Noise policy: sound policy?

A meta level analysis and evaluation of noise policy in the Netherlands

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Noise policy: sound policy?

A meta level analysis and evaluation of noise policy in the Netherlands

Geluidbeleid: gezond beleid?
Een meta analyse en evaluatie van het Nederlands geluidbeleid
(met een samenvatting in het Nederlands)

Proefschrift

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Promotor: Prof. dr. P.P.J. Driessen

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Wir kennen nicht Ziele…

Wir kennen nicht Ziele
und sind nur ein Gang.

Wir brauchen nicht Viele,
die längst schon verschlang

die Sucht zum Gemächte
dass Einer erst brächte

das Herz für die Stimme
der Stille im Seyn,

die Wildes vertrimme
im gründigen Schrein,

ist unser Mut.

(Heidegger)

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Voor Tobias, Channa en Esra

1 Introduction

1.1 Noise policy in the Netherlands

Sounds are part of our world: we need sound to communicate, express ourselves and tell our narratives. Humans produce sounds by using their voices and conduct certain activities of which sound is a by-product, such as driving cars or scooters or travelling by train. This has long been the case; however, compared to the city sounds of for example the 19th century we are seeing an enormous increase in sounds and sources. Furthermore, ever more people are living in highly urbanised areas where exposure to sounds is unavoidable; it is estimated that in 2050 approximately 70% of the world population will be living in cities[1]. Sounds are all around, in place and time; and although humans cherish their 'quiet' areas they are increasingly surrounded by unwanted sounds, i.e. 'noise' (see e.g. NRC, 2013).

Successive governments in the Netherlands, as in many other Western European countries and the European Union, developed an environmental policy in the second half of the 20th century, to try to control the possible negative – health and ecological - effects of these trends of mechanisation, industrialisation and urbanisation. Characteristic of environmental policy from that period, including noise policy, is the legislative, technocratic approach, comprised of regulations on polluting sources such as industries and traffic (Keijzers, 2000; Glasbergen, 2005). Nevertheless, there still appears to have been no breakthrough to fully counter the negative health effects of noise pollution, despite technological improvements regarding noise emissions being implemented. As the WHO recently illustrated, over 40% of the European population is regularly exposed to sound levels from traffic that are considered to have harmful effects (2011). The main source of annoyance, one of the main adverse health effects due to noise exposure, is road traffic, specifically in urbanised areas (European Commission, 1996). Other important noise sources are railway traffic, aircraft and industrial activities (ibid).

[1] Source WHO, consulted June 2013 at
http://www.who.int/gho/urban_health/situation_trends/urban_population_growth_text/en/

Surveys in the Netherlands illustrate that percentages of the population being annoyed by noise have hardly been reduced since noise policy was implemented in the 1980s (Van Kempen and Houthuijs, 2008; Van den Berg, 2012; Woudenberg and Van Kamp, 2013). In 2011 approximately 40% of the Dutch population were said to be (sometimes) annoyed by noise due to traffic noise (air, road and railway) and/or industrial noise (see Figure 1).

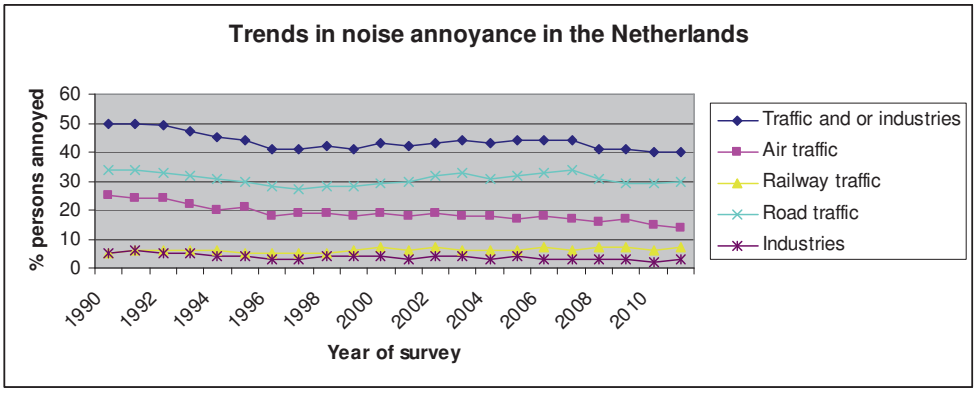

Figure 1: Trends in noise annoyance in the Netherlands 1990-2011 from CBS data (source http://www.compendiumvoordeleefomgeving.nl/indicatoren/nl0293-Geluidhinder-per-bron.html?i=13-45).

The gravity of the noise problem is expressed by Woudenberg (2013, p. 9) stating that "more than 70% of Dutch dwellings are exposed to noise from road, railway traffic or airplanes above 50 dB. And there are hardly places found where no sound from motorised traffic is audible". Similar conclusions are drawn by Jabben et al. (2013) based upon an analysis of national noise exposure data. Exposure to noise can increase stress and blood pressure; known as triggers for cardiovascular diseases. This results in a burden of disease from noise, ranging from tens to hundreds of people dying annually because of heart disease caused by noise, to millions of annoyed people due to road, neighbour, air traffic and other noise sources (Van Kempen and Houthuijs, 2008; Woudenberg, 2013). Similar figures were found for Europe; WHO (2011) estimated that at least one million healthy life years, in terms of disability-adjusted life years (DALYs) for cardiovascular disease, sleep disturbance and annoyance, are lost every year from road traffic noise alone.

Noise pollution, thus, is an old environmental problem, which still has not been resolved despite having Dutch and international noise policy in place for many decades. The environmental stressor even results in increasingly harmful health effects as noise exposure increases due to growing traffic and population numbers in cities (Miedema, 2007; Woudenberg, 2008). As the European Commission reported (2011, p. 2): "[…] environmental noise is an important environmental risk threatening public health, and noise exposure in Europe presents an increasing trend compared to other stressors". Miedema (ibid) as well as stakeholders (WHO, 2011; Hänninen and Knol, 2011; EEA/JRC, 2013) urge that more attention should be given to noise pollution.

The annual outlook on environmental quality in the Netherlands (Netherlands Environmental Assessment Agency, 2011, p. 17) underlines these alarming findings, stating that "a fundamental revision of the current policy regarding noise pollution from road traffic is needed, either through the use of other policy instrument mixes or adjustment of the defined noise policy goals".

The above figures on noise annoyance suggest that the noise policy domain so far has not been able to substantially reduce the negative health effects associated with noise pollution. Nevertheless, today's policy instruments have hardly been adjusted or revised since the implementation of noise policy in the 1980s, except for a few experiments on environmental policy integration and attempts to change noise legislation at the end of the 1990s (see e.g. Glasbergen, 2005). Recent practice and environmental policy literature suggest new approaches to environmental problem-solving, grouped under the umbrella of 'governance', in order to enhance the effectiveness of environmental policy. A key characteristic of the concept of governance is the recognition that the public sector is not the only steering actor and other actors, such as lower tiers of government but also the private sector, should be involved in solving environmental (and other societal) problems. Consequently more 'horizontal' policy instruments, such as mutual agreements or emission trading schemes, are being implemented in addition to or replacing regulative instruments typical of government approaches. Another relevant characteristic of governance is the integration of environmental policy (EPI) into other domains, such as spatial planning. However, Driessen et al. (2012, p. 154) concluded, "in [Dutch] urban environmental policy, including noise policy, governance was and still is predominantly in line with what [is] called 'centralised governance'".

Thus, at first glance few dynamics and reforms have taken place in the noise policy domain in the Netherlands, while the noise problem seems not to have been solved nor substantially reduced. Consequent questions arise as to whether the observations of limited dynamics and limited effectiveness are correct, and if so, how to explain these. Environmental governance literature addresses similar topics, for example in analysing and explaining policy processes and governance modes and evaluating policy performance. The analysis of an apparently static policy domain is interesting from a scientific point of view, as the study could provide insight into barriers to policy change and shifts towards governance approaches.

The aim of this thesis therefore is to analyse and evaluate the noise policy domain in the Netherlands. I will do so by analysing (i) modes of governance (actors, instruments and discourses); (ii) advocacy coalitions and their belief systems; (iii) integration into other policy domains; and (iv) policy instruments, goals and effectiveness. In section 1.4.2 these identified elements are presented in more detail and their relevance for analysing policy dynamics is justified. As such this study's theoretical and methodological questions add to today's approaches in – studying and explaining – policy dynamics and performance; noise policy in the Netherlands in my opinion serves a perfect empirical case.

The next section provides a general introduction into noise, health effects and noise policy in the Netherlands. For the interested reader detailed information on health effects and assessment of health effects and outcomes of the Netherlands, as well as the physics of noise are provided in respectively Appendix 2 and Appendix 3. The remainder of this chapter introduces policy analysis theories, the policy analytical frameworks and the research design employed in this thesis, including methodological challenges in designing the research framework.

1.2 Noise: health effects, causes and sources

1.2.1 Noise health effects and causes

Environmental noise is associated with a wide range of health effects, such as annoyance, sleep disturbance, elevated hormone levels, physiological stress reactions, cardiovascular disorders, mental health problems and even premature deaths (Babisch, 2002). These adverse health effects particularly occur in those situations in which activities such as concentration, communication and sleep are disturbed.

When does sound become noise? A frequently quoted definition of noise is as follows (European Commission, 1996, p. 2) "noise is unwanted sound" or "sound that is loud, unpleasant or unexpected" (e.g. Staatsen et al., 2004; Vlek, 2005; Babisch et al., 2009). This subjectivity of 'unwantedness' makes noise a complex environmental pollutant. What one person perceives as (wanted) sound might be annoying (unwanted) to another person. Factors influencing the reaction to sounds are acoustic physical factors (such as loudness and frequency) as well as other, often referred to as non-acoustic, factors. Acoustic physical factors, such as whether a dwelling has sound insulation and/or a quiet façade, explain only 25-30 % of the variance in noise annoyance at an individual level (Guski, 1999; Job, 1999; Stallen, 1999; Stansfeld and Matheson, 2003). Non-acoustic factors comprise demographic, personal, social and situational factors (Woudenberg and Van Kamp, 2013).

Annoyance is the most widely acknowledged effect of exposure to noise, and is considered to be the most widespread (Guarinoni et al., 2012). Annoyance is sound source dependent and thus, on the basis of a large number of studies, separate exposure-response relations have been derived for road and railway traffic and for aircraft noise (Miedema and Oudshoorn, 2001).

Noise from trains is usually perceived as less annoying than noise of equal sound level from road traffic (Miedema and Oudshoorn, 2001). Though the causes of the differences in annoyance are not known, Miedema suggests that, for example, the quiet periods between the passages of trains may contribute to the lower annoyance from railways compared to road traffic, which at the same average noise level has no quiet periods between passages or only shorter ones.

The 'mitigating' effects of periods of quiet do not seem to apply to aircraft noise annoyance. Research namely showed that sounds caused by aircraft, as well as wind turbines, train depots and shunting yards, are more annoying than road traffic noise. Regarding annoyance caused by aircraft noise, non-acoustical factors, such as fear associated with over-flying airplanes, the more frequent occurrence of exposure at all sides of the dwelling, and limited options to find quieter areas in the neighbourhood, might explain the higher annoyance levels (Janssen et al., 2011). Recently, evidence has become available that annoyance caused by aircraft noise has increased over the years (Guski 2004; Babisch and Van Kamp, 2009; Janssen et al., 2011), although national annoyance surveys suggest stability (see Appendix 2 for reflections and discussions on the assessment of health effects).

The mechanisms are not yet fully understood, but scholars suggest that changes in noise emitted by individual aircraft in combination with an increase in the number of over-flights and changes in the noise situation due to expansion of the airport might explain the different exposure-response relationships (Brown and Van Kamp, 2009; Guarinoni et al., 2010).

Industrial noise is the least annoying environmental noise, which is also illustrated in the figures on annoyance from surveys (see e.g. Figure 1 and EEA, 2010).

Figure 2 illustrates the *direct* and *indirect* pathways of cause (i.e. noise exposure; indicated by lines), health effects (e.g. cardiovascular diseases; presented in rectangles) and physiological outcomes (such as stress; presented in ovals). Noise causes annoyance, especially if a person feels disturbed in his/her activities or communication (Clark and Stansfeld, 2007). This annoyance may lead to stress, which can trigger the production of certain hormones eventually leading to a variety of intermediate effects, such as increased blood pressure (EEA, 2010; WHO, 2011). These indirect effects occur at relatively low noise levels during longer exposure periods; whereas acute noise exposure directly and instantaneously causes a number of short-term physiological responses such as increased heart rate, blood pressure and endocrine hormones (Babisch, 2008).

The WHO Night noise guidelines (2009) discuss in detail the relations between noise, sleep quality and health. Sleep is considered an important biological function, and as a consequence impaired sleep is considered a health effect related to a number of diseases (EEA, 2010). Some exposure-response relationships have been established, of which the most frequently applied considers self-reported sleep disturbance caused by road traffic, railway and aircraft noise.

Finally, meta-analyses of pooled data provided sufficient evidence for establishing exposure-response relationships for hypertension caused by aircraft noise (and limited evidence regarding road traffic noise) and ischaemic heart diseases caused by road traffic noise. Scientific evidence regarding these health effects has increased in recent years; currently sufficient evidence regarding thresholds for various health effects such as annoyance, perceived sleep quality and cardiovascular diseases are available. Table 1 illustrates today's thresholds that are generally agreed upon by scientists (see Appendix 2 for more details on health).

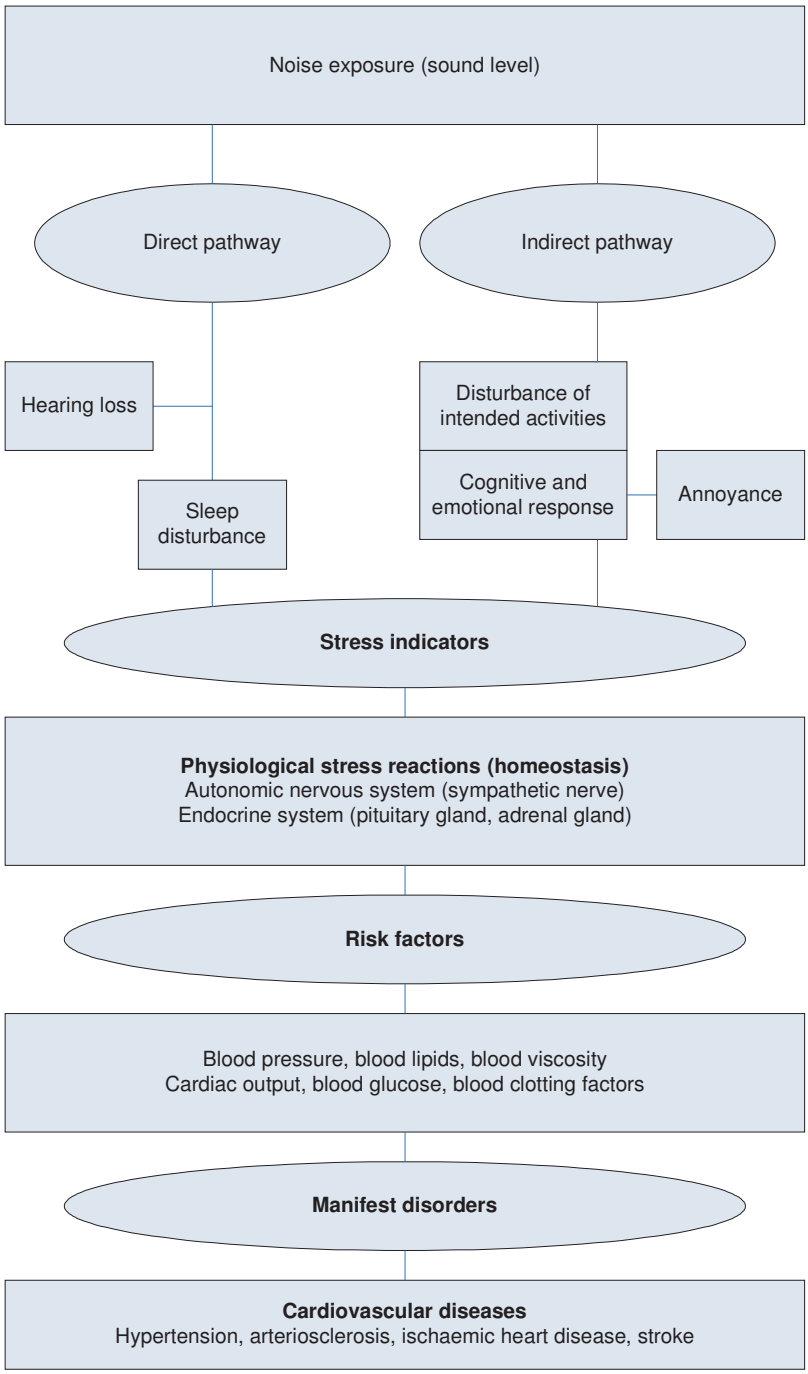

Figure 2: Simplified noise effects reaction scheme (Babisch, 2002; updated version 2013)

Although in some cases evidence is still anecdotal, scholars have recently pointed at possible societal effects of noise pollution that are negatively influencing inter-personal behaviour (see e.g. Devilee and Van Kamp, 2013). Appleyard and Lintell (1972) and later Hart (2008) showed that friendships, social interaction and contacts occur less in busy traffic roads than in quieter areas. Unwanted sounds influence social interactions, such as politeness, assistance and aggressiveness. The effect of sound levels on these relations between people might be influenced by the possibilities of controlling noise.

Effect	**Threshold**			**Time domain**
	***Dose*[2]**	***Threshold value in dB***	***Inside/ outside*[3]**	
Annoyance	L_{den}	42	Outside	Chronic
Perceived health	L_{den}	50	Outside	Chronic
Sleep disturbance				Chronic
- (start of) movement	L_{max}	32	Inside	
- sleep structure	L_{max}	35	Inside	
- EEG awakenings	L_{max}	35	Inside	
- use of sleep medication	L_{night}	40	Outside	
- arousal	L_{max} and SEL	32 resp. 53	Inside	
- motility	L_{night}	42	Outside	
- subjective sleep quality	L_{night}	42	Outside	
- sleeplessness	L_{night}	42	Outside	
- mood	$L_{Aeq,06\text{-}22h}$	>60	Inside	
Hearing loss	L_{dn}	>75	Outside	Chronic
Heart- and vascular diseases				Chronic
- increased blood pressure	L_{den}	50	Outside	
- ischaemic heart diseases	L_{den}	>55 or 60[4]	Outside	
- myocard infarct	$L_{Aeq06\text{-}22h}$	>55	Outside	
Cognitive effects, learning and memory	L_{Aeq}	50	Outside	Acute, chronic

Table 1: Overview of health effects and noise thresholds (based upon EEA, 2010; Woudenberg, 2013)

[2] For an introduction on noise doses and indicators see Appendix 3.

[3] Inside and outside concern levels within dwellings resp. at the façade of the dwelling.

[4] The higher threshold for ischaemic heart disease is reported in EEA, whereas the lower threshold refers to recent scientific insights as reported in Woudenberg.

1.2.2 Noise limits and health effect thresholds

Although various thresholds are known, these values are not directly transposed into legislative limits or standards. As Babisch (2002, p. 1) referring to other scholars (e.g. Brown, 1985; Cleland-Hammet, 1993; Moghissi, 1993) argued "decision makers have to make their decisions on rational grounds of limited resources, concurring risks and quality targets. They strongly rely on cost-effectiveness and cost-benefit considerations". As a result limit values reflect many other (political, societal) dossiers and considerations as well; transposing thresholds one to one into regulative limit values would heavily impede spatial planning, mobility and economy.

In the Netherlands the above approach is illustrated in the definition of two types of noise limits, that is a (lower) 'preferred' limit and a (higher) 'maximum allowed' limit. The former limit is health-related whereas the latter limit reflects prioritisation and cost-effectiveness assessment in a densely populated country. For several noise sources (such as road traffic or industrial activities) and different locations (such as within cities or in rural areas) a complex set of numerous noise limits has been defined in the Noise Abatement Act.

Various studies today recommend 50 – 55 $L_{Aeq,\ 16hrs}$ as health based threshold (Miedema, 2007; Babisch, 2008; WHO, 2000 and 2011; EEA, 2010). Furthermore, the WHO (2009) proposes, based upon meta-analyses, to set a target value for sleep disturbance of 40 L_{night} (outside dwellings) and an interim target of 55 L_{night}, in case the target value cannot be achieved in the short term, in order to protect the public, including vulnerable groups such as children, the chronically ill and the elderly. The EEA (2010, p. 22), however, concludes that "although more than half of the L_{den} limit values [in European countries] is close to these health-based guidelines, some are considerably higher". In the Netherlands, for example, the maximum allowed limit for a new dwelling near an existing local road is 68 L_{den} according to the Noise Abatement Act.

The consequences are illustrated in the WHO estimates that one in three individuals in Europe is annoyed during the daytime and one in five has disturbed sleep at night due to traffic noise. In addition WHO (2011) states that at least one million healthy life years (DALYs) are lost every year from traffic related noise in Western European countries, including 903,000 life years for sleep disturbance and 654,000 for annoyance.

DALY is the acronym for Disability Adjusted Life Year, which is a measure of the overall disease burden, expressed as the number of years lost due to ill-health, disability or early death. In the Netherlands, estimates are 120,000 DALYs lost due to a wide range of health effects caused by traffic noise, which includes 66,880 life years due to high blood pressure and 28,490 life years due to severe sleep disturbance and 16,260 life years due to severe annoyance (Woudenberg, 2013). The impact of noise pollution, in terms of various health effects due to environmental noise exposure in the Netherlands, as part of a detailed analysis and discussion of health effects and impacts is presented and illustrated with figures and tables in Appendix 2.

1.2.3 Noise caused by various sources

Noise is usually classified according to the sources that produce the sounds; the main categories are environmental noise, occupational noise and neighbour noise. The former, which is the topic of this research (see section 1.4.1 on research scope), is related to different human activities; the main environmental noise sources are road traffic, rail traffic, air traffic, and industry (European Commission, 1996). Today the definition provided by the EU Directive 2002/49/EC is commonly used, stating in Article 3 (a) (2002, p. 2) "environmental noise is an unwanted or harmful outdoor sound created by human activities, including noise emitted by means of transport, road traffic, rail traffic, air traffic, and from sites of industrial activity, to which humans are exposed in particular in built-up areas, in public parks or other quiet areas in an agglomeration, in quiet areas in open country, near schools, hospitals, and other noise sensitive buildings and areas".

Road traffic noise emissions are caused by the engine and the exhaust of the vehicle, the contact between tyres and road surface, the speed and number of vehicles. Freight road transport has higher noise emissions and people often perceive trucks and heavy goods vehicles to be louder – and more annoying – than passenger cars. In general, the level of noise emissions is dependent on the maintenance of the vehicle and the road surfaces, but also on the way the noise source is used, such as the way of driving (Ganzleben et al., 2010).

Rail traffic noise is caused by the engine, traction and auxiliaries, at low speed, and by the interaction of track and wheels, at higher speeds. Other factors influencing noise emissions are the construction and braking system of the wheels, its characteristics, the construction of the rolling stock and the condition of the track (ibid).

The noise emissions of industrial activities are related to the installed power at the installation and for example the periods of use of this installed power.

Aircraft noise is mainly caused by aircraft engines during take-off and landing, thus the operation of aircraft at relatively low altitude (ibid).

Finally, humans perceive noise as an accumulation of different sources (Miedema, 2004). Although noise exposure and health effects are addressed for the 'single' noise sources, cumulated sound is a relevant factor in the overall evaluation of acoustic quality in dwellings and built-up areas. In the Netherlands, cumulated noise is addressed in the regulation for physical planning, as we will further elaborate in the following section.

1.3 A brief overview of Dutch noise policy: goals, actors and instruments

In this section a brief overview of the Dutch noise policy domain is provided, by introducing the main policy goals (section 1.3.1), the actors acting in the policy domain (section 1.3.2) and the policy instruments applied (section 1.3.3).

1.3.1 Noise policy goals

The noise policy goals in the Netherlands, as well as the consequent policy instrument choices, are exemplary for many western European environmental policy domains that matured since the late 1970s. Three pillars were defined by the central government, which today still form the basis for Dutch noise policy; that is (i) prevention of noise pollution; (ii) solution of existing problems of noise pollution; and (iii) reduction of noise emissions from traffic and other sources.

Prevention of (new situations of) noise pollution and detrimental health effects was implemented through the instrument of spatial zoning in the Noise Abatement Act; separating noise sources from noise sensitive areas and dwellings was expected to at least stabilise the noise problem of the 1970s and 1980s. The latter is illustrated in the policy goal phrased during the late 1970s; the first National Environmental Policy Plan (1989, p. 150) stating "to stabilise the percentage of noise annoyed population at the level of 1985, i.e. 40 %". However, the following decades proved that the noise problem is far more complex and resistant, which is reflected in subsequent adjustments of noise policy goals and targets.

Whereas in the 1980s the national government defined a policy goal of "no *highly* annoyed population in 2010" (NEPP, 1989, p. 98), this goal of no highly annoyed has been replaced by a significantly less ambitious – but perhaps more realistic – target of "no dwellings with noise exposure levels above 65 dB along highways and above 70 dB along railways in 2020" (Van Geel, 2006, p. 88). This goal is linked to the second pillar concerning existing situations of noise pollution, whereas another goal was defined for a noise emission reduction of 2 dB from vehicles (the third pillar of Dutch noise policy).

As discussed above, various influences and changes in political, societal and economic contexts resulted in major increases in mobility and population; noise policy as defined in the 1980s had to respond. Nevertheless, the policy style remained mainly hierarchic top-down regulative steering (Glasbergen, 2005); with the national government defining the limits to which regional and local authorities had to adhere in physical planning (see section 1.3.3 as well). Furthermore, technical solutions, i.e. the introduction of quieter equipment in industries, and quieter vehicles, trains and aircraft, were regarded as the main contributors to solving noise pollution. However, the implementation of less noisy techniques is strongly dependent upon European and international regulation of noise emissions from aircraft, vehicles and trains.

1.3.2 Noise policy: governors, governed and other actors

In general, six categories of actors can be identified in noise policy; (i) the government as decision-maker (legislator and policymaker); (ii) governmental bodies as physical planner; (iii) the private sector as producer and user of sound sources; (iv) individuals as causers and as victims of noise; (v) NGOs representing groups and individuals; and (vi) scientific institutes as the producer of knowledge on noise (effects) and knowledge on (effective) noise policy.

Government as decision-maker

The first actor, the government as decision-maker, is primarily represented by the national government as the main actor or decision-maker in the noise policy domain. In the Netherlands, the Ministry of Environment has defined noise policy goals regarding road traffic, railway traffic and industrial noise since the 1980s and set regulative noise limits in the Noise Abatement Act that entered into force from 1979. Aviation noise, on the other hand, has since its infancy been in the competence of the Ministry of Traffic.

However, since 2010 both ministries have been merged into the new Ministry of Infrastructure and the Environment and from that time the responsibility regarding aviation noise, as part of environmental policy in general, resides with the Deputy Minister. The national government depends heavily on other authorities, that is, the provinces which own the main roads and the municipalities which are responsible for spatial planning and municipal roads. This is exemplary for the combination of centralised and decentralised governance modes; the national government is the main problem owner of noise pollution and partially involves decentralised governmental bodies in the implementation of noise policy. The multi-level character of noise governance also becomes evident in the role and responsibilities of European and international governmental bodies. The type approval of, for example, vehicles and tyres, including noise emission limits, are set by UNECE, the United Nations Economic Commission for Europe. These comprehensive regulations are defined by the European Commission's DG Enterprise whose primary goal is free flow of people and goods, and its ambitions regarding noise appear rather low (Kropp et al., 2007).

Governmental bodies as physical planners

The second category of actors is comprised of 'governmental bodies as physical planner', which mainly concerns regional and local authorities. There is a dilemma here of conflicting interests and priorities, as decentralised authorities also hold responsibilities for many other policy domains, and multi-sector governance through integration of noise into spatial or traffic policy domains seems to be weak. The following examples are an illustration: municipalities have to provide affordable (social) housing and provinces have to accommodate industrial activities and regional traffic flows. The national government also has to facilitate and stimulate economic growth. This is for example reflected in the 'mainports Schiphol and Rotterdam' discourses; environmental requirements have been relaxed in order to facilitate the economic expansion of Amsterdam airport and Rotterdam port as 'main ports' in the Dutch job creation and economy (De Roo, 2003). Furthermore, the national road authority has to meet policy targets on safe infrastructure and travel time reduction; an instrument in achieving the latter goal is relaxing speed limits at highways resulting in higher noise exposure levels. The railway authorities are responsible for providing reliable and efficient modes of sustainable transportation. It is not surprising that physical planning for housing, economy and infrastructure often conflicts with environmental and public health ambitions and their advocates.

Private sector

The private sector, the third category, is represented by producers of noise-generating sources such as vehicles, tyres and aircraft, and factories which cause noise due to their production activities, and smaller enterprises. Furthermore, the transport sector contributes significantly to noise pollution due to its use of (heavy or light) good vehicles, trains, or other modes to transport products. These polluters are governed through European and international regulative limits as mentioned before. Due to the active participation of the industry organisations in lobbying the European Council and Parliament against more ambitious noise limits, current emission limits for vehicles and tyres are not very stringent, compared to the continuous improvements achieved regarding the air pollution caused by traffic (Den Boer and Schroten, 2007; Nijland, 2008).

Individuals as victims and polluters

Individuals are a specific category of actors, being both victims and polluters. The aim of noise policy is to protect individuals against detrimental health effects due to noise exposure caused by, for example, road traffic and aircraft. However, characteristic of noise pollution as well as some other environmental stressors, these individuals are also themselves polluters or causers of noise impacts. Consequently individuals are governed by various noise policy instruments; (inter)national, regional and local governments decide on and implement instruments in order to change behaviour and influence the choice options of the individuals (see Appendix 4 for a detailed overview).

NGOs representing groups and individuals

Although their involvement and impact has varied during the last decades, few NGOs such as the Noise Abatement Society (in Dutch NSG) and 'Stop din from the high speed line', are active regarding noise policy at national or local level. Furthermore, specifically concerning Schiphol Airport many citizen action groups exist, many of them assembled in the Association of Joint Platforms Noise Annoyance Schiphol (in Dutch Vereniging Gezamenlijke Platforms Vlieghinder Schiphol). Their actions can be best characterised as NIMBY-like initiatives in situations where new infrastructure, such as high speed trains or airport runways, is planned or legislation is discussed in parliament. The main concern of these locally or nationally operating NGOs is to influence noise policy in a more sustainable direction.

Scientific institutes

Finally, the sixth category of actors is formed by the scientific community, as the producer of knowledge on noise and health effects, and on noise policy, such as national surveys of health effects due to noise and evaluations of noise policy (e.g. Van Kempen and Houthuijs, 2008; Van Beek and Dassen, 2009).

Another sub-group also needs to be mentioned, being the acoustic experts working in research institutes, universities and consultancies. These actors are mainly involved in the implementation of noise policy, by defining and refining methods for determining emissions from environmental noise sources and the noise exposure at dwellings. As such their impact on the technocratic discourse, characteristic of Dutch noise policy as we will illustrate in this thesis, is rather important.

1.3.3 Noise policy instruments (mixes)

In general, there are various possible approaches to avert noise pollution through changing the behaviour of actors, such as regulative systems, technical solutions or information (Vlek and Steg, 2007). Changes in the behaviour of individuals or groups of actors can be achieved by addressing knowledge, beliefs, and preferences through information sharing and learning. However, this approach often has a limited effect, and coercive and/or economic policy instruments are employed that change the choice options of these individuals or groups (Glasbergen, 1992). Examples of such noise policy instruments are: regulative noise limits to be applied in physical planning, speed limits on roads, or technical requirements regarding noise emissions from vehicle tyres.

The aforementioned pillars of Dutch noise policy (that is prevention of noise pollution, solution of existing problems and reduction of noise emissions) are addressed by various policy instruments. In practice these policy instruments are categorised based upon the main 'routes' of noise; that is emitted by the noise source, propagated over a distance, to a receiver of noise. The policy instruments and approaches applied in practice consist of (i) reduction of noise emissions at their source, for example setting limits on noise emissions from cars and tyres, and implementing quieter road surfaces or traffic management; (ii) reduction of noise transmission, for example through increasing the distance between the noise source and noise recipient, or erecting noise barriers; and (iii) reduction of noise exposure of the population through insulation of dwellings.

It should be noted that the generally applied categorisation of noise policy instruments is not one-to-one linked to the Dutch noise policy pillars. For example, the first pillar, that is prevention of noise pollution, is achieved by setting stringent noise emission limits at noise sources and noise immission limits at façades of dwellings. The second pillar, that is solving existing noise pollution, is achieved through emission and/or propagation and/or insulation measures, depending upon the specific situation. Finally, the third pillar of reduction of noise emissions from traffic and other sources, evidently, solely relies on the first category of noise source policy instruments.

1. 4 Analysing and evaluating noise policy in the Netherlands

1.4.1 Aim, scope and research questions

As I have illustrated in this chapter, noise policy in the Netherlands is a typical complex environmental policy domain, though with seemingly few dynamics since its formulation and implementation 40 years ago. The questions arise whether this observation of limited dynamics is correct and if so, how it can be explained. And, consequently, whether this lack of dynamics is problematic in terms of the performance of Dutch noise policy - is it 'sound' in terms of reducing the noise problem?

The aim of this research, therefore, is to analyse and evaluate noise policy in the Netherlands, by using different lenses on (i) modes of governance (actors, instruments and discourses); (ii) (absence of) dynamics in regulative noise limits (advocacy coalitions and belief systems); (iii) integration of noise objectives into other policy domains; and (iv) policy instruments, goals and effectiveness.

I will be do so at a *meta level*, i.e. focusing on what and how governments do and how that has changed over time. This means applying an approach that considers the aforementioned factors, that are generally accepted and studied factors in academic policy analysis literature. As Sabatier and Jenkins-Smith (1993, pp. 16-17) stated, policy subsystems, such as the Dutch noise policy domain, consist of actors from a variety of public and private organisations, and from several levels of government within a country and from international organisations. The policy subsystem, in their opinion, is the most useful unit of analysis, which in this research mainly involves the national and decentralised governments.

Policy discourses or belief systems involve the perceptions and assumptions concerning the magnitude and facets of the policy problem, its causes and possible solutions, for example the employment of specific policy instruments. Noise policies and programmes thus incorporate these actors' values implicitly; dynamics in policy subsystems, according to Jenkins-Smith et al. (1991), is often reflected in changes in the expressed beliefs of actors over time[5]. Furthermore, the approach needs to cover longer time frames in order to identify changes; as Sabatier reaffirmed "understanding the process of policy change – and the role of technical information therein – requires a time perspective of a decade or more. Such a time-span is also necessary to get a reasonable assessment of policy impacts" (1998, p. 99). The period covered in this research concerns 40 years, starting in the late 1970s until today, in which noise policy has been formulated and implemented and in which environmental policy generally was institutionalised, but discussed and revised as well. In my opinion, taking this relatively long period is pivotal in identifying shifts in discourses, actors and the impacts thereof on the policy domain as well as the outcomes achieved.

Finally, although noise pollution and adverse health effects are known to be caused by noise-generating products in home situations, neighbours and, for example, music events and in-ear headphones, this research will focus on environmental noise, mainly caused by traffic. Policy addressing environmental noise has been in force for many decades at international, national and local level, because specifically traffic is an environmental stressor of great importance. The population figures for negative health effects due to environmental noise are substantially higher compared to other noise-generating sources; consequently governments since the 1970s have felt responsible for addressing this environmental health stressor. This policy domain therefore provides an interesting empirical case. However, the public sector did not take responsibility for annoyance due to neighbour noise. Although ranking second after road traffic noise in surveys, citizens are supposed to solve problems by themselves or in unbearable situations with help from the police. As policy is absent, the empirical case of neighbourhood noise thus can not be studied from an environmental policy analysis perspective.

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[5] In this thesis discourse, belief (systems), narratives and problem frames are all interpreted as perceptions and expressions of 'the noise problem', in line with the policy analysis theories and frameworks employed.

Another remark concerns the European government level; this research focuses on the noise policy domain in the Netherlands and restricts the analysis regarding the role of the European level to reflections on the respective European public and private actors specifically regarding Dutch noise policy and practice. The argument for not incorporating this perspective is the limited impact and effect European noise legislation during the last 40 years had on the Dutch noise policy domain at central as well as decentral governmental level. Nevertheless, whenever relevant for understanding or illustrating my reflections, conclusions and recommendations European noise policy and regulations are considered.

In the light of the above aims and delineation, this thesis aims to answer the following main research questions:

1. Which stability or dynamics are evident in the noise policy domain in the Netherlands in terms of modes of governance and what explains this stability or dynamics?
2. Which (f)actors explain stability and/or change in the noise policy subsystems for (road and railway) traffic, aircraft and industrial noise and the differences in dynamics within the noise policy subsystems?
3. To what extent has integration of noise policy into spatial planning, as a specific governance approach, resulted in increased effectiveness in terms of prioritisation of health objectives?
4. Which policy outcomes have been achieved with the policy instrument mixes in place and how can these outcomes be explained?

Answering these research questions requires a stepwise approach and analysis of different factors and contexts, and thus perspectives. The analysis distinguishes between the noise policy domain in general (addressed in research questions 1 and 3) and the detailed level of noise policy subsystems of (road and railway) traffic, aircraft and industrial noise (addressed in research questions 2 and 4). The theoretical and analytical challenges posed by this research approach are discussed in the following section.

1.4.2 Developing an analysis framework from policy analysis literature

Reviewing academic policy analysis literature revealed that a variety of approaches and perspectives is employed in various theoretical and empirical studies. This is explained by the fact that policy analysis is a challenging task, as a complex set of (inter)related elements influencing public policymaking and implementation needs to be considered. As a consequence most of the existing policy (analysis) literature, whilst perfectly logical, reduces complexity through methodological simplifications. A disadvantage then could be that explanatory factors and linkages between some factors might be overlooked or disregarded. Furthermore, none of the existing policy analysis theories is all-inclusive. Some theories address similar factors and their methodological approaches partially overlap; nevertheless researchers inevitably have to disregard many factors.

The weaknesses of a 'single policy analysis theory approach' can be overcome by employing multiple perspectives, in line with Sabatier, in response to earlier comments by Platt 1964, Stinchcombe 1968 and Loehle 1987 stating that "scientists should be aware of, and capable of applying, several different theoretical perspectives – not just a single one" (Sabatier, 2007, pp. 6 and 330). Later Klein and Marmor (2006, pp. 907-908) commented as follows, "trying to understand and explain public policy as a whole – making sense of what governments do rather than analysing specific election results or policy outputs – has to be in our view, an exercise in synthesis".

Furthermore, a methodological advantage of using multiple lenses or frameworks is that it requires a reflection on assumptions and presumptions regarding the issues studied and consequently guards against confirmation bias (Weible et al., 2011). Interestingly, however, limited research is available which applies multiple frameworks in environmental policy analysis. An underlying objective of this research, therefore, is to provide a renewed outline and analytical approach for meta analysis of (environmental) policy domains.

The remainder of this section discusses theoretical and empirical issues indispensable for developing a multi-perspective analysis framework for noise policy in the Netherlands.

First, public policy involves many *actors* from governmental administrations, private sectors, non-governmental organisations, science or politics. These actors are key to the formulation and implementation of policy; without actors no actions would be taken. As a key factor in various theoretical perspectives, 'actors' are study objects, for example as participators in complex constellations or networks, narrators of storylines or power players in coalitions. Institutional factors such as rules of cooperation and information, model of representation and path dependency are directly linked with these actor dimensions.

Secondly, *discourses* as well as *beliefs* regarding policy preferences and policy instrumentation aggravates complexity; a non-disputed, straightforward relation of causes and effects is often absent. As is illustrated by agenda-setting literature, some issues gain attention from various stakeholders whereas other issues struggle to attain a position in narrow groups (Kingdon, 1995). For example, climate change is one of the main environmental issues gaining broad political and societal attention; narratives have been expressed and disputed for many years. Noise pollution, on the other hand, has gained limited attention by society, the media, politicians and other stakeholders. Although noise policy has been disputed by various stakeholders around airports, this is hardly the case for road traffic or industrial noise.

Thirdly, reflecting on policy analysis theory, a frequently uttered critique should be mentioned, that "political scientists who study public policy tend to emphasize the processes by which policies are made and implemented rather than the substantive content and impacts of policies themselves" (Weimer, 1998, p. 182 in James and Jorgensen, 2009). As an answer, scholars suggest opening the black box of the policy itself by reconstructing the policy theory (Hoogerwerf, 1990; James and Jorgensen, 2009; Schneider and Sidney, 2009). This theory can contribute to policy process theories in examining the details of the policy content, in terms of *causes and effects*, *policy instruments*, and *policy goals*. As such '*what* has changed' is added to 'what *caused* change' as for example is analysed in Advocacy Coalition Theory (ACF, Sabatier and Jenkins-Smith, 1993) and Punctuated Equilibrium Theory (PET, Baumgartner and Jones, 1993); both latter approaches lacking a framework to describe the policy content itself.

Policy design theory embracing the social construction of target populations might also be useful in understanding *when* changes are more or less likely to occur; one of the criticisms on policy process theories as well (Schneider, 2006; Schneider and Sidney, 2009).

Dynamics or stability in the policy domain have specifically been debated in environmental policy and sustainability literature concerning *governance modes* and 'shifts from government to governance' and hybrid forms (e.g. Hysing, 2009; Van Leeuwen and Van Tatenhove, 2010; Driessen et al., 2012). Key factors for exploring shifts in governance modes are actors, institutions and policy content, or as Lange et al. (2013) proposed, the dimensions of politics (dynamic relations among political processes), polity (institutional structures) and policy (policy content). These dimensions basically resemble the above-mentioned features for an analytical framework.

Finally, characteristic of governance modes, in addition to the aforementioned factors, is the *integration* into other policy domains. This research will assess a few Dutch experiments on noise policy integration into spatial planning, with a specific focus on centralised in combination with decentralised governance modes. As mentioned before, the presumed limited dynamics within the noise policy domain in the Netherlands concern attempts to integrate environmental policy through, for example, the City and Environment (Experiment) Law.

1.4.3 A multiple perspective analytical framework for noise policy in the Netherlands

Taking the above observations into account various analytical choices were made in the study of noise policy in the Netherlands, regarding the elements to be considered as well as the (causal) mechanisms linking these elements. Similar to the discussed theories and frameworks, the following main elements have been identified as relevant for the policy domain specific analytical framework, which are (i) governance modes; (ii) advocacy coalitions in the noise policy subsystem(s); (iii) the integration into other policy domains; and (iv) the noise policy instrument mix(es), noise policy goals and effectiveness (illustrated in Figure 3).

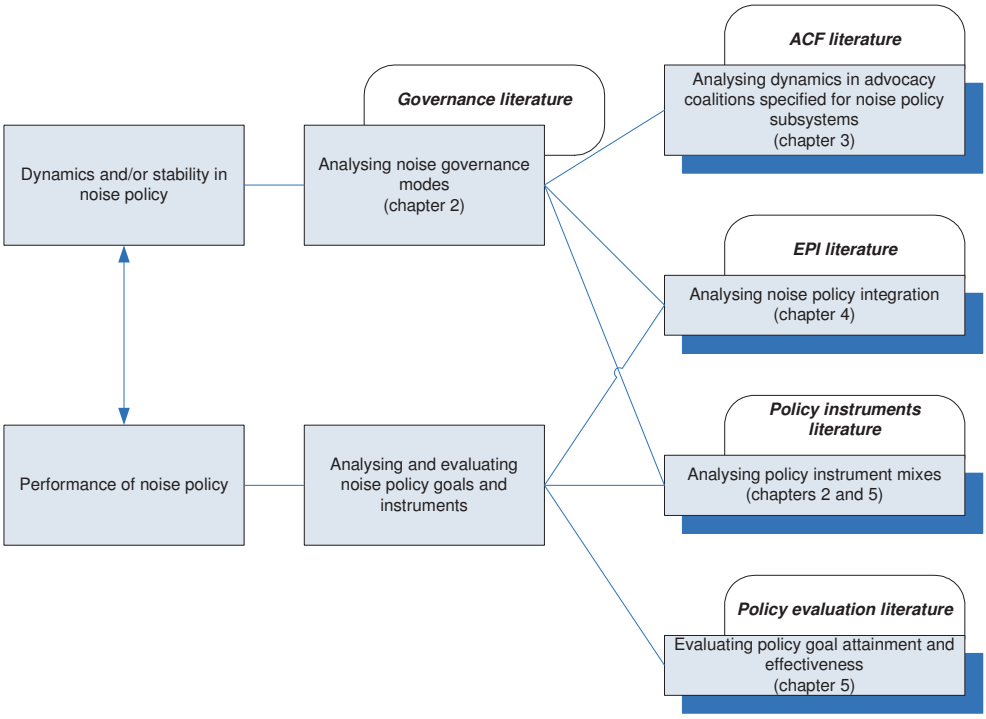

Figure 3: Framework for analysing noise policy in the Netherlands

The analytical framework visualises the research strategy and policy analysis theories employed in order to meet the research objectives (represented by rectangles in Figure 3). The structure of this thesis resembles the framework, in that the following chapters each assess one or more identified elements (represented by shadowed boxes in Figure 3). Furthermore, each chapter discusses relevant policy analysis theories and frameworks and proposes an (renewed) approach employed in the respective empirical analysis (represented by ovals in Figure 3). Chapters 2 to 5 provide more detailed presentations of and discussions on the policy analysis theories briefly introduced in this chapter as well. Therefore an account of theoretical, analytical and empirical choices is given in those respective chapters.

1.4.4 Research methodology and relevance

In order to provide an in-depth analysis of noise policy in the Netherlands, the main goal for the theoretical data analyses was to establish key factors for identifying policy dynamics and policy outcomes, as well as those factors that might be explanatory for these dynamics and outcomes. I therefore developed (for example on environmental policy integration) or revised (for example on effectiveness evaluation) analytical frameworks, which are all theoretically informed and further discussed in the respective chapters, including a methodological account.

In addition to these theoretical accounts empirical data analyses have been conducted. The empirical data consists mainly of policy statements, regulations, reports on Parliamentary discussions, and 'environmental outlooks' from the Netherlands and Europe. According to Jenkins-Smith et al. (1991, p. 855) "public documents permit retrospective analysis and – where the same individual or representative repeats expression of policy beliefs over time – analysis of change in expressed beliefs". The content-analysis of these written documents served several additional purposes, such as (i) providing a historical overview of (changes in) legislation and policy goals; (ii) providing data on the *status quo* of noise pollution; (iii) identification of actors and discourses. A similar method has been employed recently in a study of environmental health (see Stassen, 2012). The respective chapters provide further details on data and data analysis relevant to the specific research question addressed.

Furthermore, interviews have been held with many experts from (inter)national, regional and local governments, research institutes, consultancies, and NGOs who have been involved in noise policy in the Netherlands for many years (see Appendix 1 for the list of informants). The interviews occurred in stages; the first phase was exploratory and aimed to develop a global overview of the Dutch noise policy domain during the last 40 years. As such I was able to identify actors and events (for example changes in legislation or policy goals) as main factors, both causal and explanatory, for the evaluation of the noise policy domain in the Netherlands. Some interviewees were revisited in order to gain additional information about discourses and advocacy coalitions. Both exploratory and 'second-round' interviews were semi-structured based upon a list of predefined themes.

The evaluation of goal attainment and effectiveness of the Dutch noise policy instruments mixes was also enriched with interview data. Respondents were selected based on their role and position in the public, private and scientific sectors. In this case a questionnaire and scoring table were developed, in order to conduct qualitative and quantitative research. Similarly to the document review, an additional methodological account is given for the interviews in the respective chapters.

Finally a few words on validity and reliability; analysing 40 years of noise policy in the Netherlands bears a risk of missing or neglecting information. To ensure the completeness of the findings the technique of data triangulation was used in addition to – a more practical methodological solution – ensuring data collection and confirmation by actors working in the field since its formulation in the 1970s and 1980s. Data triangulation refers to both the collection of data from various actors and, more importantly, from various data sources such as written, interviewed and 'calculated' accounts. Where feasible, qualitative data has been cross-analysed with quantitative data; chapter 5 provides an example of the triangulation methods employed and discusses in more detail challenges and added value.

A final remark concerns external validity; I aimed to provide information as detailed and specific as possible on the theoretical, methodological and empirical choices made in my research. Although replication of this specific research might have limited added value, as for other similar qualitative research, in my opinion transparency is paramount in academic research.

1.4.5 Structure of this thesis

The structure of this thesis 'follows' the research framework visualised in Figure 3; the respective chapters and analysis frameworks are introduced in this chapter's last section.

Chapter 2 will address the first research question on dynamics in noise policy in the Netherlands, using policy literature on governance modes. This specific literature provides useful concepts for defining an analytical framework in order to identify eventual shifts in governance modes, based upon the following elements: discourses, actors and instruments. The aim of this chapter is to identify changes in the Dutch noise policy domain in general, and more specifically in discourses, actors and instruments during the last 40 years. Furthermore, this chapter aims to explain the absence or occurrence of shifts in governance modes due to drivers of and barriers to policy dynamics.

In order to better understand the presumed limited dynamics and effectiveness of noise governance, chapter 3 identifies the main actors in the various noise policy subsystems and analyses the influence these actors have had on the definition of regulative norms. The comparative approach applied in this chapter is centred around specific aspects of modes of governance, in this case regulative noise limits. Using Advocacy Coalition Framework policy literature, belief systems and coordination mechanisms of advocacy coalitions are identified as key elements of the analysis framework. The empirical analysis addresses three noise policy subsystems, of which the noise policy domain is comprised of, which are the (road and railway) traffic, aircraft and industrial noise policy subsystems.

Some dynamics in the noise policy domain have been observed regarding experiments with integration of noise policy into spatial planning in the late 1990s and early 2000s, which serve as practical examples of a governance approach. In chapter 4 noise policy integration into spatial planning is analysed in order to illustrate in more detail an example of integrative steering philosophies and paradigms. Environmental Policy Integration (EPI) literature has been applied in order to define the main analysis components in assessing three empirical cases, which are aligned to actors, institutions and instruments.

The last research question concerning policy outcomes is addressed in chapter 5, the analysis of policy instrument mixes that are employed in the Netherlands. The main assessment criterion in that specific study is the effectiveness of the single policy instrument as well as the policy instruments mixes. Today policy literature has paid only limited attention to analysing policy instrument mixes; the theoretical contribution of this chapter concerns suggestions for scholarly policy instrument evaluation research and the provision of empirical examples. A challenge was posed due to the shifts in policy goals and targets and the policy domain's specific difficulties in quantifying targets and outcomes.

Finally, chapter 6 summarises the conclusions of this research on noise policy in the Netherlands and reflects on the use of multiple perspectives in environmental policy research. As a major revision of Dutch noise regulations is currently being undertaken, some dynamics might become evident in the coming years. In the Epilogue, the current state of discourse is discussed based upon the synthesised conclusions of this research.

It should be noted that chapters 2, 3, 4 and 5 have been published earlier as separate articles in various international scientific journals[6]. There is therefore some overlap between chapters regarding empirical introductions of the noise policy domain in the Netherlands. Finally, detailed and in-depth background information on noise policy goals and outcomes of noise policy in the Netherlands, including methodological reflections, are presented in Appendices 2 and 4.

[6] Some minor editorial changes have been made in the chapters 2, 3, 4, and 5 regarding the literature references and the numbering of the Tables and Figures, in order to improve readability and traceability.

2 Drivers of and barriers to shifts in governance: analysing noise policy in the Netherlands

ABSTRACT[7] Shifts from government to governance in the environmental policy domain have been observed by many authors. However, the question arises as to whether these shifts are apparent in all environmental policy sub domains. And which explanations are to be given for observed differences in specific sub domains? In this article we introduce insights from policy science literature on drivers of and barriers to shifts towards governance, providing an analytical framework to illustrate and explain the changes in environmental policy in general, and in noise policy specifically. Dutch environmental policy in general has changed distinctly from previous decades: from high profile execution by public institutions and the use of coercive instruments into an increasing reliance on dialogue, networks and social inclusion. Dutch noise policy, however, is still state dominated and its legislative approach seems to better fit the dominant style of government. In this paper, we show that while shifts in governance and a changing role of the state are evident for environmental policy, as a whole, similar shifts are not seen in noise policy. The main barriers to such a shift are actors with a vested interest in maintaining the current policy arrangements and the institutional settings which are not considered problematic in achieving national and municipal goals. In addition, drivers for change such as severe incidents which have resulted in shifts in environmental governance, were largely absent from the noise policy domain.

2.1 Introduction

Over the last three decades environmental policy in the Netherlands has substantially changed in terms of the policy discourse, the actors involved in policy formulation and implementation, and the instruments applied.

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[7] This article was published in the Journal of Environmental Policy & Planning. The full reference is: Weber, M., Driessen, P.P.J. and Runhaar, H.A.C., 2011. Drivers of and Barriers to Shifts in Governance: Analysing Noise Policy in the Netherlands, Journal of Environmental Policy & Planning, 13(2), 119-137.

In the 1970s and 1980s, traditional approaches of state command-and-control were characterised by policy instruments such as legislation, standards, and permits. Policy making in this era was mainly the responsibility of specialists from governmental bodies and research institutes supporting hierarchic, state-dominated government (Keijzers, 2000). Since the 1990s, however, environmental policy has changed. Sectoral policies, e.g. on waste, noise and air quality, have been incorporated into other policy domains such as environmental permitting, infrastructure and spatial planning. In addition, new policy domains such as climate and sustainability have been introduced, partially incorporating several 'old' sectoral elements. Moreover, environmental policy has 'transnationalised' due to the influence of international actors such as the European Union. The former state dominance is limited by the influence of 'Brussels' and its numerous legislative instruments such as regulations and directives.

Implementation deficits, problems with fragmented departments and broader political discussions on the role of the state have given birth to new policy instruments and actor constellations. Traditional approaches of state command-and-control have in some domains been replaced by innovative policy arrangements in which non-state actors, namely market parties and civil society, are involved (Van Tatenhove and Leroy, 2003; Arts et al., 2006). And in multi-governance networks, regional and international actors have gained influence in policy formulation and implementation. Focusing on these policy changes, the academic debate since the late 1990s and early 2000s has concentrated on analysing 'shifts from government to governance' (Pierre, 2000; Héritier, 2002; Driessen and Glasbergen, 2002a; Jordan et al., 2005; Runhaar et al., 2010).

Governance shifts often are presented as unilinear changes in a policy domain, although several authors point at 'hybrid' approaches (Héritier, 2002) or 'coexisting policy arrangements' (Van Tatenhove et al., 2000; Hajer, 2004; Arts et al., 2006). And recently, some authors (Jordan, 2008; Hysing, 2009) concluded that the policy discourse of 'shifts from government to governance' is rather to be interpreted as a storyline on shifts between 'two poles on a continuum'. The authors agree that policy domains shift towards the pole of governance, however they do point out that government and the state often still play a significant role. The shift is thus, according to these authors (Rhodes, 1997; Pierre, 2000; Hysing, 2009), to be regarded as a change in the role and power of the state and other actors.

And the plurality and co-existence of modes of governance in the environmental policy domain mainly result from variety in actor constellations, the instruments and policy discourses (Van Tatenhove and Leroy, 2003). Or, from a decentred approach (Bevir and Rhodes, 2001; Bevir and Richards, 2009), beliefs and actions of actors constructed against the background of traditions, can change and result in diversity of governance modes.

Despite literature on differences between domains of environmental policy regarding shifts from government to governance (Van Tatenhove et al., 2000; Runhaar et al., 2010), many empirical articles analyse these shifts as a rather 'obvious' trend. Consequently, only limited literature is available on the *explanation* of differences in shifts along the continuum of government towards governance, for example, by analysing drivers of and barriers to either governance shifts or stability in a policy domain.

Noise policy[8] is often considered 'government-dominated' due to its technocratic, sectoral and regulative character. Over the last few years, however, changes in noise policy were deemed necessary by both European and Dutch authorities and institutes, and some have been implemented (European Commission, 1996, 2010; Netherlands Environmental Assessment Agency, 2010). The questions arise as to whether the changes in this sectoral environmental sub domain resemble meta-shifts towards governance as identified in the environmental policy domain in general. And what factors are responsible for these shifts or the absence of changes? Considered as a traditional, stable environmental policy sub domain, the noise policy domain thus is empirically interesting, as Van der Waals and Glasbergen (2002, p. 141) stated, "noise abatement policy is the perfect example of a field of policy which is built on the traditional, hierarchical management-based paradigm, underpinned by scientific knowledge".

This paper is structured as follows; we first discuss the main literature on governance and analysis frameworks, with a specific focus on the environmental policy domain. Subsequently, we characterise noise policy in the Netherlands and shifts in the policy domain. In order to explain the absence or occurrence of governance shifts, we draw insights from policy science literature into drivers of and barriers to changes in modes of governance.

[8] Noise policy, institutionally as well as its content, is considered a sub domain of environmental policy in the Netherlands as well as the European Community.

2.2 Shifts in modes of governance: an analytical framework

This section discusses the main literature on governance in general, more specifically environmental governance, and shifts in modes of governance (section 2.2.1) based upon three dimensions: policy discourses; actors and instruments. The latter are discussed in section 2.2.2 and applied as dependent variables in the analytical framework. Finally, from policy science literature independent variables are derived that are applied as explanatory factors or drivers to and barriers for the shifts in governance (section 2.2.3).

2.2.1 'Governance' defined

The term 'governance' and its application in social academic research is discussed in various papers (see for instance: Ostrom, 1990, 2007; Rhodes, 1997; Stoker, 1998; Héritier, 2002; Driessen and Glasbergen, 2002a; Kooiman, 2003; Kjaer, 2004; Van Kersbergen and Van Waarden, 2004; Arts et al., 2006). In general, governance is regarded as the successor of 'government'; i.e. political steering where state and non-state actors participate, in contrast to the traditional hierarchic form of steering by the national government. For example, Peters and Pierre (1998, p. 232) consider governance as "something that deliberately transcends the borders of government".

