



The Sound of Silence

Research into a pleasant acoustic living environment

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PREFACE

Dear reader,

With this thesis '*The sound of silence*' I will be finishing my master Environmental and infrastructure planning at the University of Groningen. After six years of dedication, this is the final straw of my life as a student. The subject of sound has interested me ever since I moved from a silent small town area to the buzzing city of Groningen. Where the composition of sound is totally different, yet no one seems to be surprised by the sirens, the screaming drunks or the singing birds. One thing I know is that decibel measures do often not equal the feelings people have towards the different sounds in their living environment. Interesting for me it was to see what the citizens of the Netherlands value as a pleasant acoustic environment, where are the bottlenecks and where the opportunities lay.

While finishing this thesis, one thing I know for sure is that if I ever have to write another thesis, it will be on mailboxes. I have never seen nor touched so many mailboxes in my life and truly, I think I might have become some sort of expert on the design and logistics of these mailboxes. And I believe people think too lightly about this matter.

Before you continue I want to thank some people who have made it possible for me to spread the 4000 questionnaires among these mailboxes; my parents, Anja Boekenoogen, and Melissa Dokter. Thank you for your miles. Also I would like to thank Gerrit Jan Dijkgraaf for his faithful trust in my work and his support. Next to this I also want to thank Claudia Yamu for supervising and encouraging me throughout the process. Lastly I want to thank Witteveen en Bos for the opportunity they have given me, to work on this subject and the use their full resources and knowledge. And of course all the respondents who have taken time to fill in the questionnaire.

I hope you enjoy reading this thesis.

Liesbeth de Vries
August, 2016

ABSTRACT

The increasing level of humanity accompanied with an increasing level of human activities has led to a new level of noise exposure that can be considered as a form of invasive environmental pollution (Farina, 2014). This is a growing problem, which has not only been noticed on a regional level but also by the European legislation. Currently in Europe alone it has been estimated that approximately 80 million people within Europe endure noise levels that are considered to be unacceptable (Gidlöf-Gunnarsson & Öhrström, 2007). In the Netherlands the importance of sound in relation to the perceived quality of the living environment remains underexposed (RIVM, 2010). The focus in practice and government still remains on the regulatory approach by means of legislation, standardization and noise abatement (Rehan, 2015). Yet the reduction of sound and noise levels does not always lead to a more positive perceived sound or living environment. The contrary has been observed, the lack of sound can even lead to anxiety (Stockfelt, 1991, in: v.d. Bosch, 2015). The question raised in this research is thus, how the citizens of the Netherlands value their acoustic living environment. What does their acoustical environment look like, what are their acoustical preferences and do they experience hindrance in their daily life. It was also investigated what the respondents perceive as a pleasant acoustic environment and what we should change in order to come to this. These questions were investigated by means of a case study in three neighborhoods in the city of Heerenveen. 140 respondents have filled in the questionnaire. The people of the investigated areas overall value the soundscape of their living environment positively. People value the natural sounds the highest and also see this as an important part of a pleasant acoustic environment. Traffic on the other hand is seen as a dominant sound source that cannot be fully removed, but does dominate other sound sources in the area and causes hindrance. Other returning sources of hindrance are the highway and the neighbours. From the responses it can be concluded that a pleasant acoustic environment includes way more than acoustical properties alone. When asking what a pleasant acoustic environment should look like it became clear that the visual aspect of the area, the social cohesion and safety of the area contribute to how the pleasant acoustic environment is perceived. It also has become clear that removing dominant hindering sound sources is only part of a solution. When investigating the preferences of the respondents and the different scenarios it became clear that silence is not the most desirable option. People do prefer the sounds of liveliness and to a certain degree accept the sounds that according to them belong to a city living environment.

Keywords: Acoustic environment, living environment, noise, hindrance, soundscaping, sound

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"Soon silence will have passed into legend. Man has turned his back on silence. Day after day he invents machines and devices that increase noise and distract humanity from the essence of life, contemplation, meditation... tooting, howling, screeching, booming, crashing, whistling, grinding, and trilling bolster his ego. His anxiety subsides. His inhuman void spreads monstrously like a gray vegetation."

- Jean Arp, 1886 –1966 -

1 INTRODUCTION

1.1 Inducement

We live in a rapidly urbanizing world, currently 54% of the world population is living in urban areas. So for the first time in history more people are living in urban areas than in rural areas. The world population will remain to live predominantly within urban areas as the global urban population is expected to increase to 66 % in 2050 (United Nations, Department of Economic and Social Affairs, 2014). In some countries this number is even higher. In for instance countries as the United Kingdom and the Netherlands nearly 90% of the population lives in suburban or urban areas (Irvine et al., 2009; Central Intelligence Agency, 2014). These urban areas are vivid places, where many different functions, activities and networks come together. But with these areas becoming denser and highly populated the social and environmental impact also increases (United Nations, Department of Economic and Social Affairs, 2014). City planning is therefore more needed than ever before in order to manage urban areas in the appropriate way. Problems as air-pollution, nitrogen dioxide, traffic congestions, social issues and nuisance are not uncommon issues (RIVM, 2008a). In this research we will focus on the last one; the notion of sound.

The increasing level of humanity and also increasing accompanying human activities lead to a new level of noise exposure that can be considered as a form of invasive environmental pollution (Farina, 2014). Not only our lives are becoming busier, also our environment is becoming more loud and noisy, experts have even called silence the new luxury. It has been estimated that approximately 80 million people within Europe endure noise levels that are considered to be unacceptable (Gidlöf-Gunnarsson& Öhrström, 2007). Therefore different organizations are pleading for a more pleasant acoustic environment. The Gezondheidsraad (2006) for instance advocates the creation of more quiet areas as the lack of noise is found to have beneficial health effects. According to them noise will expand further over the Netherlands, and quietness and silence will disappear if no policy efforts are made within spatial planning.

1.1.1 Problem statement

Noise pollution is a growing problem for human societies. Where our societies and economies grow and urban growth spreads our society and our surroundings are becoming more and more penetrated with sound, noise and its consequences. But our acoustic environment is of great importance to our wellbeing. It can have positive as well as negative impacts on our wellbeing. On the one hand it can have a recovering function on our system, but on the other hand it can have detrimental health consequences (Farina, 2014, RIVM, 2010). For our minds and bodies to recover a sense of wellbeing of our busy daily lives relaxation and reflection is necessary, this can be accomplished within a quiet and tranquil environment. Yet this type of surrounding is not always available to us (Farina, 2014, Kaplan 1995). Across Europe there are concerns on national, local as well as personal levels that 'noise pollution' is becoming an increasing problem that affects the livability and wellbeing of urban places (Irvine, 2009). Noise pollution is in urban areas one of the main sources of citizen dissatisfaction (Farina, 2014). Due to the growth of not only anthropogenic noises but also due to the accompanied mechanical noises a search for a more quiet and pleasant sound environment has gained more priority within our societies (Farina, 2014). Yet where this more comfortable acoustic environment gains more priority it is still at its starting point. In general there is a rather large unawareness within our society about the importance of sound in relation to how the quality of a place and a good living environment is perceived. In practice and governance the focus still remains on the regulatory approach by means of legislation, standardization and noise abatement (Rehan, 2015). Many local authorities have created a set of noise regulations. Also on European level directives were made in order to facilitate member states to create action plans to tackle the noise problematic (European Parliament, 2002). However recent research has proven that reduction of sound levels does not automatically lead to a better acoustic environment in urban areas (Yang & Kang, 2005). People are no decibel meters, but do perceive sound and add a value judgment (v.d. Bosch, 2015).

1.1.2 The case of the Netherlands

In this research the situation of Netherlands will be investigated. The Netherlands is rather small but densely populated country. As said 90% of the Dutch population lives in urban or sub-urban areas with an urbanization rate of 1.05% per year (Central Intelligence Agency, 2014). The country has a high population density of 501 people per square kilometer in 2014. Especially compared to other surrounding countries in Western Europe as Germany with 232 people per square kilometer, the United Kingdom with 267 people per sq km and Belgium with 371 people per sq km (The Worldbank, 2016). Just as many other countries the Netherlands currently experiences the problematic of more urbanization and growing economics. Due to high population density, rapid urbanization and the accompanying growth of traffic, the noise exposure is only expected to rise (RIVM, 2015). Many living areas in the Netherlands experience environmental problems, of which nuisance is one (RIVM, 2008a). Almost at every moment of the day and at every location in the Netherlands there is the constant sound of human activities (RIVM, 2015). Today one of the main sources of nuisance in the Netherlands is the exposure to traffic noise (RIVM, 2015). So far not much research was done on the meaning of sound, silence and a pleasant acoustic environment within the Dutch system (RIVM, 2010). Also in the Netherlands the importance of sound in relation to the perceived quality of the living environment remains underexposed (RIVM, 2010). To connect to the European guidelines it is important to not only look at what can be done by means of reductive methods but also to see what is wanted and needed by society in order to create a better understanding of the representation of the sound environment (Rehan, 2015). As said reduction of noise levels does often not automatically lead to a better acoustic environment (Yang & Kang, 2005). Some cities in the Netherlands currently are trying to work towards a healthier living environment in their city in order to create a more livable city and to create a city of knowledge exchange. The Dutch government has established a program called *'the smart and healthy city'*, to encourage cities to become healthier and more livable. Also creating a pleasant acoustical environment plays a major role in establishing these more healthy cities (Rijksoverheid, 2015).

1.2 Research questions and design

Therefore the aim of this research is to investigate what the citizens of the Netherlands value to be a pleasant acoustic living environment within the urban residential landscape and what the perceived value of a pleasant sound environment is. It is also investigated how we can use this in urban planning and what role urban planning can play in establishing this. The answers to these questions can help us make better decisions for our (future) living environment and urban livability. This will be researched by means of a case study within the city of Heerenvveen. In order to come to the research objective, the following research question and sub-questions will be investigated:

'How do the citizens of the Netherlands value their own acoustic living environment and what do they perceive as a pleasant acoustic environment and how can we use this for future references?'

1. What are the implications of sound on the daily life, wellbeing and the quality of the living environment?
2. What are the acoustical preferences and preferred acoustic environments and how are these valued?
3. How do the respondents perceive their own acoustic living environment and do they experience hindrance?
4. What does a pleasant acoustic environment look like according to the respondents and what should be changed within their environment to come to this?
5. And what is the value of silence and a pleasant acoustical environment?

1.3 Structure of this thesis

From this point on a line is set from the introduction of the research towards the final conclusions. Firstly the theoretical framework will be addressed in which an overview is given on the relevant literature on sound and noise, the classification of sound and the perception of sound. After this the consequences and effects of sound and noise in our living environment will be explained. Subsequently the acoustical preferences and the urban soundscape will be explained. In the final paragraph this will all come together in the importance of a pleasant acoustic environment. Following on this the chapter the methodology will be covered. In this

part the procedure of data collection will be explained, the creation of the questionnaire and the valuation of the acoustic environment will be explained. In this chapter also the choice of the case study will be explained and the characteristics of the chosen area will be elaborated by means of an area analysis and an interview with the municipality. After the methodology comes the chapter with the results and analysis. Here the results of the questionnaire are combined and analyzed. Finally the research will be concluded with a discussion and the concluding remarks.

