reduced. According to these Euro norms vehicles, that are produced after a certain date (depending on the Euro norm and the type of vehicle), have a maximum emission of polluting gasses and particles this vehicle can emit before it can be sold in the European Union. The Commission has set the goal to encourage technical development via these norms and to achieve that the emissions of new vehicles will be reduced (European Commission, 2018c).

Looking at figure 4.1 it is clear that the Euro emission standards have led to a dramatic decrease of the emission of vehicles per driven kilometre and/or kWh (depending on the vehicle category). Although recent events surrounding the measure techniques used for these standards, have resulted to a discussion on the

⁵ A micrometre is 0,000 001 metre (10⁻⁶ metre)

⁶ Carbon Monoxide (CO), Hydrocarbon (THC), Non-methane hydrocarbons (NMHC), Nitrogen oxide (NO_x), Particulate matter (PM_{2.5} and PM₁₀) and Smoke (Commission Regulation No 459/2012, 2012).

⁷ EURO 1 (1992), Euro 2 (1996), Euro 3 (2000), Euro 4 (2005), Euro 6 (2014) [named with Roman numerals for lorries and busses]

reliability of the standards in ‘real-life situations’⁸, the progress that has been made from Euro 1 to Euro 6 is undisputed. However, in the evaluation of the so-called *diesel-gate*, member of the European Parliament have asked the European Commission to review the effectiveness of the European emission standards and investigate the role that the European Union could play in creating more inclusive and effective low emission zones in European cities that can effectively help in improving air quality in European cities (European Parliament, 2017).

The European Union has therefore created standards which not only set the norms to which areas should conform to, but who also actively contribute to cleaner air in the European Union, by limiting the emissions that are allowed to be produced by new vehicles.

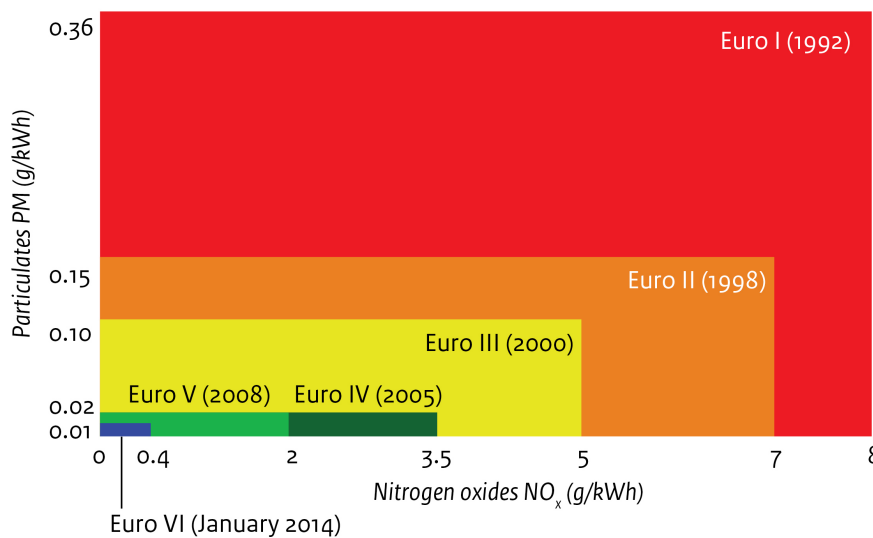


Figure 4.1: European Union emission standards for large goods vehicles (LGV; N₂) from Euro 1 (1992) until Euro 6 (2014) (European Commission, 2018c).

European Electronic Toll Service (EETS)

Apart from Directives that both limit air pollution (Ambient Air Quality Directive) and improve air quality (European emission standards Directive) in the European Union, there are many legislations that indirectly have influence on the air quality within the European Union. The European Electronic Toll Service Directive is a prime example of such legislation. This Directive has the potential to be important to the development of a LEZ in the city of Maastricht and is therefore highlighted.

In 2004 the EETS Directive was adopted to ensure interoperability of electronic road toll systems in the European Union. In this way ensuring smooth and free transport throughout the Union (Directive 2004/52/EC; Decision 2009/750/EC; European Commission, 2011). Although this Directive does not cover low emission zones, a current recast of the EETS Directive is currently being developed by the European Parliament and the European Council. In this recast there is a substantial chance that low emission zones will be added. This could mean that a European wide exchange of data of vehicles needed for low emission zone enforcement could become a reality⁹.

⁸ The diesel-gate, in which car manufacturers used software to trick Euro norm tests, has led to a debate on the reliability of test to determine the pollution of new vehicles. The EU has therefore developed the Real Driving Emissions test.

⁹ It is currently possible to exchange data between Member States within the EU for certain traffic offences as part of the Cross Border Enforcement Directive. This Directive only covers the exchange of data for the following offences: speeding, failing to use a seat-belt, failing to stop at a red traffic light, drink-driving, driving while under the influence of drugs, failing to wear a safety helmet, the use of a forbidden lane and illegally using a mobile telephone or any other communication devices while driving. It is therefore not possible to use this Directive for the exchange of data for the enforcement of a low emission zone (European Parliament and Council, 2015).

With this addition foreign registered vehicles could be checked via an ANPR camera system, making it possible to check all European Union registered that enter a LEZ. However, it is not yet clear if this addition the EETS Directive will be upheld in the definitive recast and if so, when this Directive would be operational for Member States and municipalities to use.

At the same time, it is important to keep privacy of individuals and data protection in mind. It is therefore necessary that the exchange of data across Member States complies with Regulation 2016/679 (European Parliament and Council, 2016a), Directive 2016/680 (European Parliament and Council, 2016b) and Directive 2002/58/EC (European Parliament and Council, 2002). At the same time, it could be argued that the addition of data exchange for LEZ to the EETS Directive ensures the free movement of people in the European Union. In the finalisation of the EETS Directive recast it is important that this trade-off between privacy and personal data protection and the freedom of movement is centralised.

European Union Legal Context: Conclusion

The European Union has set clear limits to the levels of pollution of different gasses and particles. The limits are formulated in the Ambient Air Quality Directive. Member States of the European Union are therefore themselves responsible of complying with these limits, the EU does not prescribe how the Member States needs to reach these limits. Together with the Ambient Air Quality Directive, the EU is also actively involved in the improvement of air quality. The European emission standards require that new vehicles have had to become increasingly cleaner of the past 20 years, making the emissions of vehicles increasingly lower and therefore the negative impact of vehicles on air pollution smaller. Finally, the European Union is working to improve the effectiveness of existing air quality improvement measures such as low emission zones, by working on the exchange of vehicle data across the European Union. Although this Directive revision is still in development, the possible positive effective of this Directive on the effectiveness of low emission zones, especially those in border regions, is vast.

Political context

It is difficult to create a full overview of the views of all political parties in the European Parliament and the views of all Member States in the Council. However, in general, most political party groups in the European Parliament are in favour of clean air initiatives and environmental measures. Moreover, a majority thinks that the European Union should play a role in limiting both environmental and air pollution damages.

The Ambient Air Quality Directive can be seen as a prime example of the vision of most political party groups in the European Parliament. The European Union should, according to them, set the limits on air pollution and try, at the same time, to promote innovation that ensures clean air (Socialist and Democrats, 2015; European People's Party, date unknown; European Democratic Party, date unknown; European United Left/Nordic Green Left European Parliamentary Group, date unknown; The Greens, date unknown).

This vision can also be seen in the 2016 Pact of Amsterdam. This urban agenda for the European Union, created by the EU ministers responsible for urban matters, sets out the role for the European Union development of cities and the pursuit of set sustainable goals. The Pact of Amsterdam sees three important roles for the European Union in the realisation of these goals: the EU as the facilitator of the creation of regulations, the funder of projects and the creator of knowledge and the facilitator of the exchange of knowledge (President of the Council of the European Union, 2016).

This makes clear that not only the European Parliament, but also the Council of Ministers of the European Union see an important role for the European Union in the creation of policy to limit air pollution and to improve air quality. Moreover it seems that the political role of the European Union in the creation of such policy is increasing, certainly looking at agreements such as the Paris Climate Agreement. In the Global Climate Action Agenda the EU has set itself the goals to live up to the Paris Climate Agreement and to further increase its actions before 2020 (European Commission, date unknown).

It is therefore clear that the handles for policies on air quality improvements are available. Also the political willingness to make policies on this area is abundant. Reports such as 'A Clean Air Programme for Europe' further confirm this (European Commission, 2013). At the same time the European Commission has announced new steps to improve the air quality within the European Union, as described in the 2018 report 'An Europe that protects: Clean air for all' (European Commission, 2018, c).

The differences in the implementation of the existing air quality directives between the Member States in the European Union is big. A group of six countries (France, Germany, Hungary, Italy, Romania and the United Kingdom) have failed to meet the EU air quality requirements for PM and NO₂ (see Ambient Air Quality Directive). The responsible commissioner Karmenu Vella has therefore started an infringement procedure against these Member States in order to force them to comply with the EU air quality requirements. Three other countries, the Czech Republic, Slovakia, and Spain, also have failed to comply with the EU air quality requirements. However, these three countries have gotten one final opportunity to create plans in order to lower the air pollution in the countries concerned, before an infringement procedure is started (European Commission, 2017).

These differences between Member States show two important problems for the future development of policy on air quality. Firstly there is a large difference between the compliance of Member States with the current Ambient Air Quality Directive. Whilst some countries, such as Estonia and Portugal do not only comply with the EU standards but also with the WHO guidelines, others, such as the in total nine countries mentioned earlier, fail to comply with the EU standards. Secondly it shows that the European Commission is not willing to crack down on all breaches of the Ambient Air Quality Directive standards. Although the Czech Republic, Slovakia and Spain should have complied with these standards since as early as 2005, the Commission is willing to give them final chance before referring these three countries to court.