Stakeholder involvement and thus the opening up of the central government's regulative steering philosophy by broadening the decision-making network, is one of the main characteristics of this shift. Rhodes (2007) uses 'governance' in referring to changing boundaries between public and private actors, as the latter get involved in policy formulation, which formerly was primarily a public task. Other often-mentioned related characteristics of governance are informal and decentralised relations and dependencies between the actors in network-like constellations. The participation of citizens, NGOs or other authorities in the problem definition and decision-making phases implies a direct introduction of knowledge, interests and power in the former state exclusive domain. In these networks of state and non-state actors, game-like interactions and rules are introduced (Rhodes, 2007). Driessen (2005), for example, distinguishes 'multi-actor' and 'multi-sector' governance depending upon the stakeholders involved in the policy domain. In 'multi-actor' modes of governance state and non-state actors are involved, whereas various government tiers are highlighted in 'multi-sector' governance. Van Kersbergen and Van Waarden (2004) refer to a (partial) shift from 'government' to 'multi-actor' governance as an example of broader stakeholder involvement and the introduction of new (private) actors in the decision-making process.

The increased importance of and influence by the European Union is, according to the authors, a typical example of a vertical shift towards 'multi-level governance'. In the context of such shifting power positions, new arrangements emerge – known as 'agreements', 'covenants' or 'partnerships' – not only between public and private actors but also among market actors and civil organisations (Driessen, 2005).

Building on these definitions, we propose to use the concept of 'governance' as the interaction between public and/or private actors ultimately aiming for the realisation of collective goals. In environmental governance, for example, these collective goals are environmental quality, safety, public health and quality of life.

In the governance literature, two main streams can be identified; i.e. a normative and an empirical approach (Pierre, 2000). The first reflects fundamental changes in opinions on political and policy processes in changing societal contexts (Hajer et al., 2004). Authors applying this approach address normative issues such as democracy, legitimacy and efficiency. Peters and Pierre (1998), for example, focus on the decentralisation of state responsibilities as a governance answer to legality and efficiency issues of the state losing its steering capacity. And in their article on environmental public works, Driessen et al. (2001) elaborate on interactive policy-making as a necessary governance approach in complex policy issues with many stakeholders.

The second, empirical approach is often used as an analytical perspective in academic, empirical research, focusing on the discourses, actors and instruments in policy processes. Stoker (1998, p. 18), for example, "values the governance perspective as an organising framework […] for understanding changing processes of governing". And Rhodes (2007, p. 1250) speaks of "a scalpel or diagnostic tool for exploring the extent to which governments work with and through networks […]". In their analysis of area-based environmental policy and food safety, Hajer et al. (ibid), for example, focus on interactions between state, civil society and market; rule-altering mechanisms; resources and discourses. And Jordan et al. (2005, p. 478) identified 'instruments' as "analytical devices that allow empiricists to distinguish 'new' modes of governance from 'old' forms of government". In deploying an analytical perspective, most authors stay away from normative debates and apply the concept of governance in an empirical way. In our paper, we elaborate on the empirical approach of 'governance' in identifying generally accepted aspects of 'government' and 'governance', i.e. policy discourse, actors and instruments.

2.2.2 Indicators of shifts in modes of governance

In governance literature, as discussed above, generic elements are frequently applied in identifying various modes of governance, i.e. policy discourse, actors and instruments (e.g. Van Tatenhove et al., 2000; Jordan et al., 2005; Wiering and Arts, 2006; Rhodes, 2007). This section discusses the characteristics of these dependent variables for government and governance modes, depicting the poles on the continuum.

The *policy discourse* is often seen in the objectives and content of the policy domain, and as such refers to storylines and paradigms used in the problem framing and decision-making process. Characteristic of government is the strong belief in hierarchic governing through technical and science-based instruments and through sector specific norm setting. Whenever goals were not achieved, norms were reformulated and enforced, reflecting a 'rigid goal-means philosophy' (Driessen and Glasbergen, 2002a).

A typical discourse of environmental governance, on the other hand, is the complexity of the problems occurring on different spatial levels and impacting health as well as natural resources. In contrast to the 'positivist government discourse', solutions require sustainable and innovative approaches balancing economic, social and environmental goals and involving many stakeholders.

Actors in the policy domain, the second element, use arguments and define problems in line with their specific beliefs, values and norms, and thus encompass story lines and discourses in their decisions and actions (Bevir and Richards, 2009). The relationship between public and private actors in the policy domain defines whether discourses are state-exclusive or multi-actor deliberative storylines (Van Tatenhove et al., 2000; Arts et al., 2006; Runhaar et al., 2010). In government, monocentric and hierarchically organised institutions are seen as the primary governing actors. Private actors take part - indirectly - through elections, or provide - directly - scientific knowledge. Multi-level and multi-actor governance on the other hand involves other administrative levels, such as the European level and the municipal level, and private actors in network constellations (e.g. Driessen and Glasbergen, 2002a; Hysing, 2009). The ultimate variant of governance, finally, consists of self-steering networks or 'governing without government' (e.g. Stoker, 1998; Rhodes, 2007). Many authors point at blurred boundaries between the public and private spheres characteristic of governance modes (Rhodes, 1997; Stoker, 1998), although academic literature has identified ongoing state steering in private-public and society-public networks as well (Kooiman, 2003).

The third generic element consists of the *instruments* applied in the policy domain. Where government is known for hierarchical, top-down governing by primarily the state through legislative and normative sectoral tools, new instruments such as trading mechanisms and negotiated agreements have been introduced in governance (e.g. Driessen and Glasbergen, 2002a). Recurrent criticisms directed at the government command-and-control instruments have resulted in the development of new policy instruments based upon communication and consultation within broad actor constellations and less central government influence (Pierre, 2000; Jordan et al., 2005). Examples of new environmental policy instruments are negotiated voluntary agreements, emission trading schemes and eco-labels (Jordan et al., 2005). Focusing on instruments, Héritier (2002) also describes several environmental policy measures as hybrids, i.e. governance instruments backed up by 'hierarchy'.

Consequently, each mode of governance has its specific combination of 'policy discourse', 'actors' and 'instruments' (e.g. Van Tatenhove et al., 2000; Wiering and Arts). These aspects of modes of governance are classified as follows:

- *Policy discourse*: the assumptions, norms and values, addressed in the mode of governance; i.e. the storylines and paradigms used in the problem framing and the decision-making process;
- *Actors:* the composition of actors and levels of authorities involved in policy formulation and implementation, e.g. European Union, regional and local administrative levels, politicians, bureaucrats, NGOs, and citizens;
- *Instruments:* the tools employed to realise the objectives, e.g. permits, norms and standards, agreements, integrated policy plans and so on.

These aspects, or indicators of shifts, and the various modes of governance presented in Table 2 are based upon Hysing (2009) and adapted to our analysis. We adhere to the idea of a continuum from government towards governance and the various stadia between the two poles, illustrated by Hysing and here in Table 2. However, where Hysing (2009, p. 649) identified "governing styles and instruments, the relationship between public and private actors, and relations between policy levels" as three dimensions of modes of governance, we introduce policy discourse as a relevant variable. In our opinion, the latter is frequently seen in empirical governance literature to be a relevant factor for understanding and characterising modes of governance.

Another adjustment to Hysing's framework regards the variable 'actors', which in our analytical framework is taken to be actor constellations and networks of public, private and societal actors. Whereas, Hysing makes a distinction between public-private networks and multi-level public actor constellations, we consider both aspects to be more or less similar and consequently we do not make such a distinct separation.

Although ideal typical, and thus not exactly representing existing modes of governance in practice, the framework in Table 2 will be helpful in analysing shifts along the continuum between the two poles, government and governance. The variables discussed above identify shifts, and subsequently give an indication of government or governance characteristics for the specific mode. As such hybrid or coexisting modes in specific environmental sub domains or specific periods in the policy sub domain's existence can be identified.

The shifts in modes of governance can be 'shallow' or 'deep' (Wiering and Arts, 2006) and result in shifts along the continuum towards governance. In the case of a shallow shift, elements and characteristics of the specific mode are slightly changed. Typical shallow shifts are changed discourses within a policy network; whereas actor constellations and instruments of the mode of governance are unchanged. On the other hand, a deep shift leads towards a new set of typical aspects of the mode of governance; e.g. actor constellation and policy discourse have significantly changed (Van Kersbergen and Van Waarden, 2004). As stated before, deep shifts often indicate a fundamental change in views and values underlying discourses on the actual content of policy and/or the policy context.

Modes of governance: along the continuum from government towards governance					
Indicators of shifts					
Policy discourse	Uniform goals, norms and values; sector specific	Tailor made policies within policy networks balancing economic, social and environmental goals	Partly integrated sectoral policies taking into account economic, social and environmental goals	Goals and measures set at the level 'most fit' for integrated (multi-sector and multi-level) decision making	Policies set by businesses, NGOs and citizens
Actors	Central government agencies and/or supra national agencies	Public-private, public-society and/or private networks	Public- private networks	Regional and local governments	Private networks and NGO-business partnerships
Instruments	Legislation, permits, norms and standards	Voluntary instruments (negotiated agreements, trading mechanisms, covenants)	Incentive-based instruments (taxes and grants)	Public covenants and performance contracts	Bottom-up voluntary instruments (eco labels)
	Government	←		→	Governance

Table 2: Modes of governance

2.2.3 Drivers of and barriers to shifts in modes of governance

The dependent variables, i.e. policy discourse, actors and instruments, indicate shifts in modes of governance, however they are not suitable for *explaining* these shifts. As such we derive general contextual factors from the policy science literature, acting as drivers to or barriers for shifts. These independent variables, i.e. macro political factors and policy domain specific factors, are subdivided into three variables each, i.e. events or episodes, performance and institutionalisation.

In her article on frameworks of policy processes, Schlager (2007) identifies mechanisms of policy shifts by comparing various theories, such as punctuated–equilibrium and advocacy coalition theories. These mechanisms or factors include *events or episodes* such as crises or, as Birkland (1997, p. 70) defined, potential focusing events, which stem from macro political contexts or from the policy domain itself. Examples of dramatic events are accidents with chemicals, or flooding, which pushed risk management onto the government agenda (e.g. Wiering and Arts; 2006; Runhaar et al., 2010). Whereas according to Baumgartner and Jones (1993) series of less dramatic or focusing events may change policy images (i.e. ideas) and beliefs as well, push the policy issue higher up the agenda, and subsequently induce a shift in the mode of governance. Events or episodes, such as oil spills or nuclear power plant accidents, often act as a driver of changes in the mode of governance. The absence of severe events, on the other hand, can be regarded as a 'barrier' to shifts.

The second variable identified is *performance.* Within the specific policy domain failure in achieving the predefined policy objectives often results in changes in the discourse, the instruments applied and/or the actors involved in the policy coalition. For example, the limited achievements in sectoral environmental domains in the 1990s resulted in several initiatives to integrate spatial and environmental policy (Miller and De Roo, 2004; Weber and Driessen, 2010) into area-based policies on soil pollution and municipal waste management. In addition, the urge for (better) performance, as stressed in the decentralisation and efficiency paradigms during the public sector reform period in the 1980s and 1990s (Bevir et al., 2003), is also a relevant macro political factor. The general idea was that bringing business management concepts into the public domain would increase goal achievement and the overall performance of government. Limited performance or goal achievement thus often acts as a driver of shifts in the mode of governance, whereas good performance can result in maintaining the existing policy arrangement and thus acts as a 'barrier' to change.

Finally, the third variable identified from policy science literature is *institutionalisation,* i.e. the construction and organisation of actor constellations or networks. Institutionalisation within a specific policy domain can act as a driver to or barrier for shifts in the modes of governance, in either involving other actors or closing the actor constellation for others. In line with Schattscheider's conflict expansion theory (1960), the existing institutional setting, i.e. actors and their formal rules, can act as a barrier to shifts and thus maintain stability, by keeping opponents out of the policy network. And Schlager (2007, p. 310), for example, states that "networks characterised by concentrated power and bargaining relationships, […], have a low to moderate potential for incremental change." On the other hand, due to the recognition in the 1990s that environmental issues occurred on all geographical levels, other levels of 'government', i.e. transnational and subnational authorities became involved in the policy domain. As such, the networks in the specific policy domain changed into multi level governance networks.

Similar effects can be identified due to macro political influences such as decentralisation and the increasing use of participatory approaches which require the 'opening up' of existing institutional settings. For example, the reorganisation of the former state government in the 1990s resulted in the externalisation of state tasks through privatisation and deregulation to public-private networks or private-social networks. The drivers of these shifts stem from general political perspectives and not from within the specific policy domain.

To sum up, the following macro political and policy domain specific variables, acting as drivers of or barriers for shifts, will be applied in explaining shifts in modes of governance:

- *Events or episodes* in the policy domain will change the policy discourse, actors and/or instruments applied in the existing mode of governance;
- *Performance* or failures in achieving objectives set, will result in shifts in the dependent variables of the mode of governance;
- *Institutionalisation* through actor coalitions, rules and resources can either stabilise the mode of governance or result in changed modes due to, for example, inclusion or exclusion of specific actors.

2.3 Environmental noise policy in the Netherlands

In the next sections, we will identify and assess shifts in the noise policy domain in the Netherlands, based upon a review of empirical findings from policy documents (government bills, programs, evaluations et cetera) over the last decades. We have applied a historical perspective in order to identify shifts in the period 1970 until now, as policy changes occur at a slow pace.

Despite the limited number of experts involved in noise policy during the last decades, expert interviews were relevant in identifying drivers of and barriers to shifts in the noise policy in the Netherlands. A total of 25 interviews were carried out with representatives of governments, civil servants from municipalities, knowledge institutes and consultancies; all involved in noise policy in Europe and the Netherlands for at least 10 to 15 years. The interviews were semi-structured, in that they focused on beliefs, discourses or narratives relevant for the noise policy domain.

2.3.1 Noise: sources and effects

In this paper we focus on noise in an urban context: the main sources of noise in cities being road and rail traffic. The concept of 'environmental noise' comprises both of these sources as well as air traffic and industrial noise (see e.g. article 3a Directive 2002/49/EU). Long-term exposure to environmental noise can result in annoyance, sleep disturbance and other negative health effects. For example, 30% of Dutch citizens are annoyed by road traffic noise (Netherlands Environmental Assessment Agency, 2010) and 40% of the EU-15 population are seriously annoyed by road traffic noise (EEA, 2008).

Although we speak of a 'singular' concept of noise, it has been implemented in a range of noise policies and legislative regimes involving diverse actors and using different policy instruments. In the Netherlands, air traffic, highway and railway noise are the main competences of the Ministry of Traffic and Water Management; regulated in two acts, namely, the Air Traffic Act, and the Noise Abatement Act. Noise from regional and municipal roads is regulated in the Noise Abatement Act and implemented by the provinces and municipalities in their spatial planning policies. Noise from industrial activities is regulated via permitting (cf. the Environment Act) and zoning (cf. the Noise Abatement Act) mainly by provinces and municipalities.

Finally, noise from neighbours, although ranking highly in annoyance field surveys, is not regulated at all. The state considered that the insulation requirements of the Building Act, local ordinances and public awareness campaigns were the apparent instruments for addressing noise annoyance by neighbours.

Noise exposure at community level can produce various effects in adults, including the feeling of annoyance and sleep disturbance. In most literature, annoyance is defined as 'a feeling of displeasure, discomfort and dissatisfaction' or 'unwanted sound or nuisance' (Staatsen et al., 2004; Vlek, 2005; Babisch et al., 2009). Non-acoustical factors, i.e. individual and socio-economic factors (e.g. anxiety, noise sensitivity and economic advantages) have a major influence on noise perception and consequent annoyance. The noise source itself is also relevant for understanding noise perception. Miedema and Vos (1998) concluded that, on average, the same noise level is reported to be more annoying when produced by an airplane than by road traffic, while railway noise at the same level is found to be least annoying. Chronic annoyance is associated with increased risk to the cardio-vascular system in adults (Miedema and Oudshoorn, 2001; Staatsen et al., 2004; Van Kempen and Houthuijs, 2008).

Noise disturbs sleep directly and indirectly (WHO, 2009). Biological effects are: increase in heart rate, arousals, sleep stage changes and awakening. In addition, sufficient evidence is available to show increase in use of medication, in body movements and insomnia as a result of exposure to noise (Griefahn, 2002; Miedema et al., 2003).

The above-mentioned effects on annoyance and health occur at all ages and both genders. In children, other negative effects have also been identified; i.e. noise exposure affects children's learning (cognition), motivation and concentration (Staatsen et al., 2004). Compared to children attending schools in more quiet areas, children near airports such as Schiphol were found to have a poorer reading ability and lower scores on national tests (Clark et al., 2006).

Noise regulation is based upon dose-effect relationships to noise annoyance and sleep disturbance of various noise sources. As already discussed, annoyance varies depending upon the source of the noise; e.g. noise from railways is less annoying than noise from road traffic. Consequently, noise regulation is a complex system consisting of preferable and maximum noise standards for roads, railways, airports and industrial zones.

The preferable noise standard is set at a level at which some annoyance will occur; i.e. it determines a percentage of annoyance that is deemed acceptable. Maximum standards should not be exceeded; although the noise regulation provides options for deviation under certain conditions.

Negative effects of noise also depend upon so-called non-acoustic factors. People perceive the meaning of a noise source and the owner of this source, and attach positive or negative feelings to the sound. In addition, whether a sound is annoying or not depends upon the subject's personal characteristics and the circumstances under which the sound is perceived (Ouis, 2002; Vlek, 2005). As such, noise (annoyance) is frequently regarded as a subjective problem. And although local initiatives, e.g. near Schiphol Airport, resulted in political agenda setting similar to other localised forms of protest, noise policy in general gained limited political and societal attention.

The key actors in noise policy are regional and local authorities, and industries implementing nationally defined noise standards in spatial plans and environmental permits. The target group of noise policy, i.e. the citizen as 'victim' and as 'polluter', is rather invisible in the policy network.

In the following section, we will elaborate on the characteristics of noise policy in terms of policy discourse, actors and instruments, and the changes in the noise policy domain during the last few decades. Our historic overview addresses the period of the 1970s to the present.

2.3.2 Noise policy: a historical overview

In the 1970s and 1980s, a wide range of environmental sectoral regulation was developed, reflecting the technocratic and hierarchic paradigm of that time. The noise report of the Dutch Health Council (Gezondheidsraad, 1971) recommended the development of new legislation on noise abatement, focusing on (emission limits for) noise sources. These recommendations fitted perfectly the ambitions of the recently established Ministry of Public Health and the Environment (1972) and finally led to the passing of the Noise Abatement Act in 1979. The Act introduced zoning as a new policy instrument, i.e. spatial separation of noise intrusive activities, such as transport and industries, and noise sensitive activities, such as living. Two other pillars of noise policy are the insulation of dwellings exposed to high noise levels and stringent limits on noise sources, such as cars and trains.

This positive attitude towards 'technological fit' is reflected in the evaluation of the Noise Abatement Act in 1985 and also in the first National Environmental Policy Plan (NEPP1) in 1989; the latter stating the aim of 'the same percentage of annoyed citizens in 2000 as in 1985' to be realistic and achievable through source-related and transport policies.

In addition, local and regional authorities were considered most fit to address the local problem of noise nuisance and to enhance local environmental and living quality through the integration of noise and spatial planning. The overall feeling of the government was that this instrument of legislative norm-setting was adequate and effective, and local level 'freedom' was supported by some adjustments of procedural requirements of the Noise Abatement Act in line with local authorities' request. Additional exemptions that have been incorporated in the Act, due to implementation difficulties at the local level, are the design of a 'deaf façade' and the use of a 'harbour limit' allowing an increase of 5 dB in living areas near port-related industrial zones.

In the mid-1990s, the national government initiated a 'rethink' of its policy approaches regarding stakeholder involvement, deregulation and quality of legislation. The Noise Abatement Act, heavily criticized by the local authorities due to its complexity and rigidity of standards, was one of the environmental topics to be addressed. As the memorandum 'Renewing Noise Policy' (in Dutch: Vernieuwing Geluidhinderbeleid) of the Ministry of Housing, Spatial Planning and Environmental Protection (1998, pp. 8-9) stated, noise policy needed new instruments as "coordination of spatial planning and environmental management should be strengthened in municipal policy formulation and implementation" and "existing noise policy would not succeed in achieving noise policy targets set for 2010". The Noise Abatement Act was expected to be replaced by generic national noise policy and more local policy freedom, including placing the responsibility of norm setting at municipal level. The proposal was in line with the municipalities' goal, urging less stringent and time-consuming procedures and less strict national noise standards. Municipalities had also been responsible for spatial planning since the 1970s; a task that would be easier to achieve if municipalities were allowed more policy freedom in setting area-specific noise standards.

Although some progress was made, the targets set in the first policy plan were found to be challenging. Consequently, the Second National Environmental Policy Plan (NEPP2, 1993) set targets for reducing noise annoyance to be achieved through the tightening of vehicle noise emission standards at the European level and through an integrated and decentralised approach to noise policy.

In addition, the national government criticised the (high) number of situations in which local authorities relaxed legislative noise standards to allow for new housing to be built. As the memorandum stated (NEPP3, 1998, p. 14), "a legal maximum noise standard is considered (by the municipalities) as legitimating (unnecessary) high noise levels: the law says so thus it is allowed!". Nevertheless, the government decided not to interfere, as this municipal responsibility was in line with the overall decentralisation ambitions of the government. During the years to follow, the highest percentages of noise annoyance were again found at the municipal level. Although noise reduction had been achieved on highways and railways through, for example, low noise road surfaces and quiet tyres for private cars in urbanised areas, this was offset by the increase of local road traffic. As the number of inhabitants and car users increased, spatial claims in 'compact cities' resulted in a higher number of citizens being exposed to high noise levels. Consequently, the government, being dependant upon the municipal level in achieving national targets, reformulated the noise goals in subsequent policy plans (NEPP3, 1998; NEPP4, 2001). The first policy plan of 1989 set the goal of limiting the number of citizens annoyed by road traffic in 2000 to the level experienced in 1985, i.e. 40 % of Dutch inhabitants, and aimed at having no highly annoyed citizens by 2010. NEPP2 and NEPP3 in 1993 and 1998, respectively, dropped the goal on high annoyance and lengthened the period for achieving the goal of limiting annoyance levels to those experienced in 1985, from 2000 to 2010. And today's noise policy ambitions have been changed to insulation of all dwellings with noise levels of 65 dB from highway traffic and 70 dB from railway traffic by 2020.

In 2001, new legislation (here the Dutch acronym MIG is translated as 'Modernisation of Instruments of Noise Governance') was introduced as the apparent next phase in noise policy; decentralisation of tasks and area-specific noise qualities and respective standards within a 'legislative framework' of nationally-set reference and maximum values. As such, after two decades of noise policy, nationally set standards would disappear, except for a maximum value, and municipalities would gain greater policy freedom in defining area-specific noise standards. However, due to discussions on the financial consequences of the proposed legislative changes and the fall of the Dutch government, it was not until 2003 that the next steps were taken in defining new noise policy instruments. Today, 10 years after new legislation was said to be implemented, changes in the regulative noise instruments are still not apparent, due to time consuming legislative processes.

The first stage of new noise policy, addressing noise from highway and railway traffic – a national government's competence – is expected to be implemented at the end of the year 2011[9]. New noise policy instruments for the regional and municipal level are still under discussion and development in working groups comprised of experts from the ministries, provinces and municipalities. In line with earlier proposals the 'new' noise policy will encompass a limited number of national-set noise standards and greater policy freedom at the local level.

2.4 Assessing and explaining shifts in noise policy

2.4.1 Noise policy characteristics and shifts

In this section, we will assess noise policy shifts as described above, applying the analytical framework consisting of the dimensions; policy discourse, actors and instruments. Regarding the noise policy *discourse,* a sectoral and technical approach is applied. Zoning and end-of-pipe technical solutions were considered appropriate instruments for solving negative health impacts at the local level within a rather short period. The objectives of noise policy are primarily based on estimated health impacts, such as the number of citizens (highly) annoyed by traffic, industrial and aircraft noise, and detailed noise emission and immission limits.

A three pillar approach, i.e. a stringent noise sources policy, insulation of dwellings and zoning, is characteristic of noise policy during the last three decades. Although the existing noise policy was deemed to be not fit for preventing the increase of number of citizens annoyed by noise, a shift in instruments and actors has been proposed, but not yet realised. Objectives at the national level, as stated in the subsequent environmental policy plans, have been 'lowered', as achieving the reduction goals is highly dependent upon the European Union regulating emissions from various noise sources such as vehicles, trains and car tyres. And integration of noise into spatial planning has been passive and occurs in the late stages of the planning process; noise levels are not optimised but assessed as a regulative prerequisite (Weber and Driessen, 2010).

[9] Swung-1 entered into force 1 July 2012 (Chapter 11 of the Environmental Management Act)

Regarding *actors*, government agencies set standards, based upon scientific (acoustic and health) input, to be implemented in decentralised administrative tiers. The actors involved in noise policy were mainly technical and acoustical experts, who were able to translate their knowledge into legislation, based upon noise source specific standards and the respective health dose-effect relations. As such, the noise policy formulation can be considered as typical 'statist and scientist'. Regional and local authorities were hardly involved in policy formulation although they are key actors in policy implementation and achieving policy goals set at the national level. However, since the mid 1990s public stakeholders, such as the umbrella organisation of the provinces (IPO) and municipalities (VNG), have been increasingly involved in the formulation and implementation of noise policy in noise expert working groups, due to general political reforms. In addition, the European Union plays an important role in the formulation of noise policy in drafting its Green Paper (European Commission, 1996) on noise and defining noise source legislation. This actor constellation is often referred to as multi-level or network governance (Van Kersbergen and Van Waarden, 2004; Driessen, 2005).

In contradiction to environmental modes of governance involving market and civil society actors, noise policy is still highly state-dominated. The national influence has even been strengthened as a new state actor, namely the Ministry of Traffic, entered the actor constellation applying the policy discourse on 'mobility and infrastructure needs'. The Ministry of Traffic is responsible for noise from highways and railways and consequently also the noise insulation of nearby dwellings. As such, budgets are allocated to the Ministry of Traffic and are only limitedly available to the Ministry of Environment; the latter being responsible for noise policy. The recently proposed noise production ceilings will also have to be implemented by the Ministry of Traffic; and although not yet approved, the draft legislation bears the signature of this influential actor in noise policy. Additional 'work space' of 1,5 decibels as part of the noise production ceilings, and cost-benefit criteria, are new elements in the noise legislation, providing total policy freedom for the Ministry of Traffic in deciding whether noise abatement measures have to be taken once the noise production ceiling is exceeded.

Regarding *instruments,* a strong focus on legislative tools, e.g. maximum noise levels for noise sources and permits, is evident. After many years of preparation, in 1979, the Noise Abatement Act came into force and has been amended and strengthened since then.

The current complex act is exemplary for this legislative, instrumental approach and is still applied at all administrative levels. Governance instruments such as flexible and area-specific noise standards are still not in place, although changes were initiated a decade ago. Similar to negotiated agreements with target groups found in environmental policy, area-specific noise targets were planned to be formulated and implemented in a network of (non-)state actors.

Placing the aforementioned noise policy characteristics or modes of governance on the continuum elaborated in Table 2, we can discredit the notion of a shift in noise policy from the pole of government towards the pole of governance. In Figure 4 this shallow shift is illustrated; early noise policy in the late 1970s and current noise policy are both scored on the axes of the indicators identified in the analytical framework. Whereas shallow shifts became apparent in the noise policy discourses and actor coalitions during the last decades, the instrument mix remained mainly based on legislative measures. Changes in the modes of governance therefore are not unidirectional toward governance but rather bidirectional or hybrid. Overall, however, today's noise policy must be depicted as a mode of governance with primarily government characteristics.

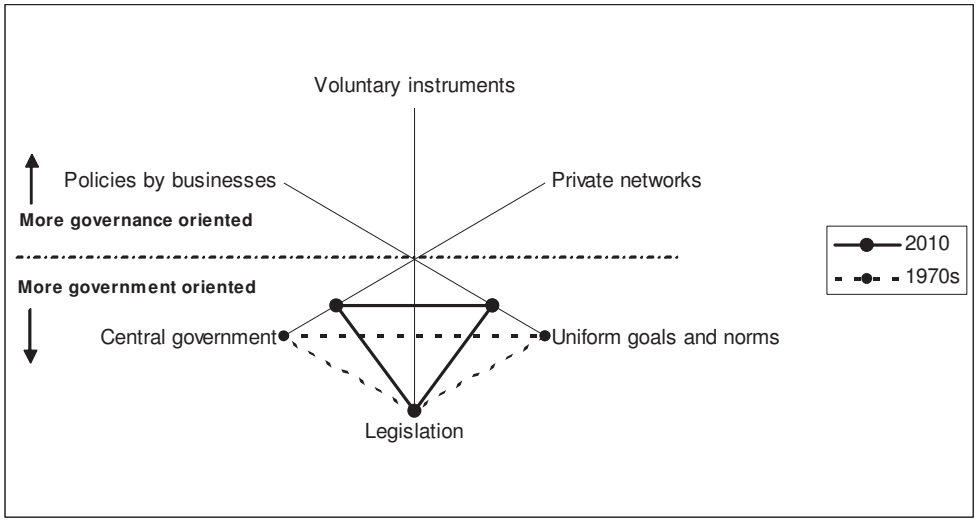

Figure 4: Noise policy assessed

2.4.2 Explaining the shift towards 'new' noise policy mode of governance: drivers and barriers

Since the mid 1990s, a stronger emphasis has been put on noise source policy, spatial claims along highways and railways and noise insulation of dwellings by the national authority, whereas local authorities should gain more freedom in integrating spatial and noise policy. However, no significant changes in the noise policy discourse can be identified. The noise policy pillars of the 21st century are more or less similar to those of the 1980s, i.e. zoning, insulation and noise source limits. One of the reasons is that *events or episodes*, like flooding and oil spills acting as driver of shifts in governance mode, were absent in the noise policy domain. Additionally, the absence of events resulted in a low position of noise policy on the political and societal agenda. Moreover, although subsequent policy plans concluded that the number of citizens negatively affected by noise levels did not decrease, this health issue was never high on the political agenda nor did it lead to a recognised substantial number of deaths.

Interestingly, the noise problems to be solved and the results to be achieved in noise policy are perceived differently by public and private actors. Infrastructure and mobility have increased, whereas noise annoyance due to road and railway traffic has been stable since the 1990s (Netherlands Environmental Assessment Agency, 2010). On the other hand, goals of reducing the number of annoyed citizens have been postponed, complaints seem to increase and municipalities are struggling to integrate noise and spatial planning targets. Nevertheless, the limited *performance* or goal achievement did not result in shifts in the noise policy domain in the Netherlands nor in other West-European countries (European Commission, 2010). Noticeably, the hypothesis in policy science literature is that limited policy performance results in changes in the policy domain. Our empirical study, however, indicates that policy performance is not an explanatory factor for policy change; at least in the sub domain of noise policy.

An explanation for this stems from the policy domain itself, in which mutual responsibilities hardly seem to be recognised by the various actors involved. First, the existing noise policy arrangement is not considered problematic or imperfect by the municipalities in achieving the (national) set goals. It *is* however considered a problem for municipal spatial planning as it restricts new spatial developments; as such municipalities have been urging legislative changes for decades, in order to realise their spatial ambitions.

Secondly, the overall noise policy targets were set in order to limit negative health effects. Citizens, however, are hardly aware of these health effects and the majority rarely act unless in local situations, where complaints arise on the negative impacts due to new developments. This ambiguity is even stronger if one also considers the citizen as a polluter; car ownership and high levels of mobility are generally widely accepted by citizens. Consequently, noise problems are hardly ever found on the political and societal agenda.

This noise policy domain specific *institutionalisation* has been a major barrier to shifts in governance modes in recent decades; the power and resources of the decentralised actors were limited, as the rules of the game, applied by the state actors, were 'exclusive' and did not include other state and non-state actors. From a macro political perspective, deregulation and decentralisation of noise policy responsibilities and tasks to the regional and local level, are the government's storylines. Referring to the principle of subsidiarity, the NEPP4 (2001, p. 289), for example, states that "tasks are decentralised to the lowest administrative level possible" and "the national government will provide more policy freedom for municipalities" (p. 325). Although subsequent governments were strongly in favour of decentralisation of noise policy to the local level, municipalities feel they lack the instruments to effectively address noise problems. Noise regulation is implemented in municipal spatial plans; the increase of – noisy – mobility, however, should be addressed by international noise source policy. Exemplary for a technical, science-driven approach to noise governance, local authorities hold the European Union and the national government responsible for the limited results achieved so far.

In their reaction to the report on Emissions from Road Traffic (Algemene Rekenkamer, 2009, p. 13), the umbrella organisation of municipalities (VNG) stated "the national government is responsible for achieving – European – minimum standards. Specifically, regarding noise source policy the European Union and the national government are the first responsible authorities." This implementation gap is an example of the strong scientific and state actor participation in noise policy, which functioned as an institutional barrier to changes in the existing modes of governance (cf. Schattscheider, 1960; Schlager, 2007).

For some years, the actor network has been opened and provinces and municipalities have been involved in defining the new noise legislation. Although there has been no deep institutional shift, interaction patterns are focused more on empowering the decentralised actors in multi-level networks, in which new instruments and innovation projects addressing railway and road traffic noise are supported.

The decentralisation discourse, however, is still embedded in existing technical, acoustical networks and systems of rules, norms and practices, which might form a barrier to deep shifts towards governance approaches. The actors involved still reflect the traditional beliefs and meanings on noise policy and legislation; and as such 'obstruct' shifts to newly institutionalised networks. Citizens, market organisations, and NGOs are not part of the noise policy networks; and the private sector is mainly involved because acoustic expertise is needed in working groups consisting of solely state actors. Indeed, actor constellation stability is apparent in the absence of shifts in the noise policy modes of governance.

2.5 Conclusions: shallow shifts embedded in government approaches

In conclusion, although shifts in environmental governance in general are apparent (Driessen and Glasbergen, 2002a: Jordan, 2008; Hysing, 2009), similar changes are visible only to a limited extent in the noise policy sub domain. A shift in governance modes, in the form of decentralising tasks and decision-making to the municipal level, has mainly been executed through changes in legislation, whereas the policy discourse and the actor networks hardly changed. This change can be considered a good example of what Thelen and Streeck (2005) refer to as layering; the amendments or revisions of existing legislation might result in differential, though not revolutionary, growth in the policy domain.

Noise policy thus differs from environmental governance in general. However, shifts in noise policy might be deemed necessary in order to reduce noise levels and numbers of annoyed citizens. Noise policy of the 21st century is in need of a multi-actor governance approach in which international, state and decentralised administrative levels in close cooperation develop the instruments needed for solving noise problems. In addition, as many authors (e.g. De Roo and Hanemaaijer, 2004; Glasbergen, 2005; Swyngedouw, 2005; Leroy and Loots, 2006) concluded, multi-sector governance approaches are needed, such as regulatory flexible area-based norms that accompany processes of innovative and integrated urban policy in broad stakeholder networks. As such, citizens and other relevant actors are involved in problem definitions and policy formulation, in which the noise perception of citizens is captured in noise standards and 'noise' is part of the broader concept of 'quality of life'.

Finally reflecting on governance literature in general, authors (e.g. Van Kersbergen and Van Waarden, 2004) are right in pointing to shifts *towards* governance. Nevertheless, Hysing (2009) is one of the few authors providing a framework for 'identifying and measuring' shifts in governance modes. In this paper we therefore applied a sector specific analysis of shifts and added explanatory factors acting as drivers of and barriers to these shifts, to the existing literature. As shown in this study, the analytical framework developed seems to be useful for empirical research on governance as it allows for a systematic examination of the relevant dependent variables. The macro political and policy domain specific independent variables, i.e. events or episodes, performance and instutionalisation, identified from the policy science theory were illustrative and explained the (absence of) changes in the policy domain. Introducing the policy science literature to the governance literature will enhance empirical research and provide interesting research questions. In line with Jordan (2008) and Hysing (2009), we propose further empirical research applying this broader scope in different policy sectors and countries, in order to gain better insight into the existence or absence of shifts in governance, and the drivers of and barriers to these changes.

3 Variation and stability in Dutch noise policy: an analysis of dominant advocacy coalitions

ABSTRACT[10] Noise exposure has harmful effects on human health. Despite policy on the prevention and reduction of noise, the environmental burden is increasing, specifically due to road traffic noise. Noise policy in the Netherlands is organised in a rather complex way, with different legal frameworks for the various sources of noise. Whereas noise limits have frequently been adjusted in the traffic noise policy subsystem, the industrial and aviation noise policy subsystems are characterised by stability in norm setting. This paper aims to explain the differences in dynamics within the noise policy subsystems, by applying the Advocacy Coalition Framework (ACF). We conclude that the dynamics in the traffic noise policy subsystem is mainly due to two adversary coalitions advocating legislative arrangements to accommodate respective spatial claims. The stability in industrial and aircraft noise policy subsystems is explained by 'balanced' coalitions and a dominant economy coalition, respectively. We identified the (only) path to policy change in Dutch noise policy to be cross-coalition learning in which 'policy brokerage' might be crucial. We conclude with some reflections on the use of ACF in empirical research and the role of professional forums and institutional arrangements in stability and/or change in policy subsystems.

3.1 Introduction

Noise is a significant environmental health problem, e.g. causing cardiovascular problems and disturbing sleep (WHO, 2011). Compared to other environmental stressors such as air quality and soil pollution, noise exposure presents an increasing trend due to, according to the European Commission, "urbanisation, growing demand for motorized transport and inefficient urban planning […]" (European Commission, 2011, p. 2).

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[10] This article was published in the Journal of Environmental Planning and Management. The full reference is: Weber, M., Driessen, P.P.J., Schueler, B.J. and Runhaar, H.A.C., 2012. Variation and stability in Dutch noise policy: an analysis of dominant advocacy coalitions, Journal of Environmental Planning and Management, 56(7), 953-981.

Since the late 1970s noise policy has been implemented in the Netherlands by complex 'technocratic' regulation, noise indicators and limit values. Noise from road and railway traffic, for example, is regulated by the Noise Abatement Act, whereas the Environmental Management Act regulates noise from industrial activities. Noise limits are set, defining various noise levels from road traffic, railway traffic and industrial areas at the façades of houses, to be adhered to in the planning of new infrastructure or houses. On the other hand, aircraft noise is regulated by the Aviation Act, through noise limits at contours around the airport, and restrictive land-use policies defining the maximum numbers of dwellings within adjacent areas.

Noise limits were originally defined to counter adverse health effects such as annoyance and sleep disturbance due to long-term exposure to high noise levels. Under specific conditions, however, less strict noise limits, involving higher health risks, could be applied. This could be the case in situations where noise mitigation measures are not cost-effective or technically not feasible. Although only meant as an exemption, municipalities frequently apply the less strict noise limits instead of the health-based lower noise limit. In addition, the height of the maximum allowable noise limits has also been discussed. For some years, the limited goal attainment of the Noise Abatement Act, due to the unrestricted increase in traffic, has been criticised. Within this context of the same recurring dilemma of economy versus public health, the three identified policy subsystems show different dynamics in the policy process, despite similar starting points. For example, maximum allowable noise limits for municipal roads have been relaxed, as exemptions were deemed necessary in spatial planning in order to facilitate house building. However, within, for example, the industrial noise policy subsystems, mutual spatial claims have been accommodated without substantial changes in noise limits. Although aircraft noise limits and policy instruments have been frequently discussed, the policy arrangements in the aviation policy subsystem have remained stable for decades.

The research question arises as follows: Which policy dynamics characterise the industrial, traffic and aircraft noise policy subsystems in the Netherlands, during the period 1970-2010? The research question is operationalised in the following empirical questions: What type of change and/or stability can be observed in the (regulative) norms of the industrial, traffic and aircraft noise policy subsystems? How can change and/or stability of this dependent variable, and the variation and differences between the policy subsystems, be explained?

We will not address the institutional fragmentation of noise policy, i.e. the fact that noise norms for the various noise sources are laid down in different acts. Although interesting, it would require a study in itself.

In order to explain variation and stability in noise limits of the noise policy subsystems we will apply the Advocacy Coalition Framework (ACF, Sabatier and Jenkins-Smith, 1993). Policy scholars have long been interested in policy processes, specifically in describing and explaining emergence, changes and stability in policy subsystems. Public policy involves many issues, such as actors, beliefs, power, and institutions. These issues are characterised by complex in(ter)dependencies, which require policy scholars to design and apply conceptual simplifications. The most prominent examples comprise the punctuated equilibrium model of Baumgartner and Jones (1993), Kingdon's multiple streams theory (1995), the policy network approach (Marsh and Rhodes, 1992) and the Advocacy Coalition Framework (ACF) (see e.g. Capano 2009 for a comprehensive review; Sotirov and Memmler, 2012).

Some other approaches are worth mentioning as well, e.g. institutional analysis and development framework (Kiser and Ostrom, 1982) and discourse analysis (Hajer, 1995). Each framework focuses on specific dependent and independent variables and illustrates conditions explaining policy change or stability. Several empirical studies have applied two or more of these approaches, offering complementary insights into a policy process (Meijerink, 2005; Hysing and Olsson, 2008; Mortensen, 2007; Albright, 2011). However, ACF is (still) one of the most widely applied frameworks in policy process research today as it is applicable to various policy domains and comprises most elements of the other mentioned policy process theories and frameworks (Sobeck, 2003; Weible et al., 2009; Weible et al., 2011; Sotirov and Memmler, 2012). The advantage of ACF, or rather considering epistemological and theoretical choices in line with Capano (2009, pp. 13-18), is that macro-, meso- and micro-levels are considered. Analysing noise policy in the Netherlands, ACF provides the required level of abstraction regarding multi-level government, addressing both national and local administrative levels. A second argument for applying ACF is the fact that the framework seems suitable to explain both policy stability and policy change. Although ACF distinguishes between different types of change, such as incremental and radical, in the specific case of Dutch noise policy its explanatory factors for stability or incremental change will be of the utmost interest (Weber et al., 2011).

Advocacy coalitions, the ideas and beliefs competition and policy learning cf. ACF will be useful in understanding the dynamics in noise limits in the three identified noise policy subsystems. With our analysis we intend to contribute to a better understanding of noise policy in general, and of the stability and/or change and variation in (regulative) noise limits. We hope to contribute to ACF *empirical* literature as well by applying ACF as a conceptual framework.

The remaining of this paper is organised as follows. After this introduction, an overview of ACF as a theoretical framework is presented and ACF concepts are employed to further elaborate on this empirical case. In this analysis we focus on how advocacy coalitions are explanatory for noise policy subsystem variation, and change or stability in (regulative) noise limits. We summarise our main conclusions regarding this empirical case and the application of ACF as theoretical framework.

3.2 Advocacy Coalition Framework

3.2.1 A theoretical framework

Literature suggests that public policy is developed in complex, interdependent political environments in which a variety of actors interact in the context of institutionalised beliefs and arrangements. Building upon Paul Sabatier's view on policy implementation and the role of technical information in that process, the Advocacy Coalition Framework (ACF) was developed in 1988. It was somewhat revised in 1993 by Sabatier and Jenkins-Smith in order to simplify this complexity of public policy by focusing on policy learning, belief and policy change (Sabatier and Weible, 2007). Theoretical revisions to the ACF have been published in Sabatier and Jenkins-Smith (1999) and Sabatier and Weible (2007). As mentioned in the introduction, ACF provides a theoretical approach on three levels, or 'foundation stones' which according to Sabatier and Weible (2007, pp. 191-192) are the following: (1) a macro-level assumption that most policymaking occurs among specialists within a policy subsystem but that their behaviour is affected by factors in the broader political and socio-economic system; (2) a micro-level 'model of the individual' that is drawn heavily from social psychology; and (3) a meso-level conviction that the best way to deal with the multiplicity of actors in a subsystem is to aggregate them into 'advocacy coalitions'.

Policy subsystems are characterised by both a functional/substantive dimension, for example noise abatement policy; and a territorial one, for example the Netherlands (Sabatier and Weible, 2007). The ACF assumes that actors within a policy subsystem can be aggregated into several (usually two or three) advocacy coalitions, and most policy subsystems are characterised by one dominant advocacy coalition and one or more minority advocacy coalitions (Meijerink, 2005; Sabatier and Weible, 2007; Hysing and Olsson, 2008). These actors from "various governmental and private organisations will cooperate in advocacy coalitions that both (i) share a set of normative and causal beliefs and (ii) engage in a nontrivial degree of coordinated activity over time" (Sabatier and Jenkins-Smith, 1999, p. 120). As these actors hold strong beliefs, which are translated into the policy process, Sabatier developed a three-tiered model of a belief system. At the top of it lie deep core beliefs, in the middle of the hierarchy are policy core beliefs, and at the bottom are secondary beliefs (Weible et al., 2009). Deep core beliefs are the broadest of the beliefs, and most stable over time. Deep core beliefs include basic ontological and normative beliefs, for example liberal and conservative beliefs, the proper role of government vs. markets in general, and about who should participate in governmental decision-making (Sabatier and Jenkins-Smith, 1999; Sabatier and Weible, 2007). Policy core beliefs are considered 'the glue' that holds coalitions together as they represent basic normative commitments to and perceptions of the policy subsystem problem definition, the causal mechanisms and the appropriateness of institutional arrangements to deal with this problem. Sabatier and Jenkins-Smith (1999) defined 11 components of policy core beliefs, being basic value priorities; groups whose welfare is at risk; overall seriousness of the problem; basic causes of the problem; distribution of authority between government and market; distribution of authority among levels of government; policy instruments preferences; methods of financing; ability of society to solve the problem; participation of public versus experts versus elected officials; policy core policy preferences. Sabatier and Weible (2007, p. 195) stated that "operationalizing two or three of these policy core beliefs is sufficient to identify at least two advocacy coalitions". Finally, compared to the policy core beliefs, secondary aspects of the belief system are more substantively and geographically narrow in scope and more empirically based. Consequently, according to the ACF, the secondary beliefs are most likely to change over time due to new data, experiences or policy learning.

Advocacy coalitions and their belief analysis bear strong resemblance to the concept of discourse coalition and the theoretical framework of discourse analysis (Hajer, 1995). The latter identifies narrative storylines used by policy coalitions to interpret and give meaning to phenomena, and courses of action in concrete social contexts. Both theories have their merits, and can be applied in parallel (see e.g. Winkel et al., 2011 and Fischer, 2003 who provided some critical reflections on ACF). According to Fischer (2003), a fundamental issue is the technocratic and scientific understanding of policy beliefs, policy learning and policy change of ACF, characteristic of an empiricist approach. Whereas social-constructionist discourse analysis emphasises the specific contexts of storylines and the role of credibility, acceptability and trust of actors within the discourse coalition. As such, analysis of beliefs in an ACF approach differs from the analysis of narratives applying discourse analysis. However, in this paper ACF is applied to analyse policy stability and/or change of "established but contested conceptions" of the technocratic policy domain and noise problem in the Netherlands (Fischer, 2003, p. 113).

The ACF holds that advocacy coalitions and policy subsystems remain stable over time as actors seek alliances with people holding similar policy beliefs, and share strategic political resources, such as formal authority, finances and information. Political conflicts are assumed to be mediated by 'policy brokers', who "are viewed as a distinct group of actors being in positions of formal authority and primarily interested in finding compromise among the adversarial stakeholder coalitions to de-escalate conflict" (Sotirov and Memmler, 2012, p. 53; Sabatier and Jenkins-Smith, 1999).

The two originally identified paths to policy change of the ACF, i.e. external events and policy-oriented learning, have been subject to theoretical debate. External events or 'shocks', such as changes in socio-economic conditions, governing coalitions, and policy decisions from other subsystems, can foster change in a subsystem. For example, redistributing resources or opening and closing venues can lead to changing policy core beliefs through substitution of the previously dominant coalition by a minority coalition (Sabatier, 1998; Sabatier and Weible, 2007). These external disturbances are "a necessary but not sufficient condition for major policy change within a policy subsystem" (Sabatier and Weible, 2007, p. 198). The second path to policy change is policy-oriented learning, which is defined as "relatively enduring alternations of thought or behavioural intentions that result from experience and/or new information and that are concerned with the attainment or revision of policy objectives" (Sabatier and Jenkins-Smith, 1999, p. 123).

As policy core beliefs are rather resistant to change, policy-oriented learning is mainly identified regarding the more susceptible secondary aspects. As a consequence policy-learning results in a minor or incremental policy change, for example, incorporating secondary aspects of belief systems of opposing coalitions or (new) scientific and technical information. This frequently is part of strategies to influence the behaviour of other coalitions and actors, in order to realise policy objectives.

The latest revision of the ACF identified two other paths to policy change, which are internal subsystem events and cross-coalition learning through "professional forums" (Weible et al., 2009). Internal events occur within the policy subsystem mainly as a result of the recognition of failures of the existing policy or advocacy coalition (Sabatier and Weible, 2007, pp. 204-205). Cross-coalition learning, that is policy-oriented learning *between* advocacy coalitions, occurs through negotiated agreements among two or more coalitions. The ACF argues that policy change through cross-coalition learning occurs when conflict is low and professional forums are present. In these forums members of opposing coalitions acknowledge that continuation of the – conflict driven – situation is unacceptable.

Summarising a large number of applications of ACF, Weible et al. (2009, p.134) conclude that "[t]he most commonly tested hypotheses involve policy change, learning, and coalition stability". However, the authors also recognise that (p. 349) "[w]ith applications and recognition come criticisms", such as that ACF overlooks causal mechanisms linking explanatory variables to outcomes, i.e. policy stability or change (Mintrom and Vergari, 1996; Nohrstedt, 2011; Albright, 2011; Matti and Sandström, 2011). We similarly found there was limited research on stability in advocacy coalitions and beliefs resulting in variation of related policy subsystems. As such we hope to enhance the application of ACF in public policy research by adding empirical reflections from a comparative, longitudinal study of noise policy (e.g. Zafonte and Sabatier, 2004; Mortensen, 2007).

3.2.2 Research method and materials

In this paper, Dutch noise policy will be used as an empirical case to study stability and/or change of (regulative) noise limits in three noise policy subsystems, focusing the ACF lens in a longitudinal and comparative approach. The relatively long history of noise policy provides a data source to evaluate actors' policy positions over time (cf. Zafonte and Sabatier, 2004).

The period of empirical analysis is from 1990-2010. As mentioned before, noise policy in the Netherlands is implemented differently for specific noise sources, such as road traffic, aircraft and industrial activities, which makes a comparison specifically interesting. This also creates the opportunity to analyse variation and differences between policy subsystems.

The primary research methodologies are desk research, document analysis and interviews with experts. In order to define advocacy coalitions, we identified the key organisations and individuals involved in noise policy subsystems in the Netherlands through in-depth interviews with top civil servants, researchers, and environmental and noise abatement NGOs. The interviews comprised open questions, with the aim of collecting data relevant for the theoretical framework, focusing on the main concepts of ACF and the main phases in Dutch noise policy since the late 1970s. During the interviews the snowballing technique was applied, i.e. asking interviewees to identify additional stakeholders until no new names were mentioned. As a result, in total 25 interviews were conducted with governmental actors at national, regional and local level, industry association and NGO representatives, and scientists/researchers. Following this, we examined laws, (minutes of) governmental and parliamentary debates, policy documents, reports and other secondary literature. The aim of the secondary desk research and the interviews was to delineate noise policy subsystems and the advocacy coalitions based upon six of the eleven components of policy core beliefs as identified by Sabatier and Jenkins-Smith (1999), i.e. basic value priorities, groups whose welfare is of greatest concern, seriousness of the problem, cause of the problem, distribution of authority, and policy preferences (cf. Weible, 2007; Hysing and Olsson, 2008). The analyses and conclusions, based on documents and interviews, were then reviewed by the representatives from all advocacy coalitions. This review did not result in major revisions. The interviewees remain anonymous, due to their positions in current political discussions on new noise legislation and regulative noise limits.

The next section contains a brief introduction of the Dutch noise policy from its infancy until the 1990s, in order to present the actors and their beliefs. As such, the overview grounds the application of the advocacy coalition framework on the three noise policy subsystems in the consecutive sections.

3.3 General overview of noise policy in the Netherlands

3.3.1 Noise legislation: the definition and implementation phase of the 1970s and 1980s

Increasing mechanisation after the Second World War led to concern amongst researchers, and subsequently policy makers, about the effects of noise exposure on public health. In the mid-1950s, aircraft noise and problems that were foreseen in fitting an expanding airport into its residential environment laid the basis for noise (annoyance) policy, implemented in 1958 through the Aviation Act. In the following years, research showed that approximately 35 % of inhabitants in the Netherlands were regularly annoyed by road traffic, which resulted in the formulation of the Noise Abatement Act.

The implementation of noise regulation fits the discourse of the 1970s, when consensus grew on the necessity of limits to environmental emissions in order to prevent adverse health effects (e.g. memorandum Environmental Hygiene Norms of 1976). Nevertheless, discussions arose on the financial consequences of the noise legislation. The Ministry of Public Health and Environment was a strong advocate of the 'polluter pays principle' and originally proposed that noise mitigation measures should be financed by the municipalities responsible for spatial planning and building houses, and the road authorities responsible for infrastructure planning. The industrial sector lobbied for 10 dB higher noise limits, as they feared high investments in mitigation measures. In consultation with the Ministry of Economic Affairs, the environment minister decided to adjust the draft legislation and leave it to the various actors to decide who should bear the costs. In addition, finances were allocated from the governmental budget for specific situations in which "financial support is needed in order to prevent serious economic impacts due to the immediate implementation of very stringent limits or very high levies" (TK, 1976). During the following decades, the 'economy versus health' dilemma, in this example 'defining noise limits and financing mitigation measures', was a recurring topic in the noise policy domain.

In 1979 the Noise Abatement Act was approved regarding road traffic noise and industrial activities. Rail traffic noise regulations were added in 1987, after sufficient research data regarding health effects had been gathered. Discussions during the incorporation of railway traffic noise in the Noise Abatement Act mainly concerned the values of noise limits.

The Ministry of Traffic (MoT) and the railway sector stated that railway traffic is less annoying than road traffic noise and underlined the need to have railway stations in city centres to facilitate sustainable transport. However, the Minister of Environment opposed this, stating that the discussions were mainly financial discussions, as the noise limit would define the number of houses to be insulated by the railway sector. A compromise was found by granting a 5 dB higher limit value than that for road traffic noise.

At the end of the 1980s the Act and its implementation were criticised by Parliament, as practice illustrated that traffic had increased autonomously without the Act requiring enforcement of applicable noise limits. In addition, many municipalities generally applied the Act's maximum allowed noise limits for residential planning, instead of the lower preferred noise limit. The Minister of Environment recognised that municipalities were primarily prioritising spatial planning over environment and public health (TK, 1989). Nevertheless, these remarks and worries were smothered in societal and parliamentary discussions on the economy, the environment and legislation. At this time Schiphol Airport was designated one of the national 'Mainports' by the government, with a special status due to its vital contribution to the Dutch economy (Boons et al, 2010). Based upon this political-administrative statement, operationalised in the National Spatial Planning Document (1989) and the Planning Document Schiphol and Surroundings (1991), the airport further expanded its activities. Mutual spatial claims from adjacent municipalities and the airport were 'solved' by introducing the "Mainport and environment" discourse in which the combination of economy and environment was regarded as a positive-sum game (Kroesen and Bröer, 2009).

3.3.2 The 1990s: a new phase in noise legislation is introduced

In the 1990s, the Ministry of Economic Affairs initiated the so-called Marketisation, Deregulation and Quality project (in Dutch: MDW-project) on the improvement of existing environmental legislation. As by that time the Noise Abatement Act had been in place for some years, the Ministry of Environment (MoE) proposed to assess the noise legislation as part of the MDW-trajectory. A working group consisting of representatives of the state government, provinces, municipalities and the industry association addressed, in its main criticism, the following characteristics of the existing noise legislation: (i) the centralised norm setting and complex system of different limits per noise source; (ii) division of tasks and responsibilities resulting in time-consuming procedures; and (iii) limited integration of noise into spatial planning (TK, 1986; Wessel and Winter, 1989).

Regarding road, railway and industrial noise the working group proposed to develop new legislation to be incorporated in the Environmental Management Act [11], ensuring decentralised norm setting at municipal level in line with the current government policy on decentralisation. At national level, the guidance norms, i.e. maximum noise limits based upon health effects, should 'limit' the local level policy freedom to define local noise limits. As such, national policy goals on reduction of the percentage of inhabitants annoyed by noise would be ensured.

In October 1996, the Parliament's environment commission discussed the proposal and letters received on the formal positions of the various organisations involved in the working group. Interestingly, although these organisations were represented in the working group that prepared the proposal for new noise legislation, support varied highly. The umbrella organisation of the municipalities (VNG), advocate of numerous decentralisation initiatives of the Parliament, supported the proposal. In addition VNG stressed the need to strengthen noise source policy by the national government. On the other hand, the provinces (organised in the umbrella organisation IPO) proposed to maintain the existing noise limits of the Noise Abatement Act and to define provincial responsibilities on assessment of local noise policy. Similar hesitance regarding limited local level expertise and the risk of non-transparent local norm setting is found in the comments by the industry association VNO-NCW and NGOs. After this consultation, MoE established the MIG (Dutch acronym for Modernisation of Noise Legislation) project organisation, consisting of a project team of representatives from the ministries of Environment, Traffic and Economic Affairs, and both umbrella organisations of municipalities and provinces. Other actors, such as workers' and industry associations, science, consultancies and NGOs, were involved in a 'consultation group'. In May 1998 the report Nota MIG was published, subtitled 'a new steering philosophy for future noise policy'. The core of MIG was the definition of noise limits, the reduction of inhabitants annoyed by noise, and the definition of noise abatement measures at each administrative level.

[11] The Environmental Management Act (in Dutch: Wet milieubeheer) was replaced by the Act on General Provisions for the Environment

Noise limits were defined as area specific, maximum allowed noise levels for road, railway and industrial noise. These had to be adhered to in spatial plans, environmental permits and other initiatives having an acoustical impact. Limits could be defined by the municipalities, although restricted by national guidance limits and based upon municipal noise policy on infrastructure, spatial and environmental permitting activities. Similar requirements were proposed for the provinces regarding infrastructure, larger industrial areas and nature areas.

In September 1998, the newly appointed Minister of Environment discussed the MIG proposal in the Parliament's environment commission, which had – again – received letters from VNG and IPO, the industry association and NGOs. The main topic in the following discussions was the impact of the proposed noise legislation on spatial claims for infrastructure (MoT), for residential housing (municipalities) and for industrial activities (industry association). Although doubts on the proposed legislation remained within various political parties of the environment commission, Parliament embraced the outline for decentralisation of noise policy. The MIG project groups continued their work on drafting new legislation.