2 THEORETICAL FRAMEWORK

2.1 Sound, Noise and the latter

2.1.1 Sound

Sound is one of the most crucial ways for human beings to perceive and communicate with their environment. The acoustic space has no determined boundaries, compared with the visual, sound is more unfocused and fluid and is less localized and most of all less tangible. It is full of emotion and helps us to get a sense of reality. Sound refers to *'the informative energy that participates in the physical phenomenon of pressure waves of a vibrating object'* (Farina, 2014, p.2). According to the oxford dictionary sound can be determined as *'vibrations that travel through the air or another medium and can be heard when they reach a person's or animal's ear'* (Oxford university press, 2016a). Acoustics on the other hand refers to *'the adjective that refers to every organismic perception, interpretation, and reaction to a sound'* (Farina, 2014, p.3).

Sound is a vibration, which is formed by a sound source that constantly nudges the air, causing compression and expansion of air to arise (air pressure fluctuations) that expands from the sound source. These air pressure fluctuations reach the eardrum through the acoustic meatus of the ear. The vibrations that form in the eardrum, reach the brains via the middle ear, inner ear and the auditory nerve. This leads to the perception and interpretation of the sound (RIVM, 2014b). The air pressure fluctuations that humans are able to hear have a frequency range that varies between 20 vibrations per second (20 Hz) to 20,000 vibrations per second (20,000 Hz.) The frequency range of the air pressure fluctuations determines the perceived pitch (RIVM, 2014a).

The strength of the sound is, also called the sound pressure level, is expressed in decibel (dB). Often the letter A is added which demonstrates that it has been corrected for the sensitivity of the human ear for different pitches (frequencies) (RIVM, 2014b). The sound level is in most cases not constant over time. The average sound level over a period of time is called the equivalent sound level (L (A)eq). Ever since the European sound guidelines were introduced in the Netherlands the exposure to ambient sound is expressed through the day-evening-night level (Lden): The average sound level over a period of day, evening and night (RIVM, 2014a). In Table 1. The indication of the quality of the sound environment for a certain level of Lden can be found. That is based on the cumulative sound impact of road, rail and air traffic (RIVM, 2013).

Lden in dB	Sound quality
<45	very good
46-50	Good
51-55	Reasonable
56-60	Moderate
61-65	Bad
>65	very bad

Table 1. Quality indication of sound. (source: RIVM 2013)

2.1.2 Classifications

Within the terminology of sound many classifications are used to classify environmental sound. The three most commonly used terms are natural sounds, human sounds and mechanical sounds. Natural sounds are sounds that relate to nature as for instance streaming water and birds. Human sounds refer to for instance speech and voices (RIVM, 2010; Yang & Kang, 2007). Lastly mechanical sounds refer to sounds such as cars and constructions. Another more specific classification system is used to compare the visual and acoustical components of a landscape. A landscape in this case is an overlap of biophonies, geophonies and anthroponies. Geophonies are sounds produced by non-biological natural elements, as waves, water,

lightning etcetera. Biophonies are the result of animal vocalization; as for instance bird songs. Anthroponies are produced by human activities and objects made by humans, as for instance technical devices and industries or cafes and conversations (Farina, 2014; RIVM, 2010; Rehan, 2015). Next to these more known classifications other categories have been established. For instance Yang & Kang (2007) address culturally approved sounds as another category that contains church bells, music etcetera which often are thought of having a pleasant connotation (Schafer, 1977 in: Gezondheidsraad, 2006). It is dependent on the contextual as well as visual information on hand which classification but also sub-categories are the most suitable.

Other classifications for sound that have been commonly used were defined by Schafer in the 1960's. These are signals/foreground sounds, keynotes and soundmarks. According to Schafer every place has its own soundscape. Such a soundscape can be seen as an acoustical environment that is perceived by humans in a certain context (ISO, 2014 in: Hong & Jeon, 2015). These soundscapes, according to Schafer, consists of at least 3 components: 1. Keynotes; background sounds that form the base of the soundscape, determining the fundamental tonality. 2. Sound signals: these are foregrounds sounds that are more distinctive and attract attention. 3. Soundmarks; sounds that have a specific meaning for communities and visitors. This concept is in line with the concept landmarks. With these components Schafer already puts down a base for the relationship between sound, the human being and the environment (Yang & Kang, 2007 & Farina, 2014).

2.1.3 Perception of sound

It has been commonly accepted that sound is not only something that can be heard but also experienced and perceived by human beings. According to reference work of Farina (2014) there are three levels of growing complexity by which the sonic environment can be described. The first level consists of the physical properties of sound, as for instance infra- to ultra sound. This is the physical level. The second level contains the physiological perception of the different species. The human perception is for instance limited from 20-20,000 hertz but for other species this might range from 20 – 0.001 hertz. The third level focuses on the interpretation of sound. This interpretation is based on the genetic, cultural and social decodification of these sonic signals. These three levels are schematized in figure 1.

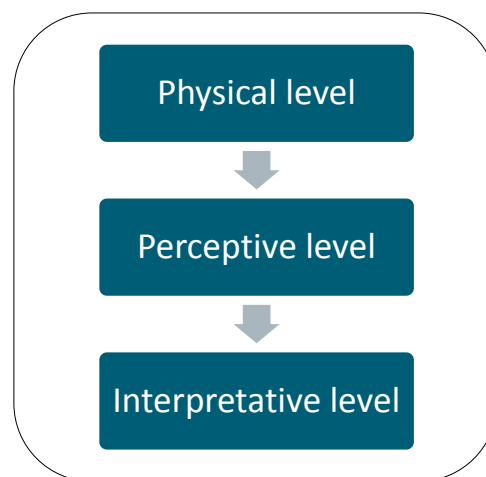


Figure 1. Schematic representation of the three levels at which humans interact with the acoustic environment (p. 109, Farina, 2014).

The reduction of sound and noise levels does not always lead to a more positive perceived sound environment or living environment. The contrary has been observed, the lack of sound can even lead to anxiety (Stockfelt, 1991, in: v.d. Bosch, 2015). What is calculated and what is experienced are two different things. The sound quality of an area cannot only be determined by one simple measurement (Raimbault & Dubouis, 2005). The sound levels and what people perceive and like are not always alike. As an example the city of Amsterdam is one of the cities that is measured to have some of the highest sound levels in the Netherlands but this city is one of the cities with the least noise hindrance experienced (Presentation GGD

Amsterdam at symposium Slimme en Gezonde Stad, 2016). Only one third of the noise disturbances can be ascribed to the acoustics alone. More and more research have shown that it is not only the physical properties of the sound, but the message that is attached to the sound; the meaning that people address to that specific sound, that has the most effects on health (Ising & Kruppa, 2004). People are not decibel meters, but they do give a judgment. A connection can be found between how people feel and how they value the auditory world that surrounds them. It is for instance hard to relax in an unpleasant living environment, as a result people seek quiet and pleasant environments to relax and to recover from stress. It seems thus that the way that people feel is linked to the way they perceive the state of their living environment and their surroundings (Kaplan, 1995, v.d. Bosch, 2015). As is schematized in figure 2 the appreciation of the (acoustic) living environment influences the mood and emotions of its inhabitant, but also the mood of the people influence how they perceive and experience their (acoustical) living environment (Presentation Kirsten v.d. Bosch at symposium Slimme en Gezonde Stad, 2016)

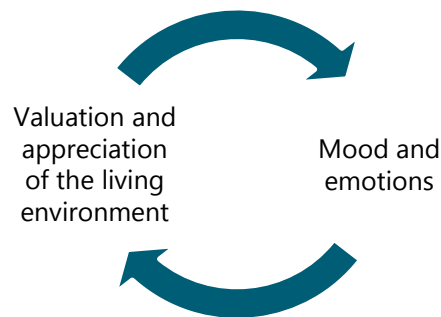


Figure 2. Based on presentation Kirsten v.d. Bosch (2016) at the Slimme en Gezonde Stad Symposium

2.1.4 Noise and hindrance

Where there is sound in general there is also the perception of noise. The concept of noise in urban areas has a long history. Already in the time of the Roman empire chariots were banned from the streets at night as they caused too much noise (Farina, 2014). Noise can be defined as 'A sound, especially one that is loud or unpleasant or that causes disturbance' (Oxford university press, 2016b). The exposure of people to noise effects has dramatically risen over the years. It is estimated that more than 500 million people across the world are being exposed to hazardous levels of noise (Farina, 2014). When looking at Europe he also states that more than half of the European population is living in an uncomfortable sonic environment, 40% of the European population is exposed to levels > 65 dB(A). In total up to 80 million Europeans are affected by an unacceptable level of noise. In developing urban areas this noise pollution is at its worst with people being exposed to a noise level of 75-80 dB (A) 24 hours a day (Farina, 2014). In figure 3. one can see that this is equal to the sound of a B-757 taking off or the sound of a person shouting within 3 ft.

Noise often relates to the human activities such as for instance road traffic, air traffic, industry, civil engineering, recreational activities and outdoor equipment. It can be considered 'as an unintentional sound that masks acoustical signals' (Farina, 2014, p. 144). It is an acoustic energy which masks and interferes with the acoustic landscape. Noise can be generated by a continuous source as running water or a discrete event as lightening but it can also be caused by a more random event, as for instance a claxon or a bell (Farina, 2014). Sound is transformed into noise when we perceive it as an indistinctive and annoying background noise. But also a more near-ground sound that cannot be identified easily can be seen as an unwanted sound. It is a voluntary or involuntary sound that can reduce the correct perception or interpretation of a signal (Farina, 2014). Noise is a hard to define concept that is often used to describe an unwanted sound or anthropogenic sounds. An aspect which also influences whether people find a sound annoying or disturbing lies in whether or not they perceive the sound as wanted or unwanted (Gezondheidsraad, 2006). When looking at the term noise pollution this is described as the negative consequence created by a noisy ambience, which is most often caused by machinery or traffic, this can affect the human as well as on the animal life. Outdoor noise is grasped in general by the word environmental noise (Farina, 2014 & Rehan, 2014).