It can therefore be questioned if the EU is strict enough on each of the Member States in order to force them to comply with the Ambient Air Quality standards. At the same time it is clear that not all Member States are taking their responsibility to lower the levels of PM_{2.5}, PM₁₀ and NO₂ within their borders. This is not only troubling for the European citizens living within these countries, but it also creates solidarity issues. Not only are all EU Member States expected to comply with EU emission standards, higher air pollution in one country also creates problems for other adjacent countries. In Maastricht for example a large portion of the air pollution is originating from German industry (Bouthoorn, Teeuwisse and Van der Pol, 2016, p. 16). This not only results into polluted air in Maastricht, but also creates problems in the light of the solidarity principle and the polluter pays principle.

European Union Political Context: Conclusion

It can therefore be concluded that there is political support for air quality improvement measures at the level of the European Union. However it is important to state that there are differences between Member States on the implementation of existing air quality measures. The relationship between the European Union and its Member States is therefore important in the future development of air quality improvement measures. Finally it can be questioned if the European Union is strict enough, firstly with the measures it has taken and secondly with checks on the implementation of Directives by Member States. Therefore, although the political support for new measures seem to be available, it remains uncertain if new stricter measures will become reality any time soon.

Netherlands

At a national level many initiatives have been taken to improve the air quality in the Netherlands. Leading for these measures are the European Union air quality standards as described in the Ambient Air Quality Directive. In this paragraph an overview legal and political context of air quality improvement measures at the national level of the Netherlands will be created.

Legal context

The backbone of legislation in the Netherlands on air quality is the Ambient Air Quality Directive. The directive has been transposed into the *environmental management law* (Wet milieubeheer). Apart from the transposition of the European Union air quality standards, this law also dictates the way air pollution is measured and the way these measurements are reported (Ministry of Infrastructure and Water Management, date unknown, a).

New plans or projects should not be at variance with article 5.16, sub 1 of the *environmental management law*. This article states that new plans or projects cannot cause a breach or possible breach of the European Union air quality standards. At the same time, new plans or projects cannot cause a net deterioration of the air quality in a certain area (Wet milieubeheer, 1979).

The Netherlands has failed to comply with the Ambient Air Quality Directive in both 2005 and 2010. In a reaction to this, and under pressure of the European Commission, the national government of the Netherlands has created the National Air Quality Cooperation Program (NSL; *Nationaal Samenwerkingsprogramma Luchtkwaliteit*) (Vereniging voor Nederlandse Gemeenten, date unknown). The NLS is a plan to improve the air quality in the Netherlands. Measures therefore are taken at all levels: national, regional and local level. The goal of the NSL was to comply with the European Union air quality standards whilst still creating the possibility to develop projects that deteriorate the air quality, such as new industry or roads. In general two main methods have been described how this goal can be reached: firstly limiting emissions and secondly limiting immission (Ministry of Infrastructure and Water Management, date unknown, b). This means firstly that the pollution should be lowered. This can be done in multiple ways. The Ministry of Infrastructure and Water Management gives a number of examples such as improving public transport, encouraging the investment in cleaner vehicles, creating low emission zones and improving traffic flows. Secondly the NLS stated that the exposure to pollutants should be lowered. This can be done by diverting traffic from urbanised areas and by creating more green buffers (Ministry of Infrastructure and Water Management, date unknown, b). The NSL ended in 2017.

Although the NSL has achieved its goal of making sure that the Netherlands complies to the European Union air quality standards, the plan itself did not create new measures which should be implemented. The plan only created an overview of all proposed plans that can improve and deteriorate the air quality in the Netherlands, and thereby making sure that measures are implemented effectively and the European Union air quality standards are met (Ministry of Infrastructure and Water Management, date unknown, c).

Some organisations, such as *Milieudefensie* (environmental protection) have claimed that the Dutch national government is not doing enough to limit air pollution in the Netherlands. Milieudefensie therefore started a court case against the Government of the Netherlands to force the State to act. Milieudefensie won this court case in first instance, however they lost the case in the appeal (NRC Handelsblad, 2018; Milieudefensie, 2017). In contrary to other court cases, such as the Urgenda case on the lowering of CO₂ emissions, the court in the Netherlands has decided not to force the Dutch government into creating additional requirements to limit air pollution (Verlaan, 2016).

Other than classic regulations, the Dutch government has chosen to work together with representatives of industry, companies and organisations in a large array of sectors to create so-called framework agreements. These agreements, such as the *GreenDeal Zes* (Green Deal Six) and the *Energieakkoord* (Energy agreement) are made in consultation with the signatories, however these agreements are binding. This means that these framework agreements create legal obligations for the parties involved (Postma, 2016). Over the past seven years more than 200 of such agreements have been signed (GreenDeal, date unknown). Other forms of these agreements are so-called covenants, such as the covenant for truck low emission zones (Covenant Stimulerend Schone Vrachtauto's en Milieuzonering, 2006). The goal of such agreements is, apart from setting goals to achieve a cleaner environment, to create clarity and long-term planning.

These agreements do not give clear methods on how air quality could be improved, however they state binding goals for not only the government itself but also for many organisations that have a strong impact on air quality. Therefore making it possible to find inclusive solutions to air quality problems, such as for example for polluting vehicles.

Finally it is important to mention the Regulations traffic rules and traffic signs (*Reglement verkeersregels en verkeerstekens*, [RVV]). This law specifies all road signs and traffic rules in the Netherlands. It therefore also dictates which traffic signs under which circumstances can be used to enforce a low emission zone. Currently the sign C22a is mandatory for indicating a low emission zone for lorries of a weight of 3500 kilograms or more, whilst the sign C6 together a bottom plate is used for low emission zones for cars, vans and other vehicles (*Reglement verkeersregels en verkeerstekens 1990 (RVV 1990)*, 2017).

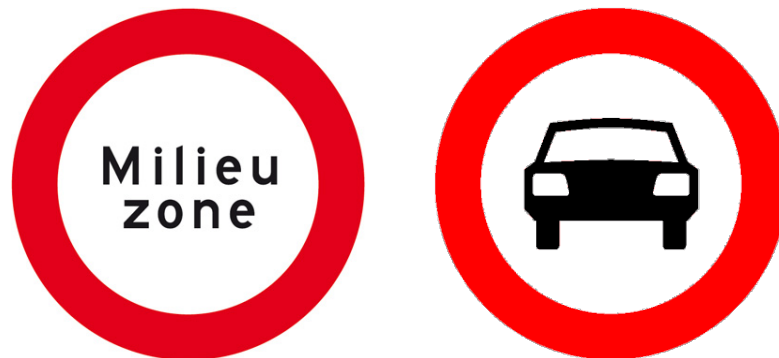


Figure 4.2: The traffic sign C22a (left, now used for lorries of a weight 3500 kg or more) and the traffic sign C6 (right, currently used for cars, vans and other vehicles; used with bottom plate).

In accordance with the government agreement of the coalition of Rutte III, the Ministry of Infrastructure and Water Management (I&W) is working on a change of the RVV in which the usage of the sign C6 for low emission zones will be no longer allowed. Instead, all low emission zones will be required to use the C22a sign. Together with this change, the access regime will be added to the RVV to create uniformity for all low emission zones across the Netherlands. This revision is currently still in development, therefore it is hard to predict how this revision will affect new low emission zones in development. However, the Ministry of I&W does plan to allow only enforcement via ANPR camera systems. Making the usage of sticker impossible when the new RVV goes effect on 1 January 2020. Because this revision is still in development it is unclear what the details of the RVV will be in its final form.

Netherlands Legal Context: Conclusion

The Netherlands mostly transcribes the Ambient Air Quality Directive into its national *environmental management law* (*Wet milieubeheer*). Although there were more concrete actions as part of the NSL to limit emission and immission, those plans have ended. The Netherlands now focusses mostly on agreements with industry representatives and others to create framework agreements. These framework agreements create long-term goals for environmental and air quality improvements. Recently the Ministry of I&W is working on concrete new rules on the implementation and enforcement of low emission zones.

Political context

Addressing air quality improvements is a political subject that has slowly moved up the political agenda. During the last general elections in the Netherlands and in the current government agreement this increasing political awareness for the problem of air pollution can be seen clearly. In the government agreement of the current coalition Rutte III two concrete instruments to improve air quality are mentioned. Firstly, the agreements names the change of parking rates to encourage the usage of zero emission vehicles. Secondly, the usage of low emission zones (LEZs) is mentioned. It is important to note that, the Dutch government sees LEZs as an important instrument to lower air pollution. However it has made clear that

local governments should implement LEZs unambiguously throughout the Netherlands, creating one system with one set of rules (Rutte, Van Haersma Buma, Pechtold and Segers, 2017, p. 39). This condition is set for the current and newly developing LEZs across the Netherlands.

Furthermore the government agreement states that in term the current National Air Quality Cooperation Program will be replaced by a National Action Plan Air Quality to achieve a permanent improvement of the air quality in the Netherlands and to make sure the Netherlands will continue to respect the European Air Quality Standards in the future (Rutte, Van Haersma Buma, Pechtold and Segers, 2017, p. 46).

Netherlands Political context: Conclusion

Although it therefore seems that a large majority of the political parties in the Netherlands support air quality improvement measures, and in more detail low emissions zones, the political climate is not stable. Only three years ago a majority of the Dutch House of Representatives (*Tweede Kamer der Staten Generaal*) voted to end the usage of low emission zones. Although local governments were still allowed to use low emission zones as an instrument to lower pollution in cities, this vote makes clear that there is not a stable support for low emission zones in national politics in the Netherlands (RTL Nieuws, 2015). This vote will most likely be overturned by the introduction of the new RVV in 2020, however it shows the changing approach towards LEZs, and together with the multiple court cases that LEZs as an instrument is not uncontested. However, this changing approach is clearly moving towards a support or acceptance of low emission zones as an effective instrument to limit air pollution in cities.