This section's empirical overview presented the main actors, i.e. national, regional and local administrations and their respective umbrella organisations; politicians and Parliament; scientists / researchers; industries, Schiphol airport and their umbrella organisations; and environmental NGOs. Some of these actors are active in all noise policy subsystems, such as the MoE and municipalities, whereas industries and the airport act in one subsystem, namely industrial noise and aviation noise policy subsystem respectively. This section also presented the main policy core beliefs, in which the prioritisation of economy vis-à-vis environment and public health is a recurring theme. Actors differ in their 'emphasis', or rather interests, e.g. road and railway authorities and industries underlining these sectors' economic priorities. NGOs urged for environment and public health to be prioritised. In addition, different steering philosophies were identified, such as the local policy freedom and decentralised norm setting advocated by municipalities. Policy core beliefs 'translated' into noise limits; e.g. low, stringent noise limits inhibit economic growth, but on the other hand prevent negative health effects.

In the following sections these actors and their beliefs are further elaborated for the period 1990 – 2010, and change and/or stability in (regulative) noise limits for the three noise policy subsystems is analysed from an ACF perspective.

In Table 3 below, various noise limits and changes in noise limits during the last two decades are summarised. Preferred noise limits represent limit values that, from a health perspective, should not be exceeded. However, in certain circumstances higher noise levels are accepted up to the maximum noise limit, and under the condition that defined noise levels inside dwellings are guaranteed. Finally, higher noise limits are applied for reconstruction of built-up areas, again under the condition that noise levels inside dwellings meet specific limits.

Noise limits and changes from 1990 - 2010

	Industries (in LAeq)				Highways and major roads			Municipal roads			Railway traffic		Aircraft (in Ke)	
	Preferred	Maximum	Rebuilding	Sea port	Preferred	Maximum	Rebuilding	Preferred	Maximum	Rebuilding	Preferred	Maximum	Non restricted zone	Restricted zone
1990	50	55			50	55		50	60/65	(70)	60	73	20	35
1993			65	60						70				
1998							60/65							
2000											57	70		
2007					48	53	58/63	48	58/63	68	55	68		
2008													20	35 Ke / 47 Bkl
2009													48	56

Table 3: Noise limits for industries, road traffic, railway traffic and aircraft in the period 1990 - 2010

3.4 Application of the ACF framework on three noise policy subsystems

3.4.1 Industrial noise

Since the formulation of the Noise Abatement Act, industries, represented mainly by the Ministry of Economic Affairs and the industry interest group VNO-NCW, have been involved in the noise policy domain. Although initially industries discussed the financial consequences of complying with limits, noise zoning was regarded as a transparent and feasible instrument as zoning clearly defined the 'acoustic space' for future industrial developments. This opinion has endured, and the noise limits defined in the Noise Abatement Act have been unchanged since the Act entered into force. An exception is the introduction of exemptions regarding rebuilt houses and the so-called sea harbour norm. The latter was initiated locally in the early 1990s and addressed the typical noise policy dilemma of economic growth versus spatial planning. Residential planning in Rotterdam was restricted by noise from large industrial and harbour areas in and nearby the municipality. Consequently, the maximum allowable limits for industrial noise could not be met. The solution proposed by the municipality was to introduce the sea harbour norm for building new houses in existing residential areas, allowing 5 dB increase of the maximum allowable limit of 55 dB up to 60 dB (TK, 1991). The main issue in the discussions between the industries and the municipality was on possible mutual spatial claims and costs for mitigation measures. Nevertheless, despite the urging of VNO-NCW for strict regulation on applicability of the norm, the Minister of Environment formally adopted the higher noise limit (EK, 1992). Some years later, in 1998, the application of the sea harbour norm was broadened, without any further discussions, to situations where new houses are planned as an extension of residential areas. The main argument for this change was a decision of the Council of State on the interpretation of spatial planning 'within' or 'adjacent' to residential areas (TK, 2004). These mutual spatial claims from industrial activities and residential planning were not new and had been discussed since the 1980s when the Noise Abatement Act entered into force. In addition, national policy goals regarding residential housing and the call for compact city planning resulted in prioritising building dwellings over health and noise limits (Weber and Driessen, 2010). In order to restrict "the broader than originally planned interpretation of the concept 'rebuilt houses' [by provinces and municipalities]" the Minister of Environment defined higher noise limits from industrial activities as well as road traffic, to be applied in rebuilding dwellings in residential areas in the Noise Abatement Act (see Table 3; TK, 1991, p. 13).

In line with the discussions described above, during the MIG trajectory the industry sector mainly focused on financial constraints due to mitigation measures or restricted spatial claims. Another topic considers the proposed policy freedom to define local noise limits at municipal level. VNO-NCW repeatedly underlined its request for nationally defined noise limits instead of – a variance of – municipal or provincial (immission) norms for industrial areas and individual industries' (emission) norms in environmental permits. The industry sector's position was supported by the Ministry of Economic Affairs, stating that decentralisation of noise policy at municipal level should not result in prioritisation of residential housing above economic growth (MMG, 2002). Additional criticism was expressed by the Ministry of Defence, the competent authority for military activities, as well as IPO. Although using different arguments, they all proposed that the Noise Abatement Act should not be replaced by new legislation. The Ministries of Economic Affairs and of Defence feared an increase of administrative burden in the sectors involved. The provinces underlined the positive effects of the existing legislation and the presumed flexibility at local administrative level. However, due to doubts and criticism regarding the proposed legislation and the fall of the Kok government during the summer of 2002, decisions on the draft noise legislation were postponed.

The discussion on spatial claims by industry and residential housing gained importance again during the following years. In 2002 the Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise (also known as the Environmental Noise Directive, commonly abbreviated END) came into force. One of the main goals of the END was the implementation of a harmonised noise indicator, the L_{den} (noise level during day, evening and night). This indicator has to be applied in strategic noise maps and noise action plans for road and railway traffic, aircraft and industrial noise. The END was implemented in Dutch noise legislation in 2007, through changes in the Noise Abatement Act and Air Traffic Act (TK, 2003). The subsequent phase in the legislative review consisted of some minor changes of the Noise Abatement Act, reflecting practical experience at regional and local administrative level, as well as case law of the Council of State. The requirement to apply L_{den} for industrial noise, however, was postponed after discussions with various actors from industry, provinces and municipalities. As substitution of the existing noise indicator L_{Aeq} by L_{den} would result in spatial and financial impacts. Again, as in the discussions on the sea harbour limit, all actors became involved in a 'spatial discourse' as the introduction of L_{den} was expected to result in 'new space' for either industrial activities or residential housing.

Therefore the decision on the introduction of L_{den} for industrial noise was postponed to the next phase of the modernisation of the noise legislation, and is currently one of the issues of discussion in the Swung trajectory, the successor of MIG (TK, 2004).

3.4.2 Analysis from an ACF perspective

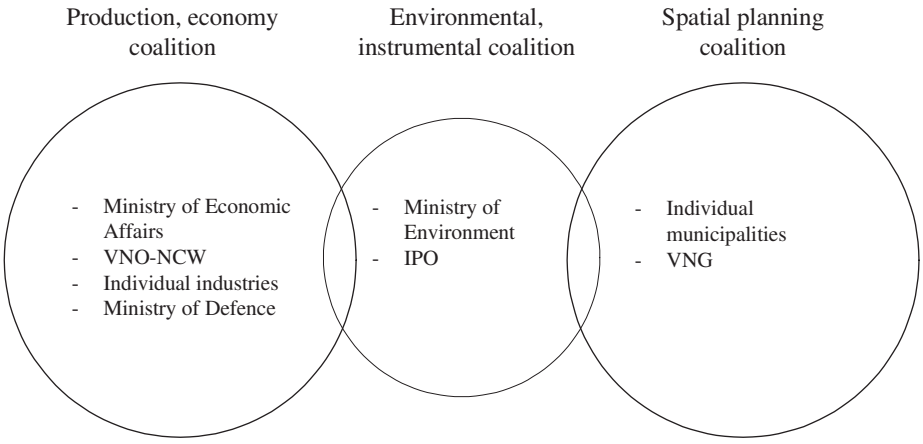

Figure 5: Advocacy coalitions within the Dutch industry noise policy subsystem

Within the industry noise policy subsystem three advocacy coalitions can be identified, based upon their respective policy core beliefs (see Figure 5 and Table 4). Two of them, i.e. the production coalition and the spatial planning coalition, are the main coalitions. Whereas the environmental coalition, i.e. MoE, as the formal juridical authority, is intermediating and facilitating by (re)writing the Noise Abatement Act. The basic value priority within the production coalition is the economic importance of industries. This should be accommodated through noise zoning, supporting and safeguarding spatial claims from industries against municipal claims for residential areas. The second coalition consists of the local administrative level, which strongly advocates its responsibility for housing its inhabitants.

In addition to the prerequisite of sharing policy core beliefs, advocacy coalitions require "a nontrivial degree of coordinated activity over time" (Sabatier, 1998, p. 103). As we will also show for the traffic noise policy subsystem, the various identified advocacy coalitions have been cooperating since noise legislation came into force. Within the spatial coalition – which exists in both the industry noise domain and the traffic domain – the umbrella organisation of municipalities, VNG, has had a long-term relationship with individual municipalities, especially the largest municipalities of Amsterdam, the Hague, Rotterdam and Utrecht, due to their specific interests and expertise. Knowledge and information are shared by the delegated civil servants, reports are drafted in close collaboration and human resources are made available by several municipalities to be involved in working groups and steering groups. Similar coordinating activities and sharing of knowledge and human resources is seen within the economy advocacy coalition. Representatives from industries and VNO-NCW are highly involved with officials within the Ministry of Economic Affairs acting in the interest of Dutch industries.

Policy core beliefs of Dutch industrial noise policy subsystem			
Policy core component	Production, economy coalition	Environmental, instrumental coalition	Spatial planning coalition
Basic value priorities	Economic importance of industry	Protection of public health	(Economic) Importance of housing
Groups whose welfare is of greatest concern	Industry, workers and society in general	Present and future generations	(Municipal) Residents
Seriousness of problem	Noise emission and immission is limited through zoning and technology	Locally negative health effects should be reduced	Noise emissions conflict with spatial planning
Cause of problem	Spatial planning allowing housing nearby industry	Industries non compliant with permit and/or ineffective zoning by local administration	Expanding industry
Distribution of authority	Market is able to select and implement techniques. Government should secure level playing field	Government is responsible for protecting public health and providing policy instruments	Municipalities are administrative level suited best for local decision making
Policy preferences	National defined regulations and noise limits	National defined noise limits and decentralised implementation of regulation	Local level policy freedom in defining noise limits

Table 4: Policy core beliefs of the coalitions within the Dutch industry noise policy subsystem

As illustrated above, the only change in industrial noise regulations during recent decades concerned the incorporation of higher noise limits for residential redevelopment areas in the early 1990s. A possible explanation for this stability is that in order to accommodate mutual spatial claims and division of responsibilities, minor legislative changes could be agreed upon. Or as an interviewee stated, "Industry is confident with the instrument of zoning as currently applied. In addition, nationally defined noise limits are preferred to discussing local set limits with 500 municipalities" (MMG, 2002, p. 12). The regulative adjustments reflected secondary beliefs and were not legal authority driven, nor did they change resource distribution between and within advocacy coalitions. The discussion on, and acceptance of, legislative changes were facilitated through institutional arrangements, such as working groups chaired by the 'neutral' MoE, which had formal legal authority regarding industrial noise legislation. The following text perfectly illustrates the instrumental position of the MoE and the beliefs of the economy and spatial planning advocacy coalitions:

> *"In September 2003, a workshop has been organised, where commitment to the introduction of L_{den} for industrial areas was found. Subsequently, attempts were made to integrate the results of the workshop in legislation. A relevant issue to be addressed is the 'new space' becoming available due to the conversion of L_{Aeq} to L_{den}. Thus, conditions to be set are to prevent one-sided use of this new space by either industry or housing. Secondly, costs should be limited for all actors involved. And thirdly, existing noise zones should be kept. In the meantime we [The MoE] have learnt that meeting these requirements is legally and technically very complex. Therefore, the discussion on industrial noise policy will be postponed to the next phase of revision of legislation."* (TK, 2004, p. 16).

In contrast to other noise policy subsystems, as we will illustrate below, the industrial noise policy subsystem is a typical uncontested subsystem. Both advocacy coalitions' actors, i.e. the industrial sector and the municipalities, "manage to maintain a low level of attention from 'outsiders', and the policy under consideration will under these circumstances be incremental and predictable" (Mortensen, 2007, p. 374). Neither society nor politics play a part in the policy subsystem and a relatively small number of experts discuss and define regulations in a positive sum, consensus-oriented instrumental approach. Or, applying the ACF lens, within the industrial noise policy subsystem, stability in (regulative) noise limits is explained by (i) collaborative advocacy coalitions, (ii) with stable policy core beliefs and secondary beliefs.

The minor changes in noise limits were discussed in working groups, a characteristic 'institution' (i.e. individuals applying rules, norms and strategies). These 'institutions' are frequently found in environmental policy in the Netherlands, as we will also illustrate in the traffic noise policy subsystem. The institutional arrangements, however, differ from the 'professionalised fora' as defined by Sabatier and Jenkins-Smith (1993, 1999). In these for a, policy-learning or negotiated agreements are achieved between opposing coalitions resulting in minor (i.e. in secondary beliefs) or major (i.e. in policy core beliefs) policy changes. In the industrial noise policy subsystem, for example, actors very infrequently gather, no scientists are involved, practical noise regulation-related issues at regional and local administrative level are discussed, and regulative changes are agreed upon.

3.4.3 (Road and railway) Traffic noise

In the early 1990s, the Parliament discussed the limited effectiveness of the Noise Abatement Act in the prevention of adverse health effects and suggested modernisation of the noise legislation (TK, 1991). Noise limits were considered in new situations, such as (re)construction of a road or residential area. Autonomous increase of mobility and the subsequent increase of noise levels at façades of nearby houses, however, was not regulated. As a result, many houses are exposed to noise levels above the maximum allowable limit and require costly insulation. Underlying this discussion on the limited effectiveness of the regulation, the so-called enforcement gap, a more fundamental disagreement on actors' responsibilities was exposed. However, this discussion was silenced in the 1990s' spatial planning paradigm (prioritising spatial planning as an instrument to address environmental issues). This illustrates the rather strong belief in the effectiveness of the Noise Abatement Act in the prevention and reduction of noise annoyance (TK, 1998). In the opinion of the government, most of the limitations of the Noise Abatement Act, i.e. restrictions on spatial planning by noise limits or procedural requirements, were removed by defining higher noise limits for rebuilt houses along municipal roads (in 1993) and near highways (in 1998) in the Noise Abatement Act (see Table 3). These regulative changes reflect the priority of the economy, i.e. spatial and infrastructural planning, over public health, in this policy subsystem.

By the end of the 1990s the MIG project groups were working on the draft legislation, until a broad stakeholder consultation in April 2000 ended in a long list of possible constraints to the proposed new legislation. VNG, originally one of the advocates of MIG, reconsidered its former support. In line with earlier proposals the MoE suggested implementing so-called noise emission ceilings on highways and railways.

These ceilings limit the noise levels from autonomous or planned increases of traffic. However, according to the municipalities these ceilings would result in significant spatial claims by the MoT, responsible for defining noise emission ceilings along highways and railways. It is noteworthy that the umbrella organisation VNG represents more than 400 municipalities, which posed a difficult task for them in taking a position in policy discussions. As an interviewee stated, "VNG's members were divided, and revision of noise legislation was mainly supported by the large municipalities" (MMG, 2002, p. 12). Interestingly, the MoT was a strong opponent of the proposed legislation due to the fact that this ministry would be (financially) responsible for mitigation measures, such as insulation, low noise pavement and noise barriers. As an interviewee stated in the evaluation of MIG, "management and civil servants of the MoT and the MoE disagreed on MIG and future noise policy" (MMG, 2002, p. 12).

Due to this limited support for MIG, the chair of the working group decided not to continue the project with the current organisational set-up. Following this, the draft legislation was formulated by the MoE, being the formal legislative authority. In February 2001, the main issue in the MIG steering group was considered to be the financial consequences of the proposed legislation. In other words, which actors should be held responsible for the insulation of houses exposed to high noise levels due to the increase of traffic. A month later, the Council of State advised on the draft legislation, reporting its doubts on the necessity for new legislation, as in its opinion the existing Noise Abatement Act functioned well. The Council's doubts had been expressed earlier by Parliament and the provinces, stating that "the 'real' problems of the Noise Abatement Act could be solved through minor adaptations, instead of provinces losing competencies due to the rigorous MIG" (quote of interviewee in MMG, 2002, p. 12). The Council's report and the explanatory report by the Minister of Environment were discussed during the Ministers' council meeting in June 2002. However, this meeting was the last meeting of the outgoing Kok government. At last, due to the long and tense discussions on the financial consequences of the new legislation, the decision on adoption of the Act was postponed. The new Balkenende I government decided to change the Noise Abatement Act in phases during the next few years, as elements of MIG's steering philosophy, such as local policy freedom and national defined maximum noise limits, did not fit the government's strategic agreement on decentralisation, deregulation and simplification (TK, 2002).

Despite the MoE recognising the former goal of decentralising the definition of noise limits at municipal level, the way to achieve this had changed to a less ambitious approach. In the years following the dismissal of the MIG project, the government adopted some minor changes of the Noise Abatement Act, including the implementation of the Environmental Noise Directive. The most prominent change was issued in January 2007 when municipalities were made responsible for defining so-called higher noise values, which before then was the competence of the provinces. Similar to earlier minor changes regarding higher noise limits in 1993 and 1998, this adaptation is characteristic of the instrumental role of MoE. As the memorandum states, "We learned from spatial planning practice that approval of the higher noise value by the province has very limited added value regarding the content of the decision and often results in longlasting procedures. Therefore we [i.e. MoE] decided to devolve this authority to the local administrative level" (TK, 2004, p. 7). Or as the VNG concludes in its position paper: "We are positive about the adaptation of the higher value procedure […] as it will be simplified and be in accordance with current practice" (VNG, 2003, p. 6).

In 2010, the proposal on the introduction of so-called noise production ceilings, limiting the noise emission from highway road and railway traffic, was approved at all governmental levels. The MoT and the provinces, in particular, emphasised the transparency of the proposed legislation; the other actors praised the enforceability of the method proposed. Nevertheless, the height of the production ceilings, or the situation-specific noise limit, was discussed by the MoT and MoE. As in earlier stages in the traffic noise policy domain, the former's main objective was financially driven. The position of the latter, on the other hand, could be mainly characterised as fitting in a 'spatial planning' discourse and, to a lesser amount, 'environmental health' discourse. The response of the Secretary of Environment in discussion with Parliament illustrates this:

> *"Considering annoyance and negative health effects, I hold the opinion that noise limits may not be changed [...] Budgets are relevant regarding the timeframe considered for achieving policy goals, but not regarding noise limits […] In the past we were convinced that infrastructure and spatial planning would solve noise problems, […] but practice proves that noise levels have increased far above preferred noise limits"* (EK, 2006, p. 4).

3.4.4 Analysis from an ACF perspective

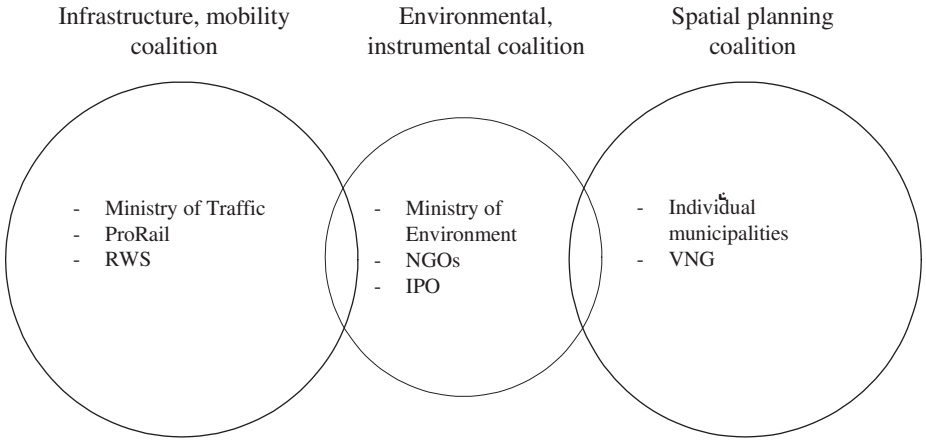

Figure 6: Advocacy coalitions within the Dutch traffic noise policy subsystem

Within the traffic noise policy subsystem three advocacy coalitions can be identified, based upon their respective policy core beliefs (see Figure 6 and Table 5). The infrastructure coalition and the spatial planning coalition are the two main adversary coalitions. The former, consisting of the MoT and its departments for railways (ProRail) and highways (RWS), advocates the economic importance of transport and infrastructure. As the Noise Abatement Act lacked an 'enforcement' requirement in those situations where traffic increased without infrastructural changes, coalition actors felt limited financial restraints. However, the proposed introduction of noise production ceilings and uncertainty about new noise limits could result in a more costly legislative system. On the other hand, the spatial planning coalition consisting of local authorities lobbied for policy freedom in defining noise limits for housing, instead of nationally defined maximum allowable limits and (juridical, time consuming) procedures for higher limits.

Similarly to the industry noise policy subsystem, an environmental coalition can be identified, consisting of the MoE holding formal responsibility for the Noise Abatement Act. In the traffic noise policy subsystem, however, other actors were also participating in the environment advocacy coalition. During the stages of development of new legislation, NGOs were involved specifically, as strong advocates of noise limits based upon environmental health endpoints and restriction of 'uncontrolled' spatial planning. This secondary belief fitted best with the environmental focus of MoE. But more importantly, the latter, holding formal legal authority, would increase the chance of coalition success and, as such, would incorporate the NGOs' value priorities.

Recently, we have seen changes in the composition of advocacy coalitions; some policy core beliefs, and specifically secondary beliefs, were reformulated due to the review of the Noise Abatement Act. In addition, some actors moved towards other coalitions (see Figure 7). The provinces, having not taken any specific position during the 1990s, moved towards the infrastructure coalition, advocating similar interests regarding the definition of noise limits (i.e. noise production ceilings), the selection of noise mitigation measures, and the cost-benefit methods to be applied in assessing mitigation measures. The main argument applied by this 'new' infrastructure, economy coalition is that in order to stimulate and facilitate transport and mobility, less time-consuming legal procedures are needed. The proposed system of noise production ceilings meets this requirement. On the 'opposite side', since 2010 the spatial planning coalition seems to have redefined elements of its policy core beliefs incorporating 'quality of life' in their former core belief on local policy freedom. Although the main policy core beliefs of both coalitions can still be characterised as a 'spatial planning and economy' storyline, other policy core values, such as transparency and accountability are also addressed.

Policy core beliefs of Dutch (road and railway) traffic noise policy subsystem			
Policy core component	Infrastructure, mobility coalition	Environmental, instrumental coalition	Spatial planning coalition
Basic value priorities	Economic importance of mobility and thus infrastructure	Protection of public health	(Economic) Importance of housing
Groups whose welfare is of greatest concern	Transport sector, workers and society in general	Present and future generations	(Municipal) Residents
Seriousness of problem	Noise emission and immission is limited through zoning and technology	Negative health effects should be reduced	Noise emissions conflict with spatial planning
Cause of problem	Spatial planning allowing housing nearby highways and railways	Not regulated increase of traffic and increase of inhabitants and houses nearby infrastructure	New infrastructure and increase of traffic
Distribution of authority	Road and railway authorities are able to select and implement techniques.	Government is responsible for protecting public health and providing policy instruments	Municipalities are administrative level suited best for local decision making.
Policy preferences	Policy freedom for road and railway authorities in defining noise limits	National defined noise limits and decentralised implementation of regulation	Local level policy freedom in defining noise limits. Government defined (low) emission limits for traffic.

Table 5: Policy core beliefs of the coalitions within the Dutch traffic noise policy subsystem

Regarding coordinated activity in this noise policy subsystem we see cooperation within as well as between the three identified advocacy coalitions. In the 1990s, advocacy coalitions were mainly internally focused. Consequently, adversarial positions of the infrastructure and the spatial planning coalitions were maintained, supported by scientific and technical reports from consultants and scientific institutes, underpinning the opposing positions and arguments (in line with Weible et al., 2009). In the following years, however, both adversary coalitions became involved in the review of legislation led by the MoE. The latter acted as intermediary, e.g. in establishing working groups which are responsible for designing new regulations on noise production ceilings and defining noise limits for roads, railways and houses. In contrast to the industrial noise policy subsystem, these working groups can be characterised as professionalised forums, cf. Sabatier and Jenkins-Smith (1993, 1999). Participants of these forums are the legal responsible authorities regarding noise policy, i.e. all governmental levels. Representatives of the advocacy coalitions discuss adjustments in regulative noise limits and regulation, based upon shared knowledge and 'new' insights from scientists as well as consultants.

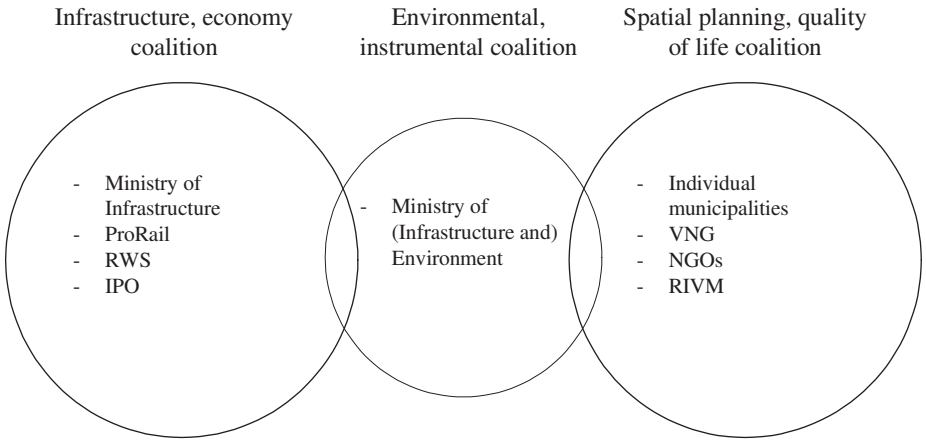

Figure 7: Recent contours of Advocacy coalitions within the 'new' Dutch traffic noise policy subsystem

In addition, the NGOs shifted towards the spatial planning coalition, although not all their policy core beliefs are similar, in order to at least temporarily increase their political influence through these allegiances (cf. Weible et al. 2009, p. 130). As a result, a shift in the secondary beliefs of the infrastructure coalition has recently become evident. In ACF literature, this shift is characteristic of policy learning within a coalition. In addition, current discussions on the noise limits for highway traffic noise and railway noise seem to fit in what Sabatier identified as cross-coalition learning - that is policy-oriented learning between advocacy coalitions. Both formerly adversarial coalitions are negotiating a 'norm and effect neutral' system of noise limits on a consensus-based approach. Recently the Secretary of Environment (2011, p. 5) underlined this approach, stating: "Noise limits for spatial planning will have to be defined in the next stage of the legislative revision. This will be done in close cooperation with municipalities and provinces, and will have to result in neutral effects regarding spatial planning and housing". The ACF argues that policy change through cross-coalition learning occurs when conflict is low and professional forums are present, in which members of opposing coalitions participate, acknowledging that continuation of the conflict-driven situation is unacceptable. All this fits perfectly with the limited progress that has been made during the last two decades in adopting new legislation for traffic noise, which was deemed necessary by both opposing advocacy coalitions. The threat of financial restraints and limited options regarding infrastructural and spatial planning resulted in adversarial advocacy coalitions. These coalitions maintained the existing policy arrangement over many years and restricted legislative changes to minor adjustments of the Noise Abatement Act.

In sum, through the ACF lens, the minor changes in (regulative) noise limits are the result of (i) converging secondary beliefs due to policy-oriented learning, both within and between advocacy coalitions. Whereas (ii) a hurting-stalemate situation and the existence of working groups acting as a professional forum led by MoE provided the necessary conditions for cross-coalition learning, and (iii) resulted in recent changes in policy core beliefs of the former adversarial advocacy coalitions of infrastructure and spatial planning.

3.4.5 Aircraft noise

The 'double ambition' of the late 1980s regarding the aviation sector's growth and the simultaneous improvement of environmental quality supported the formal approval by the Parliament of the new (fifth) runway of Schiphol Airport in 1995, with a strict limitation of the maximum number of air traffic movements (for extensive overviews on Schiphol discourse see Bröer, 2006 and Huys, 2011). However, this limit, laid down in a Planning Key Decision, proved problematic for the airport to comply with and the Parliament decided to have new legislation drafted. In parallel, a temporary platform of the aviation sector and NGOs and its successor, an independent commission of experts, were established. These were asked by the Ministers of Transport and of Environment to advise on the effect-neutral implementation of new legislation and on assessing noise immission levels at the 'enforcement points'. In a second stage, representatives of regional and local administrations were invited to participate, as well as the citizen platform.

According to Huys (2011, pp. 301-302), "for the sector, the inclusion of these public authorities was interesting, as they had to make tradeoffs between the environment and economy, whereas the environmental parties and citizen platform were merely concerned about reducing the (noise) pollution". The new Aviation Act was adopted in 2002, although the commission of experts as well as Parliament had strong doubts regarding the required equivalence of the proposed regulations. The restriction on the number of flights was substituted by a maximum for the total noise emission of the airport's activities. In addition, noise immission levels (using the new European noise indicators L_{den} and L_{night}) were defined at various 'enforcement points' around the airport at the former 35 Ke noise contour, as the government required the maintenance of the instrument of spatial zoning or separation of intruding activities and noise sensitive areas (TK, 2000). This approach seemed to work well; the airport was able to accommodate more flights and the overall noise level was reduced. However, considering the percentage of the population being annoyed or subject to sleep disturbance by aircraft noise, the proposed approach only addressed 3% of the inhabitants - those living within the circle of enforcement points (MNP, 2005). Most inhabitants in the vicinity of the airport live 'outside' this ring, in areas where noise levels do not have to be monitored and considered. As a consequence, these inhabitants were not protected against increasing noise levels. In addition, in 2006 it became clear that the airport had reached its noise limits and no further growth in the number of flights would be allowed.

During these years the use of the noise indicator Ke was discussed as well. From various studies it became clear that noise annoyance due to aircraft noise was being underestimated, as noise emissions from airplanes at levels below 65 dB were not considered in the noise calculations. Regional airports were regulated through the Aviation Act more or less similarly to Schiphol Airport. In the case of Eelde Airport, however, the Council of State judged that the formal approval of noise zones around regional airports had to be based upon Ke levels without exclusion of noise emissions, as applied in the Schiphol case. This shift towards airport-specific policy instrumentation fits the subsequent governments' programmes of devolvement of noise policy from the national authority to the provinces. This is similar to the changes implemented in traffic and industrial noise regulation. Specifically, the MoT urged the drafting of new regulations regarding regional airports, as adjusting the existing Aviation Act to fit both Schiphol Airport and regional airports was expected to slow down decision making on Schiphol's growth and approval of its fifth runway. Since the end of 2009, the provinces have been the competent authority regarding small planes and airfields, based upon the Regulation of Civil and Military Aviation; the Ministry is responsible for 'regional airports of national interest'.

The discussion on Schiphol Airport was continued at the 'Alderstafel', called after a former Minister of Environment chairing the broad platform of representatives of local communities, aviation sector, municipalities, the province, the MoT and MoE and researchers. Due to changes in policy instruments, shifting targets regarding the number of houses and number of flights, and the introduction of the new noise indicator L_{den}, aircraft noise policy was frequently debated in society, the media and politics. As a politician stated, to "go mad from the fumble with numbers" (Volkskrant, 1999). From a formal-juridical point of view, the noise policy had been effective. Nevertheless, field surveys provided evidence for increasing percentages of the population being annoyed and having their sleep disturbed by noise. Finally, at the end of 2008, agreement was reached at the Alderstafel, and in November 2010 a two-year experiment was initiated. In this experiment noise limits and other indicators were applied, which provide maximum freedom for the airport's exploitation within a defined 'overall noise budget'.

3.4.6 Analysis from an ACF perspective

The aircraft noise policy subsystem can be characterised as an adversarial subsystem consisting of diametrically opposed advocacy coalitions, which have been reinforcing their beliefs and positions over recent decades (see Figure 8 and Table 6). The 'Mainport and environment' discourse has been further narrowed and problematised by closed advocacy coalitions applying knowledge that mirrors and strengthens existing beliefs in terms of 'capacity versus noise'. According to Huys and Annema (2009), the aviation sector and the MoT 'are hand in glove' and advocate the economic importance of aviation.

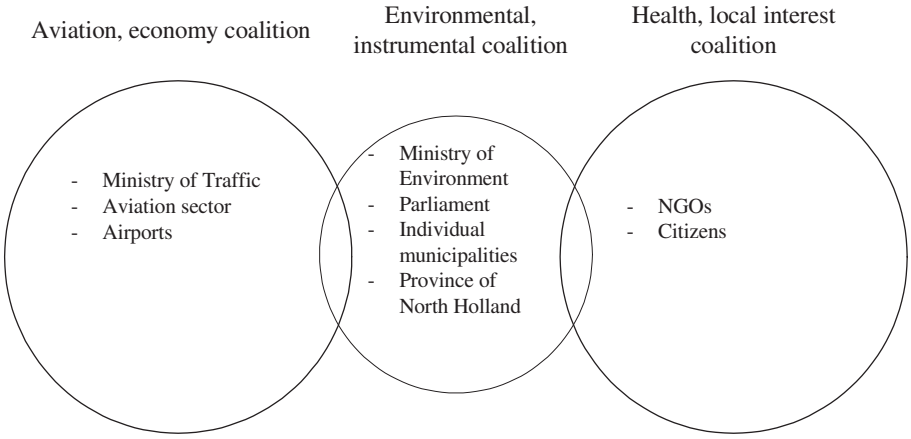

Figure 8: Advocacy coalitions within the Dutch aircraft noise policy subsystem

In contrast to the industry noise and traffic noise policy subsystems, where coalition resources were more or less balanced, here we find one dominant coalition. Most of the resource categories identified by Sabatier and Weible (2007, pp. 201-202) are available within the aviation coalition, i.e. formal legal authority, financial resources and skilful leadership. With the new Aviation Act the MoT even increased its formal authority, as it took over formal responsibilities from the MoE regarding noise and other environmental issues (Huys 2011, p. 336). In addition, public opinion and 'mobilisable troops' were 'steered' by influencing research and the dissemination of information (Huys and Annema, 2009). For example, Berkhout, the chair of the commission of experts, wrote a critical essay on the MoT's hierarchical decision-making named 'Notes on a failing democratic process' (Berkhout, 2003).

Huys (2011, p. 541) characterised the dominant aviation coalition as 'the iron triangle' of the MoT, the aviation sector and the Cabinet, which became further institutionalised during the years of discussions on Schiphol. In line with Weible (2007, p. 100) the aviation advocacy coalition is considered a dominant coalition, "[having], in comparison to minority coalitions, […] more of its members in positions of formal authority". Facing this strong opponent, a minority coalition of local inhabitants was internally at odds, and NGOs eventually lost their interest in the dossier (Volkskrant, 2010). As Huys (2011, p. 557) concluded, "[The minority coalition] often tried to organise their own research (although often resources were lacking), mobilise the media, engage in juridical struggles and tried to gain influence in interactive policy arrangements". The zero-sum game is completed by the mostly neutral position of politicians and civil servants at local and regional level and the weak(ened) position of the MoE. This is illustrated by the priority that from the very start has been given to the economy, over the environment and inhabitants' interests.

ACF's prerequisite of coordinated activity in this case can be applied as an explanatory factor for the policy subsystem stability, as well as the aviation coalition's dominance. The latter is characterised by long-term cooperation in policy formulation and decision making regarding Schiphol Airport, based upon strong resources as mentioned above. The minority coalitions are fragmented, and lack a solid core of allies and resources. Nevertheless, the platform of residents and the environmental NGOs teamed up and shared resources during the times when trade-offs were discussed. Examples of this are joint responses of the environmental parties, the province and local residents on the supposed equal protection of the new regulative system (Huys, 2011, p. 312), and the political lobby by one of the environmental parties (Milieudefensie) and some groups of local residents regarding health effects of aviation (Huys, 2011, p. 313). All actors in the advocacy coalitions shared policy core beliefs regarding the economy-environment goals. However, during discussions on trade–offs, advocacy coalitions favoured either the mainport objective or the environment objective, resulting in opposing positions and a 'policy deadlock' in the words of Huys (2011). Frequent discussions in the several committees and stakeholder platforms revolved around representativeness, (re)adjustment and (re)confirmation of problem definitions, instruments and outcomes (see Den Butter and Burgers, 2003), in line with Boons et al. (2010, p. 309), concluding "[…] almost all subsystems [or in ACF terminology: advocacy coalitions] have developed a rather conservative type of self-organisation, resulting in a highly inert governance system".

Policy core beliefs of Dutch aircraft noise policy subsystem			
Policy core component	Aviation, economy coalition	Environmental, instrumental coalition	Health, local interest coalition
Basic value priorities	Economic importance of aviation	(Economic) Importance of housing	Protection of public health
Groups whose welfare is of greatest concern	Aviation sector, workers and society in general	Present and future generations	Municipal residents
Seriousness of problem	Noise emission and immission is limited through zoning and technology	Noise emissions conflict with spatial planning and have negative health effects	Locally negative health effects should be reduced
Cause of problem	Spatial planning allowing housing nearby airport	Increase of aviation	Increase of aviation and of houses adjacent to airport
Distribution of authority	Aviation sector and airport are capable to select and implement techniques. Government should secure level playing field	Government is responsible for protecting public health and providing policy instruments	Government has to take increased responsibility in defining (more stringent) noise limits
Policy preferences	Maximum policy freedom for airport and aviation sector in using 'noise budgets'	National defined noise limits and decentralised implementation of regulation	National defined noise limits

Table 6: Policy core beliefs of the coalitions within the Dutch aircraft noise policy subsystem

Despite some minor changes in advocacy coalitions, e.g. actors such as the environmental NGOs came and went, the main structure of the policy subsystem on aircraft noise remained. Applying the ACF lens, the stability is explained by the policy core and secondary beliefs of the advocacy coalitions. It was not so much the economy-environment goal (a policy core belief) that was discussed, as rather the regulative arrangements and noise limits (secondary beliefs) that were deemed in need of change. However, (i) stability in the dominant coalition prevented policy and regulative noise limits changes; (ii) which was strongly supported by the dominant coalition resources, specifically formal legal authority, finances and information, versus (iii) the limited resources available to the minority coalition mainly acting through political lobby and media attention. Huys (2011, pp. 561-562) provided an explanation for the absence of policy-oriented learning or negotiated agreements being a lack of trust between advocacy coalitions. This resulted in clinging to existing regulatory systems despite their obvious shortcomings. However, minor changes have recently been identified; the Alders table (2007 – 2009) reached agreement on an experiment on a new regulative arrangement to be reviewed in 2012. This table can be considered a professional forum in ACF terms, including researchers "in order to make sure that the right assumptions and data were being used" (interviewee in Huys, 2011, p. 475). Whether policy-oriented learning will occur (for which according to Sabatier and Jenkins-Smith (1999, p. 123) relatively enduring changes in the actors' secondary and/or policy core beliefs is required), has to be seen during the years to follow. Currently, policy core beliefs and advocacy coalitions which existed in the 1980s are still in place.

3.5 Conclusions

Environmental noise has harmful effects on human health. This recognition led to the implementation of noise policy in the Netherlands by the end of the 1970s, consisting of complex regulative frameworks for various noise sources. As more research data became available on the health impact of environmental noise, road traffic noise, in particular, is considered the second highest environmental burden behind particulate matter ($PM_{2.5}$) (WHO, 2011). Consequently, noise pollution, is currently considered a relevant environmental issue addressed by (regulative) norms and other policy instruments. The empirical questions thus arose as to whether changes or stability could be observed in the (regulative) norms of the industry, traffic and aircraft traffic noise policy subsystems, as well as how this change and/or stability and variation between policy subsystems can be explained.

Although the impacts of noise pollution are recognised, noise problems have not been reduced. On the contrary, noise limits remained stable or were even weakened in the noise policy subsystems. Our study shows that discussions on (regulative) noise limits have been evident in all three noise policy subsystems, illustrating the recurring dilemma of the economy versus public health. Nevertheless, except for the recent minor changes in the traffic noise policy subsystem, the regulative arrangements in all subsystems remained rather stable during the last decades. The explanation for the relative stability, however, differs for the three policy subsystems. The industrial noise policy subsystem is characterised as a collaborative and uncontested policy subsystem, which "provides an optimal setting for learning across coalitions" (Weible and Sabatier, 2009, p. 207). The main coalitions, i.e. the industrial sector and the municipalities, mitigated conflicts and agreed upon minor policy changes (i.e. in secondary beliefs). On the other hand, in the traffic noise policy subsystem a stalemate situation of conflicts between the adversarial coalitions of infrastructure and spatial planning resulted in stability. This policy subsystem, however, recently shifted towards cross-coalition learning facilitated by the intermediating advocacy coalition, i.e. the Ministry of Environment. As such, the latter acting as policy broker, "has the potential to help negotiate agreements between coalitions" (Ingold, 2011, p. 449) in defining traffic noise limits and legislative arrangements. Finally, in the aircraft noise policy subsystem, the dominance of advocacy coalitions differs from the advocacy coalitions' positions in the other noise policy subsystems. A dominant advocacy coalition, i.e. the 'economy, aviation' coalition, is diametrically positioned against a minority coalition of local inhabitants and NGOs. In contrast to the industry and traffic noise policy subsystems, the intermediate advocacy coalition of the Ministry of Environment holds no formal legal authority. As a result, the zero-sum game is completely defined by the dominant coalition, explaining the stability in this policy subsystem. Variation between the policy subsystems, in conclusion, is mainly explained by the differences in advocacy coalitions' constellations and their (relative) positions within the policy subsystem.

As this empirical analysis illustrated, most discussions in the three noise policy subsystems are narrowed to disagreement on the regulative system and noise limits, and inhibited changes in the policy subsystems. This is in line with previous research by Weber et al. (2011, p. 134) on Dutch traffic noise policy, concluding that "a moderate shift in governance modes […] has mainly been executed through changes in legislation, whereas the policy discourse and the actor networks hardly changed".

Similarly, Kroesen and Broër (2009) and Kroesen et al., (2011) found that the aircraft noise debate continues along the line 'economy *and* environment'. This is despite the fact that people, in general, do not believe this win-win situation will be achieved and government is not trusted to uphold the (regulative) noise norms.

In summary, the noise policy subsystems seem to be 'paralysed' due to lack of trust and, consequently, a strong tendency to 'stick to enforceable regulation'. The empirical cases showed that, during recent decades, in none of the three noise policy subsystems and their (opposing) advocacy coalitions the (technocratic) policy core belief of using noise limits as policy instrument, or appropriate means of dealing with environmental noise problems, has been questioned. However, the underlying beliefs differ. The production coalition in the industrial noise policy subsystem, for example, approved noise limits, as these would guarantee a level-playing field. This is similar to the aviation sector in the aircraft noise policy subsystem. On the other hand, the spatial planning coalitions have criticised noise limits as strong advocates of local government policy freedom. Nevertheless, substitution of the regulative framework for other policy instruments has not been discussed. Finally, the environmental coalitions in all policy subsystems strongly held the belief that regulative norms are required as an enforceable policy instrument fitting the 'government' policy style characteristic of Dutch noise policy (Weber et al., 2011).

Along this line of reasoning, a final reflection has to be made regarding the stability in the noise policy subsystems. According to the WHO, at least one million healthy life years are lost every year from traffic-related noise in the western part of Europe (WHO, 2011). In the Netherlands, approximately 20-30% of the population is annoyed and 8% of the population has its sleep disturbed by traffic noise (Netherlands Environmental Assessment Agency, 2010; Van Poll et al., 2011). These percentages have been relatively stable during the last two decades. Consequently, if adverse health effects have to be prevented, policy change can be induced by, according to the ACF theory, shocks, changes in advocacy coalitions or policy learning. In practice however, this will be difficult to realise. Shocks, such as flooding or chemical risks resulting in deaths, are not to be expected regarding the noise policy subsystems. Although minority coalitions or actors, e.g. science and/or NGOs, might change advocacy coalitions, this would require redistribution of resources or discursive shifts. The latter is hardly to be expected, as the current emphasis on economic development in Europe and in the Netherlands will result in even stronger dominance of the 'economy advocacy coalitions'.

As Kroesen et al. (2011) and Huys (2011) concluded regarding the aircraft noise policy subsystem, trade-offs have to be made explicit in order to resolve current deadlock. Various policy options at national and local government level might be considered in addition to the existing regulative arrangements. However, this requires changes in policy core beliefs and discourses. These changes might be achieved through cross-coalition policy learning, under the condition that sufficient and convincing scientific data regarding the seriousness of the problem (i.e. health effects) and possible solutions is available.

This brings us to a reflection on ACF, which provided a useful theoretical framework for longitudinal and comparative empirical research in characterising and analysing noise policy in the Netherlands. Focusing on actors in advocacy coalitions, the beliefs of individual actors, and the conditions for policy-oriented learning between these actors, as well as explanatory mechanisms for stability or changes in the policy subsystem, have all been discussed. The advantage of ACF, as our study illustrated, is that it provides the concepts for identifying and explaining these nuances in stability and change. Overall, our research reflects similar points of attention as earlier presented and discussed by other scholars applying ACF in empirical research (e.g. Hysing and Olsson 2008 on explanatory contextual factors; Nohrstedt 2011 on various hierarchic resources). In addition, the results of applying ACF concepts largely fit the conclusions in Sotirov and Memmler's overview of empirical papers (2012), for example in identifying three advocacy coalitions, coalition stability and policy subsystem stability due to stalemate and/or dominant coalition situation.

In conclusion, we present some minor reflections on ACF concepts stemming from our empirical research. As the empirical cases showed in the industrial and in the traffic noise policy subsystems, the MoE held formal legal authority regarding the regulative system, and as such intermediated and facilitated both main advocacy coalitions. According to Sabatier (1993, p. 119) this position is characteristic of the 'policy broker' being "an important actor in mediating conflict and supporting learning processes". In line with Hysing and Olsson (2008, p. 740) the question however rises whether high ranking officials of the MoE were in this centrist position due to their 'brokers' formal regulative authority, or as advocates of the policy core beliefs 'environment and public health'. In our opinion, the latter is the case; with the MoE mainly advocating as 'issue broker' disguised as 'policy broker'. This argument is underlined when considering the air traffic noise policy subsystem in which the MoT holds formal regulative authority, but the MoE acts as 'policy broker'.

Referring to our conclusions on introducing changes in the policy subsystems, 'policy brokerage' might be crucial. It is interesting to note that, since 2011, the MoT and MoE merged into one Ministry of Infrastructure and Environment. Since this merger, the roles of either 'issue broker' or 'policy broker' within the industry and traffic noise policy subsystem are held by high civil servants from the former MoE, being still 'formal' regulative authority.

A second reflection on the empirical application of the ACF is as follows: the empirical cases analysed in this paper illustrated that minor changes in (regulative) noise limits, exemplary for secondary beliefs, were discussed in working groups of representatives of the respective advocacy coalitions. According to Sabatier and Jenkins-Smith (1999), policy-oriented learning is one of the main mechanisms for minor policy change. This learning, resulting in enduring changes in beliefs and actions, is facilitated through professional forums, with specific characteristics. However, the empirical cases provided showed changes in secondary beliefs that were achieved without the establishment of such forums, as during all phases researchers and scientists were not involved. Sabatier and Jenkins-Smith explicitly address the responsibility of these actors for providing uncontested scientific knowledge that supports policy learning. It seems that institutional rules, typical Dutch consensus-based steering philosophies and the (inter)mediating, 'policy broker' role of the MoE are explanatory factors for policy-oriented learning regarding regulative arrangements. These institutional arrangements, establishing decision-making frameworks and defining strategies for decision making, play a significant role in explaining structures, stability and changes in policy subsystems. Therefore. institutional arrangements recently have been added to ACF by Sabatier and Weible (Schlager 2007, pp. 307-308). Our empirical cases underline the relevance of these arrangements as explanatory factors for policy stability and/or change.

4 Environmental policy integration: the role of policy windows in the integration of noise and spatial planning

ABSTRACT[12] Interest in environmental policy integration (EPI) has recently been strong, both in the literature and in practice. We explore Dutch initiatives to integrate noise management into spatial planning policy in light of the body of literature on EPI. The main approaches of EPI are translated into a conceptual framework consisting of organisational, procedural, and contextual factors. The objective of this literature review is to relate paradigm shifts and policy innovations regarding noise management and spatial planning to empirical windows of opportunity for and barriers to implementation of EPI. It shows how instruments allowing a flexible approach and deviation from standards at the local level fit in with the discourse on decentralised and area-oriented policy. The analysis suggests that procedural and decision-making rules and organisational arrangements can bridge implementation gaps in local-level planning practice. However, EPI in the Netherlands has not solved the noise problem, and the number of affected inhabitants is increasing. We conclude the paper by examining the conceptual and normative issues affecting the integration and prioritisation of noise management policy.

4.1 Introduction

Although negative impacts of noise on human health have been widely recognised since the mid-20th century, noise pollution is an ever-increasing environmental health problem. Besides causing annoyance and sleep disturbance, noise has effects on children's learning. It is generally accepted that noise exposure can lead to hypertension and cardiovascular disease and is thus a potential cause of death (Knoll and Staatsen, 2005).

A technical approach to noise mitigation typically translates health standards into spatial contours. Stringent norms are set to ensure a spatial separation of noise-intrusive and noise-sensitive activities, particularly in residential areas.

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However, as planners are not impeded by noise exposure or other environmental norms, they tend to concentrate activities in compact cities in their pursuit of an efficient use of space.

During the late 1970s many Western countries adopted legislation on noise and other environmental nuisances. Briefly, the '1970s paradigm' embraced the national sectoral environmental policies that established quantitative norms and standards based upon dose-effect relations and required parties to adhere to them at the local level (De Roo, 2000). Noise policy introduced various source-related norms, notably maximum allowable noise levels and preferable maximums (Glasbergen, 2005) to be included in spatial planning documents and permissions. The discourse on noise those years was mainly about the role of noise in shaping environmental and spatial policy. During the 1980s and early 1990s this framing and steering paradigm shifted to become a noise-hampering discourse, laying the basis for the introduction of integrative mechanisms. Many planning targets in cities were hampered – at a late stage of planning and construction – by stringent noise ceilings that could hardly be met. Increasing mobility and more densely populated areas led to rising levels of noise from road and railway traffic in compactly planned urban areas. A paradigm shift to flexible, area-based integrative noise policy was deemed necessary in order to facilitate the introduction of noise at an early stage in the spatial planning process and to stimulate creativity in urban design (De Roo, 2005; Runhaar et al., 2009).

However, this paradigm shift in noise policy and spatial planning policy did not reduce the number of inhabitants negatively affected by high noise levels. On the contrary, the Netherlands Environmental Assessment Agency (2009) estimated in its Environmental Balance that road traffic noise affected 30% of the Dutch population at 'averaged' levels of above 55 dB. These levels are associated with significant annoyance as well as negative health impacts. This situation will even worsen in the next few years as urbanisation and mobility rates increase. Considering the results achieved, or rather *not* achieved, questions arise about the mechanisms at hand and the instruments made available at the national and local levels. Several initiatives on the integration of noise policy and spatial planning policy have yielded some spatial flexibility in the mandatory norms. Consequently, by lowering the noise standards the planning goals have been achieved, although the environmental quality of the result is questionable.

We analyse shifts in the policy discourse on noise and spatial planning from the perspective of policy integration. The concept of environmental policy integration (EPI) is used by scientists to evaluate and assess initiatives for coordination. According to Lafferty and Hovden (2003, p. 12) EPI implies "the incorporation of environmental objectives into all stages of policymaking in non-environmental policy sectors" and "a commitment to minimise contradictions between environmental and sectoral policies by giving principled priority to the former over the latter". EPI is often used as a frame in social science research on sustainable development. However, referring to the general category of 'environmental objectives', EPI could be used for other (integrative) environmental policy discourses as well (Lenschow, 1997 and 1999; Lafferty and Hovden, 2003).

In this context we provide an assessment of some instances of integrating noise and spatial planning, drawing specifically on examples from the Netherlands, according to recently developed EPI concepts and approaches. The objective of this analysis is to relate paradigm shifts in both sectors to empirical windows of opportunity for and barriers to implementation of EPI. Because in existing literature local-level integration activities tend to be overlooked, our analysis of the empirical case aims to contribute to the EPI academic discourse regarding innovative approaches and the specific dilemmas at the local administrative level.

As EPI has been interpreted in many ways, in section 4.2 we provide some clarification by defining its key principles and assumptions. Then in section 4.3 we present a conceptual framework, including the factors deemed relevant to the success or failure of integrating noise policy into spatial planning. Besides stipulating organisational and procedural factors, this framework identifies contextual factors, notably policy barriers and windows of opportunity. These contextual factors are particularly relevant when explaining the effectiveness of policy integration. In the political climate, major discourses and paradigms can act as policy windows or barriers when initiating and implementing new instruments. In addition, local-level decision making will be addressed, as spatial planning and noise policy are usually part of the municipal remit. In that light with this paper we offer some new insights into recent EPI multilevel governance studies (Nilsson et al., 2009) and some new perspectives on conceptual and evaluative EPI research with a specific focus on the integration of noise policy and spatial planning.

4.2 Environmental policy integration: normative and analytical discourses

One of the authors who laid the basis for EPI is Underdal, whose criteria for an 'integrated' policy are comprehensiveness, aggregation, and consistency. In his view an integrated policy is one where "all significant consequences of policy decisions are recognised as decision premises, where policy options are evaluated on the basis of their effects on some aggregate measure of utility, and where the different policy elements are in accord with each other" (1980, p. 159).

Although EPI is a recognised discourse in academic and policy debates, the literature presents it from a range of perspectives and gives it various labels. Two mainstreams may be distinguished (see e.g. Lafferty and Hovden, 2003; Lafferty and Knudsen, 2007; concise overviews are provided by Persson, 2004, and Jordan and Lenschow, 2010): a normative discourse and an EPI analytical discourse. EPI, as such – that is, giving a specific weight to environmental concerns – is perceived as desirable in the normative debate, which often focuses on whether the environment is a 'principled priority', whereas the policy-making procedures and institutions requisite to policy integration are addressed in analytical EPI studies. It must be stressed that these discourses are not mutually exclusive; indeed, several studies combine elements of both.

4.2.1 Normative discourse of EPI: 'What should be done?'

Building upon Underdal's criteria for policy integration, Lafferty and Hovden (2003, p. 12) define environmental policy integration as "the incorporation of environmental objectives into all stages of policymaking in non-environmental policy sectors, *with a specific recognition of this goal as a guiding principle for the planning and execution of policy*" (our emphasis).

The guiding principle is further emphasized by stating that contradictions between environmental and sectoral policies should be minimised by prioritising the former over the latter. Underpinning a normative discourse 'addressing', 'considering', or 'integrating' environmental concerns is the assumption that the environment needs better protection (cf. Nilsson and Persson, 2003).

Prioritisation as a type of integration has also been stressed by Healey and Shaw (1994), who state that 'leverage' of environmental sustainability over the economic discourse in spatial planning policy is crucial to the successful integration of environmental issues in spatial planning in the UK.

In contrast to this 'priority-principle' normative purpose of EPI, less strong readings have appeared in the literature as well. Jordan and Lenschow (2010, p. 149) define such 'weak' EPI as "taking environmental consideration *into account*" (our emphasis). In their state-of-the-art review the authors illustrate the normative academic discourse and conclude that "the strong normative interpretations of EPI have not been fully embedded into everyday political practices" (p. 150).

4.2.2 Analytical discourse of EPI: 'How is EPI realized in practice?'

Similar observations led to an increasing number of empirical studies, aiming to understand the precise conditions under which EPI is given its meaning, which processes take place in political systems, and which instruments are employed. When policy scientists analyse and evaluate various EPI initiatives, they are searching for the factors contributing to the success and/or failure of EPI implementation. In this discourse, too, various assumptions can be distinguished, depending on whether the study is process or output oriented. Lafferty and Knudsen (2007, p. 17) state that EPI can be analysed and evaluated as procedure, policy, and outcome; in their article they focus "on aspects of decision-making enhancing the status of environmental concerns in policy output". In their state-of-the-art review Jordan and Lenschow (2010, pp. 150-152) distinguish two approaches – a political system approach and a policy analysis perspective. The former views EPI as a process anchored in a political system, frequently applied in comparative empirical research, whereas from the latter perspective EPI "consists of a set of measures that aim to change the process of sectoral policy making" (p. 152), assessing instruments and mechanisms in place.

4.3 Developing a conceptual framework for understanding noise policy integration in practice

In developing a theoretically informed framework for the analysis of noise and spatial planning integration initiatives, clear consensus is lacking as to what factors to address in EPI assessments. Lafferty et al. (2004), for example, assessed green innovation policy in Norway applying an "independent checklist of operational mechanisms" or 'benchmarks' consisting of action plans, green budgets, and mandates, et cetera. Nilsson and Persson (2003) proposed a framework consisting of background variables (i.e. problem character, political will, international context) and independent variables (i.e. assessment processes and policy-making rules).

The dependent variable, the black box of EPI, is further detailed into organisational and procedural factors, in Lafferty and Knudsen's EPIGOV paper (2007). As we do not specifically aim to develop a framework for EPI, we present factors relevant for implementation of EPI, derived from existing EPI literature.

Applying an analytical perspective on empirical cases of integrating noise policy and spatial planning, we focus on organisational and procedural factors (Persson, 2004; Lafferty and Knudsen, 2007; Jordan and Lenschow, 2010). This approach allows us to understand the extent to which the integration strategies achieved their aims (Hertin and Berkhout, 2003; Lafferty et al., 2004). In this analytical approach there is also room for normative elements, since the assessment is driven by our 'normative academic' stance that noise management should be addressed, taken into account, or integrated into spatial planning.