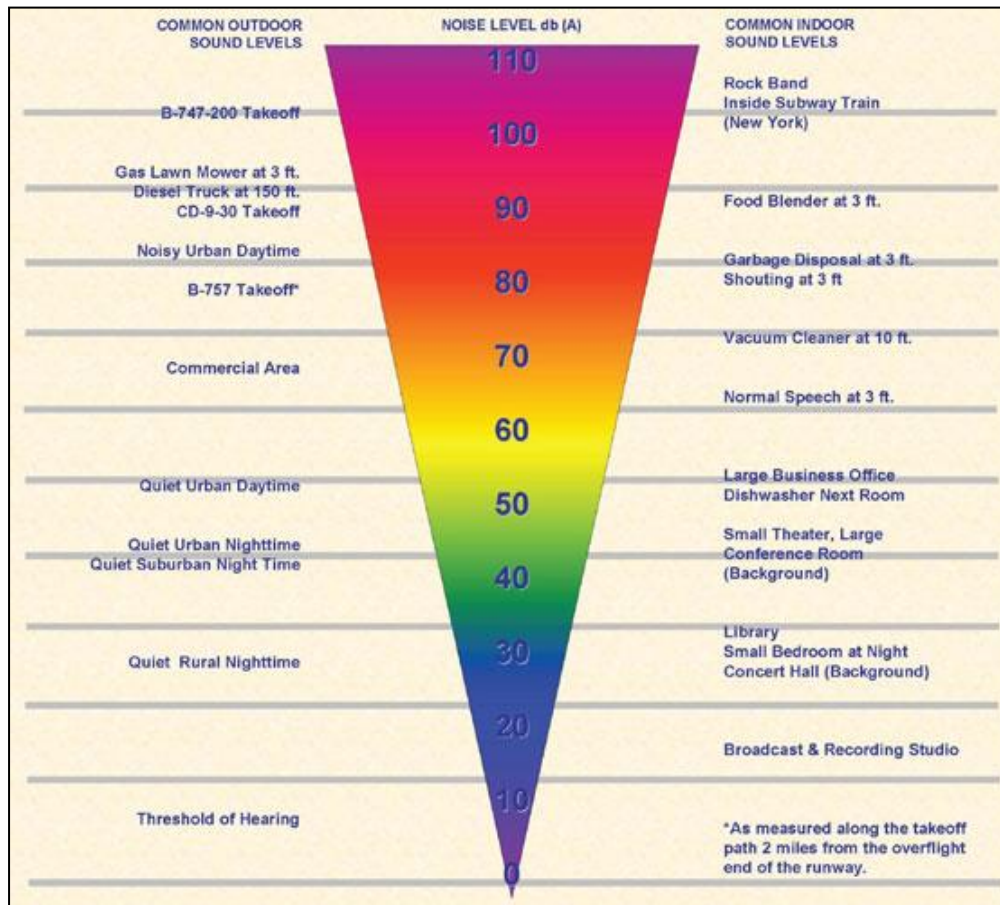


Figure 3. Noise level in decibel. (source: http://www.airportsites.net/lambert-stl/workshop1/grfx/common_noise_levels_b29_sm.jpg)

People in highly urban areas experience the most noise disturbance (Jabaaij, 2005). Within the urban daily life, traffic noise is considered to be the most important source of environmental annoyance (Ising et al., 2004). Also neighbors are a big source of hindrance in urban (but also rural) areas. Many of our cities are filled with a grey ambient noise that fills the areas between the buildings, due to the continuous sound of mechanical noises of cars and industrial activity, but also in many cases the constant anthropogenic sounds as speech and chatter (Yang & Kang, 2007). Noise in urban areas is considered to be a real problem, that is connected to many different aspects of the environment such as the topography of the area, the land use, way of life of the residents and the weather conditions (Farina, 2014).

2.1.5 Voluntary exposure to sound and tolerance

When looking at noise it is important to distinguish between voluntary and involuntary exposure to noise. When it comes to discos, parties or music people are willing to expose themselves to a higher, possibly hazardous, sound level. But when it comes to a busy road people are less willing to be exposed to these sounds. Also in regulations and legislation these varying socially accepted levels should be considered and approached differently (Farina, 2014). Also the meaning that is given to sound can play a substantial role for the reasoning why an individual would expose himself voluntary to possibly hazardous sound-levels. Visitors of a disco for instance experience the higher sound levels of for instance 95 dB to be sensational but also comfortable. The socially and culturally determined attitude towards loud sounds also plays a role when it comes to exposure to high sounds or the lack of protection against these sounds (RIVM, 2010). Also tolerance and habituation play a role. In the Netherlands for instance less than one third of the houses are located in the more quiet areas; areas with a sound exposure of less than 50 dB. Yet more than 75% of the Dutch population, when asked do not experience noise disturbance. They are used to these higher sound levels and experience them as rather normal (Jabaaij, 2005)..

2.1.6 Visual aspect

The human perception is multisensorial. Vision and hearing are connected when it comes to the human perception of their surroundings. They can reinforce each other but also interfere with each other (Carles et al., 1998 & Viollon et al., 2002). Sound can indicate features of the landscape that are not always visible to the eye. From research of Yang & Kang (2005) it was found that sonic and visual components were interlinked. Attention towards the visual aspect reduced conscientious perception of sound and the other way around. This interaction between auditory and visual perception provides people a sense of involvement and can give a more comfortable feeling. The presence of for instance vegetation within a relatively noisy area establishes conditions in which the perceived noise is lowered (Farina, 2014; Gidlöf - Gunnarson & Öhström, 2007).

2.2 Effects of sound and noise

Noise can create tangible (economic) as well as intangible (well-being) losses. It interferes with the communication, recreation, concentration and sleep (Farina, 2014). The impact that noise has on the quality of life has become an important part of urban as well as environmental policy-making across Europe (Irvine et al., 2009). For instance noise of road traffic is on a shared second place with smoking of factors in the physical living environment that cause the most burden of disease in the Netherlands (RIVM, 2014c). Noise can increase the health deficit, specifically in urban areas (Farina, 2014). Noise can create tangible (economic) and intangible (well-being) losses. It interferes with the communication, recreation, concentration and sleep (Farina, 2014). Exposure to (unwanted) sound can have several health consequences. A differentiation can be made between effects on the wellbeing, as for instance nuisance and sleep disturbance, and clinical health effects as cardio-vascular diseases (RIVM, 2014c). Yet both are necessary components to assure the quality of the human life. Next to this noise can have a negative impact on the learning abilities of children. Years of exposure to loud sound levels can cause hearing impairment. Hearing can also become damaged by one acute sound exposure, this is called acoustical trauma (RIVM, 2014c).

Most effects of sound on health are the result of a negative judgment of sound being noise. Exposure to sound can lead to nuisance, sleep disturbance, disturbance of the daily activity and stress-reactions. The effects of noise can at their turn cause high blood pressures, or heightened levels of the stress hormone cortisol which can lead to cardio-vascular diseases for instance. It can also lead to psychological reactions, which can disturb daily activities and conversation and relaxation, it can also lead to direct physiological reactions (RIVM, 2014c). The specific effects on the health are partly dependent on the characteristics of the sound, as intensity, frequency and duration. Next to this also other non-acoustical aspects play a role as for instance context, attitude towards the source of the sound, coping style of the respondent and fear or sensitivity towards the source (RIVM, 2014b, Gezondheidsraad, 2006). In the Netherlands road traffic is the main source of nuisance in the living environment. The consequences vary from nuisance or sleep disturbance to clinical health effects as acute heart attack. It is estimated that approximately 640.000 adults in the Netherlands experience severe nuisance and 290.000 adults experience serious sleep disturbance due to the noise of road traffic. Approximately 84 of the annual heart attacks are related to the exposure of traffic noise (RIVM, 2014c & RIVM, 2008b).

2.3 Acoustical preferences

From different researches it has become clear that people value natural sounds very positively. These sounds often tend to be less invasive and more calming. The human sounds are often considered more neutral these are often more influenced by personal annoyance. The mechanical sounds in contrast are perceived as the most unpleasant. A differentiation can be made between age categories. Where all ages prefer natural sounds, the young people are often more tolerant towards music and mechanical sounds in comparison to the more older people (Yang & Kang, 2007). In table 2. a more detailed overview is shown on the human perception of sounds. The table shows us the classification of sound sources within the city and how these sounds are perceived by people. Are they perceived as pleasant, unpleasant or a third option; unusual (not pleasant, not unpleasant, but not in correspondence with the surroundings). High-pitched sounds, traffic and neighbors for instance are perceived as unpleasant. More regular sounds, lively sounds and natural sounds are perceived as more pleasant. Whereas unexpected and sudden sounds as bells and screaming are not directly perceived as unpleasant but merely as unusual in the current setting (table 2).

	Perception		
	“Unpleasant”	“Pleasant”	“Unusual”
	High-pitched, piercing, strong and continuous or irregular and intermittent	Regular sound that evokes personal memories, entertainment	Unexpected, unknown, strange or foreign; has emotional valences
Background noise	Hum, urban noise	Combination of different sounds, simultaneous	Remote, not identified clearly
Mechanical equipment	Road, railway and aircraft noise. Equipment in large industrial plants and construction sites	Small industrial plants	Alarm sirens, abrupt braking
Human activity	Demonstrations, bells, sirens, trade, household noise (vacuum cleaner, drill)	Noise of small economic activity (workshops, markets), celebrations. State and religious holidays, entertainment	Doorbell, alarm, firecrackers
Noises of nature	Storms, thunders, wind, creaking	Birds, rain	Cracking, implosion, falling down
Human presence	Neighbours (telephone, barking)	Games, crunching, children	Screaming
Speech and communication	Effects of the human body	Voice, music	Discussion

Table 2. Léobon theoretical classification of sources of urban sound (Lebiedowska, 2005)

Linking to table 2. It is important to note that the determination of sounds as ‘pleasant’ or ‘unpleasant’ also has its psychological and emotional background. One of the functions of hearing and sounds is to warn. The safety of our environment can be indicated through our hearing in order for the individual to relax or to tense. This audible safety does not only indicate safety but also normality. The sounds we often perceive to be the most pleasant are the sounds that are normal within our environment. People tend to prefer the songs of birds, soft animal sounds, children and quiet conversations. These sounds are all linked to activities that take place in safety. Non-natural sounds, as for instance traffic and machines distract and interrupt, which makes it hard for humans to establish this audible safety and therefore contribute to sound annoyance. Thus, for a sound for it to be annoying or unpleasant does not mean specifically that it has annoying acoustic properties, but the fact that traffic sound obscures the more pleasant sounds of birds makes that it is experienced as annoying (v.d. Bosch, 2015).

2.4 The urban soundscape

Echoing the idea of Schafer (ISO, 2014 in: Hong & Jeon, 2015) that every place has its own soundscape, the soundscape approach has found its rise. This approach takes the entire acoustic environment into account including its potentially positive and restorative effects on the human health and well-being (Axelsson et al., 2010). The human perspective in this approach plays thus an important role. The ISO and the Handbook for acoustic ecology both define the soundscape in terms as the following: ‘an acoustic environment understood or perceived by people within a specific context’ (ISO, 2014 in: Hong & Jeon, 2015 pp. 78; Axelsson et al., 2010). Soundscaping in general plays an important role in the evaluation of the quality of the environment. It is as Rehan (2015) states: ‘The life of a space that one experiences by listening’. The emphasis lies on the interpretation of sound environment. The soundscape takes the relationship between the individual/personal experience and the subjectivity of the physical and socio-cultural context into account. These soundscapes always vary in time and space (Raimbault & Dubois, 2005). Overall the soundscape researchers argue that the understanding of the acoustical features of a place is of lesser importance than the understanding of how a place influences people emotionally (v.d. Bosch, 2015).