Concluding

In the European Union and in the Netherlands the political support for tackling air pollution problems is available. However both levels are unsuccessful in providing clear instruments or initiatives to limit air pollution. Although the European Union takes a proactive role in limiting the pollution of new vehicles in the European Union, the national government in the Netherlands only creates agreement with companies and organisations to limit the pollution to comply with the European Air Quality Standards, something that the Netherlands had to do, with or without these agreements. It seems therefore that the role of the European Union is that of a policy creator, setting the limits of air pollution via the European Air Quality Standards, whilst the role of the Dutch government is that of a controller. The Dutch government makes sure that the limits of air pollution are not breached and tries to make sure the locally created instruments to limit air pollution are consistent and uniform across the country (Rijksoverheid, 2018). This aligns with the expectations of multi-level governance, in which policy is created on multiple levels and local governments play an increasingly important role (Hooghe and Marks, 2001a, pp. 3-4). Local governments therefore are made responsible to implement instruments that can limit air pollution and that can make sure that the Netherlands complies with the European Union Air Quality Standards.

5. Results

This research focusses on the way which Dutch national policy goals can be implemented effectively in border regions. In the past chapters the context in which these national policy goals have been created, together with an insight into the legal and political options and constraints border regions face in implementing these national policy goals has been sketched. In this chapter the focus is put on the methods that border regions can use to effectively implemented national goals on air quality. This is done by firstly looking at the different options available and subsequently discussing the most effective enforcement option. Moreover the role of multi-level governance and policy diffusion is discussed in relation to the development of the most effective option, more specifically in the main case study of this research; a low emission zone in the municipality of Maastricht.

Enforcement options

The municipality has multiple options to create policy in order to comply with the Dutch national policy goals on air quality improvement. As discussed earlier this research focusses on the effective implementation of a low emission zone in the municipality of Maastricht. In order to answer the question how a LEZ be implemented effectively in the municipality of Maastricht, it is therefore crucial to find an enforcement method which is most effective according to the framework introduced in chapter 2 (see figure 2.1). Three enforcement methods have been identified which firstly are introduced before being analysed.

Automatic number plate recognition (ANPR)

The low emission zones that are currently in place in the Netherlands use an automatic number plate recognition system to detect vehicles that enter a low emission zone. This system makes use of cameras that are able to scan the number plates of passing vehicles. This information is checked in the database of the RDW (Netherlands Vehicle Authority) to verify the date of first registration or the emission standard of a vehicle (see *European emission standards*) and checking if this date or standard is above the minimum threshold needed to enter the low emission zone. For example, if the zone only allows the entry of diesel cars with a date of first registry of 1 January 2001 or newer, all diesel cars with a date of first registry before 1 January 2001 are not allowed to enter the zone. If vehicles that are, according to the access regime, not allowed to enter the low emission zone, still enter the zone they will automatically receive a fine. The access regime that is active in a low emission zone is mostly displayed on a sign that is displayed on the roads towards and just before entering the low emission zone.

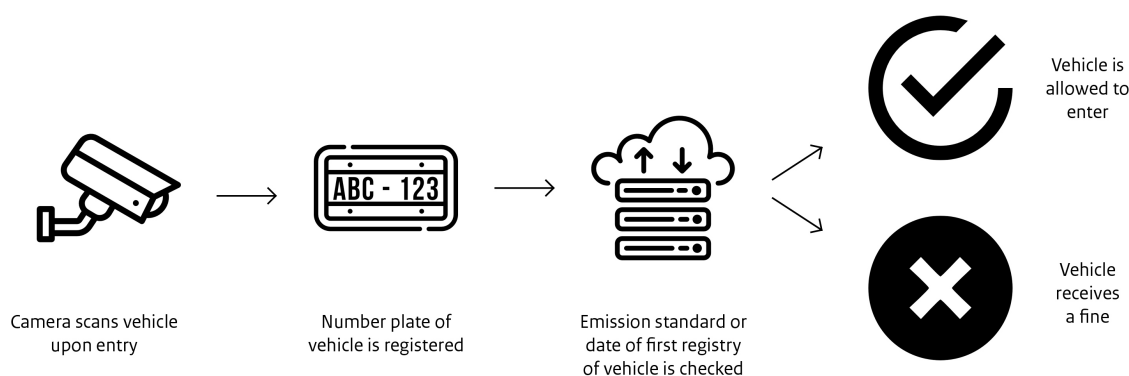


Figure 5.1: ANPR camera system.

Stickers; Umweltplakette

Germany uses a different system than the Netherlands to enforce its low emission zones. Instead of using an automatic system, the German system is analog, making use of stickers to identify if a vehicle is allowed to enter a low emission zone. Vehicle owners themselves have to obtain a sticker for their vehicle. During the purchase of a sticker the date of first registry or the emission standard of the vehicle is checked and the sticker that matches this data is provided (Germany uses multiple stickers, for example if a car has the emission standard 4 or newer it will receive a green sticker, the access regimes of low emission zones confirm to these stickers rather than an emission standard or date of first registry). Vehicles that enter a low emission zone without or with the wrong sticker are at risk of receiving a fine. Because the system is analog there are no automatically produced fines for entering the zone whilst breaching the access regime of a low emission zone.

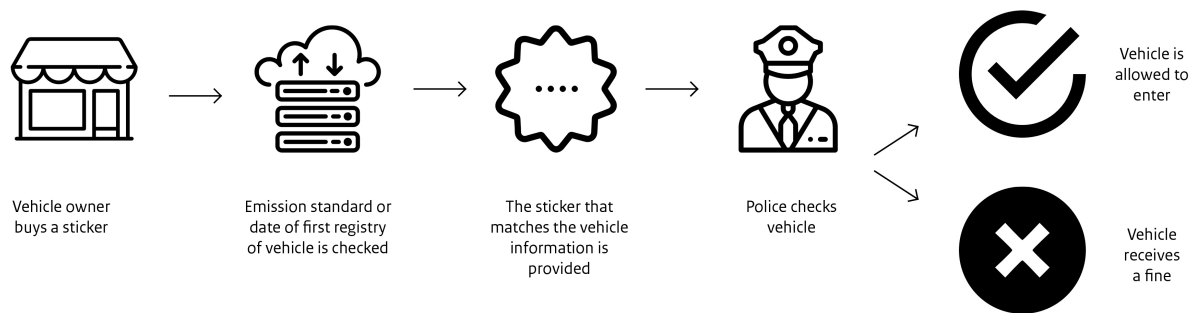


Figure 5.2: Sticker system.

Combination of ANPR and foreign registration

Finally it is possible to use an ANPR camera system in combination with a registry system for foreign vehicles such as currently is in use at the low emission zone on the Maasvlakte in Rotterdam and in the city of Antwerp. Such a system makes use of an ANPR camera system like described above. However it requires all foreign vehicles to register before entering the low emission zone. It is currently not possible to access the data of foreign vehicles. Therefore it is not possible to obtain any information about foreign vehicles when scanned. Due to the lack of this information it is not possible to determine if foreign vehicles are allowed to enter the low emission zone. However, if vehicles are required to register online in advance it is possible to check these registered vehicles. It is in this way possible to control all vehicles that enters a low emission zone, not only the Dutch registered vehicles which are in the database of the RDW.

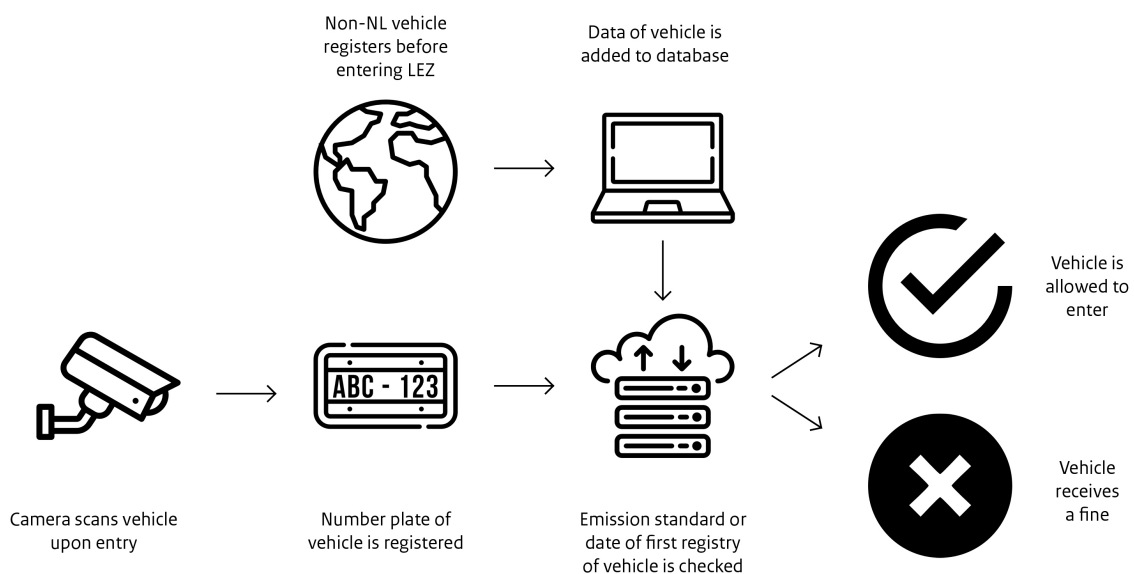


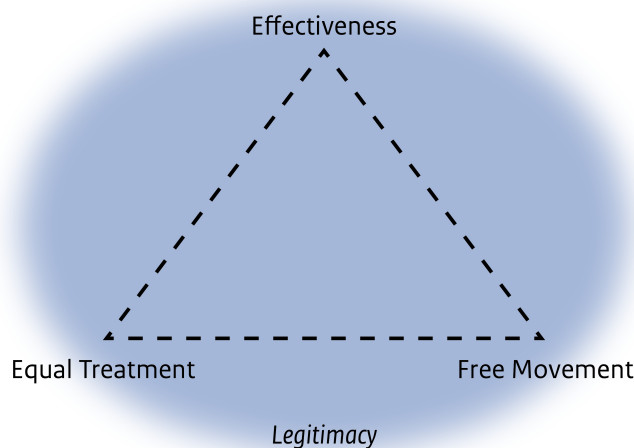
Figure 5.3: ANPR camera system with foreign registration.