In line with Persson (2004), we use a 'study-specific' working definition of EPI, one allowing optimal flexibility in assessing integrative initiatives. On the basis of Hey (2002, p. 127), we define noise policy integration as "early coordination between spatial planning and noise objectives, in order to find synergies between the two, or to set priorities for noise policy goals where necessary".

An important conceptual nuance is the focus in this paper on both the (national) policy formulation level and the (local) implementation level. Recent EPI research has drawn more attention to implementation at the local level (Nilsson et al., 2009; Runhaar et al., 2009). Many legal and policy frameworks at the national level are implemented through local-level decision-making procedures and institutions. Governmental (EPI) policies involve coordination of multilevel processes and actors (Lenschow, 2007). However, policy and political arenas at the local level will differ from the national EPI issues, which could explain possible implementation gaps.

In the conceptual framework, organisational and procedural factors are combined with sector-specific variables (Table 7). The criteria resemble the explanatory factors used by Persson (2004) in an EPI literature review (see also Nilsson and Persson, 2003). Adding the historic institutionalist perspective to the analysis allows us to distinguish any contextual or background variables hampering or facilitating policy integration. Although these variables are often hard to influence, they are relevant to an explanation of the effectiveness of EPI and as such are often found in the social science literature.

(1) *Organisational factors*

- Organisational arrangements
- Budgetary structures
- Communication structures within and between (sectoral) institutions, e.g. training and awareness programmes
- Initiating institution: top-down versus bottom-up initiatives

(2) *Procedural factors*

- Instruments and rules facilitating adoption of noise policy into spatial planning
- Routine procedures and rules for decision making, including assessment procedures
- Procedures and rules on stakeholder involvement

(3) *Contextual factors*

- Unifying paradigms, values, and norms
- Political commitment, societal backing, and public support

Table 7: Conceptual framework: relevant factors

4.3.1 Organisational factors: structures and institutions

Organisational factors are addressed in most of the EPI literature, where they are seen as fundamental to successful policy integration. The problems identified in policy integration are generally attributed to organisational fragmentation, sectoral compartmentalization, and tier responsibility. Policy sectors and administrative levels are characterized by their respective language and culture – for example, 'multidisciplinary, creative planners' who are geared toward optimising spatial quality versus 'monodisciplinary stringent technicians' who seek to maximise environmental quality. Attempts at integration entail reshaping or rebuilding the governmental and other organisational arrangements.

In addition to the organisation of governmental policy, Persson (2004) distinguishes budgetary structures as well as training and awareness programmes. The first two factors correspond to a top-down, hierarchic view of policy 'ownership' and integration as demonstrated in the literature on vertical and horizontal EPI (Lafferty and Hovden, 2003; Lafferty and Knudsen, 2007).

We would expect the local-level implementation and the mechanisms that are in place to facilitate operational and disciplinary integration (Kidd, 2007; Nilsson et al., 2009) to be (the most) significant characteristics of effective noise policy integration. Therefore, we will treat the organisational, budgetary, and communication structures as key factors. Presumably, the variance in the characteristics of these factors is largely dependent upon the initiating institution. Top-down implementation of national policy initiatives requires different infrastructures compared with local bottom-up initiatives. Governmental organisation, budgetary structures, communication structures, and the initiating institute are depicted as key organisational factors in Table 7.

4.3.2 Procedural factors: linking process and instrument

Persson (2004 and 2006) distinguishes two types of procedural factors: instrumental factors or 'measures' for implementing the EPI concept in a sector, and 'routine procedures' to be used in decision making. The overarching principle for EPI implementation through instruments is in line with the conceptual approach to policy integration and a rationalist view on the decision-making process (Persson, 2004, p. 32; for a comprehensive listing, see Schout and Jordan, 2008). Several other procedural factors are identified in the literature: assessment procedures – for instance, strategic environmental assessment (Persson, 2006; Jacob et al., 2008; Runhaar et al., 2009); policy and decision-making rules; and interaction with nongovernmental actors. The last factor is based on a broad interpretation of Kidd's (2007) concept of stakeholder integration. Policy-making rules are found in the institutional literature as well; for example, decision rules define who is to be involved in policy making and how decisions are made. Table 7 conceptualises three key procedural factors that are prominent in the literature to date: 'integration policy' instruments, decision-making procedure, and participatory rules.

4.3.3 Changing contexts captured in EPI criteria

In analysing different initiatives and tools for integrating noise policy, it appears that contextual factors can provide additional perspectives that are valuable for understanding the extent to which integration strategies are successful. Kidd (2007), for example, identifies some unifying paradigms that are relevant to the integration of health and spatial planning policy. Persson (2004) refers to normative factors such as values, norms, and traditions, stating that the effectiveness of the integration strategies is probably largely dependent upon these contextual factors.

Normative value-driven issues such as high-level political commitment, discourses, and traditions constitute relevant 'external factors' in that they reflect fundamental elements of contemporary thinking and underpin a strategic policy orientation (Knudsen, 2009). Often, these values are anchored in government steering mechanisms as well. As a case in point, the legal and constitutional steering of the traditional hierarchical environmental policy domain has been shifting towards decentralised reflexive policies since the late 1990s.

Several authors point out the importance of high-level political commitment, societal backing, and public support if the normative approach is to be effectively implemented in downstream policy making (Persson, 2006; Lenschow, 2007). In Table 7 unifying paradigms and political commitment, and societal backing and public support are put forth as useful descriptors of 'general' policy discourses and policy windows.

4.4 Paradigms and shifts in noise and spatial planning policy

In this section we subject the empirical data on noise and spatial planning policy integration in the Netherlands to an analysis using the organisational and procedural factors presented in Table 7. But, first, in order to understand the relative importance of the various factors, the paradigms of noise policy and spatial planning are addressed. In line with Nilsson's approach to energy-policy frames, the main discourses are characterized by "problem perceptions, objectives and principles, and policy prescriptions over time" (2005, p. 211).

We may distinguish three phases in noise policy as well as in spatial planning policy since the late 1970s. Each paradigm shift is marked by a change in the importance of the dossiers at the political level and in the motives for having the dossier on the political and/or policy agenda. The leading noise paradigm of the 1970s placed strong emphasis on technical source-oriented solutions for addressing the negative health impacts of noise (Driessen and Glasbergen, 2002b). The local and regional problems were to be solved through normative legislation defined at the national level. Unlike environmental policy, which tends to set norms from the top down, spatial planning has its roots at the municipal level. Local governments felt responsible for preserving residential areas and protecting their inhabitants against intrusive activities. Subsequently, national governments adopted spatial concepts to be implemented at the regional and local levels. Spatial planning policy is known for its extensive intra-governmental decision making, "portrayed as active discourse coalition-formation" (Hajer and Zonneveld, 2000, p. 340).

As the implementation of environmental policy was generally deemed insufficient, the 1980s has been highly regarded for the decentralisation and deregulation efforts that were made. Internal and external integration and regionalization are key principles in tackling fragmentation and lagging implementation at the local level (Van Tatenhove and Goverde, 2002). Typically, noise policy took a different position in the 1980s' internalization paradigm. The Noise Abatement Act, by introducing the principle of zoning in the late 1970s, "acted as a stimulus to the subsequent aim of bringing spatial and environmental policy closer together through coordination and integration" (De Roo, 2003, p. 168).

The integration paradigm was also adopted in spatial planning policy. 'Target group' policy became a synonym for involving other sectoral departments and stakeholders in implementing spatial planning concepts. Thus, spatial planning policy in the 1980s seemed to be ahead of environmental policy in integrating (internalizing) other, nonenvironmental, sectoral policies.

By the 1990s a new paradigm had emerged, focusing on the quality of our living environment. The concept of 'quality' was introduced into public policy, and the remit of the public sector was broadened from health to quality of life (Driessen, 2007). This new concept had several advantages: its new, integrative language, and its area-specific, hence flexible definition of quality for both noise policy and spatial planning policy. The coordination and integration of various environmental themes were broadened to embrace other sectors such as water management, nature, and spatial planning. The new paradigm also provided a new perspective on urban development. While the compact city paradigm of the 1980s had contributed to the desired variety and multi-functionality of cities, by the 1990s compactness was seen as negatively affecting the environmental quality of urban areas. The 'compact city dilemma' was born.

Another significant shift is the change from 'government' to 'governance' as the new steering strategy, introducing concepts such as 'network policy', 'stakeholder involvement' and 'participative planning'. In spatial planning policy, stakeholder involvement had been common practice for several years. However, this participative approach is often regarded as "'end of pipe' public participation […] *after* consensus among the main players has been secured" (Hajer and Zonneveld, 2000, p. 350, original emphasis). Recent developments in environmental policy introduced 'new' actors through the target group policy, the devolution of decision-making powers, and area-specific policy.

Positioning these stakeholders in the decision-making process and adopting governance mechanisms was a logical subsequent phase in environmental policy. Involving other actors in policy making, regardless of the sector concerned, meant renewing institutional settings and introducing procedures and mechanisms fit for this new approach to decision making.

At the turn of the new millennium a new paradigm emerged. It was based on four key principles: decentralisation, flexibilisation, integration and participation. Policy on noise and spatial planning policy was devolved to the regional and local level. More flexible legislation, although embedded in nationally set standards, supports administrative tiers in achieving area-based ambitions. A broadened integral approach has been adopted, linking "environmental aspects to aspects of spatial planning and economic development plus more participation for citizens, businesses and NGOs (nongovernmental organisations) in the decision-making process" (Driessen and Glasbergen, 2002b, p. 258).

4.5 The Noise Abatement Act and integrative initiatives

Among other sectoral regulations, the Dutch Noise Abatement Act was passed in 1979, introducing norms for each source of noise, such as road traffic, industry, and railways. Since then the law has been amended and adjusted frequently, as the hierarchical and normative legislation was considered inflexible. Examples of exemptions incorporated in the act are the 'higher value procedure' providing for local deviation from noise standards, the design of a 'deaf façade', and the imposition of a 'harbor limit' allowing an increase of 5 dB in residential areas near port-related industrial zones.

Strict noise limits, set at the national level, hampered the integration of noise issues at an early stage in local spatial planning. Despite several attempts, a more flexible and transparent legal system supportive of the concepts of compact cities, quality of life, and the integration of noise policy in spatial planning has not yet been established. In 2009 the central government prepared a new bill to adjust the existing noise legislation, building upon earlier attempts during the 1990s to shift from norm setting at the national level to a reflexive system of area-related noise objectives (Glasbergen, 2005). Whether this will enhance the chances of the desired paradigm shift remains to be seen.

In this section we present some examples of how both policy fields are integrated in the Netherlands. These cases are analysed in light of the conceptual framework discussed above. The empirical material consists of ROM projects (ROM is a Dutch acronym for spatial planning and environment; it is a process tool for integration of noise issues in spatial planning processes), City and Environment (a legally embedded process tool for integration of environmental and spatial planning processes), and MILO (a Dutch acronym for environmental aspects of living conditions; it is a local-level substantive and process tool).

Zoning, as introduced in the Noise Abatement Act (1979), was regarded as an efficient and effective tool for separating environmentally intrusive activities from environmentally sensitive land uses. Through zoning, quantitative noise standards as well as other environmental loads can be translated into spatial requirements (De Roo, 2000). By the end of the 1990s the government introduced an initiative aimed at establishing integrated environmental zones (IEZs). It was based on a scientific methodology that translates into a single indicator of distance that must be adhered to when planning industrial activities and dwellings. Owing to the technical, norm-based approach and the difficulty of integrating standards that were neither comparable nor addable, the IEZ initiative failed. Nevertheless, it laid the basis for a new integrative initiative, the ROM policy.

4.5.1 The ROM policy

Integration, both internal and external, is the '1980s paradigm'. It is aptly illustrated by the establishment of a new Ministry of Housing, Spatial Planning and the Environment (VROM). At the regional and local levels, internalization and integration were introduced by the Ministry through two interventions. One, comparing area-oriented policies, was facilitated by a shift in spatial planning from managing 'scarcity' towards enhancing spatial quality. The other amounted to an environmental paradigm shift away from limiting negative health impacts toward quality improvement and sustainability (VROM, 1990).

The Dutch Fourth National Policy Document on Spatial Planning (VROM, 1988) and the National Environmental Policy Plan (VROM, 1989) launched area-based ROM projects. Various stakeholders cooperated in these projects on solving environmental problems and improving spatial planning characteristics at the local level (Driessen and Glasbergen, 2000a; Hajer and Zonneveld, 2000; Van Tatenhove and Goverde, 2002). Although legal limits on noise and other environmental norms should be adhered to, deviation was allowed during the period that an area was under transformation.

As such, the differentiation of norms in line with the area's function was given more scope. It offered the local authorities greater flexibility for planning and designing urban areas. When expanding Rotterdam harbour, for example, industrial activities will be intensified, thereby increasing the noise impacts on surrounding residential areas. ROM policy is instrumental in the redevelopment of these areas. Noise limits have been raised to 60 dB, exceeding the legal maximum by 5 dB, thereby allowing the redevelopment of residential areas. In parallel, noise contours of industrial sites will have to be decreased in the future through the implementation of the best available techniques. In the project organisation ROM Rijnmond, established in 1993, all tiers of government along with private organisations jointly decide on and implement binding agreements on the economic expansion and liveability of the area.

The ROM projects demarcate a paradigm shift whereby policy making is decentralised to the local administrative tier, wherein an area-specific view is taken, and through which policy making becomes participatory by involving a wide range of stakeholders. The newly developed organisational arrangements meant a close involvement of national authorities within planning phases of individual ROM projects and a strong directive role for the provinces. The government initiated cooperation between national, regional, and local administrations through regular meetings between ROM project partners as well as meetings with provincial and municipal councils. A central help desk was established within the Ministry (the Transferpoint ROM areas) to coordinate ROM projects and to support the stakeholders, for instance by providing examples of area-oriented policies. Financial support from the national government at the regional and local level was secured via the annual budget of the Ministry (VROM).

Instead of the goal-oriented planning that had been typical of environmental policy for decades, the ROM designated-areas policy "emphasized the institution-oriented facet of planning" (De Roo, 2003, p. 189). The shift from 'command and control' through nationally set standards towards participative, externally integrated and area-specific policy mirrors the political and policy setting of the late 1980s and early 1990s. During that period, environmental as well as spatial planning policy developed from government into governance in many European and American countries. This alternative to the former 'hierarchic control model' (Driessen et al., 2001) introduced policy paradigms such as network and participative policies, which provided the right conditions for ROM policy.

The paradigm shift – a contextual factor – towards *substantive* integration policies opened a window for ROM initiatives. It provided an instrumental and financial basis, communication and project management structures, a guiding principle, and the political will for integration of spatial and environmental policies, all of which were very favorable to ROM policy. Nevertheless, further integration of *policy goals* at the national level and the definition of assessable ambitions within ROM projects were deemed necessary. For example, although the ROM platform in Rijnmond still exists, ROM policy has been suspended by the City and Environment Law (VROM, 1998).

4.5.2 The City and Environment Law

Another shift occurred in the 1990s, allowing flexibility in regulations for particularly difficult areas. A key manifestation of that shift is the City and Environment Law (De Roo, 2005). This movement towards addressing the environmental and spatial dilemma at the local level is exemplary for the discourse of that period. The Second National Environmental Policy Plan (NEPP2, VROM, 1993) referred to the compact city dilemma and called for the introduction of area-specific differentiation of existing standards. Characteristic of that time is the decentralisation of government tasks and responsibilities. From then on, local authorities were coresponsible for balancing environment and spatial planning. The ROM of designated areas adhered to the system of national standards; accordingly, its tasks were primarily carried out by the central government. Notably, the ROM approach laid the basis on which participatory and consensus-building policies could be implemented at the administrative tier that was directly confronted with environmental and spatial friction – that is, at the municipal level.

Under the City and Environment Law, city planning can deviate from existing norms if a project meets specific conditions. The law adds procedural requirements to the legally binding norms on noise and other environmental topics covered in the respective acts. Specifically, local authorities have to take a three-step approach. In the first step attempts have to be made to address the source of the noise in relation to the area's planning design. Then, having tried but failed, the second step entails seeking tailor-made solutions and adopting them, as long as these lie within the bounds of the legal, normative context. While these first two steps may be considered substantive guidelines, the third step introduces a strong procedural element.

For example, the local authorities can deviate from noise norms in those city planning projects where the substantive (i.e. source-oriented and tailor-made) steps are deemed insufficient to deal with the legislative noise restrictions and limitations (VROM, 2003; Flipse, 2007). The City and Environment Law formulates rules for compensation of exceeded norms and for the planning process; in the latter case, the prerequisites are transparency and stakeholder involvement.

Although the organisations involved did not change their 'arrangements', an open planning process is essential and even compulsory for third-step decision making. As provincial authorities have the power to approve the third-step decisions taken by municipal authorities, the role and responsibilities of the national authorities have de facto been decentralised and diminished. However, a nationally imposed legal framework provides the contours and procedures that the parties must adhere to.

Several local (re)construction projects have applied the City and Environment Law in areas where noise levels from industry or infrastructure have restricted spatial development. For example, some projects in The Hague and Arnhem were faced with high noise levels from industrial sites or road traffic. The planners compensated for exceeding the legal noise limits by means of additional insulation of dwellings, improvement of green areas, and public transportation in the residential area. Noise issues have been raised at the start of the construction projects. Moreover, a broad stakeholder involvement of NGOs, the health department, and the authorities has been arranged. Nevertheless, evaluation of the projects reveals that many people are still bothered by noise and negative health effects are evident.

The adoption of the law was not surprising; the system is representative of the paradigm shift of the mid-1990s during which "the traditional goal-oriented approach appeared to have reached a dead-end" (De Roo, 2003, p. 242). The practice of retaining nationally set standards while allowing deviation from them was supported by turning prescriptive standards into guidelines that local authorities can deviate from, given proper motivation, and compensate for.

In line with ROM policy, the Evaluation Commission of City and Environment (2004) concluded that organisational and procedural factors are in place and work well. Nevertheless, a cultural, organisational, and procedural paradigm shift towards integral decision making has still not occurred at all administrative levels. The commission suggests instating area-oriented organisational structures within administration, integrated planning processes, and policy documents at all levels.

Again, a paradigm shift towards flexible norm setting provided a policy window for the City and Environment Law. On the basis of the positive experience with ROM policy, the national authorities established organisational and procedural settings relevant for successful implementation at the local level. Interestingly, the concept of integration evolved from *substantive* integration (ROM policy) into *institutional* integration, in which content and organisational arrangements are equally important.

4.5.3 The MILO method

Paradigm shifts during the 1990s introduced decentralisation, participation, and policy integration into subsequent national plans. The basis for ROM policy was laid in the Fourth National Policy Document on Spatial Planning (VROM, 1988), whereas the MILO method was the result of the Fourth National Environmental Plan (VROM, 2001). VROM and the councils of provinces and municipalities initiated the MILO method in 2004, as the government felt that devolution of tasks should be accompanied by 'national' instruments supporting the municipalities in effective and efficient policy implementation (Thorborg et al., 2006). On the basis of existing practices within several municipalities, the MILO method is a typically bottom-up initiative, unlike both other tools, which originate at the national administrative level. Some comparable tools that had been developed by municipalities are LOGO (Rotterdam; a Dutch acronym for local noise and spatial plans) and MIRUP (The Hague; a Dutch acronym for environmental issues in spatial planning) (Flipse, 2007; Runhaar et al., 2009).

MILO aims at improving the environmental quality of certain parts of the city by integrating area-specific environmental ambitions in the spatial planning process. Often this leads to higher environmental quality than legally required. Yet reviews indicate that MILO's success can be assured only in areas with limited environmental constraints (Flipse, 2007). In striving for a qualitative approach within certain areas, the tool is rather ambitious and integration oriented; it is less of a problem-solving tool than ROM policy and the City and Environment Law.

Following the usual phases in a planning process, MILO illustrates the specific steps, activities, and stakeholders involved. The instrument is meant to offer guidance for spatial planning processes at the regional and local level. It does not contain any procedural or organisational provisions for involvement of the ministry or other stakeholders.

Depending on the openness of the process, experience with MILO suggests the formulation of rather specific and stringent noise and environmental ambitions in parallel with other quality criteria – for example, public transport and public space. As such, it introduces normative elements into the planning process (VNG, 2004). Experiences with MILO whereby noise is a key issue are rare. Nonetheless, this tool and comparable local ones have recently been used in preparing a third-step planning deviation within the constraints of the City and Environment legislation.

A new approach to the division of responsibility expressed in the slogan "local whatever can, central whatever should" was set forth in the National Spatial Strategy (VROM, 2006). This change in steering philosophy provided a policy window for local initiatives like MILO. Although MILO was applicable at the local administrative level and was based upon municipal initiatives, the government played a significant role in developing and propagating this instrument. The government's influence was grounded on the premise that an effective and efficient implementation and integration of policy in spatial planning would have to be supported at the national level. Particularly relevant is the emphasis on the difference between responsibilities at the national and the local levels. Specifically, the government is responsible for compliance with norms for minimum environmental and spatial quality, whereas achieving a higher quality of liveability is up to the municipalities (Van Kamp et al., 2003).

However, in contrast to the two other local-level tools mentioned above, MILO gives less attention to factors like organisational arrangements and communication structures. MILO and comparable tools focus mainly on procedural substantive integration without a conceptual or institutional embedding, leaving the latter up to the municipalities using the method. MILO is a typical guidance instrument for area-specific, integrated, and interactive planning. Despite its availability, many municipalities still take recourse to the stepwise City and Environment Law approach, probably because the noise pollution from traffic or industry often constrains spatial development. Consequently, MILO is used to identify noise-compensating measures in 'step-three decisions' and thus operates within the City and Environment Law approach.

4.6 Conclusions

The conceptual framework developed for this paper distinguishes organisational, procedural, and contextual factors. The main argument is that the political and policy discourses on decentralisation and area-oriented, flexible policy provided a policy window for EPI. Consistent with the national discourse on decentralised and area-oriented policy, two particular initiatives – ROM policy and City and Environment legislation – introduced a comprehensive set of organisational and procedural changes to ease the integration of noise policy and spatial planning. The top-down adoption of instruments and the implementation of integrated policy were thereby supported by organisational arrangements and communication structures. That support took various forms: government financing, a help desk, and guidance. In addition, the analysis demonstrates the importance of procedural factors such as rules on decision making and stakeholder involvement. These procedural aspects are less significant in MILO and other municipal tools than in the ROM policy or the City and Environment Law approach. At the local level their character is less prescriptive and formal. This seems to correspond to a typical local-level implementation focusing on organisational, *horizontal* integration of sectoral policies and stakeholders. Indeed, local regulation puts less emphasis on multilevel governance by way of *vertical* procedural or organisational factors. Interestingly, MILO is often incorporated in City and Environment processes as a bottom-up tool feeding into top-down decision making. In addition, the unique legal basis of the City and Environment Law seems to encourage policy freedom at the local level. The law provides the formal setting – to a lesser extent, the procedural and organisational conditions too – for the devolution of responsibilities in noise management and spatial planning. This seems to be in line with Lafferty and Knudsen's recommendations on the legal-administrative institutionalisation of prioritary principles, "to allow a more forceful and effective implementation" (2007, p. 27). Flexibility within the legal structures combines policy integration and policy freedom at the municipal level.

EPI has been systematically addressed in the Netherlands, initially in the field of environmental policy. The cases show that noise nuisance and spatial planning interests are often balanced through 'flexibilisation' instead of 'normative prioritisation'. That approach has left some dilemmas to be resolved. First, the noise problem proves to be rather persistent, despite several policy initiatives. The health of many inhabitants is negatively affected by high noise levels, and the number of people annoyed has not decreased during the last ten years.

Second, as a result of Dutch EPI practices, precedence is given to spatial planning flexibility in order to address demanding (re)construction targets in densely populated areas. Consequently, noise ceilings are 'lowered' and the environmental quality achieved is questionable. The improvement of acoustic quality, thus striving for 'higher' noise standards in spatial planning, is rare.

Finally, new concepts such as 'quality of life', 'liveability', and 'sustainability' introduced a new idiom that was expected to facilitate the integration of spatial planning and noise policies. Several studies, however, conclude that, to enhance the integration of these qualitative sectoral themes, an idiomatic framework is needed "that goes beyond disciplinary differences" (Van Kamp et al., 2003, p. 16). That new discourse defines "the aspects, scales, indicators and causality and some frames or methodology to weigh the components" (Glasbergen, 2005, p. 439). 'Noise', however, seems to get lost in the idiomatic discussions on sustainability, liveability, and quality of life.

In conclusion, our analysis of noise policy and spatial planning integration strategies underlines the relevance of EPI assessment at local administrative level. Innovative approaches – like the assessed instruments ROM, City and Environment Law, and MILO – supported 'EPI as process' through organisational and procedural factors. In addition, paradigm shifts provided windows of opportunity for implementation of these integration instruments. As similar instruments are applied in other environmental domains and sectors as well, we recommend further research focusing on such empirical cases and the sector-specific factors contributing to the success or failure of EPI implementation and multilevel governance.

In addition, the empirical cases assessed in this paper underlined the emerging findings from other literature – that is, "precisely what level of attention [or 'principled priority'] to give to environmental protection in the sectors" (Jordan and Lenschow, 2010, p. 156, original emphasis). Although existing literature mainly tends to look at national-level and international-level activities, dilemmas occur at the local administrative level as well, like the normative discussion in our empirical case. To integrate noise management in spatial planning, or more generally to put EPI into practice, noise has to be (at least) addressed or considered in the policy process (cf. Schout and Jordan, 2007). In the Netherlands and other West European countries, however, the claims made on space are significant.

Fundamental questions arise about whether EPI is the right way to secure noise policy outcomes, or, instead, whether the goals for noise abatement could be better achieved at the sectoral level (cf. Weale, 2009). Owing to the dense and complex decision-making structure at the local level, the integration of policies is deemed essential; noise, nevertheless, has to be prioritised. As Persson (2006, p. 44) concluded, "an organisational and procedural approach not necessarily ensures normative and substantive decisions for EPI nor solves trade-offs related to it". Normative multilevel approaches and priority setting at the national level seem to be needed to switch over to the early integration of area-based and reflexive decision making at the local administrative level.

5 Evaluating environmental policy instruments mixes: A methodology illustrated by noise policy in the Netherlands

ABSTRACT[13] Environmental policy is characterised by complexity, in causes and effects, resulting in various combinations of policy instruments. However, evaluating these policy instrument mixes and assessing their effectiveness is difficult because of a lack of methodological approaches. This paper therefore proposes a methodology which comprises (a) describing the underlying policy theory; (b) describing the policy instruments; (c) analysing goal attainment; and (d) evaluating effectiveness, focusing on coverage of points of intervention, steering power of policy instruments and coherence of the policy instruments mix. The methodology is illustrated with an evaluation of noise policy in the Netherlands - a typical complex policy domain in which a mix of policy instruments has been in place for decades, and thus provides a good empirical case.

5.1 Introduction

Various scholars have concluded that effective environmental policy requires policy instrument mixes rather than single policy instruments (Glasbergen, 1992; Taylor et al., 2012). In comparison to other policy domains, the environmental policy domain has several specific features, which make formulation of objectives and effective instrumentation of public policy particularly difficult (e.g. Weale, 1992; Lafferty and Meadowcroft, 1996; Gysen et al., 2006). For example Mickwitz (2003, pp. 416-418) summarised key characteristics of environmental problems, such as complexity, time lag effects and the often unequal distribution of impacts in place. These characteristics are often reflected in environmental policy instrumentation, comprising a range of measures at various levels and targets or causes. Individual policy instruments will often result in 'single shots', addressing few mechanisms within the complex cause-effect chain, and a fraction of the polluters or the addressees.

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Earlier, Glasbergen (1992) had already emphasized the variety of behavioural choices of addressees regarding policy instruments, the factors other than the specific policy instrument influencing these choices and the alternative outcomes of addressees' choices. Environmental policy thus, in his words "is limited in its approach; each deals with an aspect of the human character" and "will be more effective if a particular choice could be influenced simultaneously from a maximum number of angles" (Glasbergen, 1992, p. 198). Instrumental aspects of environmental policy are thus critical and challenging; and the effectiveness of policy instrumentation has gained interest among scholars (e.g. Glasbergen, 1992; Acutt and Dodgson, 1997; Mickwitz, 2003; Crabbé and Leroy, 2008).

However, problems arise here, as hardly any theoretical and/or methodological studies on the effectiveness of policy instrument mixes and the interactions between individual policy instruments are available (Oikonomou and Jepma, 2008; Taylor et al., 2012). A similar gap concerns the very limited empirical evidence supporting the claims regarding the (presumed) advantages of combining policy instruments. Most literature on policy instruments focuses on *ex ante* evaluations of policy instruments to be implemented in a specific policy subsystem (e.g. Hellegers and Van Ierland (2003) on agricultural groundwater extraction; Cubbage et al. (2007) and Van Gossum et al. (2012) on forest policy; Stavins (1997) and Grazi and Van den Bergh (2008) on climate change adaptation). These studies assess the (expected) effectiveness through comparison of single instruments. An evaluation of the (presumed or, in the case of *ex post* evaluations, realised) effectiveness of the *combined* instruments is however uncommon. This limited interest is curious as, in line with Bennear and Stavins (2007, p. 112), "in the policy world the use of combinations of multiple policy instruments is common […]".

Therefore, the core objective of this paper is to contribute to environmental policy (instruments) evaluation literature by developing a methodology for the evaluation of policy instrument mixes. The methodological question applied in our study is thus as follows: How can we evaluate effectiveness of policy instrument mixes in the environmental policy domain?

An empirical evaluation of the effectiveness of policy instrument mixes on noise pollution due to road traffic in the Netherlands is used as an illustration of the usefulness of our methodology. Noise pollution provides a suitable empirical case, as in practice a broad mix of policy instruments is employed. As these instruments have been implemented over many decades, an *ex-post* evaluation of effectiveness is feasible.

The remainder of this paper is organised as follows. The next section describes the theory on policy instruments, providing the building blocks of a methodology for effectiveness evaluation of policy instrument mixes in section 5.3. In the subsequent section the usefulness of the methodology is illustrated for the case of Dutch noise policy and summarised regarding the empirical case. We conclude with reflections on the proposed methodology and its main challenges for future research.

5.2 Policy instruments: typologies and evaluation methods

5.2.1 Policy instruments: definitions and classifications

In line with Mickwitz (2003), in this paper we define environmental policy instruments as follows: "the set of techniques by which governmental authorities wield their power in attempting to affect society – in terms of values and beliefs, action and organisation – in such a way as to improve, or to prevent the deterioration of, the quality of the natural environment" (Mickwitz, 2003, p. 419).

Various strategies and public policy instruments have been applied by governments, such as the widely used instrument of regulation (Bovens et al., 2007; Driessen and Van Rijswick, 2011; Taylor et al., 2012). Although scholars have proposed several classifications of instruments, in this section we will present a classification in three main categories as proposed by Vedung (1998) and since then frequently applied by, for example, Weiss (2000), and Grazi and Van den Bergh (2008). This classification is based on the power or degree of authoritative force involved, i.e. in the decreasing level of coerciveness of regulative ('the stick'), economic ('the carrot') and communicative instruments ('the sermon') (see Boot, 2007, p. 112; overviews see for example Bemelmans-Videc et al., 1998; Driessen and Glasbergen, 2000b).

The assumption for applying regulative instruments is that actors, public or private sector actors as well as individuals, are influenced in their behaviour by uniform rules. The approach is typically top-down, traditionally applied by governments, and as such these instruments are often called 'command-and-control' instruments. The government defining the rules and norms also has to apply sanctions, in those cases where rules are not obeyed. Examples of repressive regulative instruments include standards, bans, permits, zoning and use restrictions.

On the other hand, a covenant is a typically stimulative regulative policy instrument providing freedom of choice in how to achieve the defined targets. This gentlemen's agreement between authority and private actor is voluntary, on the basis of mutual trust and shared responsibility, and not enforceable.

Economic environmental policy instruments are less authoritative, and steer behaviour into a more environmentally friendly direction by influencing the costs and benefits of specific choices. The resulting 'freedom' in choosing makes economic policy instruments principally different from regulative instruments. Stimulative economic policy instruments make environmentally friendly behaviour more rewarding by, for example, providing subsidies and grants. In contrast, taxes and charges, examples of repressive economic policy instruments, make certain addressees' choices (financially, materially) less attractive. However, the formal basis for economic policy instruments is often regulative.

Finally, communicative policy instruments aim at altering addressees' perceptions and priorities and subsequently steering their choices in line with the policy goals, such as environmentally friendly behaviour. This type of policy instrument, also referred to as 'moral suasion' or exhortation, is the least coercive of the three categories. Examples of stimulative communicative instruments are all kinds of information dissemination about, for example, the nature of a problem that the policy at stake is aiming to resolve. Eco-labelling and environmental management systems are mostly induced by regulations; however, the resulting actions due to these labels and management systems are voluntarily and based upon the information dissemination by the addressees.

5.2.2 Effectiveness evaluation of policy instruments

Policy (processes) can be evaluated against its outputs, its outcome and its impact. Outputs are defined as tangible results of a policy, often in the form of programmes or plans. The outcome of policy, according to Gysen et al. (2006, p. 97), is "defined as the response of the target groups to the output, [and] corresponds in principle with the policy objectives". Finally, impacts are related to physical changes in the state of the environment; for example reduced levels of environmental pollution.

In policy science literature a broad range of evaluation methods is available, varying in scope (time perspective) and criteria (such as effectiveness). *Ex-ante* evaluations or assessments, such as impact assessments and cost-benefit analyses, gained attention specifically in the evaluation of policy instruments for 'new' environmental topics such as climate adaptation and sustainable transport (Bennear and Coglianese, 2005). The aim of these analyses is to inform the policymaking and implementation process. *Ex-post* evaluations or retrospective evaluations, in the words of Vedung (1998, p. 3), assess "the merit, worth and value of administration, output and outcome of government interventions, which is intended to play a role in future, practical action situations".

An *effectiveness* evaluation addresses the (expected) outcome or impact of policy programmes or policy instruments, or more specifically, the ability of these programmes or instruments to produce the intended effects (Vedung, 1998; Mickwitz, 2003; Neij and Åstrand, 2006). The standard methodology of effectiveness evaluation research concerns the goal-based or goal-achievement model (e.g. Scriven, 1991; Verschuren and Zsolnai, 1998; Mickwitz, 2003; Van Gossum et al., 2012). The choice of a single effectiveness criterion fits the analytic-rationalist perspective on policy (Bovens et al., 2006); policy success in this instrumental evaluation approach is determined by policy efforts and resulting success in tackling specific problems. Alternatively, in goal-free evaluations other criteria and perspectives are applied, such as acceptability, feasibility and equity. Cost-effectiveness is assessed in cost-benefit analyses (CBA) as well. This evaluation method builds on effectiveness evaluations in monetising the policy costs and effects achieved; thus effectiveness evaluations are integral part of CBA. Focusing solely on goal attainment and effectiveness of policy instrument mixes, which is challenging in itself, we thus propose to apply a traditional analytic evaluation approach.

Several evaluation *methods* have been developed in order to assess effectiveness. Preferably a randomised, experimental design is applied in proving causal relationships between effect and policy. However, environmental policy, in particular, is different from many other policy domains where 'clinical' experiments can be set up. Randomised control groups are often ethically unthinkable or impossible for policy programmes covering almost all addressees (Rossi and Wright, 1984). In addition, effects of environmental pollution only become evident after decades. Counteracting policy interventions will thus require decades before effectiveness is evident. Such time-lags make experimental set-ups difficult.

Consequently, in environmental policy evaluations, mainly quasi-experimental approaches, such as 'before and after' assessment within non-comparable groups, are applied. However, reliability and validity of the results of such evaluations might be critical.

Evaluation studies have various methodological and practical challenges. Problems concern, for example, vaguely formulated goals; multiple, shifting and/or changing goals; and either a tenuous or missing link between goals, activities and outcomes or 'ends and means'. Second, indirect effects from the policy domain itself or other policy domains will influence goal attainment of the policy under scrutiny (Primdahl et al., 2003; Rauschmayer et al., 2009; Laurian et al., 2010). These problems occur in the evaluation of many environmental policy domains. Third, problems frequently occur regarding the acquisition of reliable outcome data or impact data (e.g. mortality rates, pollution levels). Data scarcity and incongruity seem to be particularly critical in environmental policy evaluation studies (Crabbé and Leroy, 2008).

Acknowledging methodological problems such as the attribution question, scholars have proposed various approaches for effectiveness evaluation, often comprising the following elements: (i) identification of the logic of the programme; (ii) description of the expected behavioural changes of the addressees; (iii) analysis of the goals and actual developments in the target variables for which policy objectives are formulated over time; (iv) analysis of the causal relationships between the policy's provisions or outputs and the policy's outcomes, using experts' knowledge (Mayne, 2001; Mickwitz, 2003; Laurian et al., 2010).

Notably, effectiveness evaluation of policy instrument *mixes* is even more challenging, specifically with respect to goal achievement and causality, and counterfactuals or 'what if' analyses. Individual policy instruments often intend to achieve a specific goal, which *can* be a sub-goal or interim goal for the overall goal of the policy domain at stake. However it is not unthinkable that different goals are defined within the policy domain, without any explicit relation or linkage in outcome or impact, in time or in target addressees. Therefore, simply summing up the effects and effectiveness of individual policy instruments will not suffice. Second, several individual policy instruments can either mutually reinforce or counteract on points of interventions in the cause-effect chain. This aggravates the complexity of effectiveness evaluation of policy instrument mixes. However, as scholarly research addressing combinations of policy instruments is scarce, we will build on current environmental policy evaluation methods.

5.3 Assessment of policy instrument mix effectiveness: a methodology

Based upon current scholarly approaches, as summarised in section 5.2.2, we propose a methodology for effectiveness evaluation of policy instrument mixes, explicitly taking into account the methodological, practical and data challenges discussed above.

The methodology consists of the following elements, elaborated in the subsequent sections:

1. description of the noise policy theory in terms of causes and effects of noise pollution, (theoretical) points of application for policy interventions and (sub) goals;
2. description of the policy instruments in place in order to achieve these goals;
3. analysis of goal attainment and measured effects;
4. attribution of the relative contribution of individual policy instruments to the level of goal attainment and the combined effects of policy instrument mixes (in terms of complementarity and competition).

Step 1: description of the policy theory

As Hoogerwerf (1990, p. 285) stated, evaluation research "is the test of a causal assumption underlying a policy". Assumptions of a policy, regarding the features of phenomena concerned and the relations between these phenomena, such as causes and effects, have to be systematically reconstructed and analysed. Or in other words, the policy theory has to be described. Reconstructing the policy theory will provide insight into the main points of application, which can be addressed by various policy instruments (Runhaar et al., 2006). In our methodology we reconstruct policy theories based upon (i) collection of (written and oral) statements about the policy at issue, and (ii) tracing of goal-means and cause-effect relations.

Step 2: description of the policy instrumentation

As discussed in section 5.2.1, we apply a categorisation of policy instruments, i.e. regulative, economic and communication instruments. In this step the various types of policy instruments are described and illustrated with regard to their steering philosophy, targets or addressees and the intended effects. The link between policy instruments and policy goals is illustrated through the points of application identified in step 1.

This step will provide insight into the *coverage* of the policy instruments and, for example, the points of application that are targeted least or most by the various individual policy instruments; a relevant building block for the effectiveness evaluation.

Step 3: analysis of goal attainment

In applying a goal-attainment definition and effectiveness criterion, we take the policy goals that have been formally set in laws and policy plans as reference (Baak and Van Zanten, 1990). Policy goals are often defined as pollution reduction targets in percentages or specific loads; consequently analysing goal attainment is a typical quantitative step in the methodology. The challenge of shifting, non-measurable or adjusted goals is addressed by abstracting and defining the main and sub-policy goals that are quantified and time-restricted, and taking these goals as reference for the analysis. In line with Gysen et al. (2006), we make a distinction between goal attainment and effectiveness, since goal attainment is not necessarily due to (only) the policy interventions. In separate steps, goal attainment is identified by quantitatively measuring (recently achieved) effects and comparing these with the policy goals. Effectiveness is assessed by explaining the causal relationships between the policy and the measured effects (in step 4).

Step 4: evaluation of effectiveness

The methodological challenge regarding the assessment of the effectiveness of a mix of environmental policy instruments is that experimental methods are not applicable. Therefore, we will employ a quasi-experimental and triangulation approach in order to guarantee the highest possible reliability and validity of the research results. Triangulation consists of confronting three qualitative data sources in the analysis of the *perceived* and *expected* effectiveness of the policy instrument mixes. The former is analysed through expert judgments, using questionnaires and thematic interviews. The analysis of expected effectiveness, on the other hand, is based upon academic and empirical literature. Differences in both analyses will be discussed with the respective experts; as a result agreement is achieved, or an 'average score' on perceived effectiveness is defined. In the analysis of expected effectiveness we assume that effectiveness of policy instrument mixes will depend upon the following three elements.

The first element concerns the coverage of the theoretical points of application, which requires mapping the policy domain, as conducted in steps 1 and 2 of the methodology. Second, the steering power of the policy instruments will define effectiveness by way of exclusion of unwanted or avoiding behaviour. These behavioural aspects are also dependent upon characteristics of the regulated, for example the motivation to change or adhere to specific behaviour of the addressees and their ability to understand and follow-up the intervention (Taylor et al., 2012). Third, compensation of (negative) side effects of single instruments and/or mutual reinforcement of instruments will increase the overall effectiveness of the policy instrument mix. Applying the methodology we assume the ability to identify such gaps in the policy instrument mix.

The advantage of this proposed methodology is that triangulation of qualitative and quantitative data and triangulation of expert and literature data is possible, through which results can be validated, rivalry statements can prevent biased conclusions and the data challenges are overcome (see Baak and Van Zanten (1990) on similar alternatives for (quasi-) experimental methods).

5.4 Illustration of the policy instrument mixes effectiveness evaluation methodology: the empirical case of Dutch noise policy

In this section the practical applicability and usefulness of the methodology is illustrated by means of an assessment of the effectiveness of noise policy instrument mixes in the Netherlands. We follow the steps outlined in section 5.3; in step 1 (description of the noise policy theory) and step 2 (description of the noise policy instruments) we used data from policy documents, reports and other secondary literature. In addition, several interviews with Dutch noise policy experts have been conducted in order to review and refine our identification of policy goals and instruments employed, and to advise on policy instruments that were missing in the preliminary selection. This empirical review resulted in an overview of noise policy instruments that are or could be employed in the Netherlands as well as in many other Western countries. Following this, we made a selection and classification of the policy instruments employed today, of which adequate data could be gathered from reports, documents and interviews and are thus considered in the effectiveness evaluation. In step 3 goal attainment has been analysed, using the empirical data collected during the first two steps.

The perceived effectiveness of the policy instruments (mix) has been evaluated through expert judgements (step 4). In total six experts have been interviewed, using a questionnaire and the tables presented in this article. These experts have been working in the noise policy field for decades, and represent the public sector (two experts from local administration resp. local health department), the scientific community (two experts), NGOs (one expert) and consultancy (one expert). Some of these experts, such as the NGO and local health department experts, can be considered opponents or critical reviewers of the Dutch noise policy and as such are helpful in finding rival explanations and preventing bias in the assessment of effectiveness of the noise policy instrument mixes.

The assessment of the effectiveness of the policy instrument mixes is the task of this section, in illustrating our methodology which distinguishes perceived as well as expected effectiveness and the analysis of coverage of points of application, the steering power of policy instruments and the coherence of the instrument mix. We conclude this section with a short reflection on the effectiveness of Dutch noise policy instrument mixes. A more detailed analysis of the empirical case is available online and in Appendix 4 as supplementary material, including (i) a concise overview of noise policy instruments, actors and intended effects; (ii) policy goals, shifts, outcomes realised and goal attainment; (iii) overview of individual expert scores of policy instrument effectiveness as well as overall perceived effectiveness.

5.4.1 Step 1: Description of the noise policy theory

Road traffic is by far the most important source of noise pollution, air pollution and climate change in densely populated areas all over the world (Netherlands Environmental Assessment Agency, 2012). Environmental noise can annoy, disturb sleep, affect cognitive function in schoolchildren, cause physiological stress reactions and can cause cardiovascular problems in chronically noise-exposed subjects (Berglund et al., 1999; EEA, 2010; European Commission, 2011). Recent publications, e.g. WHO (2011), show that traffic-related noise may account for over one million healthy years of life lost annually (commonly abbreviated DALY) in European countries.

On the 'cause-side', road traffic is the main contributor of noise emissions in urbanised areas, further specified by the use of the noise source (e.g. vehicle speed and traffic volumes), the characteristics of the noise source (e.g. exhaust or engine noise), the vehicle type (e.g. passenger car, vans and trucks or electric vehicles) and the location of the noise source (e.g. nearby dwellings with(out) noise barriers).

These mechanisms are the logical points of application for various policy instruments regarding traffic noise. In the following section (see Figure 9) the causes and points of application and the effects of noise pollution are illustrated.

Noise policy goals

The basis of noise policy in the Netherlands was laid by the Noise Abatement Act in the 1970s. The original aim of the Dutch noise policy was to stabilise the percentage of persons annoyed by noise, prevent noise problems and reduce noise pollution (TK, 1976). These goals have been restated by subsequent Dutch governments in National Environmental Policy Plans. However, (socio-)economic developments, as in many other western countries, resulted in an increase of mobility, urbanisation and population density. As a consequence, noise policy goals have been shifted, adjusted, reaffirmed or removed during the last decades, and an array of additional noise policy instruments has been adopted by national and local governments.

The question thus arises of how to define 'the Dutch noise policy goal' and assess the effectiveness of the current policy instrument mix. At the time noise policy was formulated, the overall goal was to prevent and reduce noise pollution, or in quantitative terms "to stabilise the percentage of noise-annoyed population at the level of 1985, that is approximately 40%" (NEPP1, 1989, p. 150). In our empirical analysis we therefore propose to mainly focus on the *trends* in the variables, comparing the situation of the 1980s with today's relative levels of annoyance (in step 3 of the methodology, see section 5.4.3). In addition, we will address 'sub policy goals' regarding the noise immission levels on dwellings (e.g. number of dwellings with noise exposure levels above 65 or 70 L_{den}) and the noise emission levels from traffic (e.g. reduction of 2 dB from vehicles).

5.4.2 Step 2: Description of the noise policy instrumentation

In this section, an overview of noise policy instruments on road traffic is provided; the mix presented consists of instruments that are currently –for longer or shorter time periods – in place. Noise policy instruments are categorised based on the point of application for the policy instrument, as is illustrated in Figure 9 and discussed below.

Noise emissions: regulating, pricing or informing vehicle use and techniques

Noise emissions are the result of several source specificities such as the number of vehicles used and the technical standards of the vehicles. The distribution of vehicles over time and place is addressed through, for example, restricted zoning, that is, precluding certain types of vehicles from entering the city or certain zones within it or – the positive approach – privileging certain types of vehicles (Grazi and Van den Bergh, 2008; King et al., 2011).

With regard to technical standards of noise sources, for many years internationally defined technical standards have been in place regulating noise emissions from tyres (EU Directive 2001/43) and vehicle propulsion of passenger cars, light vans and heavy vehicles or trucks (EU Directive 70/157). The use of low noise tyres is also stimulated through tyre labelling, which is an example of a communication policy instrument.

An example of an economic policy instrument addressing the use of noise sources is fuel taxation. This instrument aims at promoting the purchase of smaller vehicles and more fuel-efficient models, in addition to a reduction in kilometres driven. The main environmental effects of this policy instrument are reductions of air pollutants and of noise emissions (Acutt and Dodgson, 1997).

Finally, vehicle use is addressed through traffic speed regulation and traffic management, which are examples of regulative policy instruments.

Noise transmission: technical measures between source and receiver

Competent authorities planning to (re)construct a road or a residential area have to comply with noise (immission) limits as defined in the Noise Abatement Act. Frequently technical measures, such as low noise road surface and noise barriers, are applied that reduce noise transmission from noise source to noise receiver. The act as described in the next section is the (regulative) policy instrument; whereas both technical measures are applied due to this instrument. Nevertheless, we propose to consider these technical measures as policy instruments in our empirical case.

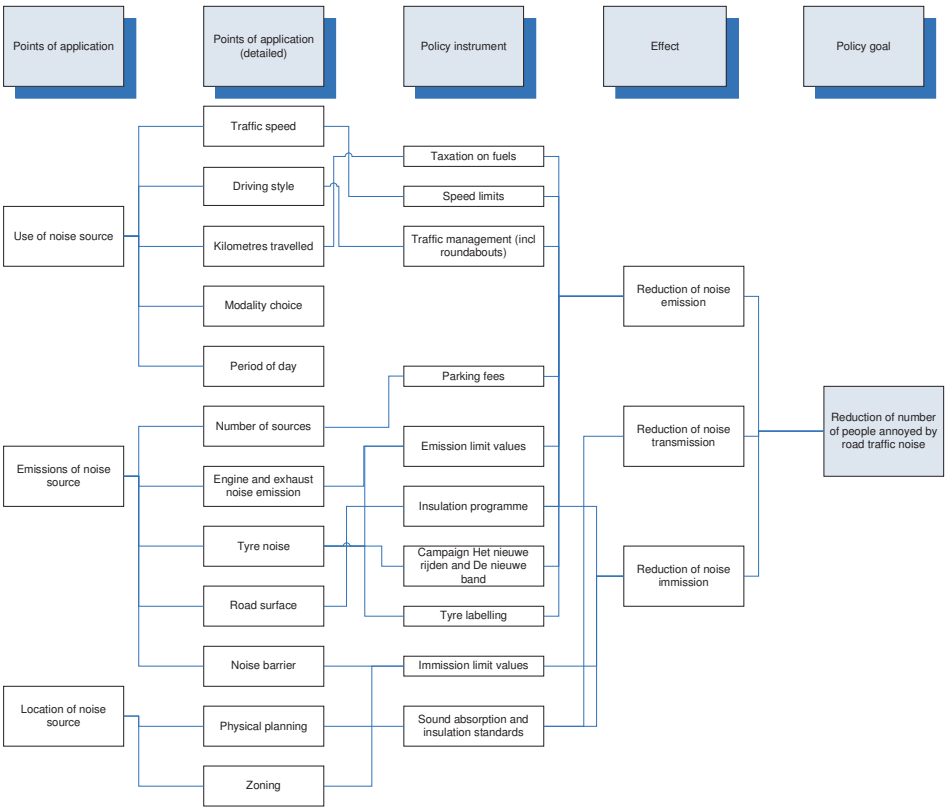

Figure 9: Noise policy – points of application and policy instruments

Noise immission: regulating and financing façade insulation

Immission standards have been in place since the late 1970s, defined in the Noise Abatement Act. This Act includes procedural as well as substantive rules, addressing spatial and infrastructural planning, in order to separate noise sources from noise receivers. As such, this policy instrument addresses local governments in order to prevent noise pollution and negative health effects on individuals. Noise limits, defined at the façades of dwellings, vary according to existing and new situations, for the location (urbanised areas versus non-built areas) and for noise sources (e.g. road traffic, railway traffic, industries) (Weber et al., 2012).

The Noise Abatement Act also aims to reduce noise pollution and insulate dwellings where noise levels at the time of the Act's implementation were higher than the regulative immission standard of 55 dB. The programme is financed, or in terms of policy instruments subsidised, by the national government and implemented by both national and local administrations.

Noise policy instrument categories

The above overview of noise policy instruments indicates a relatively high reliance on regulative policy instruments in the Dutch noise policy domain. Command-and-control steering is quite common in environmental policy in general, ans in the Netherlands specifically (see e.g. Jordan et al., 2003b). Economic policy instruments are employed less or are lacking, apart from the insulation programme which has been in place for many years. In addition a few communication instruments are implemented.

5.4.3 Step 3: Analysis of goal attainment

As discussed previously, goal attainment defines the state of the target variables relative to the policy goals defined in regulations and policy plans. Annual publications on the state of the environment and other policy documents provided information on goal attainment. The percentage of people being highly annoyed by road traffic noise has been constant during the last 25 years, at the level of approximately 30% (Franssen et al., 2004; Van Kempen and Houthuijs, 2008). On the other hand, the policy goal regarding exposure levels of dwellings has not been fully met. The number of dwellings that have to be insulated has more or less doubled since the 1980s and there are still many dwellings with noise exposure levels above 70 L_{den}. Finally, noise emissions from road traffic have hardly decreased despite the policy goal of 2 dB noise reduction.

In sum, the main policy goal of preventing noise pollution and stabilising the percentage of noise-annoyed persons has been attained. However, sub-policy goals, regarding hot spots of noise pollution and reduction of noise source emissions, have still not been met.

5.4.4 Step 4: Evaluation of effectiveness of noise policy instrument mixes

In this section we assess effectiveness of policy instrument mixes according to our methodology, applying a stepwise approach, analysing expected and perceived effectiveness based upon literature reviews and expert interviews respectively.

Expected effectiveness of policy instrument mix: coverage of points of application

Considering the main indicators and mechanisms of noise pollution, we can see how various policy instruments cover various points of application (see Figure 10). The striped boxes illustrate points of application that are addressed through policy instruments; points that are 'missed' by the policy instrument mixes are blank.

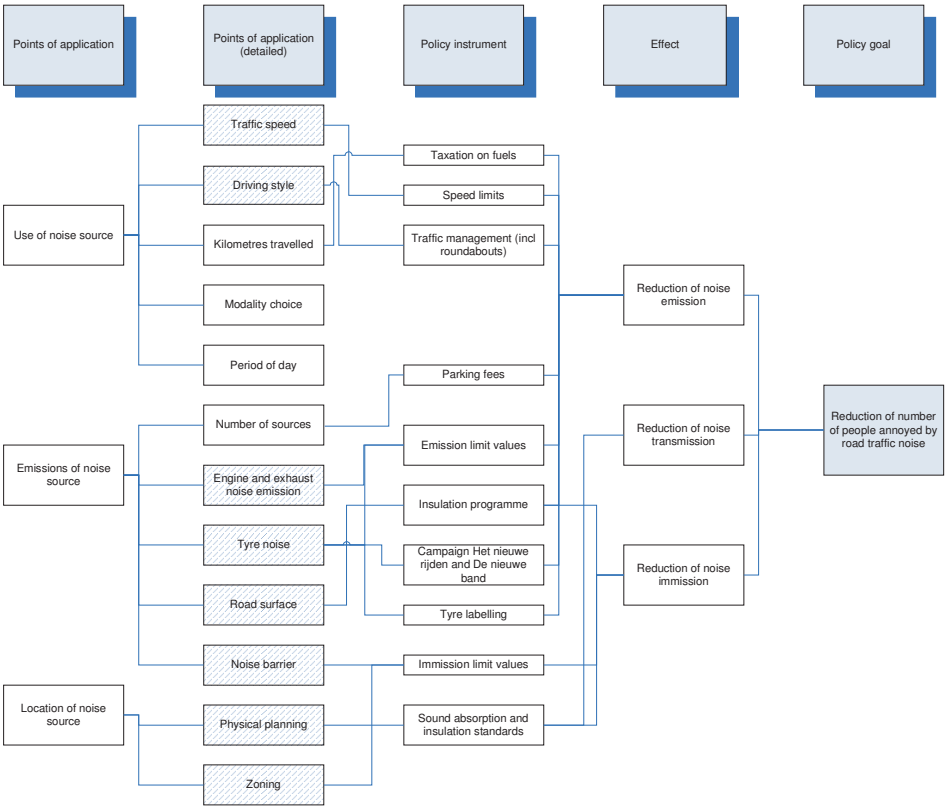

Figure 10: Coverage of points of application through noise policy instruments

From Figure 10 it becomes clear that, specifically, the use of cars, and thus noise emissions, is addressed through various policy instruments. Transmission and immission of noise are addressed through mostly regulative, policy instruments such as the Noise Abatement Act and building/sound absorption standards. In the following paragraphs on steering power and complementarities, explanations for the rather high effectiveness of these instrument mixes will be discussed. In sum, the coverage assessment illustrates the absence of traffic volume policy targeting the number of vehicles on specific road sections and the kilometres driven in general. The absence of policy instruments on traffic volume in noise policy as in other policy domains such as sustainable transport policy, results in limited expected effectiveness.

Expected effectiveness of policy instruments: steering power of policy instruments

In discussing the steering power of policy instruments, we focus on the addressees identified in the noise policy domain. The automotive industry seems to have an important role in the international policy domain, and as a result noise emission limits in place since the 1970s have hardly changed. Notably, this is in contrast to the emission standards for vehicles regarding air pollutants that have been lowered consistently and resulted in significant decrease of emissions of air pollutants. The steering power of international regulations on noise emissions thus seems to be limited, as the addressee –i.e. the car manufacturing industry – is not corrected for 'non-compliant behaviour' such as adjusting testing procedures.

On the other hand, policy instruments addressing national and local governments, including spatial planning and infrastructure departments, score high on expected effectiveness. For example road authorities seem to be rather effectively addressed through technical requirements regarding noise transmission, defined in noise regulations. An exception of the effective regulatory instruments might be the nationally defined immission limits, which are implemented by the local administrative authorities and project planners in physical planning projects. Due to the densely built environment the noise limits are often thought of as limiting and hampering the housing ambitions of municipal authorities. As a consequence, the maximum allowed noise limit, which reflects a moderate to bad acoustic environment, is frequently used, instead of the lower health-based preferred noise limit. This local practice of prioritising economy and mobility vis-à-vis public health has been criticised heavily (e.g. Algemene Rekenkamer, 2009; Weber et al., 2012).

Finally, many policy instruments addressing the transport sector are mainly economic and communication instruments which are known, from scholarly literature, to have less steering power than mandatory regulative instruments. Consequently, effectiveness of this policy mix addressing the use(rs) of vehicles is expected to be weak. A preliminary conclusion might therefore be that government (as policy maker) has not been able to steer other addressees in the desired direction.

Expected effectiveness of policy instruments: coherence and complementarities of policy instrument mixes

Effectiveness of policy instrument mixes is increased when the mix is coherent and instruments are complementary. Some examples can be found in the noise policy domain, such as the combination of regulative and economic features of policy instruments in the insulation programme. This instrument mix is considered effective, although overall goals have not been achieved, as state budgets were restricted.

Another example of coherent policy instrument mix concerns emission standards. The effectiveness of this regulative policy instrument could be reinforced once monitoring and enforcement of noise emission levels are ensured after vehicles are sold and used. Until now, car owners have been able to change exhaust systems into noisier versions without being sanctioned during metered testing in annual vehicle tests or roadside tests. Therefore, recently a proposal has been adopted by the Dutch Parliament to adapt the obligatory vehicle check-up ('in service compliance', in Dutch APK) incorporating noise measurements as per 2013 (Ministry of Infrastructure and Environment, 2012).