In order to thoroughly understand the soundscape of a place the relationship between the perception of a sonic environment and the context is very important. When looking at the soundscape, the role of the context is relevant as the context influences every element of the acoustic environment. Soundscape studies

thus include not only acoustic elements but also non-acoustic contexts that influence the human perception of the acoustic environment. These contexts include for instance, place/location, non-auditory sensation, socio-cultural factors and personal dimensions. Also landscape factors, visual quality, morphology, and functions of places are closely related to the soundscape (Jeon & Hong, 2015). The soundscape assessments are influenced by the functions of the places. *'If the same sound source exists in a place, the values for that sound source may be differently evaluated depending on the function of a place'*. For instance, a tranquil acoustic environment can be preferred in a place of relaxation, but a more eventful acoustic environment might be preferable in a playground or an inner city centre (Jeon & Hong, 2015).

A soundscape contains a variety of sounds that happen simultaneously or separately at moments in time, these sounds can be positive as well as conflicting. One of its goals is to create a surrounding of high acoustical quality and a varied acoustical landscape that is not covered in dominant sound sources as traffic noise. In the soundscape approach the acoustical surrounding is thus specifically seen as a resource and not only as a waste product. Schafer (1977) has identified two types of soundscapes the ones with high quality tones and the ones with low quality tones. A soundscape of high quality contains almost no hard continuous sounds and only a few mechanical sounds. Only little overlap exists between the foreground sounds, and the other sounds from a wider perspective remain audible. Low quality soundscapes can be connected to industrial and mechanized sounds and its sonic perspective is rather close (Schafer, 1977).

Brown (2014) sees soundscaping as a complementary approach to environmental management. Where the most sound control approaches are focused on hindrance, disruption and negative health effects, the soundscape approach allows as said the differentiation between unwanted and wanted sounds and also focuses on the context and the potential health and well-being benefits. In table 3. one can see the differentiation between the sound control approach and the soundscape approach.

Sound control approach	Soundscape approach
Concerning unpleasant noises	Concerning sound preferences
Measuring integrated sounds (Leq)	Distinguishes between wanted and unwanted noise
Aiming at reducing levels	Aiming at controlling desired sound masking unwanted noise
Sound/noise as a waste product	Sound as a 'resource'

Table 3. Sound control approach versus the soundscape approach (Brown, 2014).

Axelsson, Nilsson and Berglund (2010) have investigated the appraisal of the auditory environment by people and have developed a model which measures the quality of soundscapes. They have concluded that the appraisal by people of their auditory environment is often based on the pleasantness and eventfulness of this auditory environment as is shown in figure 4. In this figure an axis is shown with on the one hand the unpleasant-pleasant continuum and on the other hand the uneventful-eventful continuum. Based on this axis 4 types of soundscapes can be distinguished; Calm, Lively/exciting, Boring/monotonous and Chaotic (figure 4). Where a calm soundscape links to low complexity, this is a stable, consistent and harmonious area with a lot of indications of safety. This includes many natural sounds (open squares) and non-dominant sounds (open circles). An exciting or lively soundscape includes many affordances, it includes a lot of interesting and meaningful affordances and also indicates safety. It often includes many human sounds (filled squares) and some natural sounds (open squares). The chaotic soundscape on the other hand has a high complexity which is rather difficult to understand. It is general not stable for interpretation or indicative of danger. As one can see in figure 4 it includes many technological sounds (filled circles) as well as human (filled squares) and natural sounds (open squares). The last one is the monotonous or boring soundscape. It includes only a few positive or meaningful affordances. It includes only a few sounds sources mainly from technological sounds (filled circles) or non-dominant sounds (open circles) (Andringa, & Lanser, 2013; v.d. Bosch, 2015; Axelsson et al., 2010).

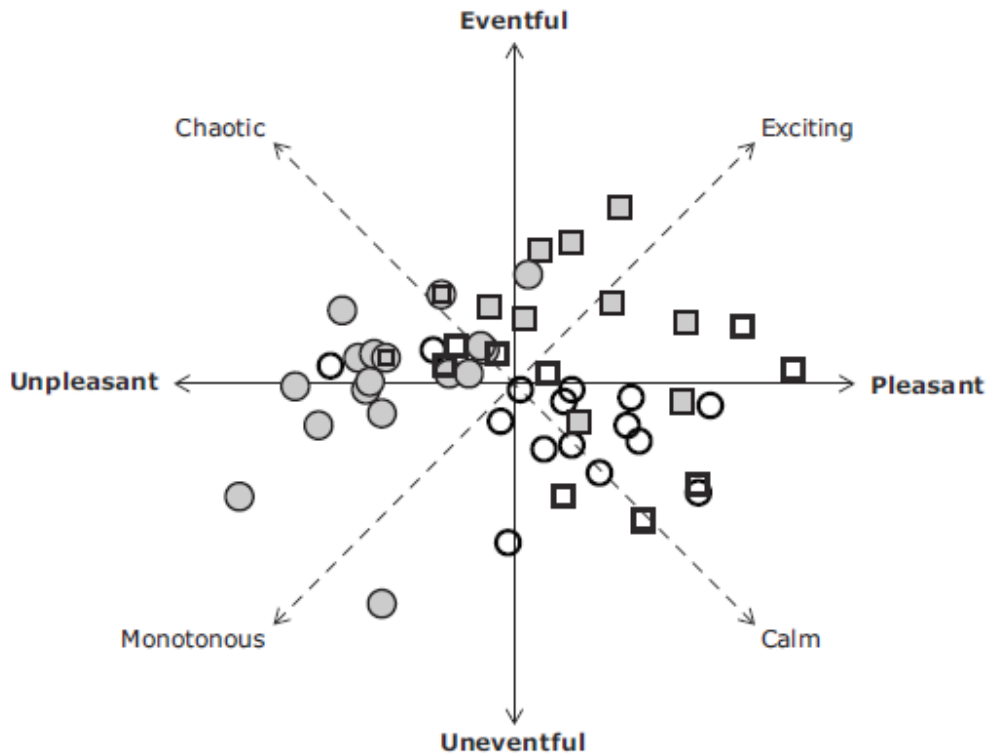


Figure 4. Taxonomy of the soundscapes (Axelsson et. al., 2010)

2.5 Laws and regulations in the Netherlands

Three main laws can be found when looking at a pleasant acoustic environment. The first is the Dutch legislation on noise pollution (Wet geluidshinder) which was revised in 2007. In this law the legislation concerning sound in living areas, urban areas and outer city areas is designated (Overheid.nl, 2016a). This law has limit values for the sound of (rail)traffic and industry. This last one includes all types of activity, also for instance recreational sound. This law uses a bandwidth, depending on the source of the sound between 50 and 75 dB(A) (Gezondheidsraad, 2006). Within the Dutch system another law is relevant which is the Dutch legislation on environmental management (Wet milieubeheer). In this law all legislation concerning sound levels of the railways and national highways and roads are designated (Overheid.nl, 2016b). Thirdly there are the European guidelines 2002/49/EG of the European parliament. These were accepted in 2004 in the Netherlands. These guidelines were established for the evaluation and control of environmental noise. This law includes a more harmonised dosage of Lden. It states that noise pollution in residential areas is an important topic. Also the member states must create strategic noise maps to inventory the sound situation and inform the public about this and to tackle the encountered environmental problems by means of action plans. The member states have their own responsibility to maintain and set Lden sound indicators and legislations and directives within their own country (European parliament, 2002).

2.6 Urban planning/design

When it comes to adjusting the auditory landscape based on the soundscaping research only a few measures are known. It remains often at the smaller interventions at squares, tunnels and parks or by including artistic expressions. The approach of adjusting the sound environment often varies from the placing of regular measures to control sound as for instance sound barriers and absorbers. In some known approaches sounds are added to improve the auditory environment as for instance the sound of water or birds. Other options are the use of special installations for 'sound art' to change the auditory setting and/or distract from the already existing characteristics of this particular auditory environment (RIVM, 2010).

In some other approaches design changes are introduced to change the acoustic environment and the perception of it. This is done through for instance changing the visual features of the area, by changing the

spatial design, or changing the area to a pedestrian area and by recommending facilities that support social interaction. This approach supports thus the improvement of the auditory environment as it changes the perception and the function of an area. This has as consequence that sound sources in a specific area are changed and the infiltration of dominating sounds decreases or that annoying sound sources are masked (RIVM, 2010). The introduction of nature as an example can change the characteristics of an area. Areas that remain loud and noisy can by including nature still be perceived as rather quiet (Gidlöf-Gunnarsson & Öhrström 2007). Locations as parks, recreational areas, shopping area and pedestrian areas are specifically suitable for the above described interventions (Brown, 2014).

2.7 Importance of a pleasant acoustic environment; towards a sustainable future

For us to create a long-term sustainable and healthy urban residential environment it is important to work towards lower sound levels and less annoyance. Not only in inner city areas but also in close neighborhood areas. This is also under scribed by the European Directive 2002/49/EC. Noise pollution by for instance road traffic is a psychosocial stressor that affects the everyday life (Gidlöf-Gunnarsson & Öhrström, 2007). How do people react in environments where wanted or unwanted sounds dominate? Noise can have influence on the communication of people; it makes that people leave social or emotional parts out of the conversation. In research of Appleyard and Lintell (1972, in: RIVM, 2010) and at a later point from Hart (2008, in: RIVM, 2010) it was shown that streets with a lot of traffic have viewer social interactions and friendships than streets that are quieter. Also in the more quiet streets the inhabitants view the street as their own domain. Noted should be that roads in general form a physical barrier and therefore also function as a source of lesser contact. Also noise can generate even more aggression from people who are already aggressive due to another aggressor. This is the result of arousal. Also an environment with a pleasant acoustic connotation can have a restorative function. Not only green features within an environment have a restorative function also the sound of pleased talking people has a soothing, recovering function (RIVM, 2010).