These three enforcement methods are identified as most realistic methods to enforce a low emission zone in the municipality of Maastricht. All three of these methods have their benefits and their drawbacks, both in comparative as in absolute terms. In the next section these three methods are further analysed by using the framework created in chapter 2.

Analysing enforcement options for low emission zones

The introduced methods for enforcing a low emission zone can be analysed for their effectivity by using the framework that has been created in chapter 2 (see *Framework low emission zone Maastricht*). This framework makes use of three factors: policy effectiveness, equal treatment and free movement. These three factors create a framework in which three trade-offs can be identified. An effective method to enforce a low emission zone in Maastricht balances these three trade-offs, in that way ensure both an effective enforcement as a legitimate enforcement method.

In this analysis each factor and the corresponding indicators (see table 2.2) are step-by-step explained, looking at both the positive as negative effects of each enforcement option.



Legend

A radar chart is used to visualise the respective effectiveness, equal treatment and free movement of each enforcement method. The optimal enforcement method spans all these three factors.

Figure 5.4: Model framework effective enforcement LEZ in the municipality of Maastricht.

Analysis of Automatic number plate recognition (ANPR) camera system

The first enforcement method that is analysed is an ANPR camera system. This system uses an automatic number plate recognition system that scans every vehicle that enters the low emission zone. The enforcement method is analysed by looking at the three factors (policy effectiveness, equal treatment and free movement) and the corresponding indicators.

Policy effectiveness

An ANPR camera system uses automatic number plate recognition to identify vehicles that enters a LEZ. Each vehicle that is in the database of the RDW and does not comply with the access regime of the low emission zone therefore automatically receives a fine. However, this is only possible for vehicles that are in the database of the RDW. This database consists only of the vehicles that are registered in the Netherlands on Dutch license plates. Therefore the probability of being fined when a vehicle does not comply with the access regime is a 100% for vehicles registered on Dutch license plates. However, this probability drops to 0% for foreign registered vehicles as it is not possible to determine the date of first registry or the emission standard of these vehicles as this data is not available at the RDW.

ANPR camera systems require large investments on the short term. The high costs of cameras and the back-office to automatically fine vehicles leads to high fixed costs. These costs are the result of the systems

needed to operate an ANPR camera system and the camera's that are needed to register vehicles entering the low emission zone. The variable costs on the long term however are comparable to that of other enforcement options for low emission zones, certainly in relation to effectiveness of an ANPR camera system. Due to the lack of on-street enforcers or police deployment for the enforcement of a low emission zone if an ANPR camera system is used, the variable costs are medium high¹⁰. However, because the extensive back-office needed to operate an ANPR camera system is expensive to maintain, the variable cost are medium high and not low¹¹.

Factor	Indicator	Outcome
Policy effectiveness	- probability of being fined	100% for Dutch registered vehicles, 0% for foreign registered vehicles
	- costs of enforcement method	High fixed costs, medium high variable costs

Equal treatment

The limitation of an ANPR camera system is that it is currently not possible to identify the date of first registry or the emission standard of foreign registered vehicles¹². The result of this is that foreign vehicles can freely enter a low emission zone that is enforced by an ANPR camera system, without the risk of receiving a fine. This not only has a negative effect on the effectiveness of an ANPR camera system, but it also creates an unequal treatment of citizens entering a LEZ. In Maastricht, the usage of an ANPR camera system results in a situation in which Belgian and German registered vehicles are able to enter a low emission zone whilst Dutch registered vehicles cannot. Because such a large portion of the traffic in Maastricht is foreign, more than 50% at peak times, the effectiveness of an ANPR camera system is hugely affected by the incompatibility with foreign vehicles. Although de jure all vehicles are not allowed to enter the low emission zone if they do not comply with the access regime, the outcome of an ANPR camera system is de facto unequal. This inequality does not only result in legal inequality, it could also lead to distortions of a level playing field and eventually to a lower public support. Firstly foreigners do not need to invest in new(er) vehicles to be able to enter the low emission zone. For commercial usage that can result into a distortion of competition between Dutch and foreign companies. Secondly, if not everyone is treated equally and the effectiveness of an enforcement method is relatively low, the output legitimacy of a low emission zone drops.

Factor	Indicator	Outcome
Equal treatment	- equal chance of being fined	No
	- equal action needed for entering a LEZ	Yes

Free movement

One of the biggest advantages of an ANPR camera system in comparison to the other enforcement options is that it creates no limitation to the freedom of movement of vehicles, other than limiting entry of vehicles that are not allowed to enter the low emission zone. Because the cameras work automatically and the data

¹⁰ The costs for cameras and software are expected to be around 200.000 - 300.000 euros. This is excluding the costs of signs and the costs for implementation.

¹¹ The expected costs for software are 100.000 euros per year.

¹² Although it is not possible to retrieve this information via government channels, numerous cities such as London make use of 'third party dept collectors' which are able to retrieve information about the vehicle and the owner of the vehicle. This is however untried in the Netherlands and its unclear if it's legally possible.

for checking the vehicles (for Dutch registered vehicles) is already available, there is no limitation to those who are allowed to enter the low emission zone. In this way the possibility to enter the city is not hindered and those who comply with the rules do not need to take action in order to legally enter the low emission zone.

Factor	Indicator	Outcome
Free movement	- possibility of free access	Yes

Looking at the three factors, policy effectiveness, equal treatment and free movement, that determine the level of effective enforcement of an ANPR camera system, the ANPR system can be scored in the framework for effective enforcement of a LEZ in the municipality of Maastricht (see figure 5.5).

Figure 5.5 illustrates that the usage of an ANPR camera system for the enforcement of a LEZ leads to a high level of free movement. However, as it is not possible to automatically check all vehicles, but only Dutch registered vehicles, the ANPR camera system scores low on both effectiveness and equal treatment. Although the effectiveness for Dutch registered vehicles is very high, the limitation to only Dutch vehicles and the high percentage of foreign vehicles in Maastricht leads to this low score on effectiveness.

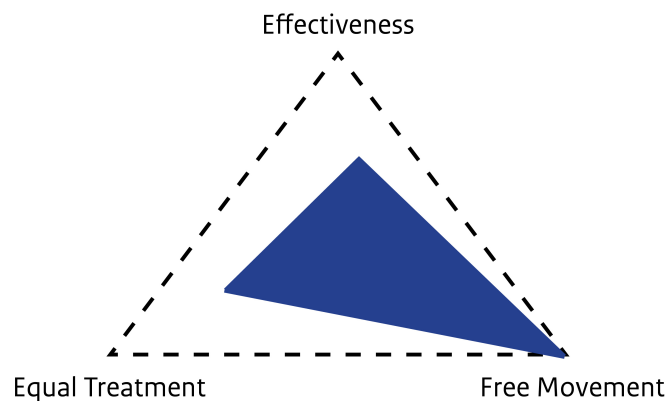


Figure 5.5: Analysis of an ANPR camera system according to the framework for effective enforcement of a LEZ in the municipality of Maastricht.

Analysis of stickers; Umweltplakette

The usage of stickers, or *umweltplakette* in German, is in almost all aspects different from the usage of an ANPR system. Firstly, it is a completely analogue system, meaning that it doesn't make use of computer technology for the enforcement of the system. The stickers are used to identify which vehicles are allowed to enter a low emission zone. This enforcement method is analysed, just as the ANPR enforcement option, by looking at the three factors (policy effectiveness, equal treatment and free movement) and the corresponding indicators.

Policy effectiveness

Because there is no automatic control of vehicles the chances of being fined is very low. This probability of being caught can be increased by increasing the police enforcement. However this raises the costs of enforcement. Although the fixed costs for the implementation of a stickers enforcement system are very low, the variable costs are comparatively high, this as the result of enforcement via police officers. The total costs of a sticker system are in the long term therefore not significantly lower than that of an ANPR camera

system¹³. Finally it is important to note that the availability of stickers and the information on the access regime and the necessity of buying stickers before entering the city, is well-spread. If this is not the case the effect of stickers and thereby the effectiveness of the low emission zone will drop.

Although it is possible, through the identification via the sticker, to identify the date of first registry or emission standard of a vehicle, it is not always possible to fine each vehicle. Because there is no exchange of information on the owners of vehicles and their details for offences such as the illegal entry of a low emission zone in the European Union or between specific EU Member States and the Netherlands, it is not possible to identify the owner of a foreign registered vehicle when the owner is not present at time of the offence. Meaning that it is not possible to fine parked foreign vehicles without or with the wrong sticker in a low emission zone¹⁴. This means that stickers as an enforcement method for a low emission zone scores low on effectiveness.

Factor	Indicator	Outcome
Policy effectiveness	- probability of being fined	Low
	- costs of enforcement method	Low fixed costs, medium high variable costs

Equal treatment

The advantage of stickers is that all vehicles are treated equally. It is possible to equally easily identify which vehicles are in compliance or non-compliance with the access regime of a low emission zone. Every driver also has to undertake the same action to be able to enter a low emission zone, namely fitting its vehicle with a sticker. However, unequal treatment on the chances of being fined remain, as described earlier. Moreover, by making the owners of vehicles that are, according to the access regime, allowed to enter the low emission zone take this hurdle and letting them pay for the sticker, the sticker system for the enforcement of a low emission zone goes against the polluter pays principle, which states that not the owner of clean vehicles, but the owners of polluting vehicles, should be financially punished.

Factor	Indicator	Outcome
Equal treatment	- equal chance of being fined	Moderate
	- equal action needed for entering a LEZ	Yes

Free movement

The usage of stickers finally creates a hinder of free movement of vehicles or than the limitation of vehicles that are not allowed to enter the low emission zone. Vehicle owners or drivers need to buy and apply a sticker to their vehicle before they are able to enter a low emission zone. This creates an obstacle which is quite easily overcome by frequent users of the low emission zone, but which can seem difficult to overcome to a seldom or spontaneous visitor that does not already have a sticker.

¹³ The municipality of Maastricht expects low fixed costs, comparing to low fixed costs in Germany. The variable costs (the costs for enforcement) are estimated to be 100.000 euro per enforcer or police officer.