Perceived effectiveness of noise policy instruments in the Netherlands

In this section we present experts' judgments on the (perceived) effectiveness of the selected noise policy instruments; in the interviews the six experts either confirmed or rejected the key findings from earlier evaluations. For example, the expected limited steering power of economic and communication instruments was confirmed by all experts. In general, all experts mutually agreed on the perceived effectiveness scores; in several cases scores were either neutral to positive or neutral to negative.

However, regarding noise immission limits and parking fees scores on perceived effectiveness varied. Effectiveness of the former was perceived positively by the local government expert, whereas most experts criticised limited steering power of this instrument in line with the literature discussed above. These different opinions are to be understood in the context of local administrations' tasks in spatial planning; in our analysis we adopted the criticism reflecting the majority of scholarly and expert views.

Regarding noise sources, the emission standards for vehicles have been updated several times since the EU directive on noise emission limits for vehicles entered into force in the 1970s. However, changes in the noise emission test methods have counterbalanced the tightening of the limits. As a consequence, the overall effect is that there is no tangible reduction of noise emissions; this is confirmed by all experts as well as scholarly evaluations (see for example Den Boer and Schroten, 2007; Nijland, 2008).

An economic policy instrument which targets noise sources is road traffic taxation. Although scholarly research is scarce, all interviewed experts concluded that fuel taxation has limited effectiveness regarding traffic volumes, as taxation mainly induces a change in size and fuel efficiency of vehicles, which reduces air pollution but hardly affects noise emissions (see also Priemus, 1995). On the other hand, all experts expect road pricing to be a highly effective economic policy instrument. However, this instrument is not employed in Dutch noise policy.

Finally, public campaigns as examples of communication policy instruments score very low on effectiveness according to the experts. It was also learned from research that although individuals were aware of the campaign for quiet tyres, the policy instrument hardly changed their behaviour (Algemene Rekenkamer, 2009). Results for the campaign on adjusted driving might be somewhat more positive, as this 'sustainable way of driving' has been incorporated in driving lessons and examination as well. In general, however, changing behaviour needs constant follow-up or repetition of the message as individual gains are very limited (Glasbergen, 1992; Vedung and Van der Doelen, 1998).

Regarding the transmission of noise, two technical measures were added to the list of noise policy instruments: low noise road pavements and noise barriers. Both noise abatement measures are applied due to immission regulations, and are perceived by experts as highly effective instruments (see below for further information).

The insulation programme initiated by the national government is an example of an economic policy instrument targeting noise immission. Although this instrument is perceived to be effective, after implementation of the programme in the 1980s and 1990s, the number of dwellings that required insulation measures seemed to be higher than originally thought. The government has reported that, due to the autonomous increase of mobility and the increase of population since 1986, the number of dwellings that currently need insulation has more or less doubled. In addition, national government budgets for insulation projects have been limited. As a consequence, experts expect it will be another 25 years or more before this target can be achieved; notably current policy has been rephrased aiming at the 'most urgent' situations. Priority is given to dwellings with noise immission levels of 65 L_{den} due to highway traffic; the number of dwellings with similar noise levels due to municipal road traffic is significantly higher, but no state budgets are available.

Effectiveness of the noise policy instrument mixes

The expected as well as perceived effectiveness evaluation of noise policy instrument mixes currently in place in the Netherlands reveals that specifically the noise source, i.e. the car (driver), is weakly targeted. Regulative emission standards have limited steering power and are not enforced once vehicles are used. In addition, influencing the use of cars in a restrictive sense, which in many Western countries is considered a 'holy cow', is often a critical topic of societal and political debates. This is reflected in the evaluation by the experts and also in the evaluation based upon empirical and academic literature; opinions on the effectiveness of economic policy instruments targeting vehicle use differ more than on the regulative policy instruments on noise transmission and immission. These contradicting opinions are found in empirical literature on, for example, effectiveness of road pricing and in the expert opinions regarding parking fees. The latter scored negatively by the local government expert due to negative side effects, whereas most other interviewed experts perceived this instrument's effectiveness neutral to positive. Feasibility and acceptability of policy instruments, such as road pricing, seem to be crucial in the definition and implementation of instruments restricting vehicle use. Overall, Dutch road traffic noise policy is characterised by gaps in the instrumentation and points of application, where noise emissions are not or only partially addressed. Suggested improvements of the noise policy instrument mixes concern specifically introducing economic policy instruments such as emission trading for the automobile industry, road pricing and environmental zones in city centres.

5.5 Conclusions

The aim of this paper was to develop a methodology for evaluation of the effectiveness of policy instrument mixes, as scholars mainly focus on single policy instruments, neglecting the fact that, in the environmental policy domain, *combinations* of instruments are usually employed and advocated by the same scholars.

Our methodology consists of four steps based on a review of scholarly policy theory and evaluation research. The empirical case, Dutch noise policy, illustrated the usefulness of the methodology. The steps of describing the policy theory and the policy instruments (steps 1 and 2), of analysing goal attainment (step 3) and the effectiveness of the policy instrument mixes (step 4), which have been employed, seem applicable in various (environmental) policy studies. In our opinion, specifically the overview of and assessment of (the coverage of) the *points of application* and the *coherence* of the policy instrument mix have added value, compared to the existing practice and focus on single policy instruments. An improvement of Gysen et al.'s (2006) and others' methodology concerns our distinction between perceived and expected effectiveness. This approach facilitates the triangulation of data and prevents biases in the analysis.

Assessing the *steering power* of policy instruments is specifically useful in relation to the assessment of cohesion and complementarities of policy instruments, or, rather, in defining and designing 'new' policy instrument mixes. As limited steering power of a single instrument can be counteracted or balanced by another policy instrument, it will result in a more coherent mix of instruments.

Finally, the empirical case of noise policy in the Netherlands proved useful in illustrating our methodology. The complexity of the noise policy domain, in terms of cause-effect chains, the subsequent points of application and variety of noise policy instruments, is analysed in a stepwise approach in accordance with our methodology, and main conclusions regarding the effectiveness of the noise policy instrument mix are drawn. As such, this empirical case is regarded as exemplary for many other environmental policy domains. We encourage other researchers to replicate our methodology in order to get a better understanding of policy instrument mixes in other (environmental) policy domains.

6 Noise policy in the Netherlands: Conclusions and reflections

6.1 Introduction

From the outset, the noise policy domain in the Netherlands seems to be a complex but stable environmental policy domain in which, apart from a few experiments with integrating noise policy into spatial policy, few dynamics have been observed during the past four decades. This is remarkable given the observation that noise policy has not been able to substantially reduce the negative health effects associated with noise pollution. The limited dynamics also is remarkable given the emergence of new forms of governance in the environmental domain, as extensively analysed in environmental governance literature. The question arose whether the observation of stability was correct and if so, how this could be explained. A subsequent question was whether this lack of dynamics is problematic in terms of the performance of Dutch noise policy, as dynamics in policy is not per se required as long as policy goals are effectively attained. The aim of the study presented in this thesis was thus to analyse and evaluate noise policy in the Netherlands, by using different lenses on (i) modes of governance (actors, instruments and discourses); (ii) (absence of) dynamics in regulative noise limits (advocacy coalitions and belief systems); (iii) integration of noise objectives into other policy domains; and (iv) policy instruments, goals and effectiveness.

The previous chapters successively answered the following main research questions:

1. Which stability or dynamics are evident in the noise policy domain in the Netherlands in terms of modes of governance and what explains this stability or dynamics?
2. Which (f)actors explain stability and/or change in the noise policy subsystems for (road and railway) traffic, aircraft and industrial noise and the differences in dynamics within the noise policy subsystems?
3. To what extent has integration of noise policy into spatial planning, as a specific governance approach, resulted in increased effectiveness in terms of prioritisation of health objectives?
4. Which policy outcomes have been achieved with the policy instrument mixes in place and how can these outcomes be explained?

The analysis was conducted at a meta level, as it focused on what and how governments do and neglect to do in general terms and did not analyse policy *practices* in detail (Sabatier and Jenkins-Smith, 1993; Klein and Marmor, 2006). The aforementioned main elements are generally accepted and studied in academic policy analysis literature. The approach built on environmental policy literature perspectives relating, specifically, to governance literature (e.g. Hysing, 2009), the Advocacy Coalition Framework (Sabatier and Jenkins-Smith, 1993), the concepts of Environmental Policy Integration theory (e.g. Nilsson and Persson, 2003), and policy theory (Hoogerwerf, 1990) and policy evaluation literature (Mickwitz, 2003).

In studying noise policy in the Netherlands this research focused on environmental noise, as a major contributor to adverse environmental health effects. Environmental noise is a concern of European, international and national governments for decades, as opposed to for example neighbour(hood) noise. The environmental noise sources addressed in this thesis are road traffic, rail traffic, air traffic and industry (see chapter 1 and European Commission, 1996). Some research questions (i.e. research questions 1 and 3) concern the environmental noise policy domain in general, thus encompassing all these environmental noise sources. On the other hand, in order to answer research question 2, environmental noise policy subsystems, delineated for the individual environmental noise sources, were distinguished and analysed separately and comparatively. Finally, the empirical focus for research question 4 was on road traffic noise as the main contributor to adverse health effects and a key topic of Dutch noise policy in terms of policy goals and policy instrumentation. Furthermore, this subsystem is far more complex in terms of actors and instrumentation compared to, for example, the industrial and railway traffic noise subsystems. The effects of the limited dynamics of actors and instruments on the effectiveness of this policy subsystem are thus of specific interest.

In the subsequent sections of this concluding chapter I first answer the research questions and reflect once more on the preliminary observation of limited dynamics in the Dutch noise policy domain (section 6.2). In section 6.3 the overall performance of the noise policy domain is discussed, indicating the barriers to 'sound' noise policy that came to the fore in this research (section 6.3). Finally, section 6.4 reflects on the approaches and perspectives applied, and section 6.5 concludes with some recommendations for future research within the environmental policy domain.

6.2 Answering the research questions

The key findings of this study and the answers to the four research questions are summarised in this section.

Research question 1: Shifts in noise governance modes?

The rationale of research question 1 was to test the preliminary characterisation of the noise policy domain in the Netherlands as a traditional, hierarchic and regulative governance mode, and the seemingly absent shifts towards other governance modes. Chapter 2 showed that while shifts in governance and a changing role of the state are evident for environmental policy in general, similar shifts are not seen in noise policy. Governance literature provided useful concepts for defining an analytical framework comprised of three elements, i.e. discourses, actors and instruments (Hysing, 2009). Based upon the assessment of these indicators, shallow shifts were found in the noise policy discourses and the actor coalitions. However, the third indicator, that is the instrument mix, remained mainly based on the 'government' characteristic legislative policy instrumentation, with the exception of some experiments with governance instruments for integration of noise objectives into flexible and area-specific spatial planning. Overall, today's noise policy in the Netherlands was thus depicted primarily as a mode of governance characterised by a combination of centralised and decentralised governance styles, where the central government sets objectives and the main policy instruments, and relies on decentral governments for policy implementation (see Driessen et al. (2012) and Lange et al. (2013) for ideal-typical governance modes).

In the analysis of the absence of shifts in governance modes three explanatory factors were identified, i.e. the absence of shock events, a lack of dissatisfaction about noise policy performance and institutionalisation, and included in the analytical framework. These explanatory factors are frequently applied in other policy analysis theories and approaches, such as punctuated-equilibrium literature on events (e.g. Birkland, 1997). In the environmental policy domain, policy change caused by shock events has been analysed for, for example, external safety where severe accidents with chemicals resulted in major changes in the policy domain and in the implementation of European legislation on chemical industries. However, such events can hardly be imagined within the noise policy domain, which was confirmed in the analysis, illustrating that such drivers for change were largely absent during the period concerned.

Dissatisfaction with the performance of the policy domain did not act as a driver for change in governance modes, either. This is in contrast to, for example, the introduction of voluntary agreements, a 'new' environmental policy instrument, on air pollution and energy consumption of the industry sectors in the Netherlands (Jordan et al., 2003a). Finally, the noise policy domain specific institutionalisation has been a major barrier to shifts; excluding various actors from the decision-making processes obstructed new discourses on problem frames and the required policy instrumentation.

Concluding, shallow shifts in the noise policy domain were revealed in terms of limited dynamics in discourses and actor coalitions as the noise policy domain's specific institutionalisation acted as a barrier for new actors to enter the policy domain.

Research question 2: Explanations for stability or change in noise policy subsystems?

Although the conclusion was drawn that, *overall*, the noise policy domain had shown little dynamics, this was not necessarily true for the subsystems (i.e. (road and railway) traffic, aircraft and industrial noise). Therefore, a detailed analysis of governance modes features was conducted, focusing on policy objectives (i.e. regulative noise limits) in the various noise policy subsystems. This focus was chosen because the Dutch noise policy domain is characterised as a combination of central and decentral governance modes that largely build on the top-down regulative policy instrument of noise limits.

Explanations for (differences in) stability and/or change of the regulative limits were explored by analysing the main actors, their belief systems and coalitions; because central and decentral governmental bodies are the primary actors in the formulation and implementation of noise limits in their daily activities as decision makers. Actors, thus, hold on to policy arrangements that suit them well and advocate changes in unwieldy noise limits.

In chapter 3 the Advocacy Coalition Framework (ACF) literature was employed as an analytical framework, specifically because, in contrast to some other frequently applied theories and frameworks, ACF seems suitable to explain both policy stability and policy dynamics. As a consequence advocacy coalitions were assessed as the aggregation of policy actors, according to shared sets of normative and causal beliefs and coordinated activities, in order to explain the variation and stability of regulative noise immission limits.

The study concluded that noise limits have frequently been adjusted in the traffic noise policy subsystem, whereas the industrial and aircraft noise policy subsystems are characterised by stability in norm setting. The main explanatory factors for presence or absence of change in the noise policy subsystems were found to be policy learning and policy brokerage. Policy learning, within and between advocacy coalitions, concerns adapting new information into beliefs and actions of the actors involved in the policy subsystem. As a consequences changes in, for example, problem frames and policy instruments can occur. In some cases policy brokers, which are mediating or entrepreneurial actors within the policy subsystem, facilitate policy learning and subsequent dynamics. The study concluded that the dynamics in the road and railway *traffic noise* policy subsystem are mainly due to two originally opposing adversarial coalitions having to search for (minor) changes in the legislative arrangements in the review of the Noise Abatement Act led by the national government. Preventing a deadlock or ending up with impractical legislation that did not meet the respective advocacy coalitions' secondary beliefs, evidence of cross-coalition policy-oriented learning was found. Both formerly adversarial coalitions of infrastructure and of spatial planning are negotiating new regulations on noise production ceilings and noise immission limits in working groups led by the 'broker' Ministry of Infrastructure and the Environment. However, problem frames and policy instrumentation, in this empirical case regulative noise limits, did not substantially change, as the main focus remains on legislation of infrastructure and spatial planning decisions as advocacy coalitions hold on to their preference for technocratic legislative policy instrumentation.

Policy learning is witnessed within the *industrial noise* policy subsystem as well. In this policy subsystem, stability was explained by uncontested coalitions reaching agreements in professional forums in which all actors collaboratively participated and defined policy arrangements that did not require significant changes in regulative noise limits.

Finally, a dominant aviation, economy coalition explains the stability in the *aircraft noise* policy subsystem outweighing the minority coalition in a zero-sum game and firmly holding on to the – in their opinion – most suitable policy arrangements. Neither policy learning nor policy brokerage is witnessed in this policy subsystem due to these unbalanced positions of the advocacy coalitions, in line with ACF literature stating that cross coalition policy learning requires low conflict and institutionalised forums or working groups.

Concluding, policy learning between advocacy coalitions facilitated by weak forms of policy brokerage by the mediating Ministry of Environment are explanatory (f)actors for minor dynamics in the traffic noise policy domain and stability in the industrial noise policy domain. The aviation, economy advocacy coalition in the aircraft noise policy subsystem dominates over the other actors and acts as a barrier for change.

Research question 3: Effective noise policy integration into spatial planning?

The third research question centred around experiments with the integration of noise objectives into early stages of spatial planning. Policy integration is a governance approach and one of the few forms of policy change observed in the Dutch noise policy domain; the rationale of research question 3 was to assess whether these experiments resulted in increased effectiveness in terms of prioritisation of health objectives related to noise. The analytical framework employed for this study was informed by Environmental Policy Integration (EPI) literature. EPI refers to the incorporation of environmental objectives in non-environmental policy sectors, as "an important first order principle to guide the transition to sustainability" (Jordan and Lenschow, 2010, p. 147).

Since the 1970s noise policy in the Netherlands has been largely built on zoning and regulation of noise emissions and immissions in physical planning procedures; integration of noise and spatial planning policy is thus institutionalised. Nevertheless, practice suggested that noise objectives were only considered at a late stage of physical planning, resulting in an under-exploitation of possible synergies and sometimes even contradictory policy outcomes (e.g. noise limits hampering spatial developments or spatial developments resulting in noise levels exceeding the norm). As a consequence noise regulations are frequently perceived critically by spatial planners. The paradigm of 'noise as a nuisance for physical planning' was addressed through some experiments of the late 1990s and 2000s with the aim to integrate noise objectives in earlier stages of urban spatial planning practice, in line with EPI theories.

This chapter assessed three experiments of centralised and decentralised noise and spatial planning integration. With ROM policy, a process tool for integration of noise issues into spatial planning processes became available, which allowed decentralised governmental bodies to deviate from legal environmental limits. The City and Environment Law allows deviation as well, though under the conditions that exceeded norms are compensated and that the decision process is transparent and involves all stakeholders.

Finally, the MILO method is a local-level guidance for area-specific integrated and interactive planning processes; it was found in practice that this method is often applied as a process step in City and Environment Law projects.

This research revealed that the above experiments have not resulted in large changes in urban planning practice, nor in reduced percentages of (highly) annoyed citizens. In order to explain the minor effects of EPI experiments opportunities for and barriers to implementation of these approaches at decentralised governments were identified. Therefore contextual factors, that is (i) paradigms and beliefs, and (ii) political commitment and public support, were assessed. The limited effects are explained by the persistent practice of giving precedence to spatial planning flexibility instead of 'normative prioritisation' of noise and health. Furthermore, the 'noise problem' seems to get lost in the integrative, often idiomatic, discourses on the quality of life and sustainability, and the subsequent discussions on what these concepts comprise of and what should be prioritised.

Based upon EPI literature two categories of factors enabling or constraining EPI were identified, that is organisational (i.e. organisational factors, budgetary structures, communication structures and initiating institution) and procedural factors (i.e. instruments and rules, routine procedures and rules for decision making, and procedures on stakeholder involvement). Specifically in a centralised/decentralised governance mode top-down implementation of integrative policy instruments needs to be supported by organisational arrangements such as budgets, communication structures and expert support – similar to what EPI literature suggests. In the case of the City and Environment Law the provision of a legal basis, that is an EPI procedural factor, explained its wide(r) employment compared to the other two policy integration experiments. Decentralised governmental bodies often prefer to employ regulative procedures in decision-making rather than pilot-like approaches that would bear risks during juridical complex procedures.

Concluding, the analysed experiments on integration of noise policy into – urban – spatial planning revealed that existing practices persisted, and limited shifts in prioritisation of health objectives and in addressing noise objectives at an early stage of spatial planning are witnessed.

Research question 4: Effectiveness of noise policy instruments mixes?

This research confirmed the preliminary observation of stability and limited dynamics in the Dutch noise policy domain. Traditional policies however are not necessarily ineffective; chapter 5 therefore analysed the effectiveness of the noise policy instruments employed in the Netherlands.

Lacking a generally accepted approach for analysing instrument *mixes*, a methodology based upon several existing scholarly approaches, such as Hoogerwerf's policy theory, Vedung's typology of policy instruments and Mickwitz's effectiveness evaluation model was developed. Although the noise policy goals in due time were shifted and adjusted, three general policy goals in noise policy over the last 40 years were identified: (i) stabilisation of the percentage of annoyed population; (ii) reduction of the number of dwellings with noise exposure levels above 65 or 70 L_{den}; and (iii) reduction of noise emission levels from traffic.

The methodology developed consists of the following steps: (i) description of the noise policy theory in terms of causes and effects and the points of application for policy instruments; (ii) description of policy instruments in place; (iii) analysis of goal attainment and measured effects; and (iv) attribution of the relative contribution of individual policy instruments to the level of goal attainment and the combined effects of policy instrument mixes by means of (a) an analysis of the coverage and steering power of the instruments and (b) an expert judgment on the effectiveness of individual instruments (by means of earlier evaluations and interviews). The evaluation of goal attainment revealed that the main policy goal of preventing noise pollution and stabilising the percentage of annoyed population has been attained. However, the sub policy goals regarding the façade insulation of dwellings with high noise exposure and the reduction of noise emissions from vehicles have not been achieved.

In line with answering research question 1 on shifts in governance modes, the study identified a relatively high reliance on regulative policy instruments. Command-and-control steering, characteristic of the centralised/decentralised governance mode, has been the main approach for many decades, whereas economic and communication policy instruments are limitedly employed or lacking in the policy instruments mixes. The main policy instruments of the Dutch noise policy are regulation of noise emissions from infrastructure and industrial areas through zoning and immission limits at façades of dwellings, and the insulation programme.

Subsequently the study focused on policy instrument addressees and illustrated the absence of noise and/or traffic policy targeting car use(rs), for example addressing the numbers of vehicles and the use of these vehicles or, preferably, stimulating sustainable public transport. In combination with the limited steering power of (international) regulations on vehicle noise emissions, this has resulted in non-effectively addressed polluters and causes of adverse health effects, that is cars (drivers).

Concluding, the evaluation of the outcomes of Dutch noise policy revealed that although the overall policy goal of stabilisation of the percentages of citizens being annoyed has been achieved, the sub policy goals have not been attained, despite being adapted into less ambitious targets. Furthermore, from a health perspective as discussed in chapter 1, noise policy has not been able to substantially reduce the negative health effects associated with noise pollution. This trend seems to be in contrast to other environmental health domains where improvements have been achieved during the last decades. Finally, regarding the policy instrument mix employed, options for improved effectiveness exist as specifically the car (driver) is weakly targeted. The preliminary observation of limited effectiveness, from a health perspective, thus still holds; a nuance though is that without noise policy the situation would have been far worse.

Overall conclusion: limited dynamics in the noise policy domain and limited effectiveness

In sum, the above presented findings underline the preliminary observations on limited dynamics in the noise policy domain in the Netherlands during the last 40 years. Today's noise policy is still primarily characterised as a combination of centralised and decentralised governance styles, with no evidence of major shifts towards other, sound(er) noise governance modes. This is further illustrated by the stability in actors and advocacy coalitions, and the regulative noise limits within the industrial and the aircraft noise policy subsystems. In the road traffic noise policy subsystem, though, the study witnessed some shallow changes in the advocacy coalitions and legislative arrangements in recent years. Furthermore, minor changes in governance modes were identified in the Dutch noise policy domain regarding the integration of noise policy into spatial planning. As a result, since the implementation of some integrative experiments, prioritisation of noise and health objectives in local spatial planning is occasionally found.

The question of the effectiveness of (road traffic) noise policy is thus interesting in relation to the limited dynamics in the Dutch noise policy domain found in this research. Overall the study concluded that from a health perspective the effectiveness of noise policy is limited and specifically weak regarding cars (drivers); ample opportunities for improvement of the noise policy instrument mixes are available.

6.3 Additional factors explanatory for noise policy stability and/or dynamics

Reflecting on the main research findings and the collected empirical data, three cross-cutting explanatory factors came up that were originally not part of the multi-perspective analysis frameworks. This section discusses these cross-cutting explanatory factors, which are: (i) problem framing; (ii) agenda setting; and (iii) problem ownership. All three factors have been, indirectly, addressed in the previous chapters; nevertheless explicitly discussing them adds to the insights gained and the conclusions drawn in this thesis.

Problem framing

Barriers to shifts in governance modes seem to stem, amongst others, from the framing of 'the noise problem' and the discourses within the noise policy domain. Environmental policy literature, such as governance and ACF literature applied in this research, illustrates the importance of problem frames in explaining stability and dynamics in policy domains. Policy instrumentation, for example, is strongly linked to how a problem is perceived; new or revised problem frames can thus act as drivers for change. The subsequent question then is what problem frames are observed in the Dutch noise policy domain, and which stability or dynamics can be revealed in the dominant problem frames?

Throughout the research various discourses on the noise problem were encountered, such as 'noise is a subjective problem', 'noise is a health problem as it causes annoyance, stress and cardio-vascular diseases', 'noise is a hindrance for economic growth' or 'noise is a nuisance for spatial planners'. These problem frames frequently were strategically employed narratives of governmental bodies and other actors, using frames most suitably reinforcing respective interests in discussing noise policy. The dominant problem frames of 'noise as a nuisance', in terms of the subjective perception of (complaining) citizens and obstructing physical planning, have not changed into for example 'noise as a major environmental health stressor', despite the increase of scientific evidence.

This is partially due to the fact that noise cause and health effects are complex, direct and indirect mechanisms, and the negative health effects cannot be 'visualised', such as lung cancer due to air pollution and smoking. Medical doctors will not diagnose myocardial infarction as a result of living close to a highway or an airport.

The emphasis of 'noise as a nuisance in economic and physical planning policy' is illustrated by a quote of the, by then, Minister for Environment Pronk in 1998 (Volkskrant, 24 December), stating:

> *"A lot of money is spent on the prevention and reduction of noise annoyance. That is fine, as noise is a severe problem. However, the vast majority of this concerns noise abatement measures. This is not my priority. Nobody dies of noise. It is a problem, but not a health concern. At least not the most important health concern. We have gone too far on that topic."*

Reframing the noise problem as a health problem, furthermore, seems complicated due to the use of (logarithmic) indicators and data analysis specificities. The first concerns 'decibels' which is the internationally accepted indicator for noise exposure levels. It is a clear and objective indicator; though absolute and relative figures expressed in this logarithmic term are difficult for laymen to understand. The latter concerns the different methods for determining the number of people being (highly) annoyed by noise, which frequently result in slightly different figures (see Appendix 5). The lack of 'hard unambiguous figures' hampers the efforts of advocates of the 'noise and health' paradigm to make a point.

Again, a leading politician, the deputy environment minister Mansveld, illustrates this nicely in a recent statement in response to a politician in parliament (TK, 2013):

> *"I [now] understand that it is not only about subjective perception as noise seems to have adverse health effects as well. This though has to be somehow objectified. I am not aware of research on the relation between noise and health. [..] Right now I do not have figures available on the effects of noise on public health nor on premature deaths or stress. In addition, I am not going to interpret such figures."*

The above illustrates that (deputy) ministers holding responsibility for protection of environmental health seem reluctant in framing noise pollution as a serious health concern. Environmental health, again, is weakly addressed and not priorirised vis-à-vis other objectives of infrastructure and environment ministers, whereas the minister of health holds formal responsibility for public health.

As a consequence other actors have hard times in reframing the problem and demanding other, more effective policy approaches and higher policy ambitions.

Noise is primarily framed as 'a nuisance', in terms of frustrating economic prioritised issues such as physical planning and mobility, and in terms of 'a subjective perception of individual citizens'. The dominance of the (nuisance for) spatial planning discourse and the precedence of policy and politics in problem framing have been illustrated by Bröer (2006) for airport noise, though as this thesis revealed it holds for the other environmental noise policy subsystems as well. Furthermore, noise is a typical 'silent killer' and as a consequence health evidence is seldom a driver for change. Shifts in discourses due to 'sound' problem (re)framing thus seem extremely difficult to achieve, and a decisive role is required for science and policy-learning in newly formed and broadened advocacy coalitions.

Agenda setting

Another but related issue to be addressed is the low position of 'the noise problem' on the academic, societal and political agendas; explanatory for the limited dynamics observed in the Dutch noise policy domain. Within the academic work a relatively low scientific interest (inter)nationally was discovered, regarding noise pollution and health effects. A Scopus search shows five to ten times more hits on scholarly papers on specific environmental topics such as air pollution or biodiversity in combination with 'governance' than on the combination 'noise' and 'governance'. This is confirmed for the Netherlands during the interviews with representatives from the public and the scientific sectors.

At societal level, citizens seem not aware of negative health effects due to exposure to noise. In situations where noise problems do occur, mainly at their homes or neighbourhood, citizens usually seem to frame the effects as 'nuisance'. Similar discourses of 'subjective perceptions and annoyance' are found in NIMBY actions mostly regarding changes in infrastructure such as a new track for high speed trains and a new runway at the airport adjacent to residential areas. As the analysis of advocacy coalitions (in chapter 3) illustrated, problems framed in subjective, nuisance terms get – idiomatically - lost in the economy vis-à-vis environment discourses. The annoyance of some individuals is easily and strategically rephrased into 'personal, subjective inconvenience' that does not weigh up against – objective - community benefits in terms of dwellings, infrastructure or jobs.

Individuals and organised citizens thus have difficulties in placing and promoting noise pollution on the – political – agenda; unless they reframe and rephrase their 'noise problem' in objective narratives and the discourses found in the main advocacy coalitions. Bröer (2006) and Huys (2011) illustrated these adaptive mechanisms for the Schiphol Airport case.

Furthermore, and consequently, the noise issue does not gain any political interest and remains at the bottom of the political agenda as well. This is illustrated by the unwillingness of subsequent parliaments to adopt 'polluter pays principles' neither in the noise policy domain or in policy instrumentation specifically addressing the 'holy cow' of car use(rs). The following quote of a local politician, Lintmeijer, serves as a good example; urging the national government to take its responsibility, though realising that (RO Magazine, 2013),

> *"Parliament shows signs of cold feet. And a breakthrough is not to be expected with this government, though one could expect a social-liberal government to put charging of vehicles on the agenda. However, the fear of addressing drivers weighs up against the willingness to solve traffic problems".*

Other barriers to moving noise pollution up the agenda and for policy change are (focusing) events which were, as this thesis revealed, largely absent and will probably, owing to the specificities of the noise problem, never occur.

Problem ownership: multi-level governance

The above illustrated dominant frame of 'noise as nuisance' and the low position on the societal and political agenda provide explanations for the weak arguments of some advocates respectively the limited interest and power of decision makers in the noise policy domain; as such these observations underline the previous conclusions on limited dynamics within the Dutch noise policy domain.

Another explanatory factor for the absence of major shifts in discourses, actors, and instruments, relates to noise problem ownership. As Zuidema (2011, p. 220) concluded, "the Dutch chose to decentralise important parts of their environmental policies whilst deregulation meant that standards became less ambitious or more flexible. The national government seriously loosened its grip on the local government". This also holds for noise policy since the late 1990s.

Decentral governmental bodies have long been responsible for economic and physical planning policy and as such specifically advocated fitting noise regulation and other noise policy instruments to economic and physical planning policy goals (that, obviously, are also higher on the national and local political and societal agenda).

As this study revealed, specifically the actor coalitions advocating economic priorities were successful in maintaining the existing policy arrangements as long as no (spatial, infrastructure, or economic) restrictions were felt. Another, related observation concerns the institutional rules regarding (formal) decision-making and the typical Dutch consensus-based steering philosophies, which result in primarily public sector advocacy coalitions sticking to existing legislative policy arrangements. As a formal governmental body, being responsible for environmental and thus noise policy, the Ministry of Environment designs legislative policy instruments which other actors have to implement. Legitimacy and acceptance of these instruments, for example, are increased once these decentralised governmental bodies are involved in the formulation of legislative policy instruments. However, belief systems of these actors mostly differ, which results in long and complex so-called Dutch polder processes. The consequent risk is that this Dutch egalitarian approach limits policy learning; opening up advocacy coalitions for other actors and their knowledge is pivotal for change and dynamics in policy (sub) systems.

In addition, noise policy goals in terms of stabilisation of the percentage of citizens annoyed due to noise, were defined and implemented by the national government. Decentralised government bodies, on the other hand, hold no explicit responsibilities for achieving noise policy goals, as policy goals in terms of overall percentages of annoyed citizens are not directly linked to the municipal responsibilities and formal roles neither in terms of applying regulative noise limits in physical planning nor in terms of noise abatement policies. For example, an average façade exposure of 55 L_{den} due to traffic noise, which is the regulative, lower 'preferred' noise limit for urban planning, results in approximately 5 % (or 2% - 10% with 95% confidence intervals; Miedema and Oudshoorn, 2001) of the population being highly annoyed. Urban planning, specifically as practice learns that frequently higher noise limits are approved, can thus sometimes conflict with the national noise policy goals (see chapter 4; VROM Inspectie, 2009).

Consequently, in line with Keijzers' conclusions (2000, p. 182) on Dutch environmental policy in general "the national government remained the sole proprietor of the environmental problems and did not adequately succeed in sharing the responsibilities with stakeholders and local and regional governments".

That the combination of central and decentralised governance modes introduces risks and uncertainties in achieving national defined policy goals is illustrated by the following quote of Van Enthoven (ministerial director during the drafting of the Noise Abatement Act) in Van den Brand (2007);

> *"Decentralisation is good, as long as this is complemented with prerequisites and instrumentation at the local administrative level. In addition, control and enforcement need to be in place in order to prevent things being messed up. That has not always been the case. As a consequence 'noise' became what it was before 1979; it has to pay the price due to high priorities for other public interests such as mobility and economy. One can see that specifically regarding road traffic and physical planning. The Noise Abatement Act is regarded an obstacle for nice new housing ambitions."*

These reflections illustrate the importance of mutually shared responsibilities and problem ownership, as a prerequisite for multi-level governance. This is in line with Lange et al. (2013, p. 14, my emphasis) stating that decentralised governance should have "uniform and *level-specific* goals and targets", which is evidently not the case for Dutch noise policy. The need for a shift towards multi-level governance is also recognised by the European Commission, stating (website, version last updated 18th September 2012 and consulted 10th June 2013) "as more information about the health impacts of noise became available, and as it has become clear that global measures [such as stringent noise emission limits for vehicles and trains] are the most cost-effective, the need for a higher level of protection of EU citizens through EU-wide measures became more imminent".

A specific remark concerns noise emissions from vehicles; a reduction of noise emission levels of more than 3 decibels is – technically – feasible. However current European level discussions on tightening noise source regulations seem to fit into the discourse of 'no ambitions and thus no effects' which have been witnessed since the 1970s when EU regulations on vehicle noise entered into force (see e.g. De Roo and Dittrich, 2013). The European Commission, and specifically DG Environment, is an advocate of stringent noise emission limits; however antagonistic positions are found at other European institutes.

In conclusion, the small basis of 'noise problem owners ' within European and Dutch actor coalitions did not succeed in broadening the central government responsibility regarding noise pollution to a multi-level governance approach based upon shared policy goals.

6.4 Discussion of the theoretical and analytical frameworks employed

In order to thoroughly assess, analyse and evaluate a complex environmental policy domain over a longer time frame, this thesis employed a multi-perspective approach in a meta analysis of noise policy in the Netherlands. This section reflects on the approach and the theoretical and analytical frameworks employed, and the (dis)advantages for environmental policy analyses in general.

Reflection on the multi-perspective analytical approach taken in this thesis

As this thesis reveals, the use of multiple perspectives based upon several policy analysis theories and (refined or developed) analytical frameworks supports a profound and in-depth study of (environmental) policy. In my opinion, a single policy analysis theory such as governance literature or ACF theory would have resulted in less convincing and rather abstract conclusions. The added value of applying several theories in empirical research is also stressed by other scholars (John, 2003; Sabatier and Weible, 2007; Hysing, 2010; Stassen, 2012).

The advantage of the multi-perspective approach is that it supports the identification of several explanatory factors for stability and/or dynamics in the noise policy domain in general and the detailed noise policy subsystems. In my opinion these explanatory factors are indispensable for fully understanding and grasping an environmental policy domain, specifically in empirical research of policy change. Similarly to what this research found for policy analysis theories and frameworks, this applies to scholarly research on policy change and/or stability (see Hysing, 2010, pp. 34-35 for a discussion). There is a wide range of scholarly literature available on policy change and policy stability; the policy analyst's task is to identify and select the most appropriate concepts and factors. In line with Hysing (2010) and Stassen (2012), therefore several theoretical concepts of policy (analysis) literature were used and elaborated into barriers to and drivers for policy change and/or stability.

It should be noted that the explanatory factors are context and policy domain dependent, and thus should not be regarded exhaustive nor generic. For example, it proved difficult to formulate firm conclusions on policy domain performance; nevertheless performance did not result in a change in governance modes nor was it explanatory for stability.

Furthermore, a multi-perspective approach is specifically valued in combination with meta analyses, analysing policy domains in general and over longer time frames. Of course, a less complex theoretical and analytical approach would be feasible in an analysis of a single policy instrument at local administrative level, for example in the case of noise policy zoning of industrial areas. The public policy analyst thus is challenged in selecting best suitable theories and analysis methods from a range of theories and a large tool box and subsequently defining conclusions and recommendations from the meta synthesis of the research findings. As no academically accepted multi-perspective approach of public policy analysis exists, this, by many scholars advised 'multi-perspective approach' (see e.g. Sabatier, 2007; Weible et al., 2011), still is 'under construction'.

In 2003 Tellegen as well as Glasbergen, for example, demonstrated the limited academic practice, in environmental policy PhD research in the Netherlands, of applying two or more theories or perspectives. Tellegen analysed 50 theses and concluded that only a few applied two approaches; see the respective studies of Eberg (1997), Van Baren (2001) and Devilee (2002), employing the Advocacy Coalition Framework of Sabatier and Jenkins-Smith, and Cultural Theory of Thompson. The reflection of Glasbergen comprised a categorisation and presentation of several types of policy analysis theses; such as studies focusing on goal attainment and effectiveness, instrumentation, network policies and social constructions of environmental problems. Glasbergen's overview similarly revealed only a few dissertations applying multi-perspectives. Both authors' reflections on (Dutch) environmental policy research largely hold today.

Similar accounts can be made regarding environmental policy reviews by national and international research institutes such as, respectively, the Netherlands Environmental Assessment Agency (PBL) and the Organisation of Economic Cooperation and Development (OECD) and the European Environment Agency (EEA); both latter institutes' main topics of interest being performance and effectiveness studies of environmental policy in member countries employing single analytical frameworks.

A note of caution, though, concerns the specific terminology employed in the different theories and frameworks, which might result in confusing presentation and wording of various factors and characteristics. In chapter 1 the different wordings for 'defining and expressing – noise – problems', e.g. discourse, paradigms, beliefs and narratives, has been illustrated. Furthermore, for example, ACF refers to policy subsystems whereas other policy analysis literature often uses the terms 'system' or 'domain'. Trying to be consistent with the specific theories and frameworks, the chapter on advocacy coalitions focuses on three noise policy subsystems within the overall policy domain; the latter being the wording in the largest part of this thesis.

Concluding, multi-perspective approaches in combination with meta analyses have added value, which still are under-exploited. The aim of this research, although humble and secondary, was to add to the scholarly discussions on multiple-perspective policy analysis. The next paragraph thus discusses the analytical frameworks employed and will be followed by a reflection on alternative approaches for policy analysis.

Policy analysis: main subjects and approaches

In my opinion, the main subjects to be analysed were the following: (i) modes of governance (actors, instruments and discourses); (ii) advocacy coalitions and their belief systems; (iii) policy integration into spatial planning; and (iv) policy instruments, policy goals and effectiveness. These subjects are most commonly studied in public policy analysis, such as ACF and governance literature, in order to identify and analyse policy formulation, policy implementation and, for example, policy change.

The governance (modes) literature turned out to be very helpful in understanding and characterising, at meta level, 40 years of noise policy in the Netherlands (chapter 2). The analytical framework comprising (i) actors; (ii) policy discourses; and (iii) instruments, facilitated the identification of dynamics and/or stability in the policy domain. In governance literature also more extensive approaches are found, such as for example Driessen et al. (2012) describing ideal-typical governance modes based upon actors features (i.e. initiating actors, stakeholder position, policy level and policy base), institutional features (i.e. model of representation, rules of interaction, mechanisms of social interaction), and features concerning content (i.e. goals and targets, instruments, policy integration, policy-science interface).

The advantage of these approaches is that hybrid and mixed forms of governance modes can be delineated and described, and consequently provide better insight in specificities of governance modes in environmental policy domains as well as the shifts in the various elements and features identified.

The analysis of shifts in the discourses and actor coalitions in the Dutch noise policy domain in chapter 3 was based on the Advocacy Coalition Framework (ACF). Advocacy coalitions within the ACF theory are identified through (i) a shared set of normative and causal beliefs and (ii) coordinated activity over time. These elements are in line with the specifications of the actor feature employed in governance modes literature; ACF analysis of beliefs provides a better understanding of discourses and their impact on dynamics or stability, whereas the analysis of coordination between actors learns us more about the actors, their roles, institutions and resources. ACF proved to be suitable and practical for studying discourses and actor coalitions in further detail based on the assessment of policy core components and coordination mechanisms. This research underlined empirical reflections of other scholars such as Hysing and Olssen (2008) and Sotirov and Memmler (2012) that, for example, a limitation to approximately half of the ACF policy core components and to three advocacy coalitions provides sound research findings (with less effort). In addition, in line with recent changes to the ACF by Sabatier and Weible (see Schlager, 2007), a third factor was added to the explanatory factors, i.e. policy brokerage and policy learning. Policy brokers and policy learning, on the other hand, are both drivers for change in advocacy coalitions, their beliefs and instruments. The newer factor concerns institutional characteristics, as section 6.3 discussed as well, in terms of problem ownership and multi-level governance. This factor emerged as specifically relevant in this research in understanding barriers to dynamics, as is probably the case in other environmental policy domains based upon a combination of central and decentralised government modes.

For the study of the effect of noise policy integration into spatial planning this thesis employed concepts of the Environmental Policy Integration (EPI) literature in chapter 4. The analysis of EPI literature revealed a lack of consensus on factors conditional for EPI, such as operational mechanisms (Lafferty et al., 2004) and problem character, political will and international context (Nilsson and Persson, 2003), and consequently an analytical framework. This research therefore developed a conceptual framework, based upon a wide range of academic EPI studies, comprised of organisational and procedural factors.

The advantage of this approach is that it aligns well with the key factors identified in governance literature, such as the actor and institutional features (Driessen et al., 2012; Lange et al., 2013). This provides an approach for operationalisation of these key factors, as for example both organisational and procedural factors have been assessed in the governance modes study in chapter 2 as well. The EPI analysis provides thus further insight into the conditions for policy integration that have to be met in practical implementation of this governance approach. Furthermore, EPI literature identified factors in order to explain the extent to which integration strategies are successful, that is in this case the effectiveness of noise policy integration into spatial planning, in terms of prioritisation of health objectives. The disadvantage of EPI literature, however, is that it still lacks a generally accepted analysis framework; rather agreement on (explanatory) factors to be analysed seems to be absent as well.

Finally, to evaluate goal attainment and effectiveness of the Dutch noise policy instrument mixes an analysis framework had to be developed, based upon different policy analysis theories, as scholars mainly focus on evaluation or comparison of single policy instruments. A stepwise approach was defined which comprised: (i) describing the policy theory in terms of causes and effects of noise pollution and the points of application for policy instruments; (ii) describing the policy instruments in place; (iii) analysing goal attainment and measured effects; and (iv) evaluating the effectiveness, focusing on the coverage of points of intervention, steering power of policy instruments and coherence of the policy instruments mix. As such, gaps and weaknesses in the policy instrument mixes could be identified and validated through triangulation of qualitative and quantitative data from literature and interview studies.

In my opinion the advantage of this stepwise approach and the analytical frameworks employed is that, specifically the assessment of (the coverage of) the points of application and the coherence of the policy instruments mixes, supports a detailed understanding of the strengths and weaknesses of the policy instrumentation. A second advantage concerns the *visualisation* of the causes and effects and the points of application for policy instruments, which added value to the verbal description of the policy theory cf. Hoogerwerf.

Reflections on other theoretical and analytical approaches

The above requires a reflection on the use of other theories and analysis approaches, specifically regarding the cross-cutting explanatory factors identified in this research. Problem framing and agenda setting are both well-known research topics in academic policy analysis studies, for example Hajer (1995, on discourse analysis) and Kingdon (1995, on agenda setting). In retrospective these theories would have fit within the analysis framework as well; nevertheless in this case both explanatory factors were analysed indirectly and, in a final step, in the overall reflections in this concluding chapter.

Reflections on the methodology employed in this thesis

Analysing and evaluating environmental policy domains primarily concerns the qualitative research of policy actors, their beliefs and instruments over longer time frames. Furthermore, environmental policy domains are typically unique, complex systems. Validation, representation and repetition are some of the critical issues that need specific attention compared to quantitative and, for example, controlled laboratory studies. In order to meet these concerns triangulation of content analysis of (policy) documents, interviews and – in the effectiveness evaluation – quantitative analysis was employed. As Stassen concluded (2013, p. 265) "the strength of this data and methods triangulation approach is its internal validity". Interviews were used to test the hypotheses and preliminary conclusions; *vice versa*, the document analysis also proved useful in cross-checking interview data.

A weakness might be the limited number of interviewees available for the analysis of this specific policy domain; the empirical topic of the research is 'handled' by an ever decreasing number of government employees specifically at the national governmental level. Broadening the study to local level practices and thus introducing case studies and surveys into the research design could possibly have resulted in increased internal validity in combination with the use of questionnaires or surveys. The main focus of research in that case could be, for example, problem framing, policy formulation and implementation in decentralised governmental bodies. Analysing these best practices at regional and local administrative level would reveal specifically micro level explanatory factors; meta-level conclusions are thus more difficult to be drawn.

Contrary to its internal validity, the external validity of the research is rather limited, as the results cannot be generalised to other countries or other environmental policy domains. Despite European and international noise policy being in force for some years, most European, American and Australian countries have different regulations, instrumentation and institutionalisation of noise objectives. The same goes for other environmental policy domains with their typical causes, effects and thus policy theories which per definition differ from noise policy theory.

Nevertheless, this research did provide insight into policy change and the explanatory factors for dynamics and/or stability in policy domains. Furthermore, this thesis presented a methodological revision of today's policy analysis frameworks, specifically with regard to evaluation of policy instruments mixes.

6.5 Recommending future research

The above reflections and critical notions on theoretical, empirical and methodological issues, provide some interesting topics for future research. A distinction is made between recommendations on analysis and evaluation research of environmental and sustainability policy, and research focusing on noise policy.

Regarding the former research would be recommendable employing a multi-perspective approach in combination with meta analysis of other (environmental and sustainability) topics. The aim would be to enhance thorough understanding of policy domains in general and, specifically, the identification of explanatory factors for policy dynamics and outcomes. These studies could further validate and improve the theoretical and analytical frameworks, as well as the methodological choices made. The main questions of interest are whether the factors identified in this research, as explanatory factors for presence or absence of shifts, are similar for other policy domains; or in other words are explanatory factors domain specific or generically applicable in the analysis frameworks?

Furthermore, multi-perspective analysis of environmental and sustainability policy domains will provide further insight into the (dis)advantages of this approach. This study revealed that the frameworks employed facilitated the identification of explanatory factors and the understanding of the dynamics and performance of the policy domain; other researchers are encouraged to prove this assumption right or false.

Regarding the latter, noise policy, research focus, specifically the following foci and approaches are recommended:

- As aforementioned a multi-perspective approach could be employed on noise policy in other countries as well, and specifically cross country comparative studies are suggested in order to improve the understanding of explanatory factors for stability or dynamics in noise policy domains and for the performance of these noise policy domains. Institutional characteristics and discourses, for example, will differ in countries; the effect of these differences on the noise policy domains dynamics and performance is of utmost interest and could facilitate the identification of key topics for future noise policy.
- An analysis of practical examples of noise policy at decentral governmental level could provide further insight in the local – and eventually national - success factors for effective approaches preventing and reducing noise pollution. The factors identified in this meta analysis of noise policy in the Netherlands then to be employed as key contextual factors.
- Finally, some other empirical topics within the noise policy domain remain of interest, such as policy regarding other noise sources such as neighbour(hood) noise which has never been addressed in Dutch noise policy, as well as 'new' noise sources like wind turbines. These studies could provide further insight into explanatory and contextual factors such as politics, as well as policy theory and policy content and their respective roles in policy dynamics and/or stability and policy performance.

7 Epilogue: a personal reflection on future policy directions

7.1 Introduction

In chapter 6, the last chapter in this thesis, conclusions on dynamics and stability of the noise policy domain in the Netherlands and its performance over the last 40 years have been drawn. However, one question remains: How to evaluate these outcomes? Or like the saying, 'Do I see the glass as half full or half empty?' The answer to this, in my opinion, should be 'the glass is half empty……' and the answer to the question of this thesis title 'Noise policy: sound policy' is negatively phrased, as there seems to be ample room for improvement in terms of multi-level and multi-sector governance modes. Sound policy, that is robust effective noise policy preventing negative health effects, thus requires changes in policy (such as instruments) and in politics (in this case actors and advocacy coalitions) (cf. Lange et al., 2013).

Whilst writing this thesis I have been managing the noise department of DCMR Environmental Protection Agency of the Greater Rotterdam area in the Netherlands. In this position I have been involved in noise policy developments at European, national and local level; representing mainly the political and policy actors from Rotterdam. Although the analysis of the noise policy domain in the Netherlands was limited to the period of the late 1970s until 2012 in my opinion this thesis is not 'finished' without a reflection on what I learned from this research and tried to bring into today's noise discourse and policy developments. Therefore this Epilogue is committed to the challenges identified in the title of this thesis: 'Noise policy: sound policy?'.

In the next section (7.2) I briefly present today's developments within the noise policy domain, followed by a reflection on the main discourses and developments in section 7.3. Based upon this thesis' main research findings, an analysis is provided in terms of (i) identification and explanation of shifts in governance modes and (ii) identification of effectiveness of these developments in the noise policy domain. Finally I will conclude this Epilogue by providing recommendations for shifts towards sound(er) noise policy (section 7.4).

7.2 New developments within the noise policy domain

Since 2010, a fundamental revision of the Dutch Noise Abatement Act has been underway, called Swung (a Dutch acronym for 'working together on new noise policy'). In 2012 the first Swung result, noise production ceilings along highways and railways, has been introduced, restricting noise emissions from these infrastructures. This can be considered an additional policy instrument compared to the policy instrument mix evaluated in chapter 5. Other major roads will also in due time be regulated through these noise production ceilings; since the 1970s the responsibility for these roads has been with the provinces, which are now adopting this new policy instrument from the central government. However, implementation of noise production ceilings at the local administrative level is rather complex; municipalities are therefore developing their own Swung methods comprising noise limits for spatial planning, noise maps and noise action plans.

The main goal of Swung is to prevent negative effects due to the autonomous increase of traffic using this new instrument of noise production ceilings and the obligation of municipalities to evaluate 'noise pollution' every five years. As such, the so-called enforcement gap in the Noise Abatement Act has been solved; previously noise limits were only applied for physical changes neglecting the fact that an increase of traffic in itself results in higher noise exposure. Furthermore, the complex sets of regulative noise limits and – in the opinion of the national government time-consuming - procedures of the Noise Abatement Ac have been simplified. Public sector working groups, chaired by noise experts from the Ministry of Infrastructure and the Environment, are discussing and drafting detailed reports as the basis for this new legislative policy instrument. Not surprisingly, problem frames, policy instruments and institutional definitions of old times are persistent; previous advocacy coalitions are trying to re-run the same play at the theater. This is illustrated by the following reflections on the main discourses and processes of recent years.

'Calculated decibels are the truth'

The combination of centralised and decentralised governance approaches will be continued under Swung; national governments are responsible for road and railway traffic noise from the main infrastructure and local governmental bodies hold responsibilities for – ever more – environmental, physical and many other policy domains.

Obviously all governmental bodies call for clear, unequivocal delineation of these tasks (and subsequent institutional and financial requirements). Physical planning (by a municipality) adjacent to highways (owned by the national road authority) serves as a good example of discussions on noise emissions from the highway and regulative immission limits at house façades. The noise production ceiling 'defines' the area available for residential purposes, and thus, to local governmental bodies and other local stakeholders, such as project developers, decibels are synonymous with currency. As a result, disagreement has increased on the validity and accuracy of the calculations of these noise production ceilings.

In the parliamentary discussion of the new legislation (in 2012) local governmental bodies and politicians formed advocacy coalitions with public health institutes and NGOs, opposing the advocacy coalition of national government consisting of the road and railway authorities and 'the legislator' Ministry of Infrastructure and the Environment (TK, 2011a; Ministry of Infrastructure and Environment, 2011a). Consequently, parliament had the draft legislation adjusted and introduced monitoring and measuring of the noise production ceilings by the independent National Institute of Public Health and Environment (RIVM) (Ministry of Infrastructure and Environment, 2011b). The discourse of objectivity and controllability of decibels reminds of the Schiphol Airport discourse on enforcement points and strong reliance on enforceable legislation and norms.

The first report on noise production ceilings and measuring results is expected in mid 2014; however practice showed that calculating the ceilings was far more complex than expected and figures have been adjusted twice since the law entered into force one year ago. There is a risk of so-called juridification of this policy instrument, once central government and decentralised governmental bodies dispute in court on the validity and legitimacy of the 'calculated truth of noise production ceiling number xxx'. Original democratic decision-making in these cases would be replaced by legal processes and argumentation. History has illustrated the negative impacts, such as paralysed advocacy coalitions, and barriers to policy learning and shifts in governance modes (see e.g. Bröer, 2006 and Huys, 2011 on the Schiphol case).

Principled priorities in the economy vis-à-vis environment discourse?

Intertwined with the criticism on the validity and accuracy of noise production ceilings, local politicians argued with the minister of Environment on the consequences of the new legislation regarding spatial planning and public health objectives. Shortly before implementation of the noise production ceilings, studies revealed that the noise calculation methods in place underestimated noise emissions from highways. Consequently the ministerial regulation on the use of calculation methods was adjusted; it is noteworthy that this regulation was adopted without consultation of or approval by parliament or other stakeholders such as decentralised governmental bodies. It is advantageous for the national road authority, as the noise production ceilings are calculated with the new methods and thus take into account higher emission levels. On the other hand, the new method results in higher figures of population exposed to road traffic noise from highways. Furthermore, higher noise emissions negatively affect the housing ambitions of municipalities, as either less space is available for physical planning or plans are more costly due to additional measures that have to be taken in order to meet the regulative immission limits. As a consequence, the well-known discourse on economy vis-à-vis environment is back on the political agenda again, though this time health and environment objectives seem to be gaining weight in the discussions because a few politicians at national level and at municipal level are advocating health and environmental quality (see e.g. TK, 2011b; Council of Utrecht, 2013). The call for effect-neutral new legislation encompasses both - opposing – objectives of no negative effects, either on public health or on physical planning, which can be considered as a deviation from the traditional trend of prioritising economic and spatial claims. The next months and year will show whether these relatively few protagonists persist in their narrative of effect-neutral legislation and have been successful policy entrepreneurs for health-based noise legislation.

A policy window for a new problem frame?

Although hesitantly, the deputy minister recently (i.e. during the high level political meeting on 7th March 2013) agreed to define new noise policy goals and mutual actions for the national government and decentralised governmental bodies in order to reverse the stable trend on noise annoyance (Ministry of Infrastructure and the Environment, 2013).

In line with my conclusions on the performance of the noise policy domain in the Netherlands, the responsible politicians at national and local level recognise the need to shift to noise policy framed as 'noise as environmental quality'. The invitation to define these goals and the necessary actions to be taken stands; it is up to the respective stakeholders to take these ambitions further and act adequately on them, which could later turn out to be a policy window.

Multi level governance and the European dimension

At the European level noise policy has gained more interest since the Green paper on Future noise policy in 1996. The EU Environmental Noise Directive (END) requires larger municipalities and national governments to draft strategic noise maps and action plans every five years. Implemented in 2002, and transposed into national regulations in the following years, interest in noise policy increased at various levels. However, it is difficult for the European Commission to give it a higher position on the political and societal agendas, as similar to the experiences in the Netherlands, noise policy has to compete with other environmental dossiers. In contrast to, for example, the Air quality directive, no noise immission limits are defined within the END; noise pollution, in the opinion of the European bodies, is a local problem and consequently the principles of subsidiarity have to be considered (Weber, 2010). However, the evaluation of the END implementation revealed that current practices within Member Sates largely differ and the policy instruments are ineffective in reversing the trends of increasing negative health effects. Therefore, the European Commission suggested introducing thresholds, trigger values or immission limits in the END; depending upon the exact formulation and height of this new regulative limit, impacts on spatial planning and noise abatement measures at decentralised administrative level can be significant. A case in point, since 2010 Dutch decentralised governmental bodies are actively lobbying in Brussels in order to prevent another problem similar to the air quality directive. The latter introduced stringent European limits in Dutch spatial planning, which could not (and still cannot) be met within the timeframe set in the derogation procedures.

Furthermore, the ambition to define more stringent noise source regulations is frustrated by the strong position and lobby machine of the private sectors such as the car manufacturing industries. Currently the European Commission proposes to define new, more stringent, noise emission limits for vehicles, but is opposed by the European Parliament that tends to listen too hard to the economic arguments held by industrial organisations and member states protecting specific manufacturing sectors (e.g. Transport & Environment, 2011).

7.3 Today's noise policy domain against the background of the research findings

This thesis identified several characteristics of the noise policy domain in the Netherlands and revealed cross-cutting factors explaining the limited dynamics within the policy domain and its moderate performance. Main factors of interest in the analysis of the policy domain were the modes of governance, the advocacy coalitions, their respective beliefs or problem frames, and the policy instruments mixes. Furthermore, the following key explanatory factors were identified: problem framing, agenda setting, and problem ownership. The question arises of how to understand today's discourses and policy processes in the light of these factors.

Is there any evidence of dynamics in today's noise policy domain?

Employing once more the approach of analysing (shifts in) governance modes (cf. chapter 2) on the developments of recent years, the resulting picture would be similar to Figure 4 (in section 2.4). The revision of the Noise Abatement Act dominates today's discourses at political and policy level; understandable from path-dependency perspective, the legislative review of the policy instruments in place is the way to proceed and to prevent wandering and exploring other routes towards (newly defined, mutually shared) policy goals. The result, however, is that most specificities of the Noise Abatement Act and, with that, Dutch noise policy are continued, under a new name Swung. Dutch noise policy will typically remain a combination of central and decentralised governance modes; central government formulates legislation and defines noise limits executed by the decentralised governmental bodies.