2.8 Conceptual model

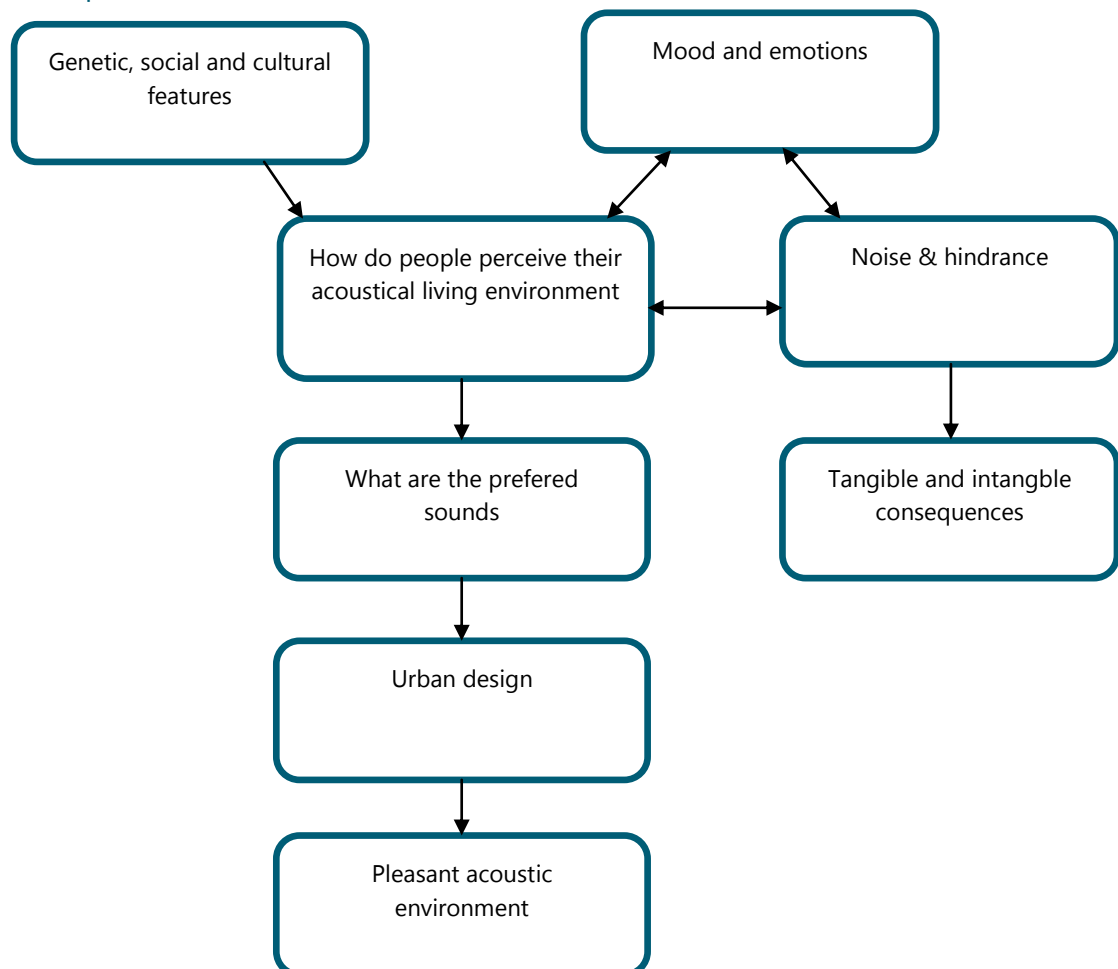


Figure 5. The conceptual model

3

METHODOLOGY

3.1 Research design

In this research it is investigated what the residents of the Netherlands value as a pleasant acoustic environment. First of all a literature review was done on what sound is and what the impact of sound is. How this can influence the wellbeing and what role it plays in our living environment. Within the city of Heerenveen a research was conducted in several residential areas. At these locations a letter was spread with a web-link which lead to a questionnaire that investigates the citizens preferences of their acoustic environment; what does their acoustical environment look like, what should it look like and who is responsible for it. Not only quantitative data is needed on what the sound levels are, but also qualitative data can contribute to the societal meaning of a pleasant acoustic environment or the perception of silence (Gezondheidsraad, 2006). This mixture of methods can help to build a bigger picture, by creating more depth to the numbers given through narratives (O'Leary, 2010). Also the willingness to pay of these citizens for two hypothetical acoustical scenarios was researched. Through conversations and an interview on the 18th of May with the policy advisor on sound of the municipality Heerenveen future and executed plans and possibilities were discussed. Also the bottlenecks when it comes to sound in the city of Heerenveen were exposed. This interview was also used to find suitable questions for the questionnaire that connect to the features of the area, to find the right locations to do the investigation and to get information on the sound exposure levels in the area. In the designated areas a field observation was done to see what the soundscape of the neighborhoods looked like.

3.2 Case study and Research area

A case study has been chosen as research method as this is a more in-depth exploration within a real world context. What specifically defines a case study is the boundary of a case and its singularity (Simons, 2014). This can be done for instance by function, size, or other area characteristics (O'Leary, 2010). In this case the Netherlands and specifically one city in the Northern Netherlands has been chosen as research area, as it is a smaller more comparable area. Because of the possible influences the cultural and environmental setting might have it is not always appropriate to compare different countries or even cities (Yang & Kang, 2005). The research area in which this research will be conducted is the city of Heerenveen. Heerenveen is an average Dutch city located in the Northern Netherlands, as one can see in the figure 6 where the city is encircled in red. The city has 28.930 inhabitants with a population density of 1220 residents per square kilometer. Next to the fact that this city is a representative of the average provincial town it also is crossed by three major sound sources; two highways and a railroad (CBS, 2014).

The focus in this research will lie on the residential areas within the city of Heerenveen. In many cases in the Netherlands road traffic noise is a main source of hindrance (RIVM, 2011). This is also the case for Heerenveen. The city lies on a junction of two adjoining highways, the A7 and the A32. In figure 7 the cumulative noise exposure of this city is shown encircled in red based on the rail, road and air traffic and the industrial sounds. The color yellow indicates a noise exposure up to 90 db, the color dark blue indicates a noise exposure of 30 db. One can see in this figure the contours of both highways, crossing the city both indicated in a yellow color which means that the city has in these specific areas a noise exposure around the 90 db. In a conversation with a policy advisor on the department of sound and spatial planning of the Gemeente Heerenveen on the 18th of May and in previous phone call appointments, several sound problems were identified.



Figure 6. Map of the Netherlands, the location of Heerenveen encircled (Kaartenatlassen, 2015).

Figure 8. shows us that the city of Heerenveen has an average cumulative noise exposure per zip code of 56-65 dB indicated by the orange to red color. Where the green areas have a noise exposure of less than 40 db. This in comparison: Regular exposure to levels above 40 dB(A) already affect the human wellbeing and levels above 60 dB(A) can be considered harmful for our health (Barreiro et al., 2005). This can be linked to the current problematic in the area. According to the policy advisor of the municipality of Heerenveen after upgrading the n32 to a national highway a lot of complaints and dissatisfaction had risen among the citizens. In order to solve these noise concerns an extra high sound barrier was constructed. Yet the situation remains to be a tight spot. Another big complaint source in Heerenveen according to the policy advisor are the neighbors. Next to the A32 highway the neighbors have been for many years one of the main sources of complaints when it comes to noise hindrance. Interestingly the railroad and the A7 (the other highway) do not generate many problems and complaints that is known off.

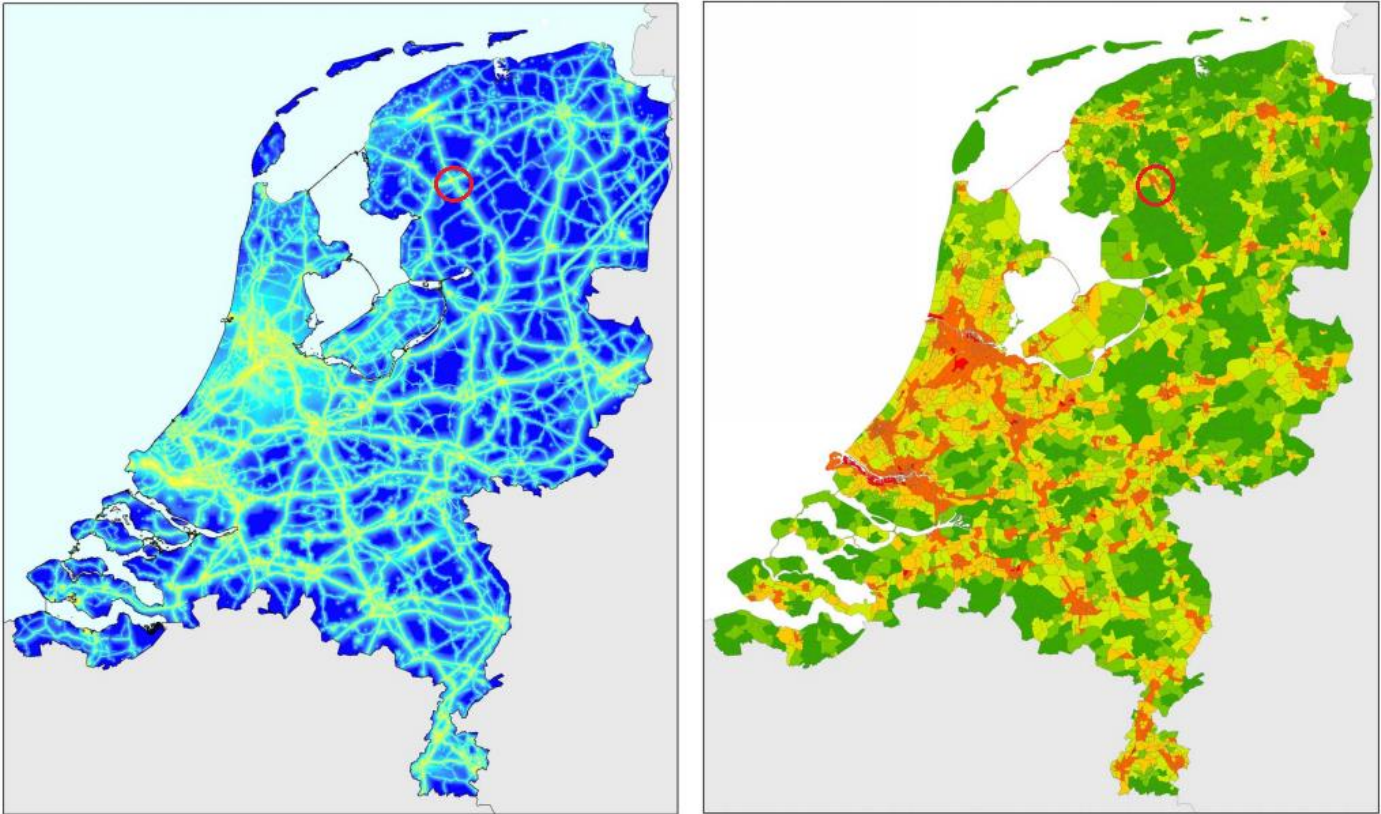


Figure 7. Cumulative noise exposure by road- and rail traffic, air traffic, industries and wind turbines in 2006, Heerenveen encircled in red (RIVM, 2008a)

Figure 8. Cumulative noise exposure per zip code, by road- and rail traffic, air traffic, industries and wind turbines in 2006, Heerenveen encircled in red (RIVM, 2008a)

Three specific adjoining neighborhoods have been chosen that shape a cross-sectional of the city of Heerenveen as is indicated in figure 9. These areas also include the indicated big sound sources of this city: high way and railroad. These three neighborhoods represent the city neighborhood areas of Heerenveen and are all three of a different composition (inhabitant-wise and building wise), but are similar in size. The neighborhoods are framed on the map of Heerenveen in the following figure (9). The first neighborhood is the Greiden. This is a residential area created in the 1970's. It is located next to the railroad and has a lot of facilities and schools. 49% of the houses in this neighborhood are rental, whereas the other half are bought houses. The average worth (woz) of these houses is 140,000 Euros. The second area is 't Hege Midden. This neighbourhood is located next to the city centre. It was built during the midst of the twentieth century. It is located between the railroad and the A32 highway and also crossed by a busy road. In general this area has a bit older inhabitant composition. A high percentage of 66% of the houses are rental houses, the average worth of these houses comes up to 130,000 Euros. The third area is a rather new wide spread neighbourhood of Skoatterwald, built since the end of the 90's up until now. Just as 't Hege midden is this area located next to the A32 (Centraal bureau voor de statistiek, 2014). This area includes a lot of young families and schools. 73% of the housing are own bought houses the average worth of these houses is 253,000 Euros. It should be noted that according to the municipality this neighbourhood specifically has a history of standing up for their rights when it comes to noise hindrance in contrast to the other neighbourhoods.