¹⁴ Although collection of fees it is not facilitated via government channels, numerous cities such as London make use of 'third party dept collectors' which are able to retrieve information about the owner of a vehicle. This is however untried in the Netherlands and its unclear if it's legally possible. If 'third party dept collectors' are not used, it is not possible for police offers to track down the owner of a foreign registered vehicle via the number plate. Therefore foreign vehicles can only be fined when the driver is present.

Factor	Indicator	Outcome
Free movement	- possibility of free access	No

Looking at the three factors, policy effectiveness, equal treatment and free movement, that determine the level of effective enforcement of a sticker system, the sticker system can be scored in the framework for effective enforcement of a LEZ in the municipality of Maastricht (see figure 5.6).

Using a sticker to enforce a low emission zone in Maastricht leads to a more equal treatment of the users of a low emission zone in comparison to an ANPR camera system. However, the effectiveness and free movement with the usage of stickers drops in comparison to the usage of an ANPR camera system. At the same time, Dutch vehicle owners are still more likely to be fined than foreign vehicle owners, making the treatment of all vehicle owners fairer, but not completely equal.

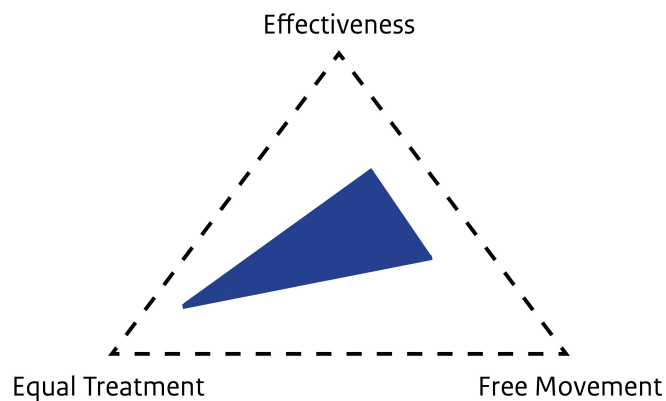


Figure 5.6: Analysis of a sticker system according to the framework for effective enforcement of a LEZ in the municipality of Maastricht.

The city council of Maastricht has decided in March 2018 that this enforcement option should be investigated for possible implementation by the municipality. The city in this research looks at the possibility to introduce the German *umweltplakette* in Maastricht. Although this investigation is ongoing it is uncertain if this enforcement system is currently legally possible according to the RVV. Furthermore the probability is high that the usage of stickers will not be allowed in the new RVV that goes into effect in 2020 (see chapter 4: *Netherlands legal context*).

Analysis of the combination of ANPR and foreign registration

The combination of both an ANPR camera system and the obliged registration of foreign vehicles could improve both the effectiveness and the equal treatment of the ANPR camera system. If foreign vehicles are required to register before entering the low emission zone, it is possible to fine those who entered the low emission zone whilst not complying with the access regime. The registry of foreign vehicles could therefore as such fill in the hole that is created by the lack of data on foreign vehicles. This enforcement method is again analysed by looking at the three factors (policy effectiveness, equal treatment and free movement) and the corresponding indicators.

Policy effectiveness

A system which combines ANPR with foreign registration is currently used in the low emission zone in both the Maasvlakte in Rotterdam and in the municipality of Antwerp. (Slim naar Antwerpen, date unknown; Gemeente Rotterdam, date unknown). In theory this enforcement option looks like a possible solution for the enforcement of foreign registered vehicles. However in practice there are some issues with this enforcement option. Firstly and most importantly it is still not possible to fine those vehicles who actively or passively did not register. This means that the incentive to register is extremely low. If a vehicle does not

comply with the access regime of a low emission zone it is extremely unlikely that the owner of that vehicle would register its own vehicle for it to be able to be checked, whilst he or she would be able to enter the low emission without the possibility to be fined if he or she decides not to register its vehicle. This problem could be solved with flanking policy, for instance by making the fine for not registering much higher than the fine for entering whilst not complying with the access regime of a LEZ. However, such measures would require police enforcement to have an effect. This effect will, if the chances of being caught for not registering is low, be limited. If these chances are high, the effect will be greater, however so would be the costs of extensive surveillance. The registration of foreign vehicles should therefore more be seen as limited compensation towards Dutch vehicle owners, in order to show that the municipality of Maastricht is trying to be equal for all vehicle owners, whilst in practice the registration of foreign vehicles would not have a significant effect on the policy effectiveness.

Factor	Indicator	Outcome
Policy effectiveness	- probability of being fined	100% for Dutch registered vehicles, possibly more than 0% for foreign registered vehicles
	- costs of enforcement method	High fixed costs, medium high variable costs

Equal treatment

The second problem with the registration of foreign vehicles could be the unequal treatment of foreign vehicle owners. Because only foreign vehicle owners are required to register the different treatment of foreign and Dutch vehicle owners could be interpreted as discrimination. Although both Dutch and foreign vehicle owners are treated equally on the grounds for accessing a low emission zone, i.e., the access regime is the same for Dutch as non-Dutch vehicles, the difference in active registration and automatic registration via the RDW could be seen as discrimination. The municipality of Rotterdam fixes this issue by stating that every vehicle should be registered and that Dutch vehicles have been registered already by the RDW. In this way it is possible to request registration of de facto only foreign vehicles (Gemeente Rotterdam, date unknown, a).

Factor	Indicator	Outcome
Equal treatment	- equal chance of being fined	More than only ANPR
	- equal action needed for entering a LEZ	No

Free movement

Finally, looking at the aspect of free movement, the required registry of foreign vehicles would limit the free movement of vehicles into the low emission zone. However, the easiness registration itself and the possibility that this registration would not be done by every foreign vehicle owners that want to enter the low emission zone in Maastricht, makes that the de facto impact of the required registration of foreign vehicles on free movement is most likely limited.

Factor	Indicator	Outcome
Free movement	- possibility of free access	Yes for Dutch vehicles, no for foreign vehicles

Looking at figure 5.7 is visible that the registration of foreign vehicles does lead to a higher effectiveness in comparison to a ANPR camera system without the required registration of foreign vehicles. However, this increase in effectiveness is only very limited.

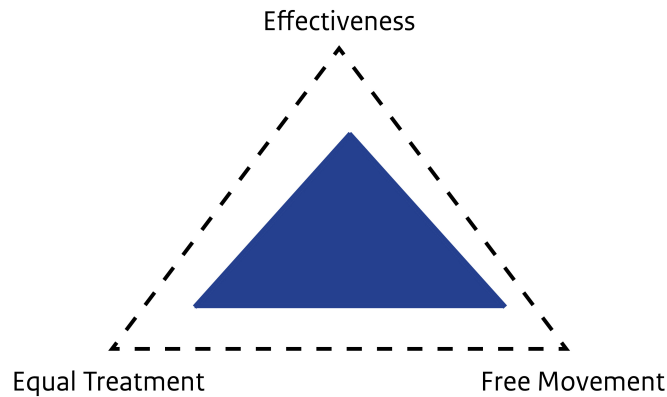


Figure 5.7: Analysis of an ANPR camera system in combination with required registration for foreign vehicles according to the framework for effective enforcement of a LEZ in the municipality of Maastricht.

Developing an optimal enforcement option

Looking at the three enforcement options for a low emission zone in Maastricht it is clear that there is one important factor that limits one or multiple elements in the framework created for the analysis of effective enforcement of a LEZ in the municipality of Maastricht (see figure 5.4). The lack of information of foreign registered vehicles creates problems for the effectiveness of a low emission zone and equal treatment of users of a low emission zone (see figure 5.5). The addition of required registration of foreign vehicles could limit this problem, however, this effect is limited (see figure 5.7). The usage of a sticker enforcement system partly solves the issue of lack of information of foreign vehicles, however in doing so the free movement for users of a low emission zone is limited, whilst at the same time the effectiveness of the low emission zone drops and Dutch and foreign users are still not treated equally (see figure 5.6). Finally it is likely that this enforcement option will be prohibited by the new RVV that will be effective on 1 January 2020. Stickers could therefore only be used for a brief period before a switch to another enforcement method must be made.

It would therefore be optimal if the information of foreign vehicles would be available to be used in an ANPR camera system. In that way the effectiveness of a low emission zone would be highest, together with the free movement and equal treatment, creating the best enforcement system according to the developed framework (see figure 5.8). At the same time, this system would be in line with prospected changes to the RVV (see chapter 4).

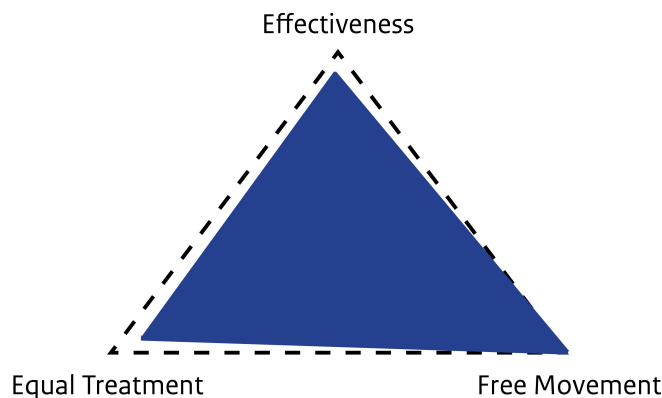


Figure 5.8: Analysis of an ANPR camera system in combination with EETS or bilateral agreements with Belgium and Germany according to the framework for effective enforcement of a LEZ in the municipality of Maastricht.

Vehicle data exchange

The lack of information of foreign vehicles is a problem that has been known for a longer time. In the development of the low emission zones for cars and vans in Utrecht, Amsterdam and Rotterdam questions have been asked on how foreign vehicles will be fined. All though this problem is already known for multiple years, the issue has not been taken on by the national government for a long time (Hotse Smit and Vos, 2018; NOS, 2018; RTV Utrecht, 2015; Van der Vegt, 2018).