Secondly, likewise no dynamics are found in the advocacy coalitions involved in the policy domain; Swung being formulated by solely public sector actors with the exception of the industrial umbrella organisations participating in the industrial noise policy subsystem.

The scientific community, NGOs, health institutes, private sector representatives and citizens are not directly involved in the Swung process. The Ministry of Infrastructure and the Environment subtly tries to keep these actors out of the play, anxious that these critical and possibly antagonist actors will frustrate the policy process. The typical Dutch approach of 'polderen' is controlled by the Ministry by way of back room politics. Nevertheless, some of the 'health and quality of life' advocates, such as NGOs and (local) health institutes, try to influence the policy process through lobbying activities with local and national politicians and the media.

In this line, a third reflection concerns today's problem frames and discourses. As presented above, the main aim of Swung is to provide better regulation addressing the effects of the autonomous increase of traffic and to simplify procedures and the setting of noise immission limits. The latter is in answer to the national government(s) programmes of deregulation and cutting red tape; the negative effects of this approach are twofold. First, in the revision of legislation the emphasis tends to be put on procedural issues and the administrative burdens of the law under review. However, the overarching goal of preventing and solving noise pollution easily gets lost in the discussions on the responsibilities and tasks of the governments involved. Secondly, the discourse of simplifying regulations reduces the noise policy theory to a 'single policy instrument approach' and ignores other policy instruments necessary for effectively addressing polluters and achieving policy goals. This effect is further aggravated by the lack of interest in (re)defining mutually shared policy goals, which is a prerequisite for multi-level governance approaches. As this research revealed, policy goals in decentralised governmental bodies are mainly formulated in terms of spatial planning targets and economy, labour and mobility. The accompanying problem frame of 'noise as nuisance for physical planning' still seems to dominate; unless the national government and decentralised governmental bodies formulate policy goals framed in terms of 'noise as a negative health effect' or 'noise as part of environmental quality'.

Is there any evidence of increased effectiveness of noise policy instrument mixes?

As discussed above, Swung continues the main steering philosophy within the Dutch noise policy domain, which is the traditionally top-down legislative approach. From a pollution prevention point of view the proposed revisions, such as the introduction of noise production ceilings, are positive.

However, two points of criticism remain. First, we are not witnessing discussions and/or dynamics in the policy domain concerning instruments and abatement measures to substantially reduce noise problems. For example, budgets for insulation programmes have subsequently been lowered by the national government and innovation programmes for low noise road pavement or other abatement measures are lacking. Secondly, as this thesis revealed, the main cause of noise pollution is the car (driver). Nevertheless no new policy instruments are being developed to effectively address these polluters. This holds at the European level as well, as EU regulations on more stringent noise emission limit values for tyres and vehicles have been relaxed either in terms of deadlines for implementation (tyres) or in terms of the height of the limit values (vehicles). At national level the government – again – postponed the introduction of road pricing and the Minister of Environment is a strong advocate of relaxing the maximum speed limits on highways, despite the negative health effects due to air and noise emissions in nearby residential areas.

In sum, despite the 'fundamental' revision of the Noise Abatement Act, today's processes in the Dutch – and European – noise policy domain reveal limited shifts towards other governance modes and no increased effectiveness of the policy instruments mix. In the subsequent paragraphs these conclusions are further illustrated based upon the explanatory factors identified in this thesis.

Problem frames: new discourses?

The analysis of the Dutch noise policy domain revealed that the widely applied problem frame of 'noise as nuisance' forms a barrier to shifts towards other – sounder – governance modes. As mentioned above, during recent years some actors have advocated new narratives, that are 'noise as public health stressor' and 'noise as environmental quality'. Though few, these local politicians, the Noise Abatement Society and local public health institutes, seem to act as policy brokers and 'use' every possible opening or policy window in order to shift the discourse from economy vis-à-vis environment towards multi-level governance approaches in which economy and environment – in terms of public health – are balanced. Public health and environmental quality of life are framed as key topics for sustainable cities, and as such justify the responsible aldermen in 'overruling' their political colleagues holding responsibilities for urban planning. The deputy minister's commitment to discuss new noise policy goals, mutual responsibilities and future policy actions is a first achievement for these policy brokers.

At the European level, however, problem frames and discourses still seem to be stuck in the 'noise as nuisance' narrative and the European Commission is struggling to reframe the old problem definition in newer terms of public health concerns. The recent increase of studies, mostly commissioned by the Commission, underpinning these statements on adverse health effects and the size of the noise problem is a case in point (see e.g. recent studies of WHO, EEA, and the European Commission's Joint Research Centre).

Agenda setting: gaining political and societal interest?

The Swung process provides – possibly - a policy window, by way of a platform and momentum, to change the problem frames and policy instrumentation of the last 40 years. However, this research revealed that a shallow shift in one or two of the identified factors, that is actors, discourses and policy instruments, probably will not result in an enduring shift in governance modes. Actors and advocacy coalitions are pivotal in stability and change in governance modes, and the future of noise policy is largely in the hands of some key stakeholders within and – largely - outside the advocacy coalitions. Policy learning will increase once the policy domain opens up to other stakeholders advocating health and environmental quality, for exameple local public health institutes and NGOs. Furthermore, policy brokers such as some key civil servants and politicians can raise the noise problem higher on – at least - the political agenda. However, as shocks or events which are known from scholarly policy literature, are absent for noise policy due to its very nature, agenda setting largely depends upon policy brokerage.

In a time of economic crises and many other political and societal interests, putting noise on the agenda will be challenging. This holds even more for the societal agenda where citizens are mostly not aware of noise pollution, its effects on health and their own contribution to the noise problem.

Problem owners: multi-level and multi-sector governance approaches?

Swung addresses some of the cause-and-effect mechanisms and points of application for policy instruments, as identified in chapter 5. However, gaps in the policy instruments mixes will remain, unless stakeholders are able to shift towards new approaches in – still to be defined – shared policy arrangements.

Institutionalisation of multi-level governance approaches requires that national government and decentralised governmental bodies recognise their respective and mutual responsibilities and act in accordance, for example, by defining "uniform and *level specific* goals and targets" (Lange et al., 2013, p. 14, my emphasis). A similar stance could be formulated from the multi-sector governance perspective as well; as we illustrated before, outcomes of noise policy are to a large extent influenced through other sectors as well, such as the mobility and spatial planning policy domains. Finally, the above leads to a critical reflection regarding the citizens, as polluters and as victims; none of today's observed mechanisms is evident concerning these actors. Furthermore, the private sector and other government sectors such as civil works and public health are missing in today's noise policy processes.

In conclusion, there is no evidence of shifts in the noise policy domain since 2010; the new developments such as Swung and the work of the European Commission continue the paths defined since the 1970s. However, the above revealed hints of dynamics within the noise policy domain in terms of problem frames and advocates. Policy brokerage in combination with policy learning in advocacy coalitions that open up for protagonists of 'noise as health effect' and 'noise as environmental quality' might trigger a shift, though probably shallow, towards sound(er) noise policy. In the next section I will reflect on these in providing recommendations for shifts towards sound(er) noise policy.

7.4 Recommendations for sound(er) noise policy

In my opinion, in order to solve the noise problem, that is significantly reduce and limit negative health effects due to noise exposure, far-reaching solutions are deemed necessary. Such policy interventions – ideally - interfere radically with 21st century's societal activities. Examples, such as road pricing, were illustrated in this study, and called for by other scholars and local politicians. However, various features of the noise policy domain are a barrier to such shifts, such as the absence of 'one central authority' and of discrete antagonists and protagonists.

In this section I will thus illustrate a modest, though realistic way forward in terms of - moderate - changes in the Dutch noise policy domain, in terms of (i) shifts towards multi-level and multi-sector governance modes; (ii) institutionalisation of policy learning; (iii) introduction of new policy instruments; and (iv) new narratives on sustainable soundscape.

Stepwise shifts in governance modes

This is the ideal moment for the Swung trajectory to step out from the back room onto the stage in order to broaden the focus of the work and the actors involved in the process. Defining mutually shared policy goals for the next decades provides insight into the policy instruments mixes needed to – effectively – achieve these goals. As this research illustrated, sound(er) noise policy requires that all stakeholders involved recognise mutual responsibilities and subsequently agree upon the multi-level and multi-sector governance approaches required to achieve these goals. The advantage will be that other, previously not considered, solutions and problem owners are integrated into the noise policy domain. Policy learning in this case specifically concerns broadening of problem frames and re-assembling policy instruments mixes.

Institutionalisation of policy learning

Secondly, institutionalisation of policy learning is of importance, which in the case of Dutch noise policy and specifically the Swung process, means involving other actors in working groups, peer groups and other work forms. Procedural and organisational factors, such as (formal) roles, resources, representation, have to be defined and agreed upon in order to guarantee legitimate and sustainable processes and outcomes.

Sharing knowledge is all the more important in the challenging task of redefining noise policy goals which build on recent insights into negative health effects, and the subsequent weighing of political and societal costs and benefits of setting noise limits and employing policy instruments mixes.

New noise policy instruments

Moving towards sound(er) noise policy also requires the employment of other and new policy instruments. It is pivotal, as this research revealed (in chapter 5), to address vehicles (use), though difficult to realise in the short term due to limited political and societal legitimacy.

Near future noise policy in my opinion should thus address, at least, the following issues: (i) best available techniques in combination with noise production ceilings cf. Swung, (ii) public-private arrangements within sustainable mobility policy such as goods distribution, and (iii) financial and communication instruments stimulating the use of hybrid and electric vehicles. These approaches are based upon a complementary policy instrument mix comprised of mainly regulative and economic policy instruments. Regulation, for example, is required to provide the conditions for continuous implementation (a push as well as pull effect) of best available techniques for low noise pavement and (freight) trains, as practice has shown that infrastructure authorities and the public transport sector need strong, enforceable drivers for these (sound) investments. Economic policy instruments, such as tax exemption, are pivotal in stimulating hybrid and electric transport modes, at individual as well as sector and branch level.

Soundscape and environmental quality as new problem frames

This study also illustrated that further strengthening of environmental policy integration approaches is pivotal for the prevention of noise pollution in the next decades. Too often noise is considered at a relatively late phase of spatial planning, and consequently sub optimal choices are made. A holistic approach could trigger a change in noise policy integration into spatial planning; this approach builds on soundscape, environmental quality and quality of life approaches. This new discourse will encompass issues such as health, well-being and quality of life; narratives that are well-known and applied by spatial planners, public health institutes and other decision-makers at local administrative level. As such so-called non-acoustic factors, not-(yet-) regulated noise sources as well as visual and acoustical aesthetics are addressed in physical planning and environmental quality. More importantly, adopting soundscape narratives facilitates the incorporation of 'wanted' sounds into planning processes. Soundscape (Andringa et al., 2013) refers to the perception of an acoustic environment, and is characterised by its focus on – sensory - humans. From a spatial planning perspective, soundscape insights are valuable in order to optimise multi-sensory designs and spatial and environmental quality. The advantage of integration of soundscape narratives into urban planning is the involvement of citizens, the neglected actors in noise policy for decades. As Adams et al. (2006) suggested these local people are of primary interest in determining which aspects of sounds people want to maintain and which noise sources are negatively perceived and thus should be 'changed'.

The positive effects of such participatory approaches are twofold: urban planning is aligned with the expectations of residents and, on the other hand, citizens become aware of soundscape, noise pollution and the effects on well-being and health. Recent local practices such as the redesign of the Nauener Platz in Berlin (Schulte-Fortkamp et al., 2008) and the selection of quiet urban areas in Amsterdam (Van den Berg, 2010) and Rotterdam (Weber, 2011) illustrate the added value of soundscape frames.

My final reflection and observation concern the following: in contrast to Dryzek (1983, p. 350) who stated that "[…] policy analyses may indeed contribute little more than noise to the system […]", to my opinion, this meta analysis and evaluation of noise policy in the Netherlands has provided important building stones for sound(er) noise policy – which is more than 'just noise'.

References

Acutt, M.Z. and Dodgson, J.S., 1997. Controlling the environmental impacts of transport: matching instruments to objectives. Transportation Research D, 2(1), 17-33.

Adams, M., Cox, T., Moore, G., Croxford, B., Refaee, M. and Sharples, S., 2006. Sustainable soundscapes: Noise policy and the urban experience. Urban Studies, 43(13), 2385-2398.

Albright, E.A., 2011. Policy change and learning in response to extreme flood events in Hungary: An Advocacy Coalition Framework. Policy Studies Journal, 39(3), 485-511.

Algemene Rekenkamer, 2009. Environmental impacts from road traffic: Feasibility of policy goals on clean, efficient and quiet road traffic (in Dutch: Milieueffecten wegverkeer: Haalbaarheid van de beleidsdoelstellingen voor een schoon, zuinig en stil wegverkeer). Den Haag: Sdu Uitgevers.

Andringa, T., Weber, M., Payne, S., Krijnders, J.D., Dixon, M., Van der Linden, R., De Kock, E. and Lanser, J., 2013. Positioning soundscape research and management, Journal of the Acoustical Society of America, 134(4), 2739-2747.

Appleyard, D. and Lintell, M., 1972. The environmental quality of city streets: The residents' viewpoint. Journal of the American Planning Association, 38(2), 84-101.

Arts, B., Leroy, P. and Van Tatenhove, J.P.M., 2006. Political modernisation and policy arrangements: A framework for understanding environmental policy change. Public Organization Review, 6(2), 93–106.

Baak, J.A.M. and Van Zanten, W.P.C., 1990. A framework for effect evaluation (in Dutch: Een stappenschema voor effectevaluatie). Heerlen: Open University, 25-46.

Babisch, W., 2002. The noise/stress concept, risk assessment and research needs. Noise & Health, 4(16), 1-11.

Babisch, W., 2008. Road traffic noise and cardiovascular risk. Noise & Health, 10(38), 27-33.

Babisch, W., 2013. Exposure-response curves of the association between transportation noise and cardiovascular diseases – an overview. Serbian Medical Society, Proceedings of the first International Congress on Hygiene and preventive medicine, 331-339.

Babisch, W., and Van Kamp, I., 2009. Exposure-response relationships of the association between aircraft noise and the risk of hypertension. Noise & Health, 11(44), 161-168.

Babisch, W., Houthuijs, D. and Pershagen, G., 2009. Annoyance due to aircraft noise has increased over the years—Results of the HYENA study. Environment International, 35(8), 1169–1176.

Baumgartner, F. and Jones, B.D., 1993. Agendas and Instability in American Politics. Chicago: University of Chicago Press.

Bemelmans-Videc, M.-L., Rist, R.C. and Vedung, E., 1998. Carrots, sticks and sermons. Policy instruments and their evaluation. 4th printing 2007. New Brunswick: Transaction Publishers.

Bennear, L.S. and Coglianese, C., 2005. Measuring progress: program evaluation of environmental policies. Environment and Policy for Sustainable Development, 47(2), 22-39.

Bennear, L.S. and Stavins, R.N., 2007. Second-best theory and the use of multiple policy instruments. Environmental and Resource Economics, 37, 111-129.

Berglund, B., Lindvall, T. and Schwela, D.H., 1999. Guidelines for community noise. Geneva: World Health Organisation.

Berkhout, G., 2003. Notes on a failing democratic process (in Dutch: Dossier Schiphol: Relaas van een falend democratisch process).

Bevir, M. and Rhodes, R.A.W., 2001. Decentring British Governance: From Bureaucracy to Networks, Working Paper 2011-11. Berkeley: University of California Press.

Bevir, M., Rhodes, R.A.W. and Weller, P., 2003. Traditions of governance: Interpreting the changing role of the public sector in comparative and historical perspective. Public Administration, 81(1), 1–30.

Bevir, M. and Richards, D., 2009. Decentring policy networks: A theoretical agenda. Public Administration, 87(1), 3–14.

Birkland, T.A., 1997. After Disaster; Agenda Setting, Public Policy and Focussing Events. Washington, DC: Georgetown University Press.

Boons, F., Van Buuren, A. and Teisman, G. , 2010. Governance of sustainability at airports: Moving beyond the debate about growth and noise. Natural Resources Forum, 34, 303-313.

Boot, S., 2007. Economic policy instruments and evaluation methods in Dutch water management, dissertation. Rotterdam: Erasmus University.

Bovens, M.A.P., 't Hart, P. and Kuipers, S., 2006. The politics of policy evaluation, In: M. Moran, M. Rein and R.E. Goodin eds. The Oxford handbook of public policy. Oxford: University Press, 319-335.

Bovens, M.A.P., 't Hart, P. and Van Twist, M.J.W., 2007. Public administration: policy, organisation and politics (in Dutch: Openbaar bestuur: beleid, organisatie en politiek), 7th printing. Alphen aan den Rijn: Kluwer.

Bröer, C., 2006. Policy shapes annoyance; how policy discourses shape the perception of aircraft noise (in Dutch: Beleid vormt overlast; hoe beleidsdiscoursen de beleving van geluid bepalen), dissertation. Amsterdam: Aksant.

Brown, S., 1985. Quantitative risk assessment of environmental hazards. Annual Review of Public Health, 6, 247-267.

Brown, A.L. and Van Kamp, I., 2009. Response to a change in transport noise exposure: a review of evidence of a change effect. Journal of the Acoustical Society of America, 125(5), 3018-3019.

Brunekreef, B., Miller, B.G. and Fintan Hurley, J., 2007. The brave new world of lives sacrified and saved, deaths attributed and avoided. Epidemiology, 18(6), 785-788.

Capano, G., 2009. Understanding policy change as an epistemological and theoretical problem. Journal of comparative policy analysis: Research and Practice, 11(1), 7-31.

Clark, C., Martin, R., Van Kempen, E., Alfred, T., Head, J. and Davies, H.W., 2006. Exposure-effect relations between aircraft and road traffic noise exposure at school and reading comprehension: The RANCH project. American Journal of Epidemiology, 163(1), 27–37.

Clark, C. and Stansfeld, S.A., 2007. The effect of transportation noise on health and cognitive development: Review of recent evidence. International Journal of Comparative Psychology, 20, 145-158.

Cleland-Hammet, W., 1993. The role of comparative risk analysis. EPA Journal, I-III, 18-23.

Council of Utrecht, 2013. Letter to the deputy environment minister on health effects due to noise pollution.

Crabbé, A. and Leroy, P., 2008. The handbook of environmental policy evaluation. Trowbridge: Cromwell Press for Earthscan.

Cubbage, F., Harou, P. and Sills, E., 2007. Policy instruments to enhance multi-functional forest management. Forest Policy and Economics, 9, 833-851.

De Roo, F. and Dittrich, M., 2013. Memorandum to Irish Presidency of the Council of the EU on EU regulation on the sound level of motor vehicles. Delft: TNO.

De Roo, G., 2000. Environmental planning and the compact city, a Dutch perspective, In: G. de Roo and D. Miller eds. Compact Cities and Sustainable Urban Development: A Critical Assessment of Policies and Plans from an International Perspective. Aldershot, Hants: Ashgate, 31-41.

De Roo, G., 2003. Environmental Planning in the Netherlands: Too Good to be True. Aldershot, Hants: Ashgate.

De Roo, G., 2005. The rise and fall of the environmental zone: a discussion about area oriented environmental planning in urban areas, In: D. Miller and G. de Roo eds. Urban Environmental Planning: Policies, Instruments and Methods in an International Perspective. 2nd edition 2005. Aldershot, Hants: Ashgate, 161-168.

De Roo, G. and Hanemaaijer, A.H., 2004. The Future of Environmental Policy. About the rules and the game of decentralisation: A policy science approach (in Dutch: De toekomst van het milieubeleid. Over de regels en het spel van decentralisatie: een bestuurskundige beschouwing). Groningen: URSI.

Den Boer, L.C. and Schroten, A., 2007. Traffic noise reduction in Europe: Health effects, social costs and technical and policy options to reduce road and rail traffic noise. Delft: CE Delft.

Den Butter, F.A.G. and Burgers, J., 2003. Schiphol: difficult dialogue between economy and environment (in Dutch: Schiphol: de moeizame dialoog tussen economie en milieu), In: J. Bouma, ed. Environmental policy in a changing context (in Dutch: Milieubeleid in een veranderende context). Den Haag: WRR, 49-80.

Devilee, J., 2002. Decision making about waste facilities. An analysis of reactions of local residents in a risk society, dissertation. Amsterdam: University of Amsterdam.

Devilee, J. and Van Kamp, I., 2013. Social effects (in Dutch: Sociale effecten). In: F. Woudenberg ed. Noise and health (in Dutch: Geluid en gezondheid. Editie 2013). Den Haag: Sdu Uitgevers.

Driessen, P.P.J., 2005. Steering on Quality. On Changing Ambitions and Strategies in Environmental Policy (in Dutch: Sturen op kwaliteit. Over veranderende ambities en strategieën in het omgevingsbeleid). Utrecht: Utrecht University Press.

Driessen, P.P.J., 2007. A spatial perspective, In: P.P.J. Driessen and P. Leroy eds. Environmental Policy: Analysis and Perspective. Bussum: Coutinho, 367-392.

Driessen, P.P.J. and Glasbergen, P., 2000a. The planning of main ports in The Netherlands: innovative decision-making for complex environmental problems, In: D. Miller and G. de Roo eds. Resolving Urban Environmental and Spatial Conflicts. Groningen: Geo Press, 223-238.

Driessen, P.P.J. and Glasbergen, P., 2000b. Environment, society and policy (in Dutch: Milieu, samenleving en beleid). Den Haag: Elsevier Bedrijfsinformatie.

Driessen, P.P.J., Glasbergen, P. and Verdaas, C., 2001. Interactive policy-making: a model of management for public works. European Journal of Operational Research, 128(2), 322-337.

Driessen, P P.J. and Glasbergen, P., 2002a. Greening Society. The Paradigm shift In Dutch Environmental Politics. Dordrecht: Kluwer Academic Publishers.

Driessen, P.P.J. and Glasbergen, P., 2002b. New directions in environmental politics: concluding remarks, In: P.P.J. Driessen and P. Glasbergen eds. Greening Society: The Paradigm Shift in Dutch Environmental Politics. Dordrecht: Kluwer Academic, 245-262.

Driessen, P.P.J. and Van Rijswick, H.F.M.W., 2011. Normative aspects of climate adaptation policies. Climate Law, 2, 559-581.

Driessen, P.P.J, Dieperink, C., Van Laerhoven, F., Runhaar, H.A.C. and Vermeulen, W.J.V., 2012, Towards a conceptual framework for the study of shifts in modes of environmental governance. Experiences from the Netherlands. Environmental Policy and Governance, 22(3), 143-160.

Dryzek, J.S., 1983. Don't toss coins in garbage cans: A prologue to policy design. Journal of Public Policy, 3(4), 345-367.

Dusseldorp, A., Houthuijs, D., Van Overveld, A., Van Kamp, I. and Marra, M., 2011. Guidance on noise annoyance from road traffic. Calculating and surveying (in Dutch: Handreiking geluidhinder wegverkeer. Berekenen en meten). Bilthoven: RIVM.

Eberg, J.W., 1997. Waste and learning. Policy dynamics of waste management and waste incineration in the Netherlands and Bavaria, dissertation. Amsterdam: University of Amsterdam.

EEA (European Environment Agency), 2008. Transport at a Crossroads. TERM 2008: Indicators Tracking Transport and Environment in the European Union. Copenhagen: EEA.

EEA (European Environment Agency), 2010. Good practice guide on noise exposure and potential health effects. Technical report 11/2010. Copenhagen: EEA.

EEA/JRC (European Environment Agency and EC Joint Research Centre), 2013. Environment and human health. EEA report No 5. Copenhagen: EEA.

EK, 1992. Explanatory memorandum to changes of the Noise Abatement Act, KST 20 985 nr. 90b.

EK, 2006. Parliamentary report on consultation considering changes of Noise Abatement Act, EK35-1661.

European Commission, 1996. Green Paper on Future Noise Policy, COM(96)540. Brussels: European Commission.

European Commission, 2010. Review of the Implementation of Directive 2002/49/EC on Environmental Noise. Brussels: European Commission.

European Commission, 2011. Report from the Commission to the European Parliament and the Council on the implementation of the Environmental Noise Directive in accordance with Article 11 of Directive 2002/49/EC, COM(2011) 321. Brussels: EC.

Evaluation Commission of City and Environment, 2004. Effectiveness and Effects of the Experimental Law City and Environment Practice (in Dutch: De doeltreffendheid en effecten van de experimentenwet Stad & Milieu). Den Haag: VROM.

Fischer, F., 2003. Reframing public policy. Discursive politics and deliberative practices. Oxford: University Press.

Flipse, L., 2007. Environmental policy integration and spatial planning: an evaluation of the MILO and LOGO methodologies for integral environmental and spatial planning, master thesis. Utrecht: Department of Innovation and Environmental Sciences, University of Utrecht.

Franssen, E.A.M., Van Dongen, J.E.F., Ruysbroek, J.M.H., Vos, H. and Stellato, R.K., 2004. Annoyance due to environmental stressors and the appreciation of the living environment in the Netherlands: Annoyance inventory 2003 (in Dutch: Hinder door milieufactoren en de beoordeling van de leefomgeving in Nederland. Inventarisatie verstoringen 2003). Bilthoven: RIVM.

Ganzleben, C., Janssen, S.A., Graham, J.M.A., Salomons, E., Vernon, J., Polinder, H. and Van der Burgt, N., 2010. Inventory of potential measures for a better control of environmental noise. Brussels: European Commission.

Gezondheidsraad, 1971. Report of the Health Council of the Netherlands on noise annoyance and noise abatement (in Dutch: Rapport Gezondheidsraad commissie geluidhinder en lawaaibestrijding). Den Haag: Gezondheidsraad.

Glasbergen, P., 1992. Seven steps towards an instrumentation theory for environmental policy. Policy and Politics, 20(3), 191-200.

Glasbergen, P., 2003. Policy science and environmental research: profile, key questions and meaning (in Dutch: Beleidswetenschappelijk milieuonderzoek: profiel, kernvragen en betekenis), In: The environment's harvest (in Dutch: De oogst van milieu), J.J. Boersema, T. Pulles, J. Van der Straaten, and J. Bertels eds. Amsterdam: Uitgeverij Boom.

Glasbergen, P., 2005. Decentralized reflexive environmental regulation: Opportunities and risks based on an evaluation of Dutch experiments. Environmental Sciences, 2(4), 427-442.

Gottweis, H., Strategies of poststructural policy analysis, In: M.A. Hajer and H. Wagenaar eds. Deliberative policy analysis: understanding governance in the network society. Cambridge: University Press.

Grazi, F. and Van den Bergh, J.C.J.M., 2008. Spatial organization, transport, and climate change: Comparing instruments of spatial planning and policy. Ecological Economics, 67, 630-639.

Griefahn, B., 2002. Sleep disturbances related to environmental noise. Noise & Health, 4(15), 57–60.

Guarinoni, M., Ganzleben, C., Murphy, E. and Jurkiewicz, K., 2012. Towards a comprehensive noise strategy. Brussels: European Parliament.

Guski, R., 1999. Personal and social variables as co-determinants of noise-annoyance. Noise & Health, 3, 59-71.

Guski, R., 2004. How to forecast community annoyance in planning noisy facilities. Noise & Health, 6, 59-64.

Gysen, J., Bruyninckx, H. and Bachus, K., 2006. The modus narrandi: a methodology for evaluating effects of environmental policy. Evaluation, 12(1), 95-118.

Hajer, M., 1995. The politics of environmental discourse. Ecological modernization and the policy process. Oxford: Clarendon Press.

Hajer, M. and Zonneveld, W., 2000. Spatial planning in the network society: rethinking the principles of planning in the Netherlands. European Planning Studies, 8(3), 337-355.

Hajer, M., Van Tatenhove, J.P.M. and Laurent, C., 2004. New Governance Forms (in Dutch: Nieuwe vormen van governance). Bilthoven: RIVM.

Hänninen, O. and Knol, A., 2011. European Perspectives on environmental burden of disease estimates for nine stressors in six European countries. Helsinki: National Institute for Health and Welfare.

Hart, J., 2008. Driven to excess: impacts of motor vehicle traffic on residential quality of life in Bristol. Bristol: University of the West of England.

Healey, P. and Shaw, T., 1994. Changing meanings of `environment' in the British planning system. Transactions of the Institute of British Geographers, New Series 19(4), 425-437.

Hellegers, P. and Van Ierland, E., 2003. Policy instruments for groundwater management in the Netherlands. Environmental and Resource Economics, 26, 163-172.

Héritier, A., 2002. Common Goods: Reinventing European and International Governance. Boston, MA: Rowman and Littlefield Publishers.

Hertin, J. and Berkhout, F., 2003. Analysing strategies for environmental policy integration: the case of EU enterprise policy. Journal of Environmental Policy and Planning, 5(1), 39-56.

Hey, C., 2002. Why does environmental policy integration fail? The case of environmental taxation for heavy goods vehicles, In: A. Lenschow ed. Environmental Policy Integration: Greening Sectoral Policies in Europe. London: Earthscan, 127-152.

Hoogerwerf, A., 1990. Reconstructing policy theory. Evaluation and Program Planning, 13, 285-291.

Huys, M., 2011. Building castles in (Dutch) air: Understanding the policy deadlock of Amsterdam Airport Schiphol 1989-2009, dissertation. Ridderkerk: Ridderprint.

Huys, M. and Annema, J.A., 2009. The politics of evidence based policy-making. Delft: Delft University of Technology.

Hysing, E., 2009. From government to governance? A comparison of environmental governing in Swedish forestry and transport. Governance: An International Journal of Policy, Administration and Institutions, 22(4), 547–672.

Hysing, E., 2010. Governing towards sustainability; Environmental governance and policy change in Swedish forestry and transport, dissertation. Örebro: Örebro University.

Hysing, E. and Olsson, J., 2008. Contextualising the Advocacy Coalition Framework: theorising change in Swedish forest policy. Environmental Politics, 17(5), 730-748.

Ingold, K., 2011. Network structures within policy processes: coalitions, power and brokerage in Swiss climate policy. Policy Studies Journal, 39(3), 435-459.

Jabben, J., Verheijen, E. and Weber, M., 2013, An indicator for rating acoustic quality of urban parks. Noise-Con 2013 proceedings.

Jacob, K., Volkery, A. and Lenschow, A., 2008. Instruments for environmental policy integration in 30 OECD-countries, In: A.J. Jordan and A. Lenschow eds. Innovation in Environmental Policy? Integrating the Environment for Sustainability. Cheltenham: Edward Elgar, 24-45.

James, T.E. and Jorgenson, P.D., 2009. Policy knowledge, policy formulation, and change: Revisiting a foundational question. The Policy Studies Journal, 37(1), 141-162.

Janssen, S.A., Vos, H., Van Kempen, E.E.M.M., Breugelmans, O.R.P. and Miedema, H.M.E., 2011. Trends in aircraft noise annoyance: The role of study and sample characteristics. Journal of the Acoustical Society of America, 129(4), 1953-1962.

Jenkins-Smith, H.C., St. Clair, G.K. and Woods, B., 1991. Explaining change in policy subsystems: Analysis of coalition stability and defection over time. American Journal of Political Science, 35(4), 851-880.

Job, S.R.F., 1999. Noise sensitivity as a factor influencing human reactions to noise. Noise & Health, 3, 57-68.

John, P., 2003. Is there life after policy streams, advocacy coalitions, and punctuations: Using evolutionary theory to explain policy change?, The Policy Studies Journal, 31(4), 481-498.

Jordan, A., 2008. The governance of sustainable development: Taking stock and looking forwards. Environment and Planning C: Government & Policy, 26(1), 17–33.

Jordan, A., Wurzel, R.K.W. and Zito, A.R., 2003a. 'New' instruments of environmental governance: patterns and pathways of change. Environmental Politics, 12(1), 1-24.

Jordan, A., Wurzel, R.K.W., Zito, A. and Brückner, L., 2003b. European governance and the transfer of new environmental policy instruments (NEPIs) in the European Union. Public Administration, 81(3), 555-574.

Jordan, A., Wurzel, R.K.W. and Zito, A.R., 2005. The rise of 'new' policy instruments in comparative perspective: Has governance eclipsed government?. Political Studies, 53(3), 477–496.

Jordan, A. and Lenschow, A., 2010. Environmental policy integration: a state of the art review. Environmental Policy and Governance, 20(3), 147-158.

Keijzers, G., 2000. The evolution of Dutch environmental policy: The changing ecological arena from 1970-2000 and beyond. Journal of Cleaner Production, 8(3), 179–200.

Kidd, S., 2007. Towards a framework of integration in spatial planning: an exploration from a health Perspective. Planning Theory and Practice, 8(2), 161-181.

King, E.A., Murphy, E., and Rice, H.J., 2011. Evaluating the impact on noise levels of a ban on private cars in Dublin city centre, Ireland. Transportation Research Part D, 16, 532-539.

Kingdon, J.W., 1995. Agendas, alternatives, and public policies. New York: Harper Collins College Publishers.

Kiser, L. and Ostrom, E., 1982. The three worlds of action. In: E. Ostrom ed. Strategies of political inquiry. Beverly Hills: Sage, 179-222.

Kjaer, A.M., 2004. Governance. Cambridge: University Press.

Klein, R. and Marmor, T.R., 2006. Reflections on policy analysis: putting it together again, In: M. Moran, M. Rein and R.E. Goodin eds. The Oxford handbook of public policy. Oxford: University Press.

Knoll, A.B. and Staatsen, B.A.M., 2005. Trends in the environmental burden of disease in the Netherlands 1980-2020, report 50029001/2005. Bilthoven: RIVM.

Knudsen, J.K., 2009. De- and re-coupling energy: environmental policy integration (EPI) and the case of renewable electricity in Scandinavia, report. Trondheim: SINTEF Energy Research.

Kooiman, J., 2003. Governing as Governance. London: Sage Publications.

Kroesen, M. and Bröer, C., 2009. Policy discourse, people's internal frames and declared aircraft noise annoyance: an application of Q methodology. Journal of the Acoustical Society of America, 126(1), 195-207.

Kroesen, M., Molin, E.J.E. and Van Wee, B., 2011. Policy, personal dispositions and the evaluation of aircraft noise. Journal of Environmental Psychology, 31, 147-157.

Kropp, W., Khilman, T., Forssén, J. and Ivarsson, L., 2007. Reduction potential of road traffic noise. Stockholm: Alfa Print.

Lafferty, W.M. and Meadowcroft, J., 1996. Democracy and the environment: Problems and prospects. Cheltenham: Edward Elgar.

Lafferty, W.M., and Hovden, E., 2003. Environmental policy integration: towards an analytical framework?. Environmental Politics, 12(3), 1-22.

Lafferty, W.M., Ruud, A. and Larsen, O.M., 2004. Environmental policy integration: how will we recognize it when we see it? The case of green innovation policy in Norway, Program for Research and Documentation for a Sustainable Society, Centre for Development and Environment. Oslo: University of Oslo.

Lafferty, W.M. and Knudsen, J., 2007. The issue of `balance' and trade-offs in environmental policy integration: how will we know EPI when we see it? , EPIGOV paper 11, (online at http://ecologic.eu.projekte/epigov/).

Lange, P., Driessen, P.P.J., Sauer, A., Bornemann, B. and Burger, P., 2013. Governing towards sustainability: Conceptualizing modes of governance. Journal of Environmental Policy and Planning, 15(3), 403-425.

Laurian, L., Crawford, J., Day, M., Kouwenhoven, P., Mason, G., Ericksen, N. and Beattie, L., 2010. Evaluating the outcomes of plans: theory, practice and methodology. Environment and Planning, B: Planning and Design, 37, 740-757.

Lenschow, A., 1997. Variation in EC environmental policy integration: agency push within complex institutional structures. Journal of European Public Policy, 4(1), 109-127.

Lenschow, A., 1999. The greening of the EU: the Common Agricultural Policy and the Structural Funds. Environment and Planning C: Government and Policy, 17(1), 91-108.

Lenschow, A., 2007. The modes of EPI in theory and practice. EPIGOV paper 10, (online at http://ecologic.eu.projekte/epigov/).

Leroy, P. and Loots, I., 2006. Flemish Environment Policy. In need of/for renewal? (in Dutch: Vlaams milieubeleid. In staat van/tot vernieuwing?. Gent: Uitgeverij Vanden Broele.

Marsh, D. and Rhodes, R.A.W., 1992. Policy networks in British government. Oxford: Clarendon Press.

Matti, S. and Sandström, A., 2011. The rationale determining advocacy coalitions: Examining coordination networks and corresponding beliefs. Policy Studies Journal, 39(3), 385-410.

Mayne, J., 2001. Addressing attribution through contribution analysis: using performance measures sensibly. Canadian Journal of Program Evaluation, 16, 1-24.

Meijerink, S., 2005. Understanding policy stability and change. The interplay of advocacy coalitions and epistemic communities, windows of opportunity, and Dutch coastal flooding policy 1945-2003. Journal of European Public Policy, 12(6), 1060-1077.

Mickwitz, P., 2003. A framework for evaluating environmental policy instruments: Context and key concepts. Evaluation, 9(4), 415-436.

Miedema, H.M.E., 2004. Relationship between exposure to multiple noise sources and noise annoyance. Journal of the Acoustical Society of America, 116(2), 949-957.

Miedema, H.M.E., 2007. Annoyance caused by environmental noise: Elements for evidence-based noise policies, Journal of Social Issues, Vol 63(1), 41-57.

Miedema, H.M. and Vos, H., 1998. Exposure response relationships for transportation noise. Journal of the Acoustical Society of America, 104(6), 3432–3445.

Miedema, H.M.E. and Oudshoorn, C.G.M., 2001. Annoyance from transportation noise: relationships with exposure metrics DNL and DENL and their confidence intervals. Environmental Health Perspective, 109, 409-416.

Miedema, H.M., Passchier-Vermeer, W. and Vos, H., 2003. Elements for a Position Paper on Night-time Transportation Noise and Sleep Disturbance. Bilthoven: RIVM.

Milford, I., Gspan, K., Aasebø, S.J. and Strömmer, K., 2013. Value for money in road traffic noise abatement. Paris: Conference of European Directors of Roads (CEDR).

Miller, D. and De Roo, G., 2004. Integrating City Planning and Environmental Improvement. Aldershot: Ashgate Publishers.

Ministry of Housing, Physical Planning and Environmental Protection, 1998. Renewal of Noise Policy (in Dutch: Vernieuwing Geluidhinderbeleid). Den Haag: SDU.

Ministry of Public Health and the Environment, 1972. Policy Document on the Urgency of Environmental Pollution (in Dutch: Urgentie Nota Milieuhygiëne). Den Haag: SDU.

Ministry of Infrastructure and Environment, 2011a. Respons on amendments related to the parliamentary discussion on Swung legislation (in Dutch: Reactie op amendementen naar aanleiding van wetgevingsoverleg Swung), LOK2011.049311.

Ministry of Infrastructure and Environment, 2011b. Parliamentary discussion on the review of the Noise Abatement Act (Swung), revised version (in Dutch: Wetgevingsoverleg debat wijziging Wet geluidhinder (Swung), herziene versie), LOK/20111048006.

Ministry of Infrastructure and Environment, 2012. Letter on vehicle check up in relation to noise

Ministry of Infrastructure and Environment, 2013. Policy choices Swung-2 (review of the Noise Abatement Act) (in Dutch: Beleidskeuzes Swung-2 (herziening geluidwetgeving), IENM/BSK-2013/355805.

Mintrom, M. and Vergari, S., 1996. Advocacy coalitions, policy entrepreneurs and policy change. Policy Studies Journal, 24(3), 420-434.

MMG Advies, 2002. Evaluation MIG intern (in Dutch: Evaluatie MIG intern). Den Haag: VROM

MNP (Milieu- en Natuurplanbureau), 2005. The environment near Schiphol (in Dutch: Het milieu rond Schiphol, 1990-2010). Bilthoven: MNP.

Moghissi, A.A., 1993. Editorial, safe is not risk-fee. Environmental International, 19, 311-312.

Mortensen, P.B., 2007. Stability and change in public policy: A longitudinal study of comparative subsystem dynamics. Policy Studies Journal, 35(3), 373-394.

Neij, L., and Åstrand, K., 2006. Outcome indicators for the evaluation of energy policy instruments and technical change. Energy Policy, 34, 2662-2676.

NEPP1, 1989. National Environmental Policy Plan: to Choose or to Lose. Den Haag: Ministry of Housing, Physical Planning and Environmental Protection.

NEPP2, 1993. National Environmental Policy Plan 2, the Environment: Today's Touchstone. Den Haag: Ministry of Housing, Physical Planning and Environmental Protection.

NEPP3, 1998. National Environmental Policy Plan 3. Den Haag: Ministry of Housing, Physical Planning and Environmental Protection.

NEPP4, 2001. National Environmental Policy Plan 4, Where There's a Will There's a World. Den Haag: Ministry of Housing, Physical Planning and Environmental Protection.

Netherlands Environmental Assessment Agency (PBL), 2009. State of the Environment (in Dutch: Balans van de Leefomgeving). Bilthoven: PBL.

Netherlands Environmental Assessment Agency (PBL), 2010. State of the Environment (in Dutch: Balans van de Leefomgeving). Bilthoven: PBL

Netherlands Environmental Assessment Agency (PBL), 2011. State of the Environment (in Dutch: Balans van de leefomgeving), Bilthoven: PBL.

Netherlands Environmental Assessment Agency (PBL), 2012. State of the living environment (in Dutch: Balans van de leefomgeving). Den Haag: PBL.

Netherlands Environmental Assessment Agency (PBL), 2013. letter on Study into noise policy regarding Schiphol Airport (in Dutch: Verkenning lessen hinderbeleid rond Schiphol). Den Haag: PBL.

Nilsson, M., 2005. Learning, frames, and environmental policy integration: the case of Swedish energy policy. Environment and Planning C: Government and Policy, 23(2), 207-226.

Nilsson, M. and Persson, A., 2003. Framework for analyzing environmental policy integration. Journal of Environmental Policy and Planning, 5(4), 333-359.

Nilsson, M., Eklund, M. and Tyskeng, S., 2009. Environmental integration and policy implementation: competing governance modes in waste management decision making. Environment and Planning C: Government and Policy, 27(1), 1-18.

Nohrstedt, D., 2011. Shifting resources and venues producing policy change in contested subsystems: A case study of Swedish signals intelligence policy. Policy Studies Journal, 39(3), 461-484.

Noise Abatement Act, 1979. Wet van 16 Februari 1979, Houdende Regels Inzake het Voorkomen of Beperken van Geluidhinder. Den Haag: Staatsblad.

NRC, 2013. The map of quietness in the Netherlands (in Dutch: De stiltekaart van Nederland), NRC Weekend June 1 & 2, 2012.

Nijland, H.A., 2008. Theory and practice of the assessment and valuation of noise from roads and railroads in Europe, dissertation. Delft: Technical University.

Öhrström, E., Skånberg, A., Svensson, H. and Gidlöf-Gunnarsson, A., 2006. Effects of road traffic noise and the benefits of access to quietness. Journal of Sound and Vibration, 295(1,2), 40-59.

Oikonomou, V. and Jepma, C.J., 2008. A framework on interactions of climate and energy policy instruments. Mitigation and adaptation strategies for global change, 13(2), 131-156.

Ostrom, E., 1990. Governing the Commons: The Evolution of Institutions for Collective Action. New York: Cambridge University Press.

Ostrom, E., 2007. Institutional rational choice. In: P. Sabatier ed. Theories of the policy process, 2nd ed. Boulder: Westview Press, 21-64.

Ouis, D., 2002. Annoyance caused by exposure to road traffic noise: An update. Noise & Health, 4(15), 69–70.

Persson, A., 2004. Environmental Policy Integration: An Introduction. Stockholm: Stockholm Environment Institute.

Persson, A., 2006. Different perspectives on EPI, In: M. Nilsson and K. Eckerberg eds. Environmental Policy Integration in Practice: Shaping Institutions for Learning. London: Earthscan, 25-48.

Peters, G.B. and Pierre, J., 1998. Governance without government? Rethinking public administration. Journal of Public Administration Research and Theory, 8(2), 223–243.

Pierre, J., 2000. Debating Governance; Authority, Steering and Democracy. Oxford: Oxford University Press.

Priemus, H., 1995. Reduction of car use: instruments of national and local policies – a Dutch perspective. Environment and Planning B: Planning and Design, 22, 721-737.

Primdahl, J., Peco, B., Schramek, J., Andersen, E. and Oñate, J.J., 2003. Environmental effects of agri-environmental schemes in Western Europe. Journal of Environmental Management, 67, 129-138.

Rauschmayer, F., Berghöfer, A., Omam, I. and Zikos, D., 2009. Examining processes and/or outcomes? Evaluation concepts in European governance of natural resources. Environmental Policy and Governance, 19(3), 159-173.

Rhodes, R.A.W., 1997. Understanding Governance. Policy Networks, Governance, Reflexivity and Accountability. Buckingham: Open University Press.

Rhodes, R.A.W., 2007. Understanding governance: Ten years on. Organization Studies, 28(8), 1243–1264.

RO Magazine, 2013. Local politicians call upon parliament to take action (in Dutch: Wethouders manen kabinet tot actie), 31(5).

Rossi, P.H. and Wright, J.D., 1984. Evaluation research: An Assessment. Annual Review of Sociology, 10, 331-352.

Runhaar, H.A.C., Dieperink, C. and Driessen, P.P.J., 2006. Policy analysis for sustainable development: The toolbox for the environmental social scientist. International Journal of Sustainability in Higher Education, 7(1), 34-56.

Runhaar, H., Driessen, P.P.J. and Soer, L., 2009. Sustainable urban development and the challenge of policy integration: an assessment of planning tools for integrating spatial and environmental planning in the Netherlands. Environment and Planning B: Planning and Design, 36(3), 417-431.

Runhaar, H.A.C., Driessen, P.P.J., Van Bree, L. and Van der Sluijs, J.P., 2010. A meta-level analysis of major trends in environmental health risk governance. Journal of Risk Research, 13(3), 319–335.

Sabatier, P.A., 1998. The Advocacy Coalition Framework: Revisions and relevance for Europe. Journal of European Public Policy, 5(1), 98-130.

Sabatier, P.A., 2007. Theories of the policy process, 2nd edition. Boulder: Westview Press.

Sabatier, P.A. and Jenkins-Smith, H., 1993. Policy change and learning: An Advocacy Coalition Approach. Boulder: Westview Press.

Sabatier, P.A. and Jenkins-Smith, H., 1999. The Advocacy Coalition Framework: An assessment In: P. Sabatier ed. Theories of the policy process, Boulder: Westview Press, 117-168.

Sabatier, P.A. and Weible, C.M., 2007. The Advocacy Coalition Framework: Innovations and clarifications. In: P. Sabatier ed. Theories of the policy process, 2nd ed. Boulder: Westview Press, 189-222.

Schattscheider, E.E., 1960. The Semisovereign People. New York: Holt, Reinhart and Winston.

Schlager, E., 2007. A comparison of frameworks, theories and models of policy processes. In: P. Sabatier ed. Theories of the policy process, 2nd ed. Boulder: Westview Press, 293-319.

Schneider, A.L., 2006. Patterns of change in the use of incarceration in the American States: A path dependency and punctuated equilibrium perspective. Political Research Quarterly, 59, 457-470.

Schneider, A. and Sidney, M., 2009. What is next for policy design and social construction theory?. The Policy Studies Journal, 37(1), 103-119.

Schout, A. and Jordan, A., 2007. EU-EPI policy coordination and new institutionalism. EPIGOV paper 13, (online at http://ecologic.eu.projekte/epigov/).

Schout, A. and Jordan, A., 2008. Administrative instruments, In: A. Jordan and A. Lenschow eds. Innovation in Environmental Policy?. Cheltenham: Edward Elgar, 49-69.

Schulte-Fortkamp, B., Volz, R. and Jakob, A., 2008. Using the soundscape approach to develop a public space in Berlin: perception and evaluation. Journal of the Acoustical Society of America, 123(5), 3808.

Scriven, M., 1991. Evaluation Thesaurus. 4th edition. Newbury Park: Sage.

Secretary of Environment, 2011. Letter to Parliament on new noise legislation, LOK/2011048006, 16 June.

Sobeck, J. 2003. Comparing policy process frameworks: what do they tell us about group membership and participation for policy development? Administration and Society, 35, 350-374.

Sotirov, M. and Memmler, M., 2012. The Advocacy Coalition Framework in natural resource policy studies: Recent experiences and further prospects. Forest Policy and Economics, 16, 51-64.

Staatsen, B.A.M., Nijland, H.A., Van Kempen, E., de Hollander, G.E.M., Franssen, E.A.M. and Van Kamp, I., 2004. Assessment of Health Impacts and Policy Options in Relation to Transport-related Noise Exposures. Bilthoven: RIVM.

Stallen, P.J.M., 1999. A theoretical framework for environmental noise annoyance. Noise & Health, 3, 69-79.

Stansfeld, S.A. and Matheson, M.P., 2003. Noise pollution: non-auditory effects on health. British Medical Bulletin, 68(1), 243-257.

Stassen, K.R., 2012. Environment and health in Flanders: 40 years of institutional struggle, dissertation. Nijmegen University, Hasselt: DigiKing.

Stavins, R.N., 1997. Policy instruments for climate change: How can national governments address a global problem? Resources for the Future Discussion paper. Chicago: University of Chicago Law School, 1-36.

Stoker, G., 1998. Governance as theory: Five propositions. International Social Science Journal, 50(155), 17–27.

Swyngedouw, E., 2005. Governance innovation and the citizen: The Janus-face of Governance-beyond-the-state. Urban Studies, 42(11), 1991–2006.

Taylor, C., Pollard, S., Rocks, S. and Angus, A., 2012. Selecting policy instruments for better environmental regulation: a critique and future research agenda. Environmental Policy and Governance, 22(4), 268-292.

Tellegen, E., 2003. Fifty dissertations on environment and society: 1992-2002 (in Dutch: 50 proefschriften over milieu en samenleving: 1992-2002), In: The environment's harvest (in Dutch: De oogst van milieu), J.J. Boersema, T. Pulles, J. Van der Straaten, and J. Bertels eds. Amsterdam: Uitgeverij Boom.

Thelen, K. and Streeck, W., 2005. Beyond Continuity. Institutional Change in Advanced Political Economies, Oxford: Oxford University Press.

Thorborg, H.W.M., Leidelmeijer, K. and Dassen, A.G.M., 2006. Quality of life and liveability: towards policy evaluation and research, (in Dutch: Leefomgevingskwaliteit en leefbaarheid: naar beleidsevaluatie en onderzoek) report 500132001/2006. Bilthoven: MNP.

Transport & Environment, 2011. Briefing: Comparing proposed noise limits to current ones. Brussels: T&E.

TK, 1976. Noise Abatement Act (in Dutch: Regels inzake het voorkomen of beperken van geluidhinder (Wet geluidhinder)), KST 13 639 nrs. 1-4.

TK, 1981. Urban renewal and the Noise Abatement Act, KST 16 621 nr. 1.

TK, 1986. Report of the Commission on Evaluation of Noise Abatement Act, KST 19 531 nrs. 2-3.

TK, 1989. Report of consultation on Multi Annual Programme on Noise Abatement 1989-1993, KST 20 803 nr. 14.

TK, 1991. Report of consultation considering changes of Noise Abatement Act, KST 20 985, nr. 10-33.

TK, 1998. Memorandum considering changes of Noise Abatement Act (MIG), KST 25 905 nr. 3.

TK, 2000. Letter of the minister of Environment on future of Schiphol Airport, KST 26 959, nr.3.

TK, 2002. Fixed values, new forms: Environmental Policy 2002-2006 (in Dutch: Notitie Vaste waarden, nieuwe vormen: Milieubeleid 2002-2006).

TK, 2003. Implementation of Environmental Noise Directive, KST 29 021 nrs. 1-2.

TK, 2004. Explanatory Memorandum to Modernisation of Noise Abatement Act, KST 29 879 nr. 3.

TK, 2011a. Amendments on Swung legislation, 32625 nr. 15 and 32252 nrs. 22-23.

TK, 2011b. Amendments on Swung legislation, 32252 nrs. 8, 12 and 14.

TK, 2013. Report on discussion on environmental quality issues, KST 30 175 nr. 63.

Underdal, A., 1980. Integrated marine policy: What? Why? How?. Marine Policy, 159-169.

Van Baren, N.G.E., 2001. Planning hierarchical solutions: a source for societal resistance (in Dutch: Planhiërarchische oplossingen: een bron voor maatschappelijk verzet), dissertation. Amsterdam: University of Amsterdam.

Van Beek, A. and Dassen, T., 2009. Review of regulations of highway traffic noise: an ex-ante evaluation (in Dutch: Herziening regelgeving verkeersgeluid snelwegen: een ex-ante evaluatie). Den Haag: PBL.

Van den Berg, F., 2010. A policy for urban quiet areas, Proceedings Internoise Lisbon 2010.

Van den Berg, M., 2012. Noise annoyance in the Netherlands 30 years later (in Dutch: Geluidshinder in Nederland dertig jaar later). Geluid, 2012(2), 6-9.

Van den Brand, P., 2008. 'Policy pioneer' Marius Enthoven on 30 years noise policy (in Dutch: 'Beleidspionier' Marius Enthoven over 30 jaar geluidsbeleid), Geluid (3).

Van der Doelen, F.C.J., 1998. The "give and take" packaging of policy instruments: optimizing legitimacy and effectiveness, In: M.L. Bemelmans-Videc, R.C. Rist and E. Vedung eds. Carrots, sticks & sermons; policy instruments and their evaluation. 4th printing 2007. New Brunswick: Transaction Publishers, 129-146.

Van der Waals, J.P.M. and Glasbergen, P., 2002. Policy innovations in the urban context, In: P.P.J. Driessen and P. Glasbergen eds. Greening Society. The Paradigm Shift in Dutch Environmental Politics. Dordrecht: Kluwer Academic Publishers, 137-160.

Van Geel, P., 2006. Future agenda for the environment: clean, smart and strong (in Dutch: Toekomstagenda milieu: schoon, slim, sterk). Den Haag: Ministry of Environment

Van Gossum, P., Arts, B. and Verheyen, K., 2012. "Smart regulation": Can policy instrument design solve forest policy aims of expansion and sustainability in Flanders and the Netherlands? Forest Policy and Economics, 16, 23-34.

Van Kamp I., Leidelmeijer, K., Marsman, G. and De Hollander, A., 2003. Urban environmental quality and human well-being: towards a conceptual framework and demarcation of concepts: a literature study. Landscape and Urban Planning, 65(1-2), 5-18.

Van Kempen, E.E.M.M. and Houthuijs, D.J.M., 2008. The burden on health and well-being of road and rail traffic noise exposure in the Netherlands (in Dutch: Omvang van de effecten op gezondheid en welbevinden in de Nederlandse bevolking door geluid van weg- en railverkeer). Bilthoven: RIVM.

Van Kempen, E.E.M.M. and Van Kamp, I., 2013. Cardio-vascular diseases (in Dutch: Hart- en vaatziekten), In: F. Woudenberg ed. Noise and health (in Dutch: Geluid en gezondheid. Editie 2013). Den Haag: Sdu Uitgevers.

Van Kersbergen, K. and Van Waarden, F., 2004. 'Governance' as a bridge between disciplines: Cross-disciplinary inspiration regarding shifts in governance and problems of governability, accountability and legitimacy. European Journal of Political Research, 43(2), 143–171.

Van Leeuwen, J. and Van Tatenhove, J., 2010. The triangle of marine governance in the environmental governance of Dutch offshore platforms. Marine Policy, 34(3), 590-597.

Van Poll, H.E.P.M., Breugelmans, O.R.P. and Devilee, J.L.A., 2011. Annoyance, concern and residential satisfaction in the Netherlands. Annoyance inventory 2008 (in Dutch: Hinder, bezorgdheid en woontevredenheid in Nederland. Inventarisatie verstoringen 2008). Bilthoven: RIVM.

Van Tatenhove, J.P.M., Arts, B. and Leroy, P., 2000. Political Modernisation and the Environment: The Renewal of Environmental Policy Arrangements. Dordrecht: Kluwer Academic Publishers.

Van Tatenhove J.P.M. and Goverde, H.J.M., 2002. Strategies in environmental policy: a historical institutional perspective, In: P.P.J. Driessen and P. Glasbergen eds. Greening Society: The Paradigm Shift in Dutch Environmental Politics. Dordrecht: Kluwer Academic, 47-63.

Van Tatenhove, J.P.M. and Leroy, P., 2003. Environment and participation in a context of political modernisation. Environmental Values, 12(2), 155–174.

Vedung, E., 1998. Policy instruments: typologies and theories, In: M.L. Bemelmans-Videc, R.C. Rist and E. Vedung eds. Carrots, sticks & sermons; policy instruments and their evaluation. 4th printing 2007. New Brunswick: Transaction Publishers, 21-58.

Vedung, E. and Van der Doelen, F.C.J., 1998. The sermon: Information campaigns in the public policy process – choice, effects and evaluation, In: M.L. Bemelmans-Videc, R.C. Rist and E. Vedung eds. Carrots, sticks & sermons; policy instruments and their evaluation. 4th printing 2007. New Brunswick: Transaction Publishers, 103-128.

Verschuren, P.J.M. and Zsolnai, L., 1998. Norms, goals, and stakeholders in program evaluation. Human Systems Management, 17, 155-160.

Vlek, C., 2005. Could we all be a little more quiet, please? A behavioural-science commentary on research for a quieter Europe in 2020. Noise & Health, 7(26), 59–70.

Vlek, C. and Steg, L., 2007. Human behaviour and environmental sustainability: Problems, driving forces and research topics. Journal of Social Issues, 63(1), 1-19.

VNG, 2004. Guidance Environmental Quality in the Living Conditions (in Dutch: Handreiking milieukwaliteit in de leefomgeving), Den Haag: VNG.

Volkskrant, 1998. Interview with former minister of Environment Pronk. Volkskrant, 24 December.

Volkskrant, 1999. Environmental NGOs still disagree with Schiphol (in Dutch: Milieubeweging blijft het oneens met Schiphol). Volkskrant, 28 juli.

Volkskrant, 2010. Schiphol resistance died in polder approach (in Dutch: Doodgepolderd Schiphol verzet). Volkskrant, 28 August.