Figure 9. The three neighborhoods in this case study. From left to right: de Greiden, 't Hege midden, Skoatterwâld.

3.3 Data collection

The focus of this research will be on the citizens of the three designated residential areas. Among these citizens a letter was spread through their mailboxes. This letter included a link on where the questionnaire could be filled in. The letter discussed the purpose of this research, the informed consent and the proceedings of the research. This letter can be found in appendix I. In total almost 4000 letters were spread. A web link was chosen instead of an on paper questionnaire as more citizens could be reached, in comparison to collecting the questionnaires from all respondents by hand. This would take up weeks. The letter also included the possibility for the respondents to contact me, the researcher, if they were willing to further explain their answers for future references. The moments of spreading were selected when there were no big music events in the area. In Heerenveen in the spring period this is a common phenomenon, but having these loud events nearby at the moment of spreading the questionnaire it might influence the answers given by the respondents. As these events are not a regular appearance in the neighbourhoods but do have a big influence on people's acoustical environment it could incorrectly influence the answers given (Departement Leefmilieu, Natuur en Energie, 2007).

3.4 Questionnaire

By means of a questionnaire the opinions of the citizens of Heerenveen were measured about what they perceive as a pleasant sound environment and how they value this and on how their own living environment can be improved according to them (the questionnaire can be found in Appendix II). The program 'Survio' was used to build the questionnaire and website where the questionnaire could be filled in and to storage the gathered data. This program also provided the possibility to skip or exclude questions when they were not relevant to the respondent. For instance if one had no hindrance of noise, he did not have to answer the questions on what specific element causes his hindrance. A questionnaire as method has been chosen as a range of individuals are asked the same questions and the answers they give can represent a bigger population in comparison to interviews, also questionnaires can be conducted in a confidential or anonymous way (O'Leary, 2010). This questionnaire has a quantitative as well as qualitative character, in order to not only generate data that can be representative for a bigger group but also data that says something about the narrative and value behind the chosen answers. This means that a combination of open and closed questions will be used. The ideal situation is to seek societal representation amongst your research population. But in reality this is not practical, in most cases you will come across specific groups in a bigger quantity than others (O'Leary, 2010).

The questionnaire consists of questions of general component as for instance, age, gender, usage of their surroundings, living situation, education, zip code etcetera. Also questions leading to the respondents view on the importance of the sound environment, their overall feeling about their connection to the neighborhood, were used to have them get familiar with the subject. The next step, are the questions on their preferences and perception of their own acoustic environment, which sounds they hear, prefer and on the overall soundscape of the area. Also questions were asked about hindrance, who is responsible and how they perceive their own responsibility. Finally the question was asked what a pleasant acoustic environment looks like according to the respondents. These questions are more thoroughly explained in sub-paragraph 3.4.1. Also a part of the questionnaire is a social cost benefit analysis which will give insight on how the respondents value silence and a pleasant sound environment and how much this is worth to them. This will be explained further in the sub-paragraph 3.4.2. The answers from the questionnaire will be gathered and analyzed in SPSS. As many explanatory questions were open questions these will be coded as presumed interview data as with coding in SPSS a lot of data will be lost. One of these coded open questions has been included in appendix III as an example to show how the coding for all the questions is established. Many of the answers given by the respondents are follow up answers to previous questions and therefore are more narrative stories about their own living environment instead of short general answers. This has as consequence that these answers cannot be expressed in number but will be used as statements.

3.4.1 Preferences and perception on silence and a pleasant acoustic environment

Different researches, mainly located in the United Kingdom, Singapore and France have done research on acoustical preferences. A lot of these researches concerning sound have had their focus on the evaluation of urban soundscapes, urban open places and silent areas. In the Netherlands, with regards to questionnaires on the topic sound, most research is done on noise nuisance and in most cases concerning especially noise

nuisance of road traffic (RIVM, 2011). Recently the Quadmap project was published (QUADMAP, 2015). This project had as objective to develop a methodology for the selection, the assessment (by means of qualitative and quantitative parameters) and management of Quiet Urban Areas (QUADMAP, 2015). Within this project several case areas have been tested, including Rotterdam. For this project also a questionnaire was developed. In this questionnaire questions about the acoustic environment were asked. It included questions regarding the sounds that can be heard and how these sounds are experienced (pleasantness and intensity). It also included questions on how the acoustic environment can be improved and also questions about the usage and the general quality of the area and their overall feeling and connection to the area (QUADMAP, 2015). These specific questions on the soundscape were also used in this research to determine what the acoustic environment in the three neighborhoods looks like and what the respondent's perception on their environment and specifically their acoustical environment is. Within the terminology of sound many classifications are used to classify environmental sound. As discussed the three most commonly used terms are natural sounds, human sounds and mechanical sounds (RIVM, 2010; Yang & Kang, 2007; Rehan, 2005; Farina, 2014). The questions regarding the sound preferences were based on this distinction. Also the soundscape scheme (figure 4) of Axelsson et al. (2010) was used to get insight in the general soundscape of the respondents. The questionnaire was also presented to the policy advisor of the municipality of Heerenveen and together with him the questions were linked to what the municipality of Heerenveen thought was interesting to gain knowledge in.

3.4.2 Social cost benefit analysis: contingent valuation method

A social cost benefit analysis is an integrated assessment tool through which all current and future societal pros and cons - in other words; welfare effects - of a spatial intervention are being weighed against each other by expressing them in money. When the benefits are bigger than the costs a project is socially responsible (Ruijgrok et al., 2004). There are though, goods that cannot be priced/valued directly as for instance nature, environment, water and in this case silence and a pleasant acoustic environment. A way to give value and to monetize these non-priced products is the contingent valuation method (CVM). This method values changes in nature and environment based on public perception and public appraisal of these changes. The economic appreciation of a change in nature or environment in this method takes place within a hypothetically created market where individuals are able to indicate themselves how much a change in environment is worth to them. Individuals, residents or visitors of areas will be asked about their perception and their willingness to pay for a specific change in nature or environment (Ruijgrok et al., 2004). In many cases, also in this case, a hypothetical scenario is used, as the real markets or scenarios are non-existing or not yet developed (King & Mazzotta, 2000). CVM is a social survey method which means that individuals are being asked about their perception and validation of changes in nature and environment by means of a questionnaire (Ruijgrok et al., 2004). A few studies already have investigated the value of noise reduction by means of CVM (Barreiro et al., 2005).

In this research in consultation with the social cost benefit expert of Witteveen en Bos it was chosen to use scenario's where people can choose how they value two different sound scenarios and whether or not they are willing to pay for such a scenario. The respondents were given two tastes as one would say. As this research investigates the pleasant acoustic environment, two trends in sound environments were suggested. A more silent acoustic environment and the other a livelier acoustic environment (see the results for a through description). As in general the approach on environmental sound is focused on the reduction of sound it is interesting to investigate to what extent sound should be reduced. In planning we try to eliminate harmful sounds and this is important. The pleasant sounds should dominate but often this is not the case and the focus remains on eliminating unpleasant sounds, but where is the line? What is pleasant and preferred? Silence is seen as something we should work towards to, something that becomes rare and something that we should have. But on the other hand the elimination of noise can lead to anxiety, as the most present acoustical anchors have disappeared and all that is known with that also disappears (Stockfelt, 1991). Also the reason behind the choices is investigated. The answering type is open questions to give people the choice how much money they want to contribute and what is in their opinion a valuable contribution. Researching this is not explicitly about the money but about the willingness to contribute to a scenario as well as about what do people want to see and why. In the creation of the questionnaire it has been kept in mind that people need to have to possibility not to answer the question and why and also they had to be reminded of the other options they could spend their money on (Departement Leefmilieu, Natuur

en Energie, 2007). A CVM is not without criticism as it is questionable whether or not it can generate valid economic values. But if the questionnaire complementary to the CVM complies with several conditions, it is a valid method to gain economic values. Yet one should keep in mind that biases can appear when the willingness to pay is estimated which can never be fully excluded. It is based on asking people questions and not their actual behaviour. (Departement Leefmilieu, Natuur en Energie, 2007; King & Mazzotta, 2000).

3.5 Ethics

When working with humans the ethical perspective should always be considered. In the case of this research questionnaires will be conducted and possibly one or two interviews. For these methods it is necessary that the respondents are aware of the informed consent and they therefore fully understand their requested involvement in the research. Also one has to make sure no harm comes to your respondents and also to make sure that the identity of those providing the data for your research is protected. This means that the data, especially for the survey method, is confidential; all data that can be identifying should only be for the eyes of the researcher (O'Leary, 2010). If different stakeholders are involved, as might become the case in this research, one should also consider the different interests of these different stakeholders and be careful with the statements made that might be harmful for a specific group.

4 RESULTS

4.1 General descriptives

In total nearly 4000 questionnaires were spread among the in chapter 3 designated neighbourhoods. In the period of June 29, 2016 until July 25, 2016, 140 questionnaires were filled in. The response rate therefore was around the 3.5 %. Per neighbourhood approximately the same amount of questionnaires was spread. From the 140 questionnaires 40.7% of the response came from Skoatterwald, 20.7% of the response came from 't Hege midden/Heerenveen midden and 54 questionnaires (38.6%) came from the Greiden.

The average age of the respondents is 52 years old but the distribution of the respondents is distributed normally with a few extremes in the ages end 60's begin 70's. The largest group that has filled in the questionnaire is the two person households with 41%. After this comes the families with young children and the single person households. More than half (51.8%) of the respondents has had a higher professional education. 114 respondent are currently living in a house they own and 24 are renting a property. On average people have been living in their house for 14 years. The average years the respondents have been living in the neighborhood they are currently living in is 15 years.

4.2 The soundscape and acoustical preferences

In order to get a general perception on what the respondents acoustical environment looks like and how they perceive it the respondents were asked to answer whether or not the acoustical environment of their living area and their neighbourhood was good. Also whether or not the current sounds fit the area. 84% of the respondent thought the acoustic environment in their living environment was good. 64 % thought the acoustic environment in their neighbourhood was good. And up to 70% thought the sounds in his or her living environment fitted the area.

The respondents were also asked about the general sound environment of their living environment based on the soundscaping approach. Figure 10 shows us how the respondents perceive their sound environment. On the right side one can see the more pleasant acoustic qualities of the sound environment whereas on the left side one can see the more negatively perceived aspects of the sound environment. In general the respondent's city neighbourhood scape is rated merely as positive. The general response is that the soundscape of the three neighbourhoods in Heerenveen are rated as safe and as non-threatening, the sounds are in correspondence with the area and are pleasant and continuous.