This however has changed from 2017 onwards. The Ministry of Infrastructure and Water Management is working on two methods to achieve vehicle data exchange between counties. These two main methods of achieving the exchange vehicle data are bilateral agreements between countries or EETS¹⁵ (Van Veldhoven-van der Meer, 2018; Van Nieuwenhuizen Wijbenga, 2018). In both methods the role of the national government is essential. It is impossible for the municipality of Maastricht to achieve bilateral agreement with other countries without the involvement of the Dutch national government, and although the revision of EETS could take place without the direct and active involvement of the Dutch national government, it would be more than useful if the Dutch government was involved in this process.

Whilst creating a EU wide exchange system of vehicle data, which could become possible via the EETS revision, would be most preferable, bilateral agreements with both Germany and Belgium would ensure that the biggest majority of all foreign vehicles in the Netherlands and the municipality of Maastricht could be checked. This because the overwhelming majority of foreign vehicles in the Netherlands and Maastricht are Belgian or German registered vehicles. Moreover, most experts are more confident in the fact that these bilateral agreement with both Belgium and Germany can be made in a relatively short time span, possibly even before the introduction of the revision of the RVV in 2020. It is however unclear if and when the EETS revision will become available and usable to enforce foreign vehicles via an ANPR camera system.

Policy Diffusion to Policy Concentration

The national government of the Netherlands is needed in the development of cross border exchange of vehicle data. It can therefore be expected that this government will play a more important role in the development of a low emission zone in Maastricht. The role of the national government and more specifically the Ministry of Infrastructure and Water Management is therefore changing. At the same time, and as a result of this changing role, policies are changing from diffuse policies to a uniform policy. It is important to explain how these changes have occurred and what the influences of the municipality, the Ministry of Infrastructure and Water Management and the European Union on this changes are and have been.

Changing role of the Ministry of Infrastructure and Water Management

Where the role of the national government was prominent in the development of low emission zones for lorries, the national government regarded the development of low emission zones for cars and vans as a local issue, that could be developed locally. The impact of the *diesel gate* (see chapter 4) and the subsequent drop in trust in low emission zones as an effective instrument to improve air quality in cities, together with the successive lack of political support for LEZs (see chapter 4), led to a change in positioning of the national government in which the development LEZs no longer seen as a national but as a local issue, in which local governments themselves could develop and enforce LEZs as has been done in Utrecht and Rotterdam.

¹⁵ These agreements for the exchange of data for low emission zones is more difficult than the existing Cross Border Exchange Directive as the information of vehicles should be exchanged before it is known that an offence has taken place. The data of all vehicles entering a low emission zone is needed to determine whether there is a breach of the access regime. Only after this has been done it can be determined if a vehicle should receive a fine or not. This is an important difference in comparison to the offences named in the Cross Border Exchange Directive. All these offences are registered before the data of a vehicle is needed. The data exchange in these offences is therefore only needed to be able to address the fine to the owner of the vehicle.

In 2017 however, the Dutch national government again changed its position, now from a decentralised approach towards a centralised approach. Two reasons for the change of the position from the Ministry of Infrastructure and Water Management from seeing low emission zones as local instrument with local rules, to a centralised and uniform approach in which the Ministry of Infrastructure and Water Management takes the lead, can be identified.

Firstly, due to the lack of national rules or management, different municipalities developed low emission zones on their own. Creating different access regimes (date of first registry 1 January 2000 in Amsterdam and 1 January 2001 in Rotterdam and Utrecht¹⁶ (Gemeente Amsterdam, date unknown; Gemeente Rotterdam, date unknown, b; Gemeente Utrecht, date unknown) and creative traffic signs in multiple municipalities (using sign C6 with multiple bottom plates). This *patchwork* of different low emission zones was seen as detrimental by the Ministry of Infrastructure and Water Management. Therefore, the formation of a new coalition (Rutte III) and a new government agreement stated that all existing and new low emission zone access regimes should be harmonised into one system with one national access regime, creating a leading role for the Ministry of Infrastructure and Water Management.

Secondly the decision of the city council of Maastricht to investigate the possibility to use German *umweltplakette* to enforce a low emission zone, together with the decision by the city council of Arnhem to implement a low emission zone from 2019 onwards with a much stricter access regime than in Utrecht, Rotterdam or Amsterdam, led to a growth of the existing *patchwork* of low emission zones (Gemeente Arnhem, date unknown; Gemeente Maastricht, 2018). These decisions further stimulated the Ministry of Infrastructure and Water Management to take a central role in the future and current developments of low emission zones, to in that way, create a uniform system of LEZs in their enforcement method and access regime.

These events can be summarised in figure 5.9

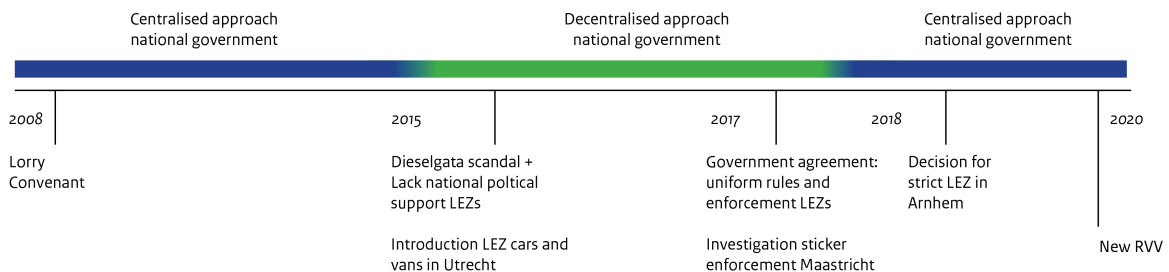


Figure 5.9: Timeline of events that influenced the centralised versus decentralised approach of the Dutch national government in the implementation and enforcement of LEZs.

Policy diffusion and policy concentration

The decision of the municipality of Maastricht to investigate the usage of the German *umweltplakette* can be seen as a move of policy diffusion. Although this investigation is not the creation of a policy, it is the first move towards a diffusion from the existing enforcement methods that are used in low emission zones in for example Utrecht and Rotterdam.

Respondents see the role of the municipality of Maastricht, together with the municipality of Arnhem as crucial in this switch from decentralised to centralised policy. The role of the municipality of Maastricht

¹⁶ In Amsterdam the low emission zone does not include cars, only vans, touring cars, taxis, lorries and scooters and mopeds.

therefore could be seen as that of a policy entrepreneur. Although it is not clear if this was intentional, the municipality has used its investigation of the usage of the German *umweltplakette* as lever to pressure the Ministry of Infrastructure and Water Management. This investigation, together with the decision by the city council to introduce a low emission zone with a differentiating access regime, forced the Ministry in its new role. It can therefore be argued that both cities created this window of opportunity by deviating from the norm.

However, other respondents note that the political support for a uniform system of low emission zones from the national government is this crucial. As the development of the plans for the government agreement of Rutte III and the development of the plans for low emission zones in Arnhem and Maastricht took place almost simultaneously, it is not possible to determine which development was the independent variable. Despite this, respondents note that the move towards further low emission zone policy diffusion has been a major factor in the development of centralised uniform policy. The development of new policy on low emission zones and more specifically the development of the new RVV (see chapter 4) can be seen as the outcome of this move.

Multi-level governance of low emission zones

Focussing on this move from policy diffusion towards policy concentration the impact of multi-level governance can be clearly identified. This paragraph focusses not only this relationship, but also focusses on the relationship between the European Union, the Dutch government and the municipality of Maastricht in the bigger picture of the EU Ambient Air Quality Directive and the improvement of air quality.

The implementation of the EU Ambient Air Quality Directive follows a traditional top-down approach (see figure 5.10). The European Union has set the limits of air pollution for different pollutants (see chapter 4 *Ambient Air Quality Directive*). These limits are set on certain areas within Member States. Member States themselves are free to choose whatever policy they prefer to reach the goals set by the European Union. In the Netherlands these policies are in some cases the responsibility of municipalities. The development of low emission zones, as locally effective measures to lower emissions, can therefore be seen a direct results of these EU limits.

In the development of a low emission zone in Maastricht however a different approach has been taken. Firstly the low emission zone was not developed as a response to a breach with EU emission limits (Bouthoorn, Teeuwisse and Van der Pol, 2016, p. 5). The municipality of Maastricht complies with these limits but has stated the goal to comply not only with the EU emission limits, but also with the WHO emission limits which are stricter than those of the EU (see table 4.1). The development of a low emission zone therefore did not start top-down, but bottom-up.

Secondly the municipality of Maastricht was and is dealing with different problems than the existing low emission zones in for example Utrecht. Because the number of foreign vehicles in Maastricht is much higher than in other cities. This high number of foreign vehicles lead to an implementation gap (Hill and Hupe, 2003, p. 480). The existing and desired policy for the implementation and enforcement of low emission zones did not fit with the local needs of the municipality of Maastricht.

The municipality therefore searched for another type of enforcement. This policy diffusion can be identified as 'lesson learning' (see table 3.3), as the municipality rationally and under influence of contextual factors decided to investigate other enforcement methods, in order to improve the effectiveness of a low emission zone in the city. At the same time, the municipality of Maastricht looked at other cities to learn from their solutions to similar problems as those of Maastricht and the municipality participated in the development of the EETS revision on a European Union level.

In a search for solutions the city therefore moved both horizontally (connecting with other cities) and vertically (European Union). This development fits in the multi-level governance theory developed by Hooghe and Marks (2001a) and the fusion theory developed by Guderjan (2012) in which not only a shift of power between different levels (EU, national and local) occurs, but in which these levels will overlap and the distinctions between different levels become blurred (Guderjan, 2012, p. 109). Looking at figure 5.10 these vertical and horizontal are both clearly visible.

The Ministry of Infrastructure and Water Management changed, as mentioned above, its approach under influence of multiple factors. The effect of this change was an increased involvement of the Dutch national government in both bilateral negotiations with both Belgium and the Netherlands on the exchange of vehicle data as the revision of the EETS Directive. Looking at figure 5.10 this move of the Ministry could therefore also be seen as a direct effect of multi-level governance. Respondents call the role of the Ministry facilitating; working to create an optimal solution for the city of Maastricht by trying to create the exchange of vehicle data of foreign vehicles.