VROM, Ministry of Housing, Spatial Planning and the Environment, Den Haag
1988 Fourth National Policy Document on Spatial Planning TK 20 490
1989 National Environmental Policy Plan TK21137
1990 Area-oriented Environmental Policy TK 21 896
1993 National Environmental Policy Plan-2 TK23560
1998 Letter to ROM Evaluation Report TK 25 600 XI (48)
2001 Fourth National Environment Plan TK 27 664
2003 Liveable Cities: A Dutch Recipe for Environmental Policy and Spatial Planning in the City and Environment Project
2006 National Spatial Strategy TK 19 19-1390

VROM Inspectie, 2009. Noise? We do not want to hear it! (in Dutch: Geluid? We willen het niet horen!). Den Haag: Ministry of Environment.

Weale, A., 1992. The new politics of pollution: Issues in environmental politics. Manchester: Manchester University Press.

Weale, A., 2009. Governance, government and the pursuit of sustainability, In: W.N. Adger and A. Jordan eds. Governing Sustainability. Cambridge: University Press, 55-75.

Weber, M., 2010. Environmental Noise Directive: a European solution for municipal problems caused by noise pollution?) (in Dutch: Richtlijn Omgevingslawaai: een Europese oplossing voor de gemeentelijke geluidshinderproblematiek?) In: S. Goedings, E. Perton, and L. Vermeer eds. European environmental regulations and decentralised authorities: From policy and law to the local practice via negotiations (in Dutch: Europese milieuwetgeving en decentrale overheden: Van beleid en recht naar de praktijk via de onderhandelingstafel). Den Haag: Sdu.

Weber, M., 2011. The soundscape of quiet urban parks in Rotterdam: Assessment and review of research approaches, 40th International Congress and Exposition on Noise Control Engineering 2011, 4007-4015.

Weber, M. and Driessen, P.P.J., 2010. Environmental policy integration: the role of policy windows in the integration of noise and spatial planning. Environmental Policy and Planning C: Government and Policy, 28(6), 1120-1134.

Weber, M., Driessen, P.P.J. and Runhaar, H.A.C., 2011. Drivers of and barriers to shifts in governance: Analysing noise policy in the Netherlands. Journal of Environmental Policy and Planning, 13(2), 119-137.

Weber, M., Driessen, P.P.J., Schueler, B.J. and Runhaar, H.A.C., 2012. Variation and stability in Dutch noise policy: an analysis of dominant advocacy coalitions. Journal of Environmental of Environmental Planning and Management, 56(7), 953-981.

Weible, C.M., 2007. An Advocacy Coalition Framework approach to stakeholder analysis: Understanding the political context of California marine protected area policy. Journal of Public Administration Research and Theory, 17, 95-117.

Weible, C.M., Sabatier, P.A. and Mc Queen, K., 2009. Themes and variations: Taking stock of the Advocacy Coalition Framework. The Policy Studies Journal, 37(1), 121-140.

Weible, C.M., Sabatier, P.A., Jenkins-Smith, H.C., Nohrstedt, D., Henry, A.D. and deLeon, P., 2011. A quarter century of the Advocacy Coalition Framework: An introduction to the special issue, 39(3), 349-360.

Weimer, D.L., 1998. Book review: Policy design for democracy by Anne Schneider and Helen Ingram. Annals of the American Academy of Political and Social Science, 559, 181-182.

Weiss, G., 2000. Evaluation of policy instruments for protective forest management in Austria. Forest Policy and Economics, 1, 243-255.

Wessel, J. and Winter, H.B., 1989. Evaluation of the Noise Abatement Act (in Dutch: Evaluatie van de wet geluidhinder). Beleidsanalyse, 3, 42-48.

WHO (World Health Organisation), 2000. Evaluation and use of epidemiological evidence for environmental health risk assessment. Environmental Health Perspectives, 108(10), 99701001.

WHO (World Health Organisation), 2009. Night noise guidelines for Europe. Copenhagen: WHO.

WHO (World Health Organisation), 2011. Burden of disease from environmental noise. Quantification of healthy life years lost in Europe. Bonn: WHO.

Wiering, M.A. and Arts, B., 2006. Discursive shifts in Dutch river management: 'Deep' institutional change or adaptation strategy? Hydrobiologia, 565(1), 327–338.

Winkel, G., Gleißner, J., Pistorius, T., Sotirov, M. and Storch, S., 2011. The sustainably managed forest heats up: discursive struggles over forest management and climate change in Germany. Critical Policy Studies, 5(4), 361-390.

Woudenberg, F., 2008. What is worse? Air pollution or noise pollution? (in Dutch: Wat is erger: vieze lucht of lawaai?). Geluid, 2008(3), 4-6.

Woudenberg, F., 2013. Health effects due to noise (in Dutch: Gezondheidseffecten van geluid). In: F. Woudenberg ed. Noise and health (in Dutch: Geluid en gezondheid. Editie 2013). Den Haag: Sdu Uitgevers.

Woudenberg, F., Van Kamp, I., Van den Berg, G.P., Devilee, J., Hofman, W.F., Van Kempen, E.E.M.M. and Perenboom, R.J.M., 2013. Noise and health (in Dutch: Geluid en gezondheid. Editie 2013). Den Haag: Sdu Uitgevers.

Woudenberg, F. and Van Kamp, I., 2013. Annoyance (in Dutch: Hinder), In: F. Woudenberg ed. Noise and health (in Dutch: Geluid en gezondheid. Editie 2013). Den Haag: Sdu Uitgevers.

Zafonte, M. and Sabatier, P., 2004. Short-term versus long-term coalitions in the policy process: Automotive pollution control, 1963-1989. Policy Studies Journal, 32(1), 75-107.

Zuidema, C., 2011. Stimulating local environmental policy: making sense of decentralisation in environmental governance, dissertation. Groningen University, Zutphen: Wöhrman Print Service.

Appendix 1 List of informants

Overview of noise policy: actors and discourses (chapters 2, 3 and 4)

L. Jacobs	Noise expert at Ministry of Infrastructure and the Environment (I&M)
D. de Gruijter	Noise expert at Ministry of Infrastructure and the Environment (I&M)
M. van den Berg	Noise expert at Ministry of Infrastructure and the Environment (I&M)
H. Verspoor	Team leader at Ministry of Infrastructure and the Environment (I&M)
D. Welkers	Expert at Ministry of Infrastructure and the Environment (I&M)
R. Bouman	Team leader mobility and infrastructure and noise at Ministry of Infrastructure and the Environment (I&M)
P. Kiela	Expert at Ministry of Infrastructure and the Environment (I&M)
H. Herremans	Team leader at Ministry of Infrastructure and the Environment (I&M)
T. Giele	Expert at Ministry of Infrastructure and the Environment (I&M) and formerly Province South Holland
F. Woudenberg	Manager Environmental Health division at Public Health Service of Amsterdam (GGD)
F. van den Berg	Expert at Public Health Service of Amsterdam (GGD)
J. Meijdam	Expert at Rotterdam-Rijnmond Public Health Service (GGD)
H. Wolfert	Expert DCMR Environmental Protection Agency and EUROCITIES
H. van Dijkhuizen	Noise expert at City of Utrecht
R. Balkema	Noise expert at City of Utrecht
J. Smits	Team leader at Port of Rotterdam
I. van Kamp	Senior researcher environmental health at National Institute for Public Health and the Environment (RIVM)
J. Jabben	Senior researcher acoustics at National Institute for Public Health and the Environment (RIVM)
H. Nijland	Senior policy researcher Netherlands Environmental Assessment Agency (PBL)
R. de Jong	Researcher noise perception at TNO Research Institute
P. de Vos	Noise consultant at Royal Haskoning DHV
H. van Leeuwen	Noise consultant at DGMR
E. Wijdeveld	Expert at Deltalinqs (organisation of industries in Rijnmond area)
J. Granneman	Expert at VNO-NCW (employers organisation)

E. Roelofsen	Director of the Noise Abatement Society (NSG)
J. Kuiper	Director (formerly) of the Noise Abatement Society (NSG)
J. Fransen	Expert at Society for Nature and Environment (Stichting Natuur en Milieu)
A. Bosgoed	Expert at InnoNoise
C. Padmos	Expert at InnoNoise and formerly Ministry of Traffic

Noise policy instruments: (perceived) effectiveness evaluation (chapter 5)

H. van Dijkhuizen	Noise expert at City of Utrecht
J. Jabben	Senior researcher acoustics at National Institute for Public Health and the Environment (RIVM)
H. Nijland	Senior policy researcher at Netherlands Environmental Assessment Agency (PBL)
E. Roelofsen	Director of the Noise Abatement Society (NSG)
P. de Vos	Noise consultant at Royal Haskoning DHV
F. Woudenberg	Team leader Environmental Health at Public Health Service Amsterdam (GGD)

Additional with respect to environmental policy integration (chapter 4)

S. Hubregtse	Spatial planning expert at DCMR Environmental Protection Agency
A. van Wijk	Noise expert at DCMR Environmental Protection Agency

Additional with respect to today's noise policy discourses (chapters 6 and 7)

T. Bos	Project manager Swung at Ministry of Infrastructure and the Environment (I&M)
W. Alberts	Infrastructure noise expert Ministry of Infrastructure and the Environment (I&M)
B. Kortbeek	European noise policy expert at Ministry of Infrastructure and the Environment (I&M)
C. Nugent	Noise policy expert at European Environment Agency (EEA)
M. Paviotti	Noise policy expert at European Commission, DG ENV
B. Gergely	Noise policy expert European Commission, DG ENV
A. van Huffelen	Alderman for Sustainable Development, Inner City and Public Spaces at the City of Rotterdam (politician)

R. Kint	Team leader at City of Tilburg
F. Meelker	Team leader at City of Amsterdam
A.M. Cox	Team leader at City of Utrecht
S. Kreuger	Noise expert at Province of Utrecht
R. Lannoye	Expert at Umbrella organisation of municipalities (VNG)

Appendix 2 Noise health effects in detail

Chapter 1 of this thesis, Introduction, addresses amongst others the causes and effects of environmental noise. The aim of this research is to analyse noise policy in the Netherlands and, part of the analysis, to evaluate the performance of the noise policy domain in terms of reduction and prevention of noise pollution, annoyance and other negative health impacts. This Appendix elaborates these effects and the methods available for determining health effects in more detail, and as such provides the interested reader additional insight into public health issues due to environmental noise. Furthermore, this Appendix presents recent figures on the health impacts due to noise and other environmental stressors in the Netherlands.

Noise pollution is a persistent environmental problem. Despite decades of noise policy in the Netherlands overall noise exposure and, consequently, the percentages of annoyed and sleep disturbed citizens have not decreased. As Woudenberg et al. (2013, introduction) state "noise is an exception in the domains of environment and quality of life. Where we see that living conditions increased, people live longer and healthier, and the air is cleaner, noise exposure in the Netherlands is similar to or even higher than 40 years ago".

Dutch noise policy has been effective in solving excesses and noise exposure peaks; relatively few dwellings (approximately 3 % of all dwellings) are exposed to noise levels above 65 L_{den} (Jabben et al., 2013). However, a good acoustic quality requires exposure levels around 50 – 55 L_{den} and significant negative health effects, such as high blood pressure, ischaemic heart disease and myocard infarct, are found at noise exposure levels of 50 respectively 55 L_{den} (WHO, 2009; WHO, 2011). In the Netherlands around 70% of the dwellings is exposed to noise levels above 50 dB caused by road, railway or air traffic. In addition, one can hardly find a place where no sounds from motorised traffic are heard. This results in a burden of disease from noise ranging from tens to hundreds of people annually dying because of a heart disease caused by noise, to millions of annoyed people due to road, neighbour, air traffic and other noise sources (Van Kempen and Houthuijs, 2008; Woudenberg, 2013).

The impact of noise pollution, in terms of various health effects due to environmental noise exposure in the Netherlands is presented in Table 8.

Effect and cause	According to surveys (measured, number of people)	According to exposure-response relations (calculated, number of people)
Highly annoyed		
- *road, rail and air traffic*		727,000
- *road traffic*	813,000	640,000
- *railway traffic*	136,000	
- *air traffic*	407,000	
Highly sleep disturbed		
- *road, rail and air traffic*		337,000
- *road traffic*	407,000	290,000
- *railway traffic*	0	
- *air traffic*	136,000	
Heart- and vascular diseases		
- *increased blood pressure*		110,000 – 270,000
- *myocard infarct*		84
- *death due to infarct*		620

Table 8: Overview of health effects and population figures in the Netherlands (Woudenberg, 2013)

As Brunekreef et al. (2007) and Woudenberg (2013) concluded presenting numbers of deaths encounters difficulties and uncertainties, and thus suggest to use DALYs (Disability Adjusted Life Years, e.g. WHO, 2011). The latter provides insight in the number of years people die earlier due to various (environmental) factors. As such the health effects due to noise pollution can be compared with other (environmental) health stressors.

For example, noise pollution is, after particulate matter (air quality), the second environmental health stressor (see Figure 11).

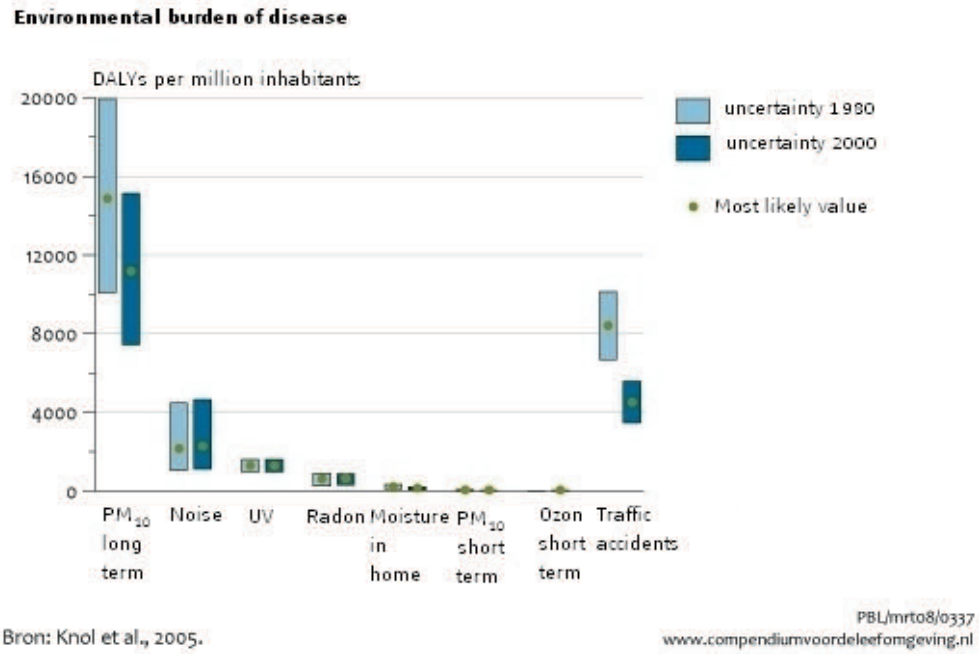

Figure 11: Overview of environmental burden of disease in DALYs per million inhabitants in the Netherlands in 1980 and 2000.

Another way to contextualise the health impacts of noise pollution is to indicate the percentage of "noise-DALYs" of "total-DALYs". Woudenberg (2013) conclude that noise contributes approximately 1-4% to the total of DALYs in the Netherlands; in comparison with other factors such as active smoking (14%), malnutrition including obesities (11%), air pollution due to road traffic (4%), passive smoking (0,3%) and for example high voltage cables (0,0006%). In comparison, a significantly larger part of the Dutch population has adverse health effects due to air pollution than due to noise pollution. Woudenberg (2008) illustrated this difference in DALYs; 180,000 healthy life years versus 36,800 healthy life years annually lost, based upon various published studies (e.g. Franssen et al., 2004; Knol and Staatsen, 2005).

This author, though, utters critical remarks on the assumptions and selections applied; for example neighbour(hood) noise and air traffic noise are not accounted for in the DALY calculations despite academically proven health impacts such as annoyance and sleep disturbance. Correcting for these and other limitations, Woudenberg, concludes that the adverse health effects due to air pollution and noise pollution, in DALYs, are similar. And, even more important, assuming that the declining trend of air pollution continues as foreseen noise pollution will be the number one environmental stressor in the Netherlands from 2020.

Another perspective on the Dutch noise policy domain is the comparison of Dutch figures and European data. As mentioned before road traffic noise is the main source resulting in adverse health effects in cities; this is the case in the Netherlands as in all other European countries. At meta level research learned that more than half of the EU population is regularly exposed to noise levels above 55 dB from road traffic. Based upon the data stemming from the noise maps according to the Environmental Noise Directive suggests, in 2011 around 56 million people across the EU were exposed to noise levels above 55 L_{den} from road traffic within cities, of which 2.6 million (that is 4.6 %) live in the Netherlands. Considering the high population density, as in some other western European countries, this percentage is in line with what could be expected from having 3 % of the EU population living in the Netherlands. Concerning the other environmental noise sources, Figure 12 illustrates even lower numbers, absolutely and relatively, comparing the Netherlands with EU level data.

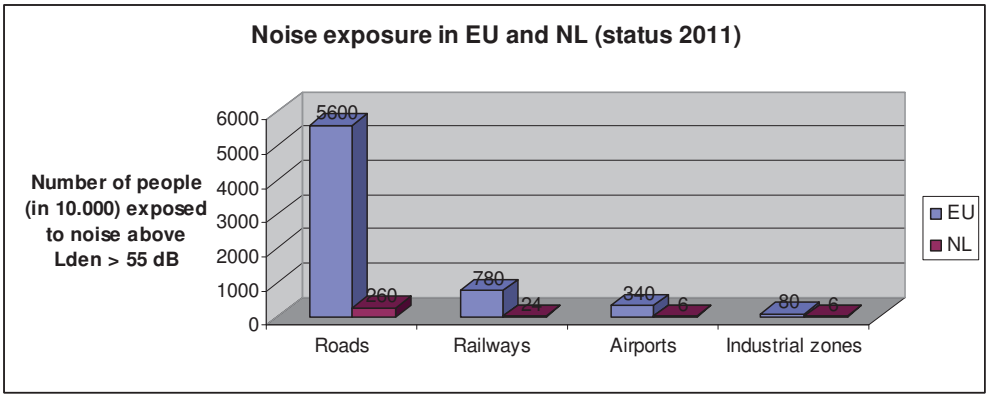

Figure 12: Noise exposure in EU and NL (status 2011)

On the basis of the burden of disease methodology, the WHO estimates that at least one million healthy life years are lost every year from traffic-related noise in western European countries, including 654,000 for annoyance. This figure is, in line with the figures on noise exposed people, comparable to DALYs calculated for health effects due to road traffic noise in the Netherlands.

Another environmental noise source has been addressed in a recent study on noise policy and airports. The authors concluded for Schiphol Airport, that both the population percentages for high annoyance, high blood pressure, and severe sleep disturbance, and the number of dwellings exposed to (high) noise levels due to airplanes are relatively low compared to other major airports in western Europe, such as London Heathrow, Paris Charles de Gaulle and Frankfurt (Netherlands Environmental Assessment Agency, 2013).

Although our study, specifically in chapter 5, focused on the percentage of (highly) annoyed population, the above discussed analyses and figures are relevant for understanding the complexity of the noise policy domain. At the time of formulation and implementation of the Dutch noise policy adverse effects of noise pollution were phrased in terms of noise annoyance as health indicator. Over the last decade though new and better insight has been gained on the health effects, the (in)direct mechanisms from exposure to cardio-vascular diseases and premature death, and the 'scale of the noise problem'.

Appendix 3 Noise: an introduction on physics

Noise is energy, transported wavelike through air and once it reaches the ear translated by hair cells and our brain into sounds with meaning. Sounds are measured by their loudness (sound pressure levels in decibels, abbreviated dB) and their frequencies (in Hertz, abbreviated Hz). Relevant to note is that, strictly speaking, the decibel is not a unit, but the logarithmic ration of the sound pressure to a specific reference pressure in the same units. The following equation illustrates this strength of sound applying the reference sound pressure of 20 μ Pa:

$$Lp = 10 \log (p/p_0)^2 \text{ in dB}$$

The logarithmic scale means that an increase of 10 dB represents a doubling of the perceived sound levels. Adding sound pressure levels also differ from the usual way of addition, for example adding 2 (10, 20, or 100) equal sound pressure levels results in an increase of 3 (10, 13 or 20) dB (European Commission, 1996).

The decibel scale ranges from $-\infty$ to $+\infty$, but the human ear can only perceive sound pressure levels from 0 dB (the threshold of normal human audibility) to approximately 130 dB (the threshold of pain). To illustrate; everyday noise in the outdoor environment ranges from roughly 35 dB to about 110 dB. A 'normal' person can distinguish a 3 dB change in noise levels.

The sound levels are usually expressed based on A-weighted noise; this weighting is applied to correct for the sensitivity of the human ear for specific frequencies (mostly ranging from 1 kHz to 5 kHz). In addition, as noise is fluctuating in time for example small noise fluctuations close to highways and large fluctuations near airports, noise is averaged into one single indicator that is the so called equivalent continuous sound pressure level L_{Aeq} in dB(A). This indicator is mostly used, in some variances as described below, in regulation as well as by the ISO for the measurement of environmental noise exposure (European Commission, 1996). The most frequently applied noise indicators are the following (cf. EEA, 2010):

- L_{max} is the maximum sound pressure level occurring in an interval, such as the passage of a car;
- SEL is the sound exposure level or sound pressure level over an interval normalized to 1 second;

- L_{day} is the average sound pressure level over one day, mostly comprising 12 or 16 hours;
- L_{night} is the average sound pressure level over one night of 8 hours. This night is often chosen as being representative for nights over a longer period. Since 2002, the EU Directive 2002/49 on environmental noise entering into force, the L_{night} is also used as the *yearly* average night time level.

The EU Directive introduced the L_{den} indicator, which represents the average sound pressure levels over all days, evenings and nights in a year. In this indicator the evening value gets a penalty of 5 dB and the night value of 10 dB in order to account for the need of quiet time periods during evening and undisturbed sleep during the night.

Noise policy and regulations in general apply the latter two noise indicators; for example requiring noise levels from road traffic on new highway should be lower than 48 L_{den} (Dutch Noise Abatement Act) or proposing an interim target of 55 L_{night} in order to limit sleep disturbance (WHO, 2009).

Appendix 4 Noise policy: an illustration of effectiveness evaluation in detail

This Appenidx is available on the website of the Journal of Environmental Planning and Management as well, and provides detailed information and supporting tables and figures in addition to the empirical assessment presented in the print version of our research paper (i.e. chapter 5). In the subsequent sections we present background information and overviews regarding the empirical case, such as the policy goals, analysis of policy goal attainment, policy instruments and policy instrument mix effectiveness scores.

Mapping the noise policy domain: causes, effects, points of application and policy goals

The empirical case

Noise pollution due to road traffic can be illustrated as follows (inspired by Glasbergen, 1992): consider individuals driving their cars to work, not attending to speed limits and selecting the shortest and fastest route through densely built residential areas. In this example at least three actors and their respective choices that contribute to noise nuisance can be identified, namely the *car manufacturing industry* designing cars, the *car owner* driving his/her car instead of using – less noisy – public transport at high - and thus loud - speed levels along roads, where many citizens rent a home situated very close to the road of which construction has been approved by the *municipal building department* despite the fact that regulative preferred noise immission levels could not be met. Each actor's choice affects the resulting acoustic quality, positively or negatively. And as such, each choice can be assumed a 'point of application' or 'point for intervention' through a specific policy instrument.

Noise policy goals

The paper presents the noise policy goals and the challenges in defining policy goals in the situation goals are adjusted, dropped or postponed. In this supplementary material we address another methodological challenge as well; a brief explanatory intermezzo. Noise annoyance, as such, is caused by various factors; acoustic as well as non-acoustic such as the physical characteristics of the sound (e.g. noise level), the (perceived) meaning of the noise source, as well as various demographic, personal, social and situational factors. This complex of factors illustrates the various mechanisms determining outcomes of noise exposure and, consequently, the possible impact of changes in for example noise sources and/or situational factors on the occurrence of (high) annoyance of individuals.

Relevant to point is that the points of application of the noise policy instruments mainly address acoustic factors. Non-acoustic factors such as a human's relation with the noise source or polluter and trust in authorities adequately taking actions are not addressed through noise policy instruments, and the non-acoustic factors such as demographic and social factors are targeted in other policy domains which seldom consider noise (side-) effects.

Noise annoyance can be determined in two ways, that is (i) questioning individuals whether they were annoyed by specific noise sources (using cf. ISO standard a 11 point Likert scale), or (ii) using doses-response relations (so-called Miedema curves) and calculated noise levels at façades. Unfortunately, the outcomes from both methods often differ. And to further aggravate complexity, different surveys and surveying techniques have been applied in the Netherlands since the 1980s which measured different numbers of annoyed population as well (Van Poll et al., 2011). These methodological differences concern, for example, type of questions, noise sources included in the answer categories, the categorisation of noise sources, and the cut-off point for 'annoyed' versus 'highly annoyed'.

Reconstructing policy theory: noise policy instruments in the Netherlands

Noise policy instruments can be classified as, firstly, instruments influencing noise emissions, e.g. reducing noise emission levels from cars, speed limits, or traffic volumes. Secondly, the propagation of noise is reduced e.g. through zoning (increasing the distance between noise sources and noise recipients) or applying technical measures such as low noise road pavement and noise barriers. Finally, policy instruments can reduce noise immission at dwellings through insulation of façades (see the overview provided in Table 9).

Policy instruments			
Type	**Who governs / initiates?**	**Who is governed?**	**Intended effect**
Noise source (emission) - Distribution over time and place of noise source			
Regulatory instruments			
Zoning (spatial planning)			
Zones along roads and railways defining noise immission limits to be adhered to in urban planning	National government	Local administrative level (urban planning) Project developers	Spatially separating noise sources from noise sensitive activities in order to limited adverse health effects

Policy instruments			
Type	**Who governs / initiates?**	**Who is governed?**	**Intended effect**
Economic instruments			
Restricted zones			
Restricting traffic during specific periods of day in specific areas. Or car free zones/pedestrian zones	Local administrative level	Transport sector Individuals (car drivers)	Limiting noise at specific periods of day, specifically night on order to prevent annoyance and sleep disturbance
Parking fees			
Levying fees for parking in specific (inner city) areas	Municipal authorities	Individuals (car drivers)	Limiting noise annoyance from road traffic in specific noise sensitive areas
Noise source (emission) - Technique of noise source			
Regulatory instruments			
Emission limit values			
Noise emission limits for passenger cars and heavy goods vehicles and tyres	European and national administrative level	Car and tyre manufacturers	Defining maximum noise emission levels of cars during type approval ensuring lower noise emission levels for cars and for heavy goods vehicles and tyres
Communication instruments			
Tyre labelling			
From 2012 tyres have label stating energy efficiency and noise emission	EU administration	Tyre manufacturers (directly) and tyre buyers / car owners (indirectly)	Enhancing market introduction of quiet tyres and (indirectly) pull effect on manufacturers
Campaign 'De nieuwe band'			
Information campaign in order to raise awareness of car drivers on quiet tyres	National government	Transport sector Individuals (car drivers)	Use of quiet tyres decreases noise emissions from road traffic

Policy instruments			
Type	**Who governs / initiates?**	**Who is governed?**	**Intended effect**
Noise source (emission) - Volumes of noise sources			
Economic instruments			
Road pricing/charging			
Use of road is charged through fixed or differential fee paid per kilometre, per type of vehicle or other variable.	National government	Transport sector Individuals (car drivers)	Decreasing noise emissions during certain periods of the day or in general, in specific areas.
Taxation			
Increasing price of fuel through excise duty	National government	Transport sectorIndividuals (car drivers)	Pricing fuel in order to reduce consumption and car use
Noise source (emission) - Use of noise source			
Regulatory instruments			
Speed limits			
Speed limits for road traffic	Administrative body (national, regional or local) that manages road	Transport sector Individuals (car drivers)	Defining speed limits for road traffic reduces noise emission and subsequent health effects
Traffic management			
Measures that induce more fluid traffic flow, such as roundabouts and calming/environmentally adapted through-roads	Administrative body (national, regional or local) that manages road	Transport sector Individuals (car drivers)	Limiting noise emissions from road traffic
Communication instruments			
Campaign 'Het nieuwe rijden'			
Information campaign in order to raise awareness of car drivers on (quiet and energy efficient) driving styles	National government	Transport sector Individuals (car drivers)	Use of other driving styles decreases noise emissions from road traffic

Policy instruments			
Type	**Who governs / initiates?**	**Who is governed?**	**Intended effect**
Noise transmission			
Regulatory instruments			
Technical requirements			
Noise barriers and low noise road surfaces, in order to meet noise limits at façades cf. Noise Abatement Act	National government	Road authorities at national, regional and local administrative level	Ensuring noise immission limits at façades of dwellings by reducing or preventing transmission of noise
Noise receiver (immission)			
Regulatory instruments			
Immission limit values			
Noise exposure standards to be adhered to in (re)construction of (rail)roads and during planning of residential areas	National government	Local administrative level (spatial planning and infrastructure planning) and project developers	Protecting citizens against adverse health effects due to noise exposure at their dwellings
Sound absorption standards			
Standards for sound absorption and insulation of walls	National government	Local administrative level (idem) and project developer	Protecting citizens against adverse health effects due to noise exposure at their dwellings
Economic instruments			
Insulation programmes			
Insulation of façades of dwellings	National government	Citizens (or indirectly municipalities being responsible for providing insulation)	Insulation of façades decreases noise levels inside houses

Table 9: Noise policy instruments in the Netherlands: actors and intended effects

Noise emissions: regulating, pricing or informing vehicle use and techniques

Noise emissions are the result of several source specificities; that are the number, place and time of vehicles that are used and the technical standards of the vehicles. The distribution of vehicles over time and place is addressed through for example restricted zoning, that is precluding certain types of vehicles from entering the city or certain zones within it or – the positive approach – privileging certain types of vehicles (Grazi and Van den Bergh, 2008; King et al., 2011). Exclusion respectively inclusion criteria are for example size of the vehicle, noise emissions and air pollution. Banning 'polluting vehicles' or allowing hybrid or electric vehicles have immediate effects on traffic and decreases locally air and noise pollution, although traffic flows may increase in other areas (Acutt and Dodgson, 1997).

Internationally defined technical standards are in place since many years regarding the noise emissions relating to tyres (EU Directive 2001/43) and vehicle propulsion of passenger cars, light vans and heavy vehicles or trucks (EU Directive 70/157). Main purpose of these and similar international directives is harmonising product requirements and markets in Europe; consequently it is difficult if not impossible to define national emission limits as this is regarded as market distortion.

In line with Vedung (1998, p. 49) we consider tyre labelling as an example of communication policy instruments. Although firms are required to label through a regulative policy instrument (in this case EU Directive on tyre noise), informing individuals is the ultimate goal. By providing information on noise emission levels of the specific tyres, consumers might be influenced in the choice of their purchase in a more environmentally friendly direction.

Other examples of communication policy instruments are the public campaigns launched by the national government, on 'The new tyre' (i.e. quiet and energy efficient tyres) and 'The new way of driving' (using the right gear saving fuel consumption and decreasing noise emission). Both campaigns consisted of spots on television, bill boards as well as a websites for example presenting a list of quiet tyres.

Both instruments are affirmative or stimulative communication instruments. These policy instruments are frequently applied in addition to or parallel to other policy instruments; or horizontal packaging as called by Vedung (1998). Stimulative instruments, such as campaigns, "legitimate and create support for the intervention whereas repressive instruments effectuate the intervention and produce results" (Van der Doelen, 1998, p. 134).

Pricing of parking is frequently used in city centres, influencing traffic volumes, distribution of traffic over time and place, and traffic mode. In general the aimed shift from private vehicles to public transport modes or bikes is achieved through increasing hourly costs of parking and limiting available parking time and parking space. Another charging instrument is road pricing, i.e. pricing of the use of infrastructure and/or kilometres driven, resulting in changes in traffic volumes, distribution of traffic over time and place, and traffic mode. Research is limited, although recently various larger cities have either implemented this instrument, regarding air pollution, or are discussing its feasibility.

In theory, road pricing can involve paying a price for use of roads during specific times of the day (peak hours or off-hours), or for the use of specific roads or zones (e.g. in an urban area, see 'restricted zones').

Another policy instrument addressing the volumes of noise sources is fuel taxation, which is an example of an economic policy instrument increasing the costs of car use of individuals. Due to this cost increase addressees are likely to purchase smaller vehicles and more fuel-efficient models, in addition to a reduction of kilometres driven. The main environmental effects of this policy instrument are equivalent reductions of air pollutants and a non-linear reduction of noise emissions (Acutt and Dodgson, 1997). In the 1980s fuel taxation was discussed as part of noise policy in the Netherlands although not implemented; currently fuel consumption is part of a broader environmental taxation instrument that is mainly levied for revenue raising instead of correcting externalities.

Finally, vehicle use is addressed through traffic speed regulation and traffic management. These policy instruments are categorised as regulative policy instruments as they prescribe addressees' actions through regulations. In contrast to emission standards aiming at technical features of vehicles, speed reduction and traffic management influence the noise emission due to the specific *use* of the vehicles.

Traffic management includes, for example, measures that induce a more fluid traffic flow such as roundabouts instead of traffic lights and 'green waves' or traffic calming/environmentally adapted through-roads. Addressees of both policy instruments are road authorities, such as the national government regarding highways and local governments regarding municipal roads, as well as the individuals, the car drivers. This is a typical example of what Bemelmans-Videc and Vedung (1998, pp. 258-262) depict as 'vertical packaging' of policy instruments.

Noise transmission: technical measures between source and receiver

In this section we discuss two technical measures, that are low noise road surface and noise barriers. Competent authorities planning to (re)construct a road or a residential area have to comply with noise (immission) limits as defined in the Noise Abatement Act. Frequently technical measures are applied that reduce noise transmission from noise source to noise receiver. In a strict sense, the act as described in the next section is the (regulative) policy instrument; though both technical measures in practice have proven the main mechanisms, or instruments, applied in preventing or reducing noise transmission between source and sensitive building. Therefore we propose to consider these measures as policy instruments in our empirical case.

Noise immissions: regulating and financing façade insulation

Immission standards are in place since late 1970s, defined in the Noise Abatement Act. This act includes procedural as well as substantive rules, addressing spatial and infrastructural planning, in order to separate noise sources from noise receivers. As such this policy instrument addresses local governments in order to prevent noise pollution and negative health effects of individuals.

Noise limits, defined at the façades of dwellings, vary for existing and new situations, for the location (urbanised areas versus non-built areas) and for noise sources (e.g. road traffic, railway traffic, industries) (Weber et al., 2012). Local governments assess noise immission levels due to spatial plans applying a bandwidth of regulative limits ranging from preferred noise limits (48 L_{den}) to – higher – maximum allowed noise limits (68 L_{den}). In addition, noise levels inside dwellings are regulated in a building decree (in Dutch: Bouwbesluit) defining insulation and absorption requirements preventing negative health effects due to annoyance and sleep disturbance.

The Noise Abatement Act aims as well to reduce noise pollution and insulate dwellings where noise levels at the time of the act's implementation (the status quo set at 1st January 1986) were higher than the regulative immission standard of 55 dB. The programme is financed, or in terms of policy instruments subsidised, by the national government and implemented by both national and local administrations. This façade insulation improves acoustic quality within dwellings.

Goal attainment

As discussed before, goal attainment defines the outcomes achieved related to the policy goals defined in regulations and policy plans. These goals have been adjusted, shifted or dropped during the last decades. An overview of the changes, in italics, is presented in Table 10.

Policy goal ***[Source, document]***	**Adapted or shifted policy goal**
Prevent and solve noise problems and guarantee good acoustic quality *[Wgh (MvT, KST 13 639, nrs. 1-4, 1975-1976, p. 69)]*	-
Percentage of noise annoyed persons is stabilised in 2000 at level of percentage of noise annoyed persons in 1985 (i.e. 40%) and number of persons being highly annoyed is 0% *[NEPP (1989)]*	
Percentage of noise annoyed persons is stabilised in 2000 at level of percentage of noise annoyed persons in 1985 (i.e. 40%) *[NEPP2 (1994)]*	Policy goal regarding 0% highly annoyed persons in 2010 is not included
Percentage of noise annoyed persons is stabilised in 2000 at the level of the percentage of noise annoyed persons in 1985 (i.e. 40%) *[NEPP3 (1998)]*	Idem
Maximum noise levels of 70 dB are not exceeded in 2010. *[NEPP4 (2001)]*	
Ambition to have no maximum noise levels of 70 dB exceeded in 2010. *[Vaste waarden, nieuwe vormen (2002)]*	
All dwellings with noise levels above 55 dB (i.e. in the year 1986) will be insulated by 2010. *[Wgh, saneringsparagraaf (1986)]*	
Appr. 90% resp. 50 % of the dwellings with noise levels above 65 dB and 60 dB will be insulated by 2010. *[NEPP4 (2011)]*	Adaptation of insulation criterion from 55 dB to 60 dB
Goals regarding insulation of dwellings with noise levels above 65 dB and 60 dB are 'only' for major roads *[Vaste waarden, nieuwe vormen (2002)]*	Adaptation of target group, i.e. limiting to dwellings along major roads
Maximum noise levels of 70 dB are not exceeded in 2010, however due to budget restrictions this goal will be achieved in 2017. *[VROM-begroting 2004 (2003-2004, 29 200 XI, nr. 2)]*	Adaptation of time of goal achievement from 2010 to 2017

Policy goal *[Source, document]*	Adapted or shifted policy goal
All dwellings with noise levels above 65 due to traffic noise from highway/major roads will be insulated in 2020. *[Nota Ruimte and Nota Mobiliteit (2005)]*	Adaptation of target group, i.e. limiting to dwellings along major roads. In the other hand, all dwellings with noise levels above 65 dB due to highway traffic noise constructed after 1986 will be insulated as well (Wgh insulation + NoMo insulation of dwellings along major roads).
All dwellings with noise levels above 65 dB due to traffic noise from highways/major roads will be insulated in 2020. In case budget restrictions continue, this will be achieved in 2023. *[VROM-begroting 2005 (2004-2005, 29 800 XI, nr. 2)]*	Adaptation of time of goal achievement from 2010 to 2020
All dwellings with noise levels above 65 dB due to traffic noise from highways/major roads will be insulated in 2020 *[Toekomstagenda Milieu (2006)]*	Reconfirmation of (adjusted) policy goals defined in NEPP4 and Nota Ruimte
All dwellings with noise levels above 65 dB due to traffic noise from highways/major roads will be insulated in 2023. *[VROM (2007]]*	Adaptation of time of goal achievement from 2020 to 2023
Noise emissions from road traffic will be reduced with 2 dB in 2010; and long term goal is reduction of noise emissions from road traffic of 6-8 dB. *[Beleidsnota Verkeersemissies (VROM 2004)]*	
In 2006/7 highway roads near dwellings will have quiet road surface (so-called double layered very open asphalt concrete)	

Table 10: Noise policy goals: original and adapted or shifted aims

Annual publications on the state of the environment and other policy documents provided information on the attained results. For example, the percentage of people being highly annoyed by road traffic noise has been constant during the last 25 years, at the level of approximately 30% (Franssen et al., 2004; Van Kempen and Houthuijs, 2008). The policy goal regarding exposure levels of dwellings, on the other hand, has not been fully met. There are still dwellings with noise exposure levels above 70 dB and the number of dwellings that have to be insulated has more or less doubled since the 1980s. Finally, noise emission from road traffic has hardly decreased despite the policy goal of 2 dB noise reduction.

In sum, Table 11 presents the policy goals, as identified in several national policy plans, and the goal attainment by way of the outcomes realised per 2010 and a score on goal attainment (abbreviated goal att.) of 'not attained' (-), 'neutral' (-/+) and 'attained' (+).

Policy goal *[Source, document]*	**Outcomes realised (appr. situation 2010)**	**Goal att.**
Prevent and solve noise problems and guarantee good acoustic quality. *[Wgh (MvT, KST 13 639, nrs. 1-4, 1975-1976, p. 69)]*	2.5 mio of a total of 7 mio dwellings have noise levels above regulative preferred noise level (48 dB) due to traffic noise. Acoustic quality of 2.5 mio dwellings varies between 'moderate' (48-53 dB) to 'extremely negative' (more than 68 dB). Appr. 1,1 mio dwellings have noise levels above 60 dB due to traffic noise.	+/-
Percentage of noise annoyed persons is stabilised in 2000 at the level of the percentage of noise annoyed persons in 1985 (i.e. 40%) and the number of persons being highly annoyed is to reach 0%. *[NEPP (1998)]*	Appr. 30% of the Dutch (adult) population is annoyed due to road traffic noise, based upon surveys (CBS; RIVM/TNO, PBL).	+
Maximum noise levels of 70 dB are not exceeded in 2010. *[NEPP4 (2001)]*	Appr. 46.400 persons live in dwellings with noise levels higher than 70 dB (according to noise maps END). This approximates 1 % of the Dutch population.	-
All dwellings with noise levels above 55 dB (i.e. in the year 1986) will be insulated by 2010. *[Wgh, saneringsparagraaf (1986)]*	By the end of 2008 appr. 180.000 dwellings are insulated and still 530.000 dwellings have noise levels above 60 dB (based upon situation 1986 and the adjusted threshold for insulation), of which appr. 245.00 have noise levels above 65 dB.	-
Noise emissions from road traffic will be reduced with 2 dB in 2010; and long term goal is reduction of noise emissions from road traffic of 6-8 dB. *[Beleidsnota Verkeersemissies (VROM 2004)]*	Noise monitoring along highways proves no reduction of noise emissions from road traffic has been achieved (RIVM 2008). Rather recent measurements proved road traffic noise being appr. 2 dB higher than assumed in noise calculation models	-

Table 11: Policy goal attainment

Assessment of the effectiveness of Dutch noise policy instrument mixes

Perceived effectiveness of Dutch noise policy instruments

Focusing on the points of applications in the cause-effect chain (empirical) literature revealed relevant issues regarding several policy instruments applied in Dutch noise policy. In addition experts have been questioned on the effectiveness of the selected noise policy instruments (see scores in Table 12).

Point of application and policy instrument	Actors influenced	Effectiveness in terms of reduction of noise pollution (Expert opinions)	
		Scores	Argumentation
Noise source (emission)			
Distribution over time and place of noise sources			
Zoning (spatial planning)	Local administration	0	Zones function well for dwellings within close proximity to roads. But as zones are based upon distances and not noise levels (residential) areas outside zones still can have relevant noise impact from these roads and not being legally protected.
		++	
		+	
		+	Preventive effectiveness, but not effective in existing situations of noise pollution
		++	
		+	
Restricted zones	Transport sector	0	
		0	
	Individuals (car drivers)	0	
		- -	Not implemented yet
		0	
		0	
Parking fees	Transport sector and individuals (car drivers)	+	
		-	
		-	

Point of application and policy instrument	Actors influenced	Effectiveness in terms of reduction of noise pollution (Expert opinions)	
		Scores	Argumentation
		+	Effective specifically in large cities
		- -	No direct noise impact, and in worst case drivers are searching (longer) for free or cheap parking spots
		0	
Technique of noise source			
Emission limit values	Automotive industry	+	Concerns only heavy vehicles. Negative score on passenger cars
		0	
		0	
		+	Concerns only heavy vehicles. Negative score on passenger cars
		+	
		- -	
Tyre labelling	Tyre manufacturing industries	0	Positive potentials in case tyre labelling is combined with policy instrument on annual car maintenance test (in Dutch: APK)
	Transport sector	0	
		0	
		- -	Experience in Germany showed very limited to non effectiveness
		- -	
		+	
Campaign 'De Nieuwe Band (The New Tyre)'	Transport sector	0	
		0	
	Individuals (car drivers)	-	
		-	
		- -	
		0	

Point of application and policy instrument	Actors influenced	Effectiveness in terms of reduction of noise pollution (Expert opinions)	
		Scores	Argumentation
Volumes of noise sources			
Road pricing/charging	Transport sector	0	Not implemented, though expected highly effective
	Individuals (car drivers)	0	
		0	
		-	Missed opportunity; would be highly effective policy instrument if implemented
		- -	Not implemented; risk of more drivers taking local roads in order to avoid highways where use is charged
		+	
Taxation on fuels	Transport sector	0	Individuals are not aware they are paying for noise or other environmental impacts, nor does current taxation influence behaviour
	Individuals (car drivers)	0	
		0	
		- -	Taxes levied are not used for noise (abatement) measures
		- -	No direct effect/change in behaviour
		0	
Use of noise source			
Speed limits	Transport sector	0	
		+	
	Individuals (car drivers)	+	
		- -	Recently, (again) speed limits are set at higher levels, average speed is increasing and enforcement is lacking
		-	Speed limits are increased from 100 km/h at highways, and since summer 2012 at 130 km/h)
		+	

Point of application and policy instrument	Actors influenced	Effectiveness in terms of reduction of noise pollution (Expert opinions)	
		Scores	Argumentation
Traffic management (e.g. traffic calming)	Transport sector	+	
	Individuals (car drivers)	- / 0 / +	
		n.a.	
		0	
		++	
		0	
Campaign 'Het nieuwe rijden'	Transport sector	0	
	Individuals (car drivers)	0	
		-	
		-	
		- -	
		+	
Noise transmission			
Technical requirements i.e. noise barriers	Road authorities (national, regional and local)	++ / + / 0	++ for highways owned by national road authority, + for main roads owned by provincial road authorities, and 0 for municipal roads
		++	
		++	
		++	
		++	
		++	
Technical requirements i.e. low noise road pavement	Road authorities (national, regional and local)	+	Only effective on highways
		++	
		++	
		++	Specifically effective on highways
		++	
		++	

Point of application and policy instrument	Actors influenced	Effectiveness in terms of reduction of noise pollution (Expert opinions)	
		Scores	Argumentation
Noise receiver (immission)			
Immission limit values	Local administration	+ / 0	+ for dwellings along highways and main roads, and 0 for dwellings along municipal roads as for the latter relatively high maximum allowed limits are applied
		0	
		++	
		0	In practice exemptions of noise immission limits (i.e. even higher than maximum allowed noise limits) are applied, instead of the lower, health-based preferred noise limits
		++	
		-	
Sound absorption and insulation standards	Local administration and project developers	++	
		+	
		n.a.	
		-	Best available techniques are not incorporated in nor enforced
		+	
		+	
Insulation programme (ISV)	Local administration	+	
		+	
		++	
		+	Effective, however too slow process and only highest noise exposed dwellings are insulated.
		+	
		+	

Table 12: Expert scores on perceived effectiveness of noise policy instruments in the Netherlands

In Table 13 the effectiveness of the various policy instruments for the specific points of application and addressees is summarised in terms of reduction of noise pollution. The scores range from not effective at all (- -) to very effective (+ +); if a policy instrument has not been implemented yet or expert opinions vary (0) is applied.

Point of application and policy instrument	**Actors influenced**	**Perceived estimated effectiveness in terms of reduction of noise pollution**
Noise source (emission)		
Distribution over time and place of noise sources		
Zoning (spatial planning)	Local administration	+
Restricted zones	Transport sector and individuals (car drivers)	0 (not implemented)
Parking fees	Transport sector and individuals (car drivers)	0 (average of expert opinions)
Technique of noise source		
Emission limit values	Automotive industry	+ (heavy vehicles) - (passenger cars)
Tyre labelling	Tyre manufacturing industries and transport sector	0 (not implemented)
Campaign 'De Nieuwe Band (The New Tyre)'	Transport sector and individuals (car drivers)	-
Volumes of noise sources		
Road pricing/charging	Transport sector and individuals (car drivers)	0 (average of expert opinions)
Taxation on fuels	Transport sector and individuals (car drivers)	-
Use of noise source		
Speed limits	Transport sector and individuals (car drivers)	0 (average of expert opinions)
Traffic management (e.g. traffic calming)	Transport sector and individuals (car drivers)	+
Campaign 'Het nieuwe rijden'	Transport sector and individuals (car drivers)	-

Point of application and policy instrument	Actors influenced	Perceived estimated effectiveness in terms of reduction of noise pollution
Noise transmission		
Technical requirements i.e. noise barriers	Road authorities (national, regional and local)	++ Note: not policy instrument in definition as applied in research
Technical requirements i.e. low noise road pavement	Road authorities (national, regional and local)	++ Note: not policy instrument in definition as applied in research
Noise receiver (immission)		
Immission limit values	Local administration	+
Sound absorption and insulation standards	Local administration and project developers	+
Insulation programme (ISV)	Local administration	+

Table 13: Perceived effectiveness of Dutch noise policy instruments

Appendix 5 Outcomes of noise policy in the Netherlands

Our study revealed that answering the research question on effectiveness of an environmental policy domain, and specifically the noise policy domain, is extremely difficult due to various policy and politics characteristics. As mentioned before in chapter 5, one of the challenges concerns quantitatively assessing goal attainment and policy outcomes. The original goal of stabilisation of the percentage of noise annoyed persons at approximately 40% has been shifted and rephrased during the 90s and 2000s. Therefore we assessed trends in noise annoyance as well as sub policy goals regarding insulation of dwellings and reduction of vehicle noise (emission). In limiting our analysis to – trends in – percentages of annoyed population, overall conclusions on the policy outcomes could be drawn. However, other indicators and perspectives are relevant in valuing the outcomes of 40 years of noise policy in the Netherlands. In this Appendix we provide additional reflections on methodological challenges in analysing the magnitude and severity of the 'noise problem' in the Netherlands.

Different methodologies

First, though the indicator of percentage of annoyance seems fairly straight forward, the methodologies for defining the exact numbers vary largely. In order to establish the percentage of (highly) annoyed population two main research approaches exist; that is (i) field surveys and (ii) calculations based upon exposure-response relations (Dusseldorp et al., 2011). The former has been employed since 1977, whereas the latter was broadly adopted with the EU Environmental Noise Directive in 2002. Since 1977 every 5 year large scale surveys on noise annoyance have been conducted in the Netherlands; results of these TNO/RIVM studies have frequently been discussed in the noise policy domain and eventually led to far-reaching revision of the policy goals as the trend of annoyance percentages due to various noise sources remained stable (Van den Berg, 2012). Similar stability in trends becomes evident from the annual surveys conducted by the National Statistics Bureau (CBS, see Figure 1 in chapter 1). The absolute figures of both surveys though differ due to different phrasing of questions and different delineation of noise source categories. Currently, surveys are considered the best way to assess the actual noise annoyance, whereas exposure-response relations are more appropriate for estimating percentages of noise annoyance for future situations (Dusseldorp et al., 2011). Based upon noise exposure at the façades of dwellings the percentages of annoyed and sleep disturbed population can be calculated.

Exposure-response relations have been established by Miedema and Oudshoorn (2001) from international surveys in Europe and Canada during the 1970s until mid 1990s; separate relations are available for road, railway, and air traffic and industrial areas. These figures, though, differ significantly from the percentages annoyed population stemming from surveys. For example, the percentage of the Dutch population aged 16 years and older being annoyed by at least one category of road traffic noise is six times as high as the number that is calculated. In this case, as well, the explanation provided lays within the research methodology. Figure 13 below illustrates the absolute numbers for noise annoyance for both survey methods (CBS and TNO/RIVM) and from the calculation method (POLKA).

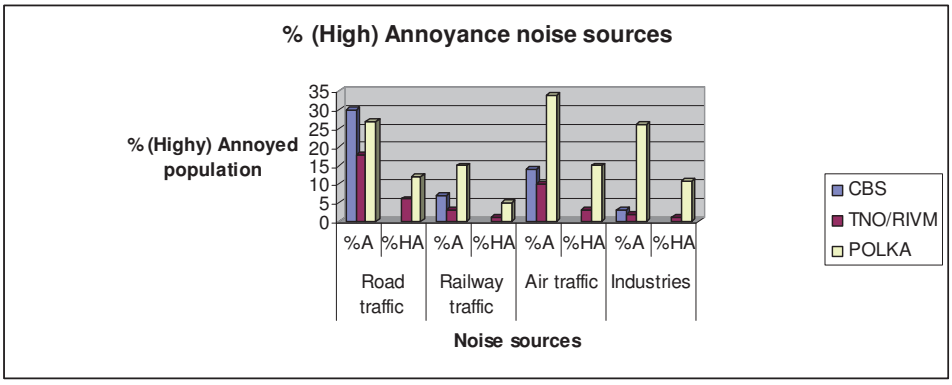

Figure 13: Percentages (highly) annoyed population in 2011 based upon three methods

Acoustic quality, environmental noise and other noise sources

Secondly, in our research we focused on environmental noise sources, that is road, railway, and air traffic and industrial zones. Perception of acoustic environments, well-being and health are influenced by other noise sources as well. Neighbour noise, noise from construction activities and outdoor equipment, for example, are known to have significant health effects as well. In surveys some of these noise sources are assessed; policy instruments such as the Noise Abatement Act and calculation of health effects using exposure-response relations though do not consider noise from for example scooters, mowing machines or neighbours. The adverse health effects of the latter noise sources, in terms of annoyance, have been illustrated in the national surveys on noise annoyance conducted by TNO/RIVM. Since mid 1990s these surveys also addressed various neighbour(hood) noise sources, such as neighbours (in dwellings), radio and television, outdoor (garden) equipment.

Overall, a similar stable trend in (high) annoyance is found for these sources as for environmental noise. In absolute terms neighbour(hood) noise is slightly less annoying, though can not be disregarded once assessing health impacts, well being and quality of life. For example neighbour noise according to TNO/RIVM surveys results in approximately 14 % annoyed population (Van Poll et al., 2011); the annual CBS survey reveals – stable – figures of 20 % annoyed population (Woudenberg and Van Kamp, 2013).

Regarding road traffic noise, a detailed analysis illustrates the difference in annoyance due to various categories of traffic (e.g. Franssen et al., 2004; Van Poll et al., 2011). Approximately 29% of the population stated to be highly annoyed by road traffic; of which scooters are most annoying (19%), followed by motor bikes and heavy trucks. Notably, as mentioned before, motorised two-wheelers are not considered in noise models and calculations for spatial and infrastructure planning nor in the strategic noise maps according to the EU Environmental Noise Directive. This noise source is thus very weakly addressed through the noise policy instrument mixes.

	Annoyed						Highly annoyed					
Year	77	87	93	98	03	08	77	87	93	98	03	08
Passenger cars, taxis	14	19	18	16	18	12	7	8	9	6	6	4
Vans	11	17	13	9	13	9	5	7	6	3	4	3
Heavy trucks	22	28	20	20	22	13	15	14	11	9	10	6
Busses	9	12	9	7	9	5	5	5	5	3	3	2
Mopeds	-	-	6	11	9	6	-	-	3	5	5	2
Scooters	29	36	24	30	37	17	16	18	13	15	19	6
(Cross)motor cycles	17	30	19	19	23	11	9	14	10	9	11	5
Military vehicles	18	4	2	2	1	1	11	2	1	1	1	1

Table 14: Negative health effects due to noise (percentage of people in the Netherlands per year) (Source : Van Poll et al., 2011)

Quiet areas and restorative effects

Thirdly, the negative health effects due to noise exposure are even worse when considering the increasing absence of quietness, relatively quiet areas and times of the day, and acoustic environments comprised of natural, pleasant sounds. Research showed that access to quiet areas is beneficial for health (e.g. Öhrström et al., 2006) and that natural sounds are preferred over mechanical sounds (e.g. Berglund et al., 1999).

Specifically in noisy cities, areas should be provided where noise levels are relatively low or significantly lower than in the surrounding areas. These gardens, inner courts, and parks though are threatened by the 'noise blanket' over the Netherlands. As Woudenberg (2013, p. 153) concludes "quietness for an hour is almost nowhere found in the Netherlands".

One cause and several effects

Finally some words on multi-factor effects or confounding effects. The main source of environmental noise and adverse health effects is road traffic; a source known for air pollution and subsequent cardio-vascular diseases as well. The question rises whether these specific negative health effects from road traffic noise are purely to be accounted to the noise exposure or due to air pollution from traffic as well. As Van Kempen and Van Kamp (2013, p. 88) conclude, "few recent studies have tried to distinguish effects due to noise exposure and air pollution, though no comprehensive conclusions could be drawn".

Summary

Noise policy: sound policy?

A meta level analysis and evaluation of noise policy in the Netherlands

Introduction

Sounds are part of our world. However, compared to the city sounds of the 19th century an enormous increase in sounds and sources is witnessed, and humans are increasingly surrounded by unwanted sounds, i.e. 'noise'. Successive governments in the Netherlands, as in many other Western European countries developed environmental policy during the last four decades, including noise policy. Characteristic for this policy is the legislative, technocratic approach of top-down regulation of polluting sources such as industries, aviation and traffic. Nevertheless, there still appears to have been no breakthrough to fully counter the negative health effects of noise pollution. As the World Health Organisation (WHO) recently illustrated, over 40% of the European population is regularly exposed to sound levels from traffic that are considered to have harmful effects. Similar figures are found for the Netherlands, where national surveys illustrated that 40% of the Dutch population were said to be (sometimes) annoyed by noise. Exposure to noise and annoyance can increase stress and blood pressure; known as triggers for cardiovascular diseases.

Noise: causes and health effects

Noise is usually classified according to the sources that produce the sounds. The main categories are environmental noise, occupational noise and neighbour noise. The former, which is the topic of this research, is related to noise from road traffic, rail traffic, air traffic, and industrial activities. Environmental noise is associated with a wide range of health effects, such as annoyance, sleep disturbance, elevated hormone levels, physiological stress reactions, cardiovascular disorders, and even premature deaths. Annoyance is the most widely acknowledged effect of exposure to noise, and is considered to be the most widespread. Various studies today recommend 50 – 55 $L_{Aeq,\ 16hrs}$ as health based threshold, in order to limit annoyance and adverse health effects due to traffic noise.

In addition, the WHO recently proposed to set a target value for sleep disturbance of 40 L_{night} (outside dwellings) and an interim target of 55 L_{night}, in case the target value cannot be achieved in the short term. These health based limits, though, are far below many regulative limits in European countries; for example the maximum allowed limit for a new dwelling near a municipal road in the Netherlands is 68 L_{den} according to the Noise Abatement Act.