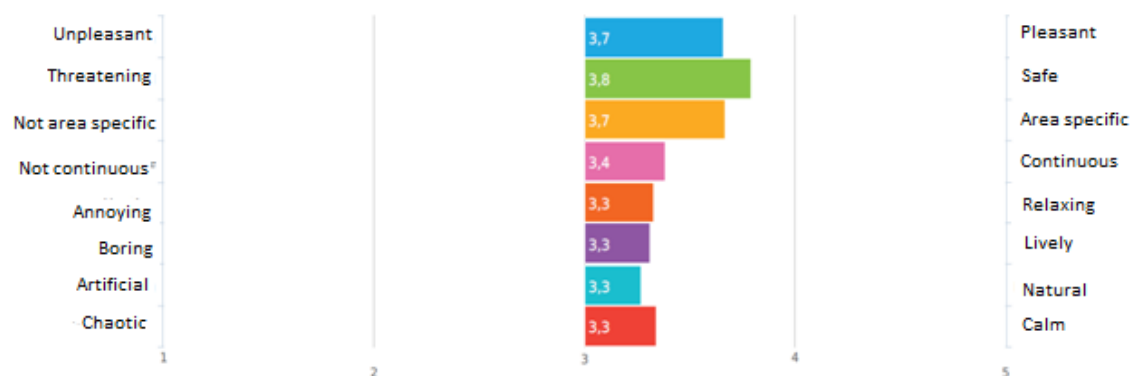


Figure 10. Description of the general acoustics of the living environment

But when looking more closely whereas the means do not differ that much the spreading of the answers differ quite distinctively. So what do these numbers say about the neighbourhoods specifically. In table 4 we can see that 't Hege midden scores on all aspects a little bit lower than the other two neighbourhoods. Especially on the unpleasant/pleasant, annoying/relaxing and the chaotic/calm spectrum, where they tend towards the unpleasant, annoying and chaotic realm. On the boring/lively spectrum on the other hand they

score a bit higher than the other areas. This is in line with that specific neighbourhood as it is a more vivid part of the city, located near the city centre. Yet with a more vivid and busy inner city area also more unpleasant or annoying sounds can be encountered.

Neighbourhood		Unpleasant - Pleasant	Threatening - Safe	Not area specific - Area specific	Not continuous - Continuous	Annoying - Relaxing	Boring - Lively	Artificial - Natural	Chaotic - Calm
Skoatterwald	Mean	3,89	3,81	3,72	3,47	3,54	3,16	3,26	3,68
	N	57	57	57	57	57	57	57	57
	Std. Deviation	,994	1,260	1,098	1,071	1,019	,922	1,203	1,121
Hege midden	Mean	2,97	3,72	3,38	2,93	2,79	3,48	2,90	2,76
	N	29	29	29	29	29	29	29	29
	Std. Deviation	,944	,922	1,147	1,100	,861	,688	,817	1,123
De Greiden	Mean	3,80	3,91	3,81	3,43	3,37	3,43	3,43	3,31
	N	54	54	54	54	54	54	54	54
	Std. Deviation	,998	1,217	1,150	1,057	1,087	,838	1,126	1,241
Total	Mean	3,66	3,83	3,69	3,34	3,32	3,33	3,25	3,35
	N	140	140	140	140	140	140	140	140
	Std. Deviation	1,043	1,175	1,132	1,085	1,048	,852	1,113	1,211

Table 4. Acoustics per neighbourhood

The respondents were asked to describe for different sounds how intense they experienced them in their living environment and whether or not they experienced them as pleasant or unpleasant. The natural sounds in general but also wind, birds and water itself are perceived as pleasant to very pleasant according to the respondents. They are on the other hand not experienced very intensely in all three neighbourhoods. The human sounds, including yelling and the sound of children are also not very intensely experienced. Human sounds are perceived as neutral by the respondent. But the sounds of children are perceived more neutral tending towards pleasant in comparison to yelling which is merely perceived as unpleasant. Traffic sounds in general and also cars and scooters are perceived as unpleasant. But they are experienced only a little intense, especially not as intense as one would imagine as traffic is a main source of hindrance. The train is perceived as neutral but is also not intensely experienced in the living environments.

Interesting it is to see how close the different means per neighbourhood are to each other (see table 5). No big differences can be found between the perceived intensity and the perceived pleasantness between the different neighbourhoods. Only a few slightly bigger differences can be found. For instance in 't Hege midden, which is located near the city centre, yelling is experienced a bit more intensely than in the other two neighbourhoods. Also in Skoatterwald, a neighbourhood with a lot of children, especially in comparison to the other neighbourhoods, the sound of children is experienced a bit more intensely than in the other areas. The traffic sounds are experienced more intensely in the city like area of 't Hege midden than in the other two areas, nature on the other hand is in this area experienced less intense in comparison to the other two neighbourhoods.

Neighbourhood		Road traffic intensity	Road traffic pleasantness	Car intensity	Car pleasantness	Train intensity	Train pleasantness	Scooter intensity	Scooter pleasantness	Construction intensity	Construction pleasantness	Sirens intensity	Sirens pleasantness
Skoatterwald	Mean	2,04	2,78	2,08	2,84	1,10	3,36	1,63	3,02	1,50	3,08	1,79	2,85
	N	51	54	50	55	51	50	51	53	52	52	53	52
	Std. Deviation	1,058	1,040	1,140	1,085	,861	1,156	,848	1,168	,852	1,026	,817	,916
Hege midden	Mean	2,52	2,48	2,65	2,43	1,96	3,24	2,23	2,70	1,96	2,74	2,00	3,00
	N	25	23	26	23	25	21	26	23	26	23	26	23
	Std. Deviation	1,122	,730	1,263	,728	1,098	,768	1,366	,926	1,148	,689	1,265	,426
De Greiden	Mean	2,12	2,87	2,12	2,85	1,36	3,30	2,19	2,62	1,46	3,02	2,02	3,02
	N	52	48	52	48	50	46	52	47	50	48	52	48
	Std. Deviation	1,263	,890	1,149	,875	,776	,785	1,358	1,054	,908	1,021	1,163	,887
Total	Mean	2,16	2,76	2,21	2,77	1,37	3,32	1,98	2,80	1,58	2,99	1,92	2,94
	N	128	125	128	126	126	117	129	123	128	123	131	123
	Std. Deviation	1,162	,937	1,182	,956	,787	,953	1,208	1,091	,952	,971	1,057	,833

Humans intensity	Humans pleasantness	Yelling intensity	Yelling pleasantness	Playing children intensity	Playing children pleasantness	Nature intensity	Nature pleasantness	Wind intensity	Wind pleasantness	Birds intensity	Birds pleasantness	Water intensity	Water pleasantness
2,04	3,33	1,75	2,57	2,41	3,40	2,49	4,39	2,37	4,11	2,63	4,43	1,52	4,04
52	51	51	54	51	52	49	56	49	55	49	56	50	54
,969	,766	1,017	1,175	1,169	,913	1,175	,652	1,112	,896	1,093	,735	,995	,846
2,12	3,04	2,08	2,57	1,72	3,50	1,77	4,22	1,74	4,04	2,23	4,44	1,32	3,68
26	23	25	23	25	24	22	27	23	26	22	27	22	25
1,107	,767	1,152	1,037	,980	1,142	1,193	,934	1,096	,774	1,193	,698	,646	,748
1,98	3,14	1,70	2,41	1,89	3,60	2,21	4,47	2,20	4,33	2,50	4,54	1,57	3,92
49	49	50	49	47	48	48	51	46	52	46	50	44	48
1,031	,866	1,165	1,059	,983	,765	1,091	,644	1,147	,678	1,188	,613	,950	,846
2,03	3,20	1,79	2,51	2,07	3,50	2,24	4,39	2,18	4,18	2,50	4,47	1,50	3,92
127	123	126	126	123	124	119	134	118	133	117	133	116	127
1,015	,809	1,105	1,101	1,095	,906	1,164	,714	1,137	,796	1,149	,681	,918	,832

Table 5. Intensity and pleasantness of the different sounds per neighbourhood

4.3 Hindrance

In total a little over half of the respondents: 55.7 % said to have noise hindrance at some moments during the day. In the neighbourhoods Skoatterwald and de Greiden respectively 50% and 48% said to have hindrance. In 't Hege midden on the other hand 79% experiences hindrance at some point. The people who experienced hindrance were asked to explain by means of an open question which sounds within their living environment they specifically experienced as hindering. The answers given can be categorized within 8 categories; 1. The highway A32 2. Soccer tournaments and stadiums 3. The neighbours 4. Traffic 5. Youth (nightlife crowd) 6. Festivals and funfair 7. Machinery and garden equipment 8. Children & 9. Construction work (see appendix III).

These eight categories of noise hindrance are present in all three neighbourhoods according to the respondents, except for the train which is only a source of hindrance for the respondents specifically living near the railway in 't Hege Midden. But there is some differentiation in the frequency and specifics per neighbourhood. Nightly activity of youth is common in all three neighbourhoods just as traffic noise pollution. Traffic is main reason for hindrance throughout all three areas. Within the general traffic hindrance a special place is assigned to the scooters. These tend to cause a lot of peak noises that disturb. But also neighbours are a main source of hindrance; this includes their barking dogs which cause a lot of disturbance according the respondents. The sound of the A32 highway gives the most complaints in the Skoatterwald area, which is located directly near the highway. 't Hege midden on the other hand even though it is also located near the highway experiences fewer problems with this. This area experiences more hindrance of the festivals and funfairs, but also from the soccer stadium. Also Skoatterwald experiences the sound of the stadium and soccer fields as hindering. Another cause of hindrance that is not so familiar in the literature but that comes back in all three neighborhoods, but specifically in Skoatterwald, are the sounds of garden equipment, whether it is done by the neighbor or by the municipality, it is for a lot of respondents a source of hindrance. *'Mowing the grass and landscaping the park, hindering yet necessary.'* Yelling children is another aspect; this is more common in the area of Skoatterwald that has as discussed a lot of young children. But where children sounds are perceived in above question as neutral to pleasant it here is also a main source of hindrance. One should note that here the sound of children equals yelling. It also should be noted that this part explains the sources of hindrance, but almost 50% of the respondents does not experience hindrance.

The moment when people experience hindrance is often at the rest moments. *'At quiet moments when reading a book or when in conversation with others, in the day time or in the night time when the neighbours are barbecuing'*. These moments are often in the weekend and in the night, at these moments people try to relax in their gardens or at home and experience hindrance more thoroughly. Also when people are trying to sleep. *'When it is nice weather and I want to relax and sit on my balcony. Also at night I cannot sleep with my doors open because of traffic and the trains'*. People thus experience noise the most when they are trying to relax and recover. This is in line with the literature where it is discussed that for our minds and bodies to recover a sense of wellbeing relaxation and reflection is needed, but this is accomplished within a quiet and tranquil environment (Farina, 2014, Kaplan 1995). That is why hindering sounds are experienced more deeply and are seen as more intrusive at these specific moments. Throughout the entire day is also a commonly named answer. When it influences the daily life. *'During the daily life, the entire day'*. It should be noted that some people address some specific noise complaints as the mosque or cars picking up children at school, when experiencing hindrance this happens at the specific moments when the noise is activated.

4.3.1 Is there a solution?

On the question investigating whether or not people believe noise hindrance is a problem that can be solved easily 62% of the respondents did believe this was a problem that could be easily dealt with. But who is responsible to tackle this problem? Multiple answers were possible, as in many cases not one party is responsible on its own. As we can see in figure 11 the municipality can be seen as the one that is mainly responsible for tackling the noise problematic with 76.7%. This is in correspondence with the story of the acoustical expert of the municipality of Heerenveen; in many cases when it comes to noise and sound, the municipality is seen as the direct source to solve the problem. The other often given answer with 46% on who is responsible are we as society should solve this problem. The answers given at the 'other' option are in correspondence with the previously suggested sources of hindrance. The sporting clubs, the police, the letter and the housing corporation. But a returning credo is *'it is the common duty of all'*.