Interestingly though, the proposed new RVV legislation that most likely will determine the access regime and enforcement method of low emission zones in the Netherlands from 2020 onwards, could be seen as a top-down measure that breaks from multi-level governance. Although this new RVV is developed in cooperation with multiple municipalities, the initiative lies with the Ministry. However, at the same time this development could be seen as a consolidation of all developments in the past months and years that have formed this policy concentration in which the Dutch government takes the lead.

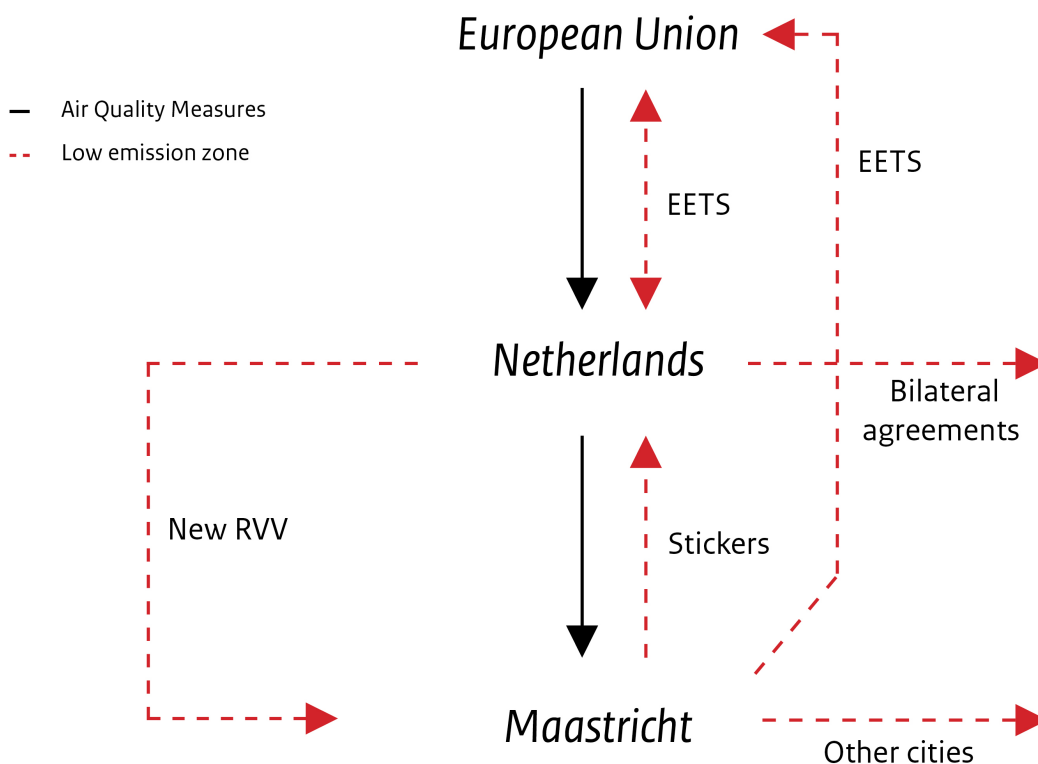


Figure 5.10: Multi-level governance of the implementation of the air quality measures as result of the Ambient Air Quality Directive and the multi-level governance of the development a low emission zone in Maastricht.

National demands and local needs

The development of a low emission zone in the municipality of Maastricht shows the difficulty of different goals of different actors in a multi-level governance system. The alignment of these goals asks for mutual adjustment of all parties involved (Zürn, 2010, pp. 85-86). Looking at the development of the low emission zone in Maastricht, this alignment is currently not available but the movement towards alignment is initiated. However, because the municipality is strongly dependant on the efforts of the Ministry of Infrastructure and Watermanagement to facilitate the exchange of data of foreign vehicles, something that until now has not successfully been done, it is not possible say with certainty if in the outcome to demands of the national government and the needs of the municipality of Maastricht will align. According to respondents however the first steps in this alignment, being talks with both German and Belgium government officials on the cross-border exchange of vehicle data, have been positive.

If the exchange of data of foreign vehicles would become possible, an optimal enforcement method for a low emission zone, in the form of an ANPR camera system, could be used. This would at the same time satisfy the demands of the Ministry of a uniform access regime and enforcement system in the Netherlands as a whole, while it also facilitates the needs of foreign vehicle enforcement in Maastricht. In this way, the most effective enforcement method could be achieved whilst adhering to national and local demands.

6. Conclusion

In this research the way in which Dutch national policy goals on air quality can effectively be implemented in border regions has been investigated. This has been done by focussing on the implementation and enforcement of a low emission zone in the municipality of Maastricht. By using the concepts of multi-level governance and policy diffusion, the role of multiple actors, the European Union, the Dutch government (more specifically the Ministry of Infrastructure and Water Management) and the municipality of Maastricht, has been researched. Using a framework with relevant criteria for the effective enforcement of a low emission zone in the municipality of Maastricht, and the usage of an analysed legal and political context of both the European Union and Dutch policy on air quality improvement, the most effective way to enforce a low emission zone has been found.

In the legal and political context, it has been made clear that EU air quality standards are dominant in national laws to lower air pollution in the Netherlands. However, aside from these air quality standards, the role of the Dutch national government is limited in the way it has developed concrete policies to limit air pollution. Although there are framework agreements on the limitation of emissions, concrete policies or instruments are lacking. The Dutch government does however have the obligation to comply with EU air quality standards. It can be concluded therefore that most action is and should be taken on a local level and that therefore cooperation between the Dutch national government and local governments is necessary to effectively implement air quality improvement measures to comply with EU air quality standards.

From the case study, that was used in this research, it can be concluded that the alignment of national demands and local needs is essential to achieve the effective implementation of air quality improvement measures. Without this alignment it is not possible to effectively implement policy in border regions, as the implementation gap between national developed policy and locally implemented policy prevents this (Hill and Hupe, 2010, p. 482). In the case of Maastricht this alignment was not present when the city decided to implement a low emission zone. The enforcement system used by other cities (ANPR system) made it impossible to enforce a low emission zone on foreign vehicles, something that is necessary to effectively implement a low emission zone in Maastricht. The municipality therefore had to find other ways to enforce a low emission zone. The effect of contextual factors that are a direct result of the geographical location of Maastricht, therefore forced the municipality to investigate alternative ways of enforcement. This deviation from the standard used enforcement system of low emission zones in the Netherlands can therefore be seen as a form of policy diffusion.

This policy diffusion, together with the political changes as result of the new government agreement of the cabinet Rutte III, changed the role of the Ministry of Infrastructure and Water Management. Where firstly municipalities were free to implement and enforce low emission zones, if these complied with the RVV (Regulations traffic rules and traffic signs; *Reglement verkeersregels en verkeerstekens*) now the Ministry planned to centralise the rules for low emission zones with predetermined access regimes and enforcement methods for low emission zones.

In this change, the movement from decentralised towards centralised policy, from the jurisdiction of local governance to the authority of national government, can be clearly seen, whilst at the same time, the effects of multi-level governance on the development of policy is visible. Both the Ministry of Infrastructure and Water Management and the municipality adapted to a mutual adjustment of their positions, whilst both are influenced by European Union developments and challenges between other countries and cities on a horizontal axis and alignment of demands on a vertical axis (see figure 5.10). Frictions between local and national levels of governance and the need of territorial cohesion (Faludi, 2006, p. 668) in the border region sparked a process of interactive policy development and thereby the alignment of national demands and local needs within the EU framework of air quality norms.

Effective enforcement LEZ in Maastricht

Three different enforcement methods have been investigated in this research. By using a framework of the concepts *policy effectiveness*, *equal treatment* and *free movement* as assessment criteria these three enforcement methods have been analysed. From this analysis, it can be concluded that an ANPR camera system is the most effective, equal and least obstructionist enforcement method. However, this is only the case when it is possible to enforce not only Dutch registered vehicles, but also foreign registered vehicles. The Ministry of Infrastructure and Water Management has stated it is working on a bilateral agreement on the exchange of data of those vehicles, thereby making this enforcement option an effective enforcement method in the future. The big question therefore remains when this exchange of data of foreign registered vehicles is made a reality. Although the Ministry has made 2020 a target date, it is impossible to say if this is realistic or not.

Recommendation

The exchange of data of foreign registered vehicles is crucial for the effective enforcement of a low emission zone in the municipality of Maastricht. However, it is not certain when this exchange of data will be possible. If the city council decides to implement a LEZ before the exchange of data of foreign registered vehicles has been taken care of, the city could impose a transition period in which only warnings are given, before enforcing with fines when the exchange of data is possible, in that way preventing unequal treatment, or choose to enforce the LEZ with an ANPR camera system supplemented by checks by police officers in order to prevent unequal treatment between Dutch and non-Dutch vehicle owners using the low emission zone. It is important to note that, in both of these possible solutions, the uncertainty of the exchange of data remains. The municipality should therefore make the consideration if it is a wise decision to invest in an ANPR camera system without the certainty of effective enforcement.

By making sure that both Dutch and foreign vehicles can be checked in the low emission zone in Maastricht, the output-legitimacy of the low emission zone remains high. Whilst it could also be an option for the municipality to wait until the enforcement of foreign vehicles via an ANPR camera is possible, it can be questioned who will benefit from that delay. After all, the goal of implementing a low emission zone is to improve air quality in the city of Maastricht.

Finally it is important to note that the development of a new RVV will not only clarify the rules and enforcement systems of low emission zones across the Netherlands, it will also strengthen the legal basis for low emission zones. Low emission zones have been legally challenged (for example in Utrecht and Rotterdam; see *chapter 4: Netherlands legal context*) for the proportionality of the measure. Creating one set of rules at national level will most likely, just as in the low emission zone for lorries, limit the vulnerability to these court cases. A clear set of rules for low emission zones is thereby not only positive for the users of low emission zones, but for the instrument itself.