Noise: goals, actors and instruments

Noise policy in the Netherlands was formulated in the late 1970s based upon three pillars, which still exist; that is (i) prevention of noise pollution; (ii) solution of existing problems of noise pollution; and (iii) reduction of noise emissions from traffic and other sources. The original policy goal, phrased in the first National Environmental Policy Plan (1989), was "to stabilise the percentage of the noise annoyed population at the level of 1985, i.e. 40%"; this implied the partial acceptance of the noise problem. This goal was set by the government, as legislator and policymaker the first of six categories of actors in the Dutch noise policy domain. Other categories of actors involved in noise policy are governmental bodies as physical planner, which mainly concerns regional and local authorities; the private sector; NGOs; and the scientific community. The last, specific, category concerns individuals, being both victims and polluters.

In order to influence the behaviour of polluters a mix of policy instruments is employed, limiting the negative health effects of noise pollution by reducing noise emissions from sources, noise propagation over certain distances, and immission of noise at dwellings (the so-called noise receivers).

Analysing and evaluating noise policy in the Netherlands

Noise pollution is an old environmental problem, which still has not been resolved despite having Dutch and international noise policy in place for many decades. Nevertheless, today's policy instruments have hardly been adjusted or revised, except for a few experiments on environmental policy integration. Noise policy in the Netherlands was and still is typically a 'centralised governance mode'.

Academic literature illustrated that during recent decades changes are witnessed in many – sectoral - environmental policy domains, such as decentralisation, integration into other policy sectors and implementation of policy instruments involving private sectors.

Such interactive and deliberative approaches, known under the umbrella of 'governance', seem to be absent in the Dutch noise policy domain. The consequent questions arise as to whether the observations of limited dynamics and limited effectiveness are correct, and if so, how to explain these.

Research aim and approach

The aim of this thesis was to analyse and evaluate the noise policy domain in the Netherlands, answering, in a meta analysis, the following main research questions:

1. Which stability or dynamics are evident in the noise policy domain in the Netherlands in terms of modes of governance and what explains this stability or dynamics?
2. Which (f)actors explain stability and/or change in the noise policy subsystems for (road and railway) traffic, aircraft and industrial noise and the differences in dynamics within the noise policy subsystems?
3. To what extent has integration of noise policy into spatial planning, as a specific governance approach, resulted in increased effectiveness in terms of prioritisation of health objectives?
4. Which policy outcomes have been achieved with the policy instrument mixes in place and how can these outcomes be explained?

Reviewing academic policy analysis literature revealed that a variety of approaches and perspectives is employed in various theoretical and empirical studies. However, these 'single policy analysis theory approaches' have weaknesses and limitations; which in this research were overcome by employing multiple perspectives. The main elements relevant for the analysis and evaluation of the noise policy domain in the Netherlands are (i) modes of governance (actors, instruments and discourses); (ii) (absence of) dynamics in regulative noise limits (advocacy coalitions and their belief systems); (iii) the integration of noise objectives into spatial planning; and (iv) noise policy instruments, goals and effectiveness.

These elements were studied in the subsequent chapters of the thesis; each chapter discussed the relevant policy analysis theories and frameworks and proposed an (renewed) approach employed in the respective empirical analysis. The four core chapters have been published in international peer-reviewed academic journals.

From governance literature the main factors for the identification and description of governance modes in noise policy were selected (chapter 2). Subsequently (the differences in) dynamics in noise regulation were analysed in further detail for three noise policy subsystems, i.e. (road and railway) traffic, industrial and aircraft noise policy subsystems, using the Advocacy Coalition Framework (ACF) of Sabatier and Jenkins-Smith (chapter 3). Integration of noise policy into spatial planning policy was studied using concepts of Environmental Policy Integration theory, regarding three practical experiments such as the Experiment Law City and Environment (chapter 4). In order to assess whether the presumed limited dynamics affected the performance of the noise policy domain, in chapter 5 the outcomes of Dutch noise policy were evaluated. A stepwise approach was developed in order to be able to evaluate policy instrument *mixes*; in my opinion today's policy analysis literature has paid too little attention to analysing mixes and this chapter thus specifically aimed to contribute to scholarly policy evaluation research. The approach was based upon, amongst others, Hoogerwerf's policy theory (1990) and Mickwitz's effectiveness evaluations (2003).

The preferred research method in this thesis was a historical, meta analysis of advocacy coalitions, discourses and instruments influencing the performance of the Dutch noise policy domain. The main goal for the theoretical data analysis was to define key factors for identifying policy dynamics and policy outcomes, as well as those factors that might be explanatory for these dynamics and outcomes. Therefore analytical frameworks were developed or revised; in combination with illustrating the advantages of multi-perspective approaches we aim to contribute, though modestly, to policy analysis research. The empirical data analysis consisted of document reviews and interviews, in order to (i) provide a historical overview of (changes in) legislation and policy goals; (ii) providing data on the status quo of noise pollution; and (iii) identification of actors and discourses.

Main research results

Shifts in noise governance modes

The rationale of research question 1 is to test the preliminary observation of the noise policy domain in the Netherlands as a traditional, hierarchic and regulative governance mode, and the seemingly absent shifts towards other governance modes. In general, governance is regarded as the successor of 'government'. These governance modes, though, should be considered ideal-types, whereas research learned that hybrid forms exist. Characteristics of governance are, for example, (broader) stakeholder involvement and the introduction of new policy instruments such as voluntary agreements and emission trading schemes. From the main literature on governance generally accepted aspects of 'government' and 'governance' were identified, i.e. policy discourse, actors and instruments, as key elements of the analysis framework. In addition, these dependent variables were helpful in analysing shifts in governance modes as well. Based upon the assessment of these indicators, shallow shifts were found in the noise policy discourses and the actor coalitions. Decentralisation of tasks and decision-making to local government bodies has been executed through changes in legislation. This seemed to fit within the main policy discourse of 'stick to enforceable regulation', and the state-dominated public actor constellations. The third indicator, that is the instrument mix, though remained mainly based on the 'government' characteristic legislative policy instrumentation. Overall, today's noise policy in the Netherlands thus was depicted as a combination of 'central and decentralised governance modes', where central government sets objectives and the main policy instruments and relies on decentral governments for policy implementation.

In order to understand the presence or absence of shifts in governance modes three explanatory factors were identified as well, i.e. events, performance and institutionalisation. These factors were derived from policy science literature, such as the punctuated equilibrium and policy network literature. The analysis revealed that events, which are known to be drivers for change, were largely absent during the period concerned. Furthermore, in contrast to what might be expected from scholarly research on the performance of environmental policy domains, the fact that the noise problem was not solved did not act as a driver for change in Dutch noise policy. Also the noise policy domain specific institutionalisation has been a major barrier to shifts; the 'exclusive' public sector and state dominated policy networks limited involvement of other actors and obstructed new discourses on problem frames and the required policy instrumentation.

Variation and stability in regulative noise limits

Although the research, presented in chapter 2, revealed that, *overall,* the noise policy domain had shown limited dynamics, this is not necessarily true for the subsystems, i.e. (road and railway) traffic, aircraft and industrial noise. Therefore, actors cooperating in, cf. ACF terminologie, advocacy coalitions were assessed in order to explain the variation and stability of noise policy, specifically regarding regulative noise limits. From the Advocacy Coalition Framework (ACF) the main factors for the analysis framework are identified, i.e. advocacy coalitions, beliefs and coordinated activities over time. The ACF holds that advocacy coalitions and policy subsystems remain stable over time as actors seek alliances with people holding similar beliefs, and share strategic political resources, such as formal authority, finances and information. Advocacy coalitions, within the three noise policy subsystems, were identified based upon the so-called policy core components or (secondary) policy beliefs, suggested by Sabatier and Jenkins-Smith. In addition, explanatory factors for change and/or stability were identified from ACF literature, i.e. policy brokerage and policy learning. Political conflicts are assumed to be mediated by 'policy brokers'; these brokers often hold formal authority and are interested in finding a compromise among adversarial coalitions. Policy learning often occurs in strategies to influence the behaviour of other coalitions and actors; specifically cross-coalition learning occurs through negotiated agreements among two or more coalitions participating in 'professional forums'.

The research learned that the dynamics in the road and railway traffic noise policy subsystems are mainly due to two originally opposing adversarial coalitions. In order to prevent a deadlock in the revision of the Noise Abatement Act cross-coalition learning was facilitated by the mediating Ministry of Environment. The latter holds formal responsibility for the revision and implementation of noise legislation, and thus acted as a policy broker in order to have the spatial planning and the infrastructure coalitions finding a compromise. Problem frames and policy instrumentation, in this empirical case the regulative noise limits, though did not substantially change. Stability was found in the industrial and the aircraft noise policy subsystems, though the explanations for stability differ. In the industrial noise policy subsystem stability was explained by uncontested coalitions reaching agreements in professional forums in which all actors collaboratively participate. On the other hand in the aircraft noise policy subsystem a dominant economy, aviation coalition is outweighing the minority coalition of citizens and decentralised governmental bodies and firmly holding on to the – in their opinion – most suitable policy arrangements.

Noise policy integration into spatial planning

A few experiments on the integration of noise objectives into spatial planning seemed to be the exception to the shallow shifts in governance modes and limited dynamics in noise policy subsystems regarding regulative noise limits. Environmental policy integration (commonly abbreviated as EPI) is an approach studied in governance research, as an example for shifts towards sustainable policy. EPI implies the incorporation in, and, from a normative perspective, prioritisation of environmental objectives over other policy objectives. One of the main instruments in Dutch noise legislation is the principle of zoning; noise intruding activities are separated from noise sensitive buildings to prevent noise pollution. Practice though suggested that noise objectives were only considered at a late stage of physical planning; noise policy being framed as 'nuisance for spatial planning' by planners and decision-makers. This paradigm was addressed through some experiments of the late 1990s and 2000s with the aim to integrate noise objectives in spatial planning practices. Three experiments in the Netherlands were analysed, that is ROM policy, the City and Environment Experiment Act and the MILO method.

Based upon EPI literature an analysis framework was developed comprising the following main identified factors: organisational and procedural factors. Organisational factors are addressed in most of the EPI literature, where they are seen as fundamental to successful policy integration. This research focused on organisational arrangements, budgetary structures, communication structures and the initiating institution. The most common procedural factors in EPI literature, and thus part of the analysis framework, are 'integration policy' instruments, decision-making procedures and participatory rules. Furthermore, contextual or explanatory factors were identified, that are relevant for understanding the extent to which integration strategies are successful. Two factors are assessed that could act as policy window for integration, that is (i) unifying paradigms and beliefs, and (ii) political commitment and public support.

The research revealed that the wide(r) employment of the City and Environment Law, compared to the other two instruments, was explained by the provision of a legal basis. Decentralised governmental bodies often prefer to adhere to regulative procedures in urban planning and decision-making, rather than voluntary approaches such as MILO that would bear risks during juridical complex procedures.

Furthermore, although political and policy discourses on decentralisation and area-oriented flexible policy of the late 1990s and early 2000s could have provided a policy window for integration of noise objectives into spatial planning, the research revealed only limited changes at local administrative level practice. This was explained, using the contextual factors of the analysis framework, by the persistent practice of giving precedence to spatial planning flexibility instead of 'normative prioritisation' of noise and health.

Effectiveness of noise policy instruments mixes

The research confirmed the preliminary observation of stability and limited dynamics in the Dutch noise policy domain. The subsequent question was whether the presumed limited effectiveness of noise policy was correct; as traditional policies are not necessarily ineffective. Despite various scholars concluding that effective environmental policy requires policy instrument mixes rather than single policy instruments, a generally accepted approach for analysing these instrument mixes is lacking. This thesis thus proposed a methodology based upon existing scholarly approaches, such as Hoogerwerf's policy theory, Vedung's typology of policy instruments and Mickwitz's effectiveness evaluation model. The stepwise approach comprised (i) description of the noise policy theory in terms of causes and effects, and the points of application for policy instruments; (ii) description of policy instruments in place; (iii) analysis of goal attainment and measured effects; and (iv) attribution of the relative contribution of individual policy instruments to the level of goal attainment and the combined effects of policy instrument mixes. The latter step focused on the coverage of points of intervention, steering power of policy instruments and coherence of policy instruments mixes.

One of the challenges in effectiveness evaluations is that policy goals often, in due time, are shifted or adjusted; this is the case in the Dutch noise policy domain as well. Therefore the research mainly focused on the trends in the variable 'percentage of noise annoyance' in line with the original goal of noise policy in the Netherlands to stabilise the percentage of noise annoyance at the levels of 1985. In addition, sub policy goals were analysed regarding noise immission levels on façades of dwellings and the noise emission levels from traffic.

The research revealed that the main policy goal of preventing noise pollution and stabilising the percentage of annoyance has been attained; the sub policy goals, though, are not yet achieved.Furthermore, from a health perspective as discussed in chapter 1, noise policy has not been able to substantially reduce the negative health effects associated with noise pollution. This trend seems to be in contrast to other environmental health domains where improvements have been achieved during the last decades. The resulting limited effectiveness of today's noise policy instrument mixes was explained by analysing the policy instrument characteristics and the points of intervention that are addressed through these policy instruments. The research revealed that, in line with answering research question 1 on shifts in governance modes, Dutch noise policy relies heavily on regulative policy instruments. However, regarding the policy instrument mixes employed, options for improved effectiveness exist as this research illustrated a gap in the instrument mix regarding car use(rs). Regulative, economic and/or communication policy instruments addressing the numbers of vehicles and the use of vehicles are largely absent. Furthermore, the research concluded that the steering power of (international) regulative instruments on noise emissions from vehicles is limited. Overall, this results in non-effectively governed polluters and causes of adverse health effects, that is the car (driver).

Conclusions and reflections

The main findings of this research underline the preliminary observations on limited dynamics in the noise policy domain in the Netherlands during the last 40 years. Today's noise policy is still primarily characterised as a combination of centralised and decentralised governance styles, without any evidence of shifts towards sound(er) noise governance modes. This was further illustrated by the stability in actors and advocacy coalitions and the limited effects of the integrative experiments in terms of prioritisation of noise and health objectives vis-à-vis spatial planning objectives. The subsequent question on effectiveness of the Dutch noise policy domain was addressed in chapter 5, which revealed that the expected as well as the perceived effectiveness of the noise policy instrument mixes is specifically weak regarding cars (drivers).

Reflecting on these research findings and the collected empirical data three cross-cutting explanatory factors came up that were originally not part of the multi perspective analysis frameworks, that is (i) problem framing; (ii) agenda setting; and (iii) problem ownership.

The dominant problem frames of 'noise as a nuisance' in terms of the subjective perception of (complaining) citizens and obstructing physical planning have not changed into, for example, 'noise as a major environmental health stressor' despite the increase of scientific evidence. A shift in discourses though seems to be extremely difficult to achieve due to some specificities of noise and noise pollution, such as the complex cause and effect mechanisms. Noise causes are expressed in the difficult to understand logarithmic indicator 'decibel'; whereas on the effect side noise is a typical silent killer. Another, related issue, is the low position of 'the noise problem' on the academic, societal and political agendas. This is illustrated, for example, by the unwillingness of subsequent parliaments to adopt 'polluter pay principles' in the noise policy domain or in policy instrumentation, specifically addressing the 'holy cow' of car use(rs). Finally, the institutionalisation or problem ownership in the Dutch noise policy domain is explanatory for the absence of major shifts in discourses, actors and instruments. Noise policy goals in terms of stabilisation of the percentage of citizens annoyed due to noise, were defined and implemented by the national government. Decentralised government bodies, on the other hand, hold no explicit responsibilities for achieving these noise policy goals. Multi-level governance, in the case of Dutch noise policy a combination of central and decentralised governance styles, thus bears a risk of non-effectiveness and limited goal attainment when mutually shared responsibilities and policy goals are absent.

Reflection on theoretical and analytical frameworks: the added value of multiple perspectives

The main subjects analysed in this thesis were the following: (i) modes of governance (actors, instruments and discourses); (ii) advocacy coalitions and their belief systems; (iii) integration into spatial planning; and (iv) policy instruments, goals and effectiveness. These subjects are most commonly studied in public policy analysis, such as governance (modes) literature and the Advocacy Coalition Framework. The 'single approach' theories and (renewed) frameworks employed in this research turned out to be very helpful in understanding and assessing the main identified subjects. However, in my opinion it is the use of multiple perspectives based upon these 'single' approaches that supported a profound and in-depth study of (environmental) policy. The added value of applying several theories and analysis frameworks is also stressed by other scholars; although a generally accepted scholarly approach seems to be lacking.

The advantage of the multi-perspective approach is that it supported the identification of several explanatory factors for stability and/or dynamics in the noise policy domain and in (environmental) policy domains in general. Notably, explanatory factors are context- and domain-dependent, and thus should not be regarded exhaustive or generic in meta and multi-perspective policy analyses.

Regarding the methodology employed attention should be drawn to the empirical analysis, which is primarily qualitative research of the main identified subjects over longer time frames. Internal validation in this kind of research is specifically critical; triangulation of content analysis of (policy) documents, interviews and - in the effectiveness evaluation - quantitative analyses in my opinion is pivotal.

Recommendations for future research

I would advice future (environmental) policy research to employ multi-perspective approaches and analysis frameworks in order to enhance thorough understanding of policy domains in general and identification of explanatory factors for policy dynamics and outcomes. In addition, these studies could further validate and improve the theoretical and analytical frameworks, as well as the methodological choices made. The main questions of interest are whether the factors identified in this research, as explanatory factors for presence or absence of shifts, are similar for other policy domains; or in other words are explanatory factors domain specific or generally applicable in the analysis frameworks?

Regarding noise policy, we would specifically recommend similar meta and multi-perspective approaches on noise policy in other countries and in cross-country comparative studies, in order to enhance the understanding of explanatory factors for stability or dynamics and the performance of noise policy domains. Finally, the analysis of practical examples of noise policy at decentral government level could provide further insight in the (local) success factors for effective approaches preventing and reducing noise pollution.

Final reflections

This thesis focused on noise policy as it was in place between 1970 and 2010. Since 2010, a fundamental revision of the Dutch Noise Abatement Act has been underway, called Swung. The main goal of Swung is to prevent negative health effects due to the autonomous increase of traffic using a new policy instrument of so-called noise production ceilings. A second aim of the revision is to simplify the complex set of regulative noise limits and the physical planning procedures.

In my professional work as manager of the noise department at DCMR Environmental Protection Agency I have been closely involved in the Swung process. As, to my opinion, there is ample room for and a need for a change towards sound(er) noise policy, the question arises how today's discussions on noise policy are to be understood. In the Epilogue of this thesis I argued that there is – still – no evidence of shifts in the noise policy domain; and the new developments such as Swung continue along the paths defined since the 1970s. However, a few hints of dynamics within the noise policy domain in terms of problem frames and advocates could be revealed. In order to support, shallow, shifts towards sound(er) noise policy I therefore recommended to adopt multi-level and multi-sector governance modes; (ii) institutionalise policy learning involving other actors in working groups and other work forms; (iii) introduce new policy instruments such as regulative and economic instrument mixes specifically addressing vehicle use(rs); and (iv) adoption of the new problem frame and narrative of soundscape which centres around human perception of its living and acoustic environments and that emphasises the positive value people associate with sounds and quietness.

Samenvatting

Geluidbeleid: gezond beleid?

Een meta analyse en evaluatie van het Nederlands geluidbeleid

Introductie

Geluiden zijn onlosmakelijk verbonden met onze samenleving. Sinds de 19e eeuw zijn het aantal geluidbronnen en de geluidsvolumes echter sterk toegenomen en is de mens steeds vaker omringd door ongewenst geluid, ook wel 'lawaai' genoemd. Blootstelling aan geluid en hinder verhogen stress en bloeddruk; beide factoren kunnen tot cardiovasculaire ziekten leiden. De Nederlandse overheid heeft daarom, net als veel andere West Europese landen, sectoraal geluidbeleid ontwikkeld. Kenmerkend voor dit beleid is de technocratische, van bovenaf opgelegde regulering van hinderlijke bronnen zoals industrie, luchtvaart en verkeer via normen. Het geluidbeleid is inmiddels zo'n 40 jaar oud, maar desalniettemin lijkt er vandaag de dag nog steeds geen doorbraak bereikt te zijn in het voorkomen en verminderen van negatieve gezondheidseffecten van blootstelling aan geluid en lawaai. Zo rapporteerde de Wereld Gezondheid Organisatie (WHO) onlangs dat 40% van de Europese bevolking regelmatig wordt blootgesteld aan geluidniveaus door wegverkeer waarbij negatieve gezondheidseffecten kunnen optreden. Een vergelijkbare situatie doet zich voor in Nederland, waar landelijke inventarisaties aantonen dat 40% van de Nederlandse bevolking aangeeft gehinderd te zijn door geluid.

Geluid: oorzaken en gezondheidseffecten

Geluid wordt veelal ingedeeld naar type geluidsbron. De belangrijkste hoofdcategorieën hiervan zijn omgevingsgeluid, geluid op de arbeidsplek en burengeluid. Dit onderzoek richt zich op omgevingslawaai, ofwel geluid afkomstig van wegverkeer, spoorwegen, luchtvaart en industriële activiteiten. Dit geluid en bijbehorende effecten komen overal in de maatschappij voor; daarom is er in tegenstelling tot de andere type geluidsbronnen sinds decennia (inter)nationaal en lokaal beleid dat relevante en interessante empirie voor wetenschappelijk onderzoek biedt. De negatieve gezondheidseffecten van omgevingslawaai zijn divers, zoals hinder, slaapverstoring, verhoogde hormoonspiegels, fysiologische stress reacties, cardiovasculaire ziekten en, uiteindelijk zelfs, vroegtijdige sterfte.

Geluidhinder is het meest voorkomende en alom erkende effect van blootstelling aan geluid. Diverse studies bevelen geluidniveaus van maximaal 50 tot 55 $L_{Aeq,16\ uur}$ aan als grenswaarde; bij deze blootstellingniveaus worden hinder en negatieve gezondheidseffecten door verkeerslawaai beperkt. In aanvulling hierop adviseerde de WHO onlangs een streefwaarde van 40 L_{nacht} (buitengevel woning) voor slaapverstoring en een interim waarde van 55 L_{nacht} indien de eerstgenoemde waarde niet op korte termijn kan worden gerealiseerd. Deze gezondheidswaarden zijn echter veel lager dan de grenswaarden die in diverse Europese wet- en regelgeving zijn opgenomen. Ter illustratie: de maximale grenswaarde voor een nieuwe woning aan een gemeentelijke weg is 68 L_{den} conform de Nederlandse Wet geluidhinder.

Geluid: doelen, actoren en instrumenten

Het Nederlandse geluidbeleid is aan het eind van de zeventiger jaren van de vorige eeuw in werking getreden en is gebaseerd op drie pijlers, namelijk (i) voorkomen van geluidhinder; (ii) oplossen van geluidhinder; en (iii) verminderen van geluidemissies door verkeer en andere geluidbronnen. Deze drie pijlers vormen nog steeds de basis van het geluidbeleid. Het oorspronkelijke beleidsdoel, zoals in het Nationaal Milieubeleidsplan (NMP1 uit 1989) staat geformuleerd, was "stabilisatie van het percentage geluidgehinderden op het niveau van 1985, dat wil zeggen 40% geluidgehinderden". Dit doel en het beleidsinstrumentarium zijn door de rijksoverheid vastgesteld. Andere actoren die van belang zijn in het geluidbeleid zijn decentrale overheden met ruimtelijke ordeningstaken (provincies en gemeenten), de private sector, milieu- en burgergroeperingen, de wetenschapssector, en burgers (zowel in de betekenis van slachtoffer of geluidgehinderde, als in de rol van veroorzaker van geluidhinder). Om het gedrag van veroorzakers van geluidhinder te beïnvloeden worden diverse beleidsinstrumenten toegepast. Deze instrumenten beperken negatieve gezondheidseffecten door de begrenzing van geluidemissies van geluidsbronnen, vermindering van de overdracht van geluid en verlaging van de immissie van geluid op woningen (geluidontvangers).

Analyse en evaluatie van het Nederlandse geluidbeleid

Geluidhinder is een oud milieuprobleem dat ondanks decennialang Nederlands en internationaal geluidbeleid nog niet is opgelost.

Desondanks zijn de toegepaste beleidsinstrumenten nauwelijks herzien, met uitzondering van enkele experimenten ten aanzien van beleidsintegratie. Het Nederlandse geluidbeleid was en is nog steeds gebaseerd op een typisch 'gecentraliseerd, regulatief' sturingsarrangement. Uit wetenschappelijk onderzoek blijkt echter dat gedurende de afgelopen decennia in veel andere milieubeleidsdomeinen veranderingen zijn opgetreden, zoals decentralisatie van overheidstaken, integratie in andere beleidssectoren en toepassing van publiek-private beleidsinstrumenten. Deze veranderingen worden doorgaans verklaard door maatschappelijke trends en veelal noodzakelijk geacht voor een effectieve aanpak van milieuproblemen. Dergelijke interactieve en deliberatieve democratische benaderingen, veelal samengevat onder de noemer 'governance', lijken in het Nederlandse geluidbeleid afwezig te zijn. De vraag die opkomt, is in hoeverre de op het eerste oog geconstateerde beperkte dynamiek in het geluidbeleid inderdaad kan worden vastgesteld en, indien dat daadwerkelijk zo is, hoe het gebrek aan dynamiek kan worden verklaard. Een vervolgvraag betreft de effectiviteit van het gebruikte beleidsinstrumentarium; een gebrek aan dynamiek hoeft immers geen probleem te zijn zolang het geluidprobleem effectief wordt aangepakt.

Onderzoeksdoel en methode

Dit onderzoek beoogt het Nederlandse geluidbeleid te analyseren en te evalueren waarbij in de meta analyse de volgende onderzoeksvragen worden beantwoord:

1. Welke stabiliteit of dynamiek is te zien in de sturingsarrangementen binnen het Nederlandse geluidbeleid en hoe kan deze stabiliteit of dynamiek worden verklaard?
2. Welke (f)actoren verklaren stabiliteit of dynamiek op het niveau van de subsystemen van het geluidbeleid ((weg- en spoor-)verkeerslawaai, luchtvaartlawaai en industrielawaai) en wat verklaart eventuele verschillen in dynamiek tussen deze subsystemen?
3. In welke mate heeft integratie van geluidbeleid in ruimtelijke ordening, als een specifiek sturingsarrangement, geleid tot effectiever geluidbeleid in termen van prioritering van gezondheidsdoelstellingen?
4. Hoe effectief is de ingezette beleidsinstrumentenmix en hoe is deze effectiviteit (of het gebrek eraan) te verklaren?

Een verkenning van wetenschappelijke beleidsanalyseliteratuur leert dat er een brede variëteit aan benaderingen en invalshoeken wordt toegepast in zowel theoretische als empirische studies. Deze veelal 'enkelvoudige' benaderingen hebben echter hun beperkingen; in dit onderzoek is daarom voor een 'meervoudige' benadering en is voor meerdere invalshoeken gekozen. De belangrijkste elementen in de analyse en de evaluatie van het Nederlandse geluidbeleidsdomein zijn: (i) sturingsarrangementen (actoren, instrumenten en discoursen); (ii) actorcoalities, hun waardesystemen inclusief probleemdefinities en de wijze waarop die coalities interacteren; (iii) integratie van geluiddoelen in andere beleidsdomeinen zoals de ruimtelijke ordening; en (iv) beleidsinstrumenten, beleidsdoelen en effectiviteit van het geluidbeleid. Deze elementen worden in opeenvolgende hoofdstukken van dit proefschrift onderzocht. In elk hoofdstuk wordt een specifieke theoretische invalshoek uitgewerkt en toegepast op de betreffende beleidsempirie. De vier inhoudelijke hoofdstukken zijn alle gepubliceerd in internationale, peer-reviewed wetenschappelijke tijdschriften.

Uit specifieke literatuur over governance zijn de belangrijkste factoren geselecteerd voor het identificeren en beschrijven van sturingsarrangementen of 'governance modes' in het geluidbeleid (hoofdstuk 2). Vervolgens wordt aan de hand van het Advocacy Coalition Framework (ACF) van Sabatier en Jenkins-Smith (het verschil in) de dynamiek in geluidregelgeving in meer detail onderzocht voor drie subsystemen in het geluidbeleid, namelijk (weg en spoorweg) verkeer, luchtvaart en industrie (hoofdstuk 3). De integratie van geluidbeleid in de ruimtelijke ordening wordt geanalyseerd aan de hand van het concept Environmental Policy Integration, wat wordt toegepast op drie Nederlandse praktijkvoorbeelden: ROM, de Interimwet Stad en Milieu en MILO (hoofdstuk 4).

Tenslotte worden in hoofdstuk 5 de resultaten van het Nederlandse geluidbeleid geëvalueerd. Om beleidsinstrumentenmixen te kunnen evalueren, is een methode van vier stappen ontwikkeld. Aangezien in de huidige literatuur nauwelijks aandacht is besteed aan evaluaties van instrumentmixen, beoogt dit hoofdstuk tevens een bijdrage te leveren aan academisch beleidsevaluatieonderzoek. De evaluatiemethode is gebaseerd op onder andere Hoogerwerf's beleidstheorie (1990) en Mickwitz' effectiviteitevaluaties (2003).

Dit onderzoek is grotendeels uitgevoerd als een longitudinale meta-analyse van sturingsarrangementen, actorcoalities en waardesystemen, beleidsdoelen en -instrumenten. Met de toepassing van een combinatie van verschillende invalshoeken en analysekaders hoop ik, op bescheiden wijze, bij te dragen aan de verdere ontwikkeling van beleidsanalytisch onderzoek. De empirische basis van dit proefschrift bestaat uit documentenanalyses en interviews, waarmee (i) een historisch overzicht van (veranderingen in) wetgeving en beleidsdoelstellingen wordt gegeven; (ii) inzicht in de huidige omvang van het geluidhinderprobleem wordt verkregen; en (iii) actoren en discoursen geïdentificeerd worden.

Onderzoeksresultaten

Veranderingen in sturingsarrangementen

Het doel van onderzoeksvraag 1 was het toetsen van de observatie dat het Nederlandse geluidbeleid een traditioneel, hiërarchisch en regulatief beleidsdomein lijkt te zijn waarin ogenschijnlijk geen veranderingen in sturingsarrangementen zijn opgetreden. In de wetenschappelijke literatuur wordt 'governance' als de (logische) opvolger van 'government' gezien. Beide sturingsarrangementen zijn ideaaltypen; in de praktijk zullen er ook hybride vormen bestaan. Kenmerkend voor governance zijn, bijvoorbeeld, (brede) participatie van publieke en private sectoren en nieuwe beleidsinstrumenten zoals convenanten en emissiehandel. Gebaseerd op de wetenschappelijke governance literatuur zijn de algemene kenmerken van 'government' en 'governance' bepaald, namelijk beleidsdiscours, actorcoalities en beleidsinstrumenten. Deze factoren zijn van belang bij de analyse van de veranderingen in sturingsarrangementen. Conclusie is dat het Nederlandse geluidbeleid bestaat uit een combinatie van centrale en decentrale sturingsarrangementen, waarbij de rijksoverheid de beleidsdoelstellingen en instrumenten bepaalt en de implementatie van het geluidbeleid aan decentrale overheden overlaat.

Uit de analyse is vervolgens gebleken dat er marginale veranderingen hebben plaatsgevonden in het geluidbeleidsdiscours en in de actorcoalities. Door aanpassing van wet- en regelgeving zijn taken en besluitvorming naar de lokale overheden gedecentraliseerd. Dit lijkt te passen bij het dominante beleidsdiscours van 'handhaafbare wetten en regels' en bij de hiërarchische sturingsfilosofie.

De derde factor, de beleidsinstrumenten mix, is echter stabiel gebleven en bestaat na vier decennia nog steeds primair uit beleidsinstrumenten die worden geassocieerd met 'government'.

Om de veranderingen in sturingsarrangementen of de afwezigheid van veranderingen te duiden, zijn in dit onderzoek drie verklarende factoren geïdentificeerd, namelijk ingrijpende gebeurtenissen (of 'shock events'), beleidsprestaties en institutionalisering. Ook deze factoren worden veelvuldig in wetenschappelijk onderzoek toegepast, zoals in de Punctuated Equilibrium theorie en in de literatuur over beleidsnetwerken. Uit de analyse bleek dat er gedurende de afgelopen decennia geen relevante ingrijpende gebeurtenissen hebben plaatsgevonden. Daarnaast bleek, in tegenstelling tot hetgeen in academisch onderzoek naar beleidsprestaties geconcludeerd wordt, dat de beperkte terugdringing van het geluidprobleem in de afgelopen 40 jaar, geen drijfveer voor herzieningen was. De geluidbeleidspecifieke institutionalisering, tenslotte, heeft als barrière voor veranderingen gefungeerd; het 'exclusief publieke sector' gedomineerde beleidsnetwerk wist andere actoren buiten te sluiten en blokkeerde daarmee een nieuwe discours over probleemdefinities en het benodigde beleidsinstrumentarium.

Variatie en stabiliteit in wettelijke normstelling

Alhoewel het onderzoek, gepresenteerd in hoofdstuk 2, aantoonde dat het Nederlandse geluidbeleid in het algemeen weinig dynamiek heeft gekend, is dat niet automatisch ook het geval op het niveau van de verschillende subsystemen van het beleidsdomein, namelijk (weg- en spoorweg) verkeerslawaai, luchtvaartlawaai en industrielawaai. Derhalve zijn actoren en de samenwerking in coalities, in ACF terminologie 'advocacy coalitions', onderzocht, en variatie en stabiliteit van deze subsystemen met betrekking tot de wettelijke geluidnormstelling geanalyseerd. Gebruikmakend van ACF literatuur zijn de kernelementen van het analysekader bepaald, namelijk actorcoalities, probleemdefinities en samenwerking gedurende een langere periode. Volgens ACF blijven actorcoalities en subsystemen over langere perioden stabiel doordat er allianties gesloten worden met personen die vergelijkbare probleemdefinities hanteren en vervolgens (strategisch, politieke) middelen met elkaar delen, zoals formele bevoegdheden, budgetten, en kennis en informatie. Voor elk van de drie subsystemen in het geluidbeleid zijn de actorcoalities geïdentificeerd, daarbij gebruikmakend van de zogenaamde 'kernbeleidsovertuigingen' (in Engels 'policy core components') zoals door Sabatier en Jenkins-Smith (1999) is voorgesteld.

Vanuit de ACF literatuur zijn tevens factoren geïdentificeerd, die verandering en/of stabiliteit verklaren, namelijk 'beleidsmakelen' en 'beleidsgericht leren'. Vaak blijkt een zogenaamde 'beleidsmakelaar' (in het Engels 'policy broker') bemiddelend op te treden bij politieke conflicten. Deze bemiddelaars zijn vaak ambtenaren met formele bevoegdheden in het betreffende beleidsdomein, en hebben (dus) veelal belang in het zoeken naar een compromis tussen de tegenovergestelde coalities. Beleidsgericht leren (in het Engels 'policy learning') betreft het verkrijgen van nieuwe inzichten en kennis met betrekking tot probleemdefinities en beleid vanuit recente ervaringen, analyses of interactie met andere actoren. Beleidsgericht leren vindt zowel binnen een actorcoalitie als tussen coalities plaats; het laatste treedt voornamelijk op in 'professionele fora' waaraan de actorcoalities deelnemen en naar overeenstemming streven.

Uit deze studie is gebleken dat de dynamiek in het verkeerslawaai-subsysteem voornamelijk verklaard kan worden door de twee tegenover elkaar staande coalities. Om een patstelling in het proces van herziening van de Wet geluidhinder te voorkomen, is leren tussen beide coalities gefaciliteerd door ambtenaren van het milieudepartement van het ministerie VROM (nu I&M). Dit ministerie is formeel bevoegd gezag voor de herziening en de implementatie van de geluidwet- en regelgeving, en handelde als beleidsmakelaar tussen de 'vechtende' ruimtelijke ordenings- en infrastructuur coalities. Probleemdefinities en beleidsinstrumenten, zoals in dit geval de wettelijke normstelling, zijn echter nauwelijks veranderd.

De beide subsystemen voor industrielawaai en luchtvaartlawaai bleken overwegend stabiel gedurende de afgelopen decennia. De verklaringen voor deze stabiliteit zijn echter verschillend per subsysteem. De stabiliteit in het industrielawaai-subsysteem wordt voornamelijk verklaard door open, constructief handelende coalities, die in professionele fora (zoals publiek-private werkgroepen) telkens tot een werkbare invulling van de normstelling kwamen.

Bij luchtvaartlawaai daarentegen werd het beleid primair bepaald door een dominante coalitie van de luchtvaartsector en het transportministerie; de coalities van burgers en lokale overheden waren welhaast machteloos en krachteloos ten opzichte van de economisch gedreven luchtvaartcoalitie, die vasthield aan de voor deze coalitie meest wenselijke beleidsarrangementen.

Integratie van geluidbeleid in de ruimtelijke ordening

Een uitzondering in de beperkte dynamiek in het Nederlandse geluidbeleid betreft de experimenten rondom de integratie van geluiddoelstellingen in de ruimtelijke ordening en de hiervoor genoemde kleine wijzigingen in de wettelijke normstelling. Milieubeleidsintegratie (in het Engels 'Environmental Policy Integration', afgekort tot EPI) is veelvuldig onderwerp van academische studies, als een specifieke sturingsstrategie voor de verduurzaming van beleid. Vanuit normatief perspectief wordt onder de noemer van EPI veelal een prioritering van milieudoelstelling ten opzichte van andere beleidsdoelen gepropageerd.

Eén van de belangrijkste instrumenten in de Nederlandse geluidwet- en regelgeving is zonering; geluidveroorzakende activiteiten worden gescheiden van zogenaamde geluidgevoelige bestemmingen, zoals woningen, om geluidhinder te voorkomen. In de praktijk blijkt echter dat geluiddoelstellingen en –normen pas laat in het ruimtelijk ordeningsproces worden meegenomen, met als resultaat dat de geluidnormen vaak als belemmerend worden bestempeld. 'Geluidhinderbeleid' wordt dan 'hinderlijk geluidbeleid' in de ogen van de ruimtelijk ordenaars. Dit paradigma is in de jaren '90 van de vorige eeuw en het begin van deze eeuw geadresseerd in een aantal experimenten om geluiddoelstellingen eerder en beter in de ruimtelijke ordeningspraktijk te integreren. In dit onderzoek zijn drie van dergelijke experimenten geanalyseerd, te weten ROM-beleid, de Experimenten- (en later Interim)wet Stad en Milieu en de MILO-methode.

Gebaseerd op EPI literatuur is een analysekader ontwikkeld om de mate van beleidsintegratie te verklaren, bestaande uit organisatorische factoren en procedurele factoren. Organisatorische factoren zijn veelvuldig onderzocht in EPI studies en worden veelal als cruciale voorwaarden voor succesvolle beleidsintegratie beschouwd. In dit proefschrift is gekozen voor een detaillering van organisatorische factoren in organisatorische arrangementen, budgetstructuren, communicatiestructuren, en de initiërende institutie.

De meest toegepaste procedurele factoren in EPI studies, en derhalve onderdeel van het ontwikkelde analysekader, zijn de ingezette beleidsintegratie-instrumenten, besluitvormingsprocedures en regels met betrekking tot participatie. In aanvulling op deze organisatorische en procedurele factoren zijn contextuele en anderszins verklarende factoren uit de EPI literatuur afgeleid. Deze laatste factoren zijn van belang voor het duiden en begrijpen van de mate waarin beleidsintegratie succesvol is geweest.

Twee factoren zijn in de analyse meegenomen; factoren die kunnen werken als 'policy window' voor beleidsintegratie, namelijk (i) verbindende paradigmas en overtuigingen, en (ii) politiek en maatschappelijk draagvlak.

Het onderzoek heeft aangetoond dat de brede toepassing van de Interimwet Stad en Milieu, vergeleken met de andere twee instrumenten, vooral verklaard kan worden door de wettelijke basis die dit eerste instrument biedt. Decentrale overheden prefereren een wettelijke procedure in de stedelijke bouwopgaven en lokale besluitvorming, in tegenstelling tot de meer vrijwillige benaderingen, zoals MILO, waarbij grotere risico's bestaan op langdurige, complexe juridische procedures. Alhoewel in de onderzochte periode decentralisatie en gebiedsspecifiek beleid in allerlei discoursen op nationaal en lokaal niveau belangrijke thema's waren, hebben deze niet geleid tot significante veranderingen in de lokale uitvoeringspraktijk. Dit is vanuit contextuele factoren verklaard door de sterke voorkeur van gemeenten voor flexibele ruimtelijke planning in plaats van een meer 'normatieve prioritering' van geluid en gezondheid.

Effectiviteit van beleidsinstrumentenmix

Zoals hiervoor geschetst bevestigt het onderzoek de veronderstelde beperkte dynamiek in het Nederlandse geluidbeleidsdomein. Een logische vervolgvraag is of het geluidbeleid dan ook beperkt effectief is geweest, aangezien stabiel beleid niet per definitie ineffectief behoeft te zijn. Alhoewel veel wetenschappers stellen dat effectief milieubeleid inzet van een mix van beleidsinstrumenten vergt in plaats van een enkelvoudig instrumentarium, ontbreekt een algemeen geaccepteerde methode voor het analyseren van instrumentenmixen. Dit onderzoek stelt derhalve een methode voor, gebaseerd op bestaande academische studies en invalshoeken, zoals de beleidstheorieën van Hoogerwerf (1990), de categorisering en typering van beleidsinstrumenten van Vedung (1998), en effectiviteitevaluaties van Mickwitz (2003).

De toegepaste onderzoeksmethode bestaat uit de volgende stappen: (i) beschrijving van geluidbeleid in termen van oorzaken en gevolgen, en de aangrijpingspunten voor beleid; (ii) beschrijving van beleidsinstrumenten; (iii) analyse van doelbereiking en beleidsresultaten; en (iv) analyse van de relatieve bijdrage van individuele beleidsinstrumenten aan het doelbereik en de gecombineerde effecten van de instrumentenmix.

Deze vierde, laatste stap richt zich op de dekking van alle aangrijpingspunten door de diverse beleidsinstrumenten, de sturingskracht van de beleidsinstrumenten, en de consistentie van de instrumentenmix.

Eén van de uitdagingen in effectiviteitevaluaties is dat beleidsdoelen in de loop der tijd kunnen veranderen of soms zelfs afgeschaft worden; dit bleek ook het geval in het Nederlandse geluidbeleid. In het onderzoek is derhalve gekozen voor evaluatie van de variabele 'geluidgehinderden' zoals het oorspronkelijke beleidsdoel is geformuleerd, namelijk het percentage geluidgehinderden te stabiliseren op het niveau van 1985. Daarnaast zijn subdoelstellingen geanalyseerd met betrekking tot de geluidbelasting op woningen en de geluidemissies van voertuigen.

Uit het onderzoek blijkt dat de hoofddoelstelling, dat is het voorkomen van geluidhinder en het stabiliseren van het percentage geluidgehinderden, is gerealiseerd; de subdoelstellingen echter zijn nog (steeds) niet bereikt. Vanuit gezondheidsoogpunt, zoals in hoofdstuk 1 is besproken, is daarnaast een kanttekening te plaatsen; het geluidbeleid is namelijk niet in staat gebleken negatieve gezondheidseffecten door geluidbelasting significant te reduceren. Deze trend is ogenschijnlijk in contrast met andere milieugezondheidsdomeinen, waar de afgelopen decennia wel degelijk successen zijn behaald. De beperkte effectiviteit van het Nederlandse geluidbeleidsinstrumentarium is verklaard vanuit de kenmerken van de gebruikte beleidsinstrumenten en de aangrijpingspunten voor de beleidsinstrumenten. In lijn met het antwoord op de eerste onderzoeksvraag ten aanzien van dynamiek in sturingsarrangementen, is in dit deelonderzoek gebleken dat het Nederlandse geluidbeleid sterk leunt op regulerende instrumenten. De effectiviteit van de huidige instrumentenmix kan echter vergroot worden, wanneer de auto (gebruiker) zou worden geadresseerd. Dit hiaat in het palet van veroorzakers en beleidsinstrumenten kan worden ingevuld met behulp van regulerende, economische en/of communicatieve instrumenten die zowel het aantal voertuigen als het gebruik van voertuigen beperken. Daarnaast is geconstateerd dat de sturingskracht van (internationale) regulerende instrumenten met betrekking tot geluidemissies van voertuigen zeer beperkt is. Dit alles leidt tot een ineffectief geadresseerde veroorzaker van geluidhinder, namelijk de auto (gebruiker).

Conclusies en reflecties

Dit proefschrift toont aan dat het Nederlandse geluidbeleid in de afgelopen 40 jaar een beperkte dynamiek heeft gekend. Het huidige geluidbeleid is nog steeds voornamelijk een combinatie van gecentraliseerde en gedecentraliseerde sturingsarrangementen. Dit blijkt onder meer uit de stabiliteit van de betrokken actoren en coalities en het beperkte effect van experimenten tot beleidsintegratie in termen van prioriteren van geluid en gezondheidsdoelstellingen boven ruimtelijke ordening en woningbouwopgaven. Ten aanzien van de effectiviteit van het Nederlandse geluidbeleid is geconstateerd dat deze beperkt is, met name door het beperkte sturen op de auto (gebruiker).

Reflecterend op de onderzoeksresultaten en het verzamelde empirische materiaal blijken drie verklarende factoren van belang. Deze factoren zijn op een hoger abstractieniveau geïdentificeerd dan de factoren van de afzonderlijke analysekaders en omvatten: (i) de framing van het geluidprobleem, (ii) agendering, en (iii) probleemeigenaarschap. De dominante probleemdefinitie van 'geluid als hinder' in de zin van subjectieve perceptie van (klagende) burgers en als belemmerende factor voor ruimtelijke ontwikkelingen prevaleert. Geluid wordt daarentegen zelden als belangrijke gezondheidsstressor gedefinieerd, ondanks de toename van wetenschappelijk bewijs hieromtrent. Een verandering in het geluiddiscours lijkt zeer moeilijk te bereiken; dit is vooral te verklaren door enkele specifieke kenmerken van geluid en geluidbeleid, zoals de complexe oorzaak-gevolg mechanismen. De oorzaken worden vaak uitgedrukt in de on(be)grijpbare logaritmische eenheid decibel, en aan de gevolgenkant blijkt geluid een 'stille moordenaar'. Daarnaast, en met het voorgaande verband houdend, staat geluid erg laag op de academische, politieke en maatschappelijke agenda. Dit blijkt onder meer uit de onwil van diverse kabinetten om het zogenaamde vervuiler-betaalt-principe in te voeren in het geluidbeleid, met name met betrekking tot de – heilige koe – auto. Tenslotte blijkt ook het probleemeigenaarschap in het Nederlandse geluidbeleid een verklarende factor voor de afwezigheid van relevante veranderingen in discoursen, actoren en beleidsinstrumenten. Geluidbeleidsdoelstellingen in termen van percentages geluidgehinderden zijn indertijd door de rijksoverheid gedefinieerd en geïmplementeerd. De decentrale overheden zijn echter niet verantwoordelijk (gemaakt) voor het bereiken van deze doelstellingen. Multi-level governance, in het geval van het Nederlandse geluidbeleid een combinatie van gecentraliseerde en gedecentraliseerde sturingsarrangementen, draagt dus een risico van ineffectiviteit en beperkte doelbereiking in zich indien gezamenlijk geformuleerde en gedragen beleidsdoelen ontbreken.

Reflectie op theoretische en analytische kaders: de toegevoegde waarde van meerdere perspectieven

De belangrijkste elementen die in dit proefschrift zijn onderzocht, zijn de volgende: (i) sturingsarrangementen (actoren, beleidsinstrumenten en discoursen); (ii) actorcoalities, hun waardesystemen inclusief probleemdefinities en de wijze waarop die coalities interacteren; (iii) integratie van geluiddoelen in andere beleidsdomeinen zoals de ruimtelijke ordening; en (iv) beleidsinstrumenten, beleidsdoelen en effectiviteit van het geluidbeleid. Dit zijn algemeen gehanteerde invalshoeken in wetenschappelijke beleidsstudies, en bleken zeer waardevol in het begrijpen en analyseren van de belangrijkste thema's in het Nederlandse geluidbeleid, zoals in de respectievelijke onderzoeksvragen en hoofdstukken zijn behandeld. Het is echter, naar mijn mening, juist de combinatie van deze 'enkelvoudige' methoden tot een 'meervoudig' analytisch perspectief die cruciaal bleek in het volledig en diepgaand doorgronden van het geluidbeleid. De toegevoegde waarde van het gebruik van meerdere perspectieven en analysemethoden wordt ook door andere academici onderkend, maar desondanks lijkt een algemeen geaccepteerde wetenschappelijke methode te ontbreken. Het voordeel van verschillende invalshoeken is dat meerdere verklarende factoren voor stabiliteit of dynamiek in het geluidbeleidsdomein en in andere (milieu)beleidsdomeinen geïdentificeerd kunnen worden. Opgemerkt moet worden dat deze verklarende factoren vaak wel context- en beleidsdomein afhankelijk zijn; de in dit onderzoek gehanteerde verklarende factoren zijn derhalve niet uitputtend of altijd in gelijke mate relevant.

De empirische analyse betrof voornamelijk een kwalitatief onderzoek van de belangrijkste geluidbeleidsonderwerpen gedurende de afgelopen decennia betrof. Interne validatie in dit type onderzoek is kritisch; daarbij is triangulatie door middel van documentanalyse, interviews en – in de effectiviteitanalyse – kwantitatieve analyse cruciaal en daarom zoveel mogelijk uitgevoerd.

Aanbevelingen voor onderzoek

In (milieu)beleidsonderzoek raad ik vooral het gebruik van meerdere benaderingen, theorieën en daarmee verbonden analysekaders aan om diepgaand en gefundeerd inzicht te verkrijgen in beleidsdomeinen in algemene zin en in de verklarende factoren voor beleidsdynamiek, beleidsprestaties en -resultaten.

Daarnaast kunnen dergelijke studies de door mij toegepaste en ontwikkelde analysekaders en mijn methodologische keuzes valideren en verbeteren. Interessante onderzoeksvragen zijn in hoeverre de in dit proefschrift geïdentificeerde factoren, als verklarende factoren voor (gebrek aan) veranderingen in sturingsarrangementen, tevens in andere beleidsdomeinen voorkomen. Oftewel: in hoeverre zijn de verklarende factoren beleidsdomeinspecifiek dan wel generiek?

Ten aanzien van geluidbeleid, stel ik vooral vergelijkende landenstudies voor, om het inzicht in de verklarende factoren voor stabiliteit of dynamiek en voor de prestaties van het beleidsdomein te vergroten. Tenslotte kan de analyse van praktische voorbeelden en uitvoering van geluidbeleid op decentraal niveau bijdragen aan een beter begrip van de (lokale) succesfactoren voor een effectief geluidbeleid.

Reflecties

In dit proefschrift is het Nederlandse geluidbeleid in de periode 1970 tot 2010 onderzocht. Sinds 2010 wordt er gewerkt aan wat wordt gezien als een fundamentele herziening van de Wet geluidhinder, onder de naam Swung (een acroniem van Samen Werken aan de Uitvoering van Nieuw Geluidbeleid). Het doel van Swung is het voorkomen van negatieve gezondheidseffecten veroorzaakt door de autonome groei van verkeer via de introductie van een nieuw beleidsinstrument - het zogenaamde geluidproductieplafond. Daarnaast moet de herziening van de wet leiden tot een vereenvoudiging van het geluidnormenstelsel en van de procedures rondom ruimtelijke ordening en infrastructuur.

In mijn professionele werk als leidinggevende van het bureau geluid van de DCMR Milieudienst Rijnmond ben ik nauw betrokken bij het Swung proces. Aangezien, naar mijn mening, veranderingen in het geluidbeleid nodig én mogelijk zijn om tot 'gezond beleid' te komen, rijst de vraag hoe het huidige Swung discours te begrijpen in relatie tot hetgeen in dit proefschrift geconcludeerd is. In de Epiloog constateer ik dat er – nog steeds – geen verandering in het beleidsdomein plaatsvindt; nieuwe ontwikkelingen zoals Swung volgen het beleidspad zoals dat in de jaren zeventig van de vorige eeuw is gestart. Er is echter een aantal voorzichtige aanwijzingen van dynamiek in het geluidbeleidsdomein met betrekking tot probleemdefinities en actoren.

Om deze eerste aanzetten tot een verbeterd geluidbeleid te faciliteren, beveel ik de volgende randvoorwaarden aan: (i) borg het beleid via multi-level en multi-sector sturingsarrangementen; (ii) institutionaliseer beleidsgericht leren tussen publieke, private en NGO actoren in werkgroepen en andere 'werkvormen'; (iii) implementeer nieuwe beleidsinstrumenten zoals regulerende en economische instrumentenmixen die specifiek het autogebruik adresseren; en (iv) ontwikkel nieuwe probleemdefinities en waardesystemen zoals 'soundscape' of 'beleving van het geluidklimaat' die de mens en zijn/haar beleving van de leefomgeving en gezondheid centraal stellen en de positieve waarden die mensen aan geluid en stilte geven benadrukken.

Curriculum Vitae

Miriam Weber was born in Osterode am Harz, Germany, on April 21, 1967. She grew up in Appingedam, the Netherlands, where she completed secondary education at the RSG Ommelander College in 1985. She studied Semitic Languages and Cultures during three years at the University of Groningen, though decided to shift to her childhood interest in nature and environment after the birth of her second child in 1992. During her study Environmental and Nature Science at the Open University she worked as a consultant advising European, national and local public sector on a broad range of environmental domains. Her main topic was capacity building and implementation of European and national environmental regulations and policy such as environmental permitting and enforcement. She attained her Master degree in 2003 on a study on the EU Water Framework Directive and the policy instruments addressing eutrofication of the Eem- and Gooi lakes.

Since October 2007 Miriam is managing the noise department of DCMR Environmental Protection Agency of the Greater Rotterdam Area; in this function she is involved in the review and implementation of European noise policy and regulations, the development of new national noise legislation (Swung) and advising local politicians on noise policy. Furthermore she is member of board of the Dutch Noise Abatement Society (NSG) and of the editorial board of the noise journal 'Geluid'. Miriam worked since 2008, in parallel, on her PhD study on noise policy in the Netherlands at Utrecht University.

Publications

Andringa, T., Weber, M., Payne, S., Krijnders, J.D., Dixon, M., Van der Linden, R., de Kock, E. and Lanser, A., 2013. Positioning soundscape research and management, Journal of the Acoustical Society of America, 134(4), 2739-2747.

Jabben, J., Weber, M. and Verheijen, E., 2010. Low frequency noise in the Rijnmond, 39th International Congress on Noise Control Engineering 2010, 2550-2559.

Weber, M., 2009. Urban development in the port area of Rotterdam: Challenging noise constraints, 8th European Conference on Noise Control 2009, Proceedings of the Institute of Acoustics 31 (PART 3).

Weber, M. and Jabben, J., 2010. An indicator for area specific noise impact: Gden, 39th International Congress on Noise Control Engineering 2010, 2051-2060.

Weber, M. and Luzzi, S., 2010. Quiet areas: Turning missed opportunities into enhancing soundscapes?, 39th International Congress on Noise Control Engineering 2010, 2550-2559.

Weber, M., 2010. Quiet urban areas in Rotterdam: Enhancing soundscapes? in Axelsson, Ö. ed. Designing soundscape for sustainable urban development (at http://www.soundscape-conference.eu).

Weber, M., 2010. Richtlijn Omgevingslawaai: een Europese oplossing voor de gemeentelijke geluidshinderproblematiek? (in English: Environmental Noise Directive: a European solution for municipal problems caused by noise pollution?) in Goedings, S., Perton, E., Vermeer, L. eds. Europese milieuwetgeving en decentrale overheden: Van beleid en recht naar de praktijk via de onderhandelingstafel (in English: European environmental regulations and decentralised authorities: From policy and law to the local practice via negotiations), Den Haag: Sdu.

Weber, M., 2011. The soundscape of quiet urban parks in Rotterdam: Assessment and review of research approaches, 40th International Congress and Exposition on Noise Control Engineering 2011, 4007-4015.

Weber, M., 2011. The next steps in soundscape research: The search for standardized approaches in a study of quiet urban areas in Rotterdam, Proceedings of Forum Acusticum, 2019-2024.

Weber, M., 2011. A new area-based noise indicator Gden: Assessing noise annoyance in residential areas, 40th International Congress and Exposition on Noise Control Engineering 2011, 3428-3434.

Weber, M. and Driessen, P.P.J., 2010. Environmental policy integration: the role of policy windows in the integration of noise and spatial planning. Environmental Policy and Planning C: Government and Policy, 28(6), 1120-1134.

Weber, M., Driessen, P.P.J. and Runhaar, H.A.C., 2011. Drivers of and barriers to shifts in governance: Analysing noise policy in the Netherlands. Journal of Environmental Policy and Planning, 13(2), 119-137.

Weber, M., Driessen, P.P.J., Schueler, B.J., Runhaar, H.A.C., 2012. Variation and stability in Dutch noise policy: an analysis of dominant advocacy coalitions. Journal of Environmental of Environmental Planning and Management, 56(7), 953-981.

Weber, M., Driessen, P.P.J., and Runhaar, H.A.C., 2013. Evaluating environmental policy instruments mixes: A methodology illustrated by noise policy in the Netherlands. Journal of Environmental Planning and Management, online DOI 10.1080/09640568.2013.808609.

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Alhoewel dit proefschrift het resultaat is van 'weekend discipline' hebben mijn team (het bureau Geluid van de DCMR Milieudienst Rijnmond) en vele geluidexperts in Nederland en daarbuiten, mijn doordeweekse dagen gekleurd en georchestreerd als een boeiend empirisch schouw- en luisterspel. Ik prijs mezelf gelukkig onderzoek te hebben mogen doen naar een beleidsdomein waarin ongekend gepassioneerde en maatschappelijk gedreven professionals werken. Dank aan jullie allen voor het bieden van een veilig empirisch speelveld, en van de ruimte om deelgenoot van en soms zelfs even 'policy broker' in het geluidbeleidsdomein te zijn.

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Als laatste, maar niet minst belangrijke, enkele woorden tot Ruud. Het combineren van een veeleisende leidinggevende functie, een promotie onderzoek en ons gezin met drie, inmiddels jong volwassen, fantastische kinderen, was een uitdading en bij tijden 'pittig'. Dat ik dit heb kunnen volbrengen, is vooral te verklaren door de ruimte, steun en aandacht die jij continue, ruimhartig geboden hebt. "Dank je wel" zeg te weinig…….

Utrecht, oktober 2013