Broader lessons learnt

Central in this research is the discrepancy between national demands and local needs. The focus of this research has been on border regions, areas in which, such as in the case of Maastricht, local needs differ in comparison to other regions. The key for effective implementation of national demands lies in the alignment of these national demands and local needs. This is not only needed to achieve policy effectiveness, but also to achieve policies which are legitimate on an output level.

The cooperation between national and local governments is therefore crucial. National governments are forced to comply with the European Union Ambient Air Quality Directive. Local governments create policy

within the policy frameworks of both the EU and the national government. In the implementation of policies differences can therefore occur between countries. In border regions these differences are problematic. In these areas territorial cohesion is necessary to ensure the equal treatment and free movement of European citizens (Faludi, 2006, p. 668). National governments are needed to create alignment of local needs and national demands. At the same time, these national governments should create the conditions in which territorial cohesion can be created, in line with EU regulations and principles. Subsidiarity, as such, remains essential, however, the need for territorial cohesion forces local governments to appeal to their national governments. Territorial cohesion therefore asks for multi-level governance system and influences the way subsidiarity takes shape in border regions. The situation in border regions such as Maastricht therefore perfectly fits in the principle of 'decentralised where possible, centralised where needed' (Raad van State, 2006, p. 16)

In a bigger picture the cooperation between different levels is even more essential. The legitimacy of measures, such as a low emission zone, depend greatly on the effectiveness of such a measure. It can be expected that, with the increased need for sustainable policies to lower the emissions of carbon gasses and other polluting gasses and particles, the public support for a measure such as a low emission zone is essential. Without this support the change towards a more sustainable society in which emissions are limited is not possible. However, to achieve this support, the burden of this change needs to be distributed fairly and equally.

The case study of implementation of a low emission zone has shown that this is possible. However, it is needed that the Dutch national government pays more attention to the local needs of border regions.

To achieve both national and European goals on limiting air pollution it is necessary that the European Union, national governments and local governments work together. Air pollution is a problem that occurs locally, however that only can be solved effectively if effective measures are taken. This means that coordination between national demands and local needs is needed. The transition towards a cleaner and more sustainable society can only be taken if everyone does their part and if everyone participates. The case study of the municipality of Maastricht shows that this is possible, however it asks for a mutual adjustment of all parties involved.

Multi-level Governance and Policy Diffusion

Border regions, such as Maastricht, are faced with the problems that borders produce. The difference between countries and the issues that these differences bring with them affect the effectiveness of policies in border regions. Although air quality improvement measures are in essence local measures, the case study of the implementation of a LEZ in Maastricht shows that territorial coherent policies are necessary in order to effectively implement instruments such as a LEZ. The role of national governments and the EU are key in achieving this cohesion (Faludi, 2006, p. 668). It is therefore necessary that, to effectively achieve results on air quality improvement, and in a bigger picture, to successfully create more sustainable cities and environments, that this cohesion is found. In a multi-level governance system, this means that border regions themselves play an important part in identifying coherency problems, but that the EU and national governments play a role in creating policies and conditions that limit territorial misalignment and that bridge the differences between countries that create problems for border regions. Only that way effective implementation of national policy goals in border regions is possible.

In this analysis it is clear that a multi-level governance is developed as a response to complex problems. These problems ask for the cooperation between different actors, as can be seen in the implementation of a low emission zone in Maastricht, where European, national and local actors must cooperate to achieve effective policy results. In this case study the overlap between different levels and blurring of divisions between these levels as described by Guderjan (2012, p. 109), Wessels (1997, p. 275) and Hooghe and Marks

(2001b, p. 4) is clearly visible. It is therefore clear that the governance in the development of a low emission zone can be categorised as type 2 Governance (Hooghe and Marks, 2001a, pp. 4-9). Although this system matches the development towards *loose coupling*, it is interesting to see that the development of fusion arenas only takes place within the territorial space of one country. Different areas, from different levels, have become more interconnected, however there has been only limited horizontal cooperation between countries on a national level and between local governments on a local level.

It is therefore interesting that in this research, in contrast to the expectations of the multi-level governance theory of Hooghe and Marks (2001a), the role of the national government has not become smaller. Although, as Scharpf (2010, pp. 69-70) mentions, *mutual adjustment*, is an important element and response to the development of multi-level governance in the development of a low emission zone, the role of the national government remains crucial for the creation of territorial cohesion in border regions. The complexity of a EU-wide exchange of vehicle data, makes that a European Union solution most likely will not be found easily. It is therefore crucial that national governments bridge the gap between countries, and make sure that the exchange of vehicle data as a precondition for the effective implementation of a low emission zone in Maastricht, will become available.

It could therefore be stated that the multi-level governance theory of Hooghe and Marks (2001a) misses the importance of national governments in the bridging of differences between geographical neighbouring arenas seeking territorial cohesion. Although fusion between arenas in border regions takes place, territorial differences between countries remain. If the European Union does not find solutions for these specific border issues, national governments are needed to create territorial cohesion.

The case study in the municipality of Maastricht on the other hand does show the importance and effects of paradiplomacy and cooperative paradiplomacy in a fusion arena (Guderjan, 2012, p. 111; Tatham, 2010, p. 77). The blurred divisions between different levels has made it possible for the municipality of Maastricht to lobby for the exchange of vehicle data at both the national as European level. However, this paradiplomacy and cooperative paradiplomacy almost only took place on a vertical axis, with limited connections with other cities on a horizontal axis, on the other side of the national boundary, in line with the limited cooperation between different arenas as identified above.

Focussing on the development of the policy on low emission zones in the Netherlands, it could be argued that the municipality of Maastricht played the role of a policy entrepreneur (Mintrom and Norman, 2009, p. 650; Shipan and Volden, 2012, p. 788). The development of uniform policy on low emission zones created a window of opportunity for the municipality of Maastricht to pressure the Ministry of Infrastructure and Water Management. As described in chapter 5, this form of policy diffusion has played an important role in the development of the new RVV legislation that creates uniform rules for LEZs in the Netherlands and in the changing role of the Dutch government in the exchange of vehicle data.

If this vehicle data exchange is successfully implemented, the outcome of Maastricht's policy diffusion can be seen as policy innovation. By drawing lessons from the existing systems for the enforcement of LEZs in the Netherlands and highlighting the shortcomings of these systems via policy diffusion, the municipality of Maastricht then has created conditions for a more effective system.

This outcome would fit in the expectations of Riise, who describes that convergence of policies and cooperation between different levels is expected to be one of the outcomes of policy diffusion (2016, p. 5). The important role of cooperation between different levels in a multi-level governance structure is again highlighted in this outcome. However, as stated earlier, this cooperation is only visible on a vertical axis, not on a horizontal axis. The latter, named regional cooperation by Riise, does occur, however only on a European and national level, not on a local level as Riise describes.

Looking at the outcomes of this research, it would be interesting to see further research on the development of this relationship between national governments and municipalities, focussing on policy areas in which the dependency of both levels on each other is big. It can be expected that this relationship will become increasingly important in the future. The transition towards sustainable cities and thereby towards a more sustainable environment can only be achieved by the support of both local and national actors, possibly with the support of the EU. Looking at new, even more ambitious plans, such as that of Rotterdam to become carbon-neutral in 2050 (Köping, 2018), it is crucial that all actors work together. To achieve this, more research on how an effective relationship between these actors can develop needs to be done.

Notes and acknowledgments

In this paragraph the limitations of this research are highlighted. Firstly, it is important to highlight the limited generalisation of this research. Although the development of an optimal enforcement method (chapter 5) could be generalised amongst other areas, certainly border regions with a similar traffic composition as Maastricht, the analysis of this optimal enforcement method is very contextual. Although it has been tried to explain these contextual factors, it is not recommended to generalise these findings.

Furthermore, this research has been focussed mostly on the development of a low emission zone in the municipality of Maastricht. This development has been used as a case study for effective implementation of national policy goals in border regions. Although an effective enforcement options has been created, which can satisfy both national demands as local needs, it can still be questioned if a low emission zone is the right instrument to achieve to goals of a cleaner city for the municipality of Maastricht. It is therefore important that other enforcement options are always investigated. The research of Royal HaskoningDHV has done this for the city of Maastricht and concluded that a low emission zone was the most effective measure that could be taken. However, although this conclusion was made, it is still contested if low emission zones provide the desired effect. It is nearly impossible to measure the attribution of low emission zones to lowered air pollution, as the lowering of air pollution is dependent on many variables. It is therefore necessary that the effects of low emission zones are investigated to the best ways possible and that at the same time always other options are investigated as well. Although it is expected that low emission zones have a concrete positive effect on air quality, the introduction of a low emission zone alone will not drastically improve the air quality in a city. Other measures should therefore be taken, certainly if cities such as Maastricht want to comply with the World Health Organization air quality norms in the future.

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Appendix I

Interview questions

1. Could you give a short introduction about yourself and explain your function and your organisation?
 2. How is your organisation involved in the creation (policy creation, implementation or enforcement) of air quality improvement measures, specifically low emission zones?
 3. What do you think the role of your organisation is in the creation of low emission zones?
 1. Has this role developed over time?
 2. Do you see this role develop in the future?
 3. If, why is the role changing? What makes it change?
 4. Which policy level can best create the rules for a low emission zone? (EU, national, local)
 1. Why?
 2. What gives 'your' level the advantage over the other levels?
- Explain situation in Maastricht, explain different enforcement options -
5. Which option is best for Maastricht? Why?
 6. Do you think there should be other rules for border regions?
 7. Do you see the role of municipalities in a multi-level Europe change in the implementation and development of air quality improvement measures?
- Show figure 2.1 to respondent, explain trade-offs (effectiveness, free movement, equal treatment) -
8. Could you fill in these trade-offs. Which factor is most important to you in the development/enforcement of a low emission zone in Maastricht?
 9. Looking at figure 2.1, how would you transcribe the effects of the earlier mentioned enforcement methods into this figure?
- End-
10. Are there relevant aspects/issues not covered by these questions? Or do you have additional viewpoints you want to add to this interview?