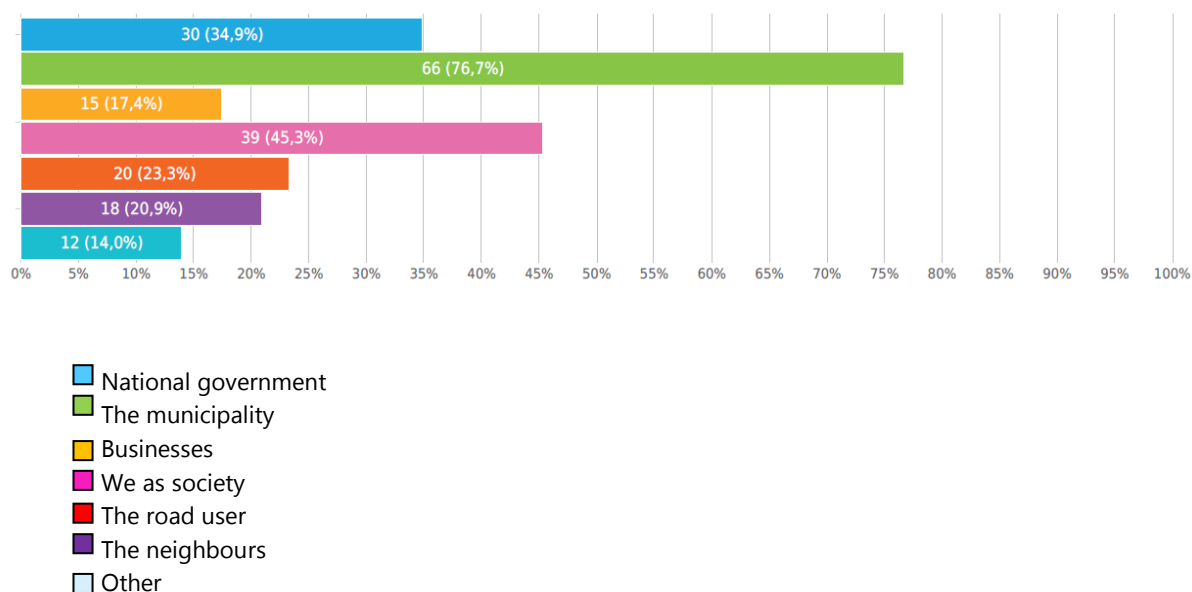


Figure 11. Who is the right party to tackle the noise hindrance problem

Where many of the respondents who do believe that noise hindrance can be quite easily tackled have said that we as society should tackle the noise hindrance problem. Most of the 53 respondents who did not believe the problem can be easily tackled note that we, people, are the reason this problem cannot be easily tackled. According to them sound and noise is something personal that has something to do with experience *'what one experiences as pleasant another can find interrupting'* Also the person who produces the 'noise' often does not see what the problem is or does not experiences this as a problem, *'you don't have any influence on it'*. The realisation is not always there. Another mentioned aspect that correlates to the previous one is that it is hard to grasp *'it does not fit the controllable measures'* and it is just not that easily solved. Also 27% of the respondents believe not important enough to solve and 15% believes it is too expensive to solve.

4.4 What does a pleasant acoustic environment look like

But in order for society to work towards a pleasant acoustic environment we do have to know how this is perceived. First thing to notice in the answers given to this specific question is that people continue with summing up the negative aspects within their environment. Often the elements they have discussed on the 'do you experience hindrance in your daily life' question return in this question. If respondent A experienced leaf blowers as hindering, in some cases respondent A would also answer on the 'what does a pleasant acoustic environment sound like' that such an environment should not include much usage of leaf blowers. One thus could say that often a pleasant acoustic environment is linked to what one sees as negative in his or her daily life sound environment.

The most important aspect of a pleasant acoustic environment according to the respondents is the inclusion of natural sounds. 41% of the respondents indicate that a pleasant acoustic environment should include natural sounds. As for instance birds, water and rain, the rustling of the trees etcetera. But a part of these respondents also indicate that this might not be feasible in a city-like area and think these aspects can be found more easily in rural areas. Added should be that this soundscape should not only exist of natural sounds, but the areas could use some more natural sounds and most important, these natural sounds should not always be overly dominated by the more artificial sounds. *'That you can see and hear nature, birds etcetera without having the sound of trains and the highway dominate this'*. Also to the respondents the sound of nature equals relaxation and rest. There is a consensus that the sounds that belong to the average daily life are a part of the living environment *'Normal sound of traffic and neighbours, so no hindrance of dogs and the bigger traffic roads'*. People accept the sounds of sources as traffic and neighbours, they just do not want them hindering or dominating. Only 4% of the respondents want to see utter silence and *'library level'*.

The sound of traffic still remains something that should not have a place in a pleasant acoustic environment according to the respondents. But in general it comes down to the reduction of traffic sounds as these sounds belong to the city landscape. Key is to not have the traffic sounds dominate the more pleasant sounds. *'Within a city area the right balance between city- and traffic sounds and natural sounds like humans and animals should be found.'* The sound of loud music and loud neighbours has no place in a pleasant acoustic environment. But the softer sound of music and neighbours is on the other hand perceived as merely pleasant. In contrast to what was suggested in the hindrance part the sound of playing children is here seen as a positive sight that improves the quality of the acoustic environment. Especially in the night and weekend there should be no hindering sounds as these are the moment people get their senses back and restore *'During the day the day the normal noises of traffic, children and birds. In the evening and night no hindrance of festivals and funfairs. Give people the rest to get back to their senses from all the business during the day'*.

Another aspect that is highlighted by several respondents is that they link a pleasant acoustic environment to safety. *'An environment where I can feel safe and relaxed. I want to cross the street unthreatened without having hindrance of other people. When I get annoyed, I tend to not feel that well and because of that I can't relax anymore'*. Linked to this insecurity are the properties of the sound. Multiple respondents add that they do not prefer high peaks in the sound environment as for instance loud yelling or sudden hard traffic sound. *'I prefer continuous calm sounds. No peaks. Peaks give me a sense of insecurity'*. Also elements that produce a constant noise are seen as annoying. Every now and then some mechanical building sounds or leaf blowers is fine, yet a constantly dominating unpleasant sound is not valued.

Interesting it is to see that in some cases the visual aspect and the social aspect of an area are linked to the pleasant acoustic environment. Which is underlined by the following quotes: *'Social interaction with the neighbours, also just take each other into account.'* *'Limited traffic, lots of green and water. Architecture that encourages social contact. Shops in the area for the daily needs.'* *'Low rise buildings, no vinex-area, lots of green, 30 km zones, shops in a central position in the neighbourhood, schools at the edge of the neighbourhood. No hospitality industry, no sports-facilities in the close surroundings and isolated houses.'* A pleasant acoustic environment is thus also in the eyes of the respondents more than acoustic properties alone. It can be linked to safety, visual pleasantness and social constructions. This is in correspondence with the soundscape approach which takes the relationship between the individual/personal experience and physical and socio-cultural context into account (Raimbault & Dubois, 2005) and the results of Yang & Kang (2005) that sonic and visual components were interlinked.

4.4.1 What should be changed then

On the question whether or not things should be changed in their acoustic living environment 52% of the respondents indicate that their acoustic living environment is fine as it is. The other respondents want to see some things changed. More than half of them indicate that they want to see things changes traffic-wise. This is a logical response as this is also the main source of hindrance. Returning is also the A32 as a dominant sound source. They also address some solutions to the noise pollution. For instance *'Reducing the maximum speed from 130 to 100 km per hour'*. *'Reducing noise from the A32 by using other asphalt or other sound reducing methods'*. Also often addressed options are better isolation, maximum speed to 30 and more control by the police on for instance scooter drivers. Also including more green areas are addressed as an improvement of the area. And raising children not to yell as much. Again the festivals are a returning subject, of which the noise levels should be reduced. Interesting it is to see in the answers given to this specific question is that most people continue with summing up what should be removed and not what should be added. This complies with the common way of sound reduction, where hindering noises are scaled down or masked. The view of adding pleasant sounds is not yet that common in the area of acoustics and urban planning.

4.5 Who is responsible for our acoustic environment?

When it comes to creating a more pleasant acoustic environment multiple answers were possible. 73% of the respondents believe that we, as society are responsible for creating a more pleasant acoustic environment. 67% of the respondents believe the municipality is responsible and 41% believes also the national and provincial government are responsible. Also the neighbours and road users are both 36 times chosen to be

responsible. This is in correspondence with previous results in this research. Where many respondents have indicated that we as society should try to create a better acoustic environment and should take each other into account: *'take each other into consideration, and don't make noise at the moments you wouldn't like yourself either.'*

But these things are more easily said than done; therefore the respondents were asked if they feel themselves responsible for a better acoustic living environment. Almost all respondents, did not only explain whether or not they felt responsible and why, but also explained how they tried to fill in this responsibility: *'I make sure, even though I am a music lover and often have an open sliding door, that I don't make noise and hinder other people'* or *'Yes, you take other into account when you're having a party, or you notify your neighbours about this.. No honking when driving away... driving away calmly.. Teaching my children not to yell hard outside... Take the neighbours into account when playing loud music.'* But when focussing on how they fill in this responsibility these actions remain in most cases within their own living environment, often even within their own house. This responsibility is often limited to the closeness of the house. Three quart of the respondents indicates that they do feel responsible for a better acoustical environment. They try to take their neighbours into account and the other people in their living environment. *'Yes everybody is responsible for his own living environment and should keep his neighbours in mind and should approach people who conduct anti-social behaviour'*. A lot of the answers come down to *'do not do onto others that which you would not have them do onto you'*. 20 respondents indicate they do not feel responsible for a better acoustic environment. They indicated that they do not cause noise hindrance or are not responsible for the noises people perceive as hindering. The other respondents do not feel the responsibility but do in general make sure they do not cause explicit noise hindrance.

4.6 What is the value of a pleasant acoustic environment?

As discussed in the introduction silence can be seen as the new luxury. But as previous research and also this research suggest people do not specifically prefer silence, they prefer more or less silence when it suits them. And silence should not be total silence. In order to investigate what acoustical scenario really appeals the most to the respondents, they were asked to rate two scenarios on how pleasant they perceive them. In scenario A. all dominating annoying noises in the area will be masked but the sounds belonging to the daily life, as human and natural sounds remain present. With as a result a lively sound environment. In scenario B. a silent sound environment is created where the sounds of most sound sources will be reduced or removed. A silent sound environment with almost none redundant sounds is the result.

Scenario A was valued with an average grade of 7.8. This in contrast to scenario B. which was valued with an average grade of 5.0. When looking at figure 12 and figure 13 it shows us that the spreading of both scenarios are rather different. Scenario A is overall validated positive with only 17 respondents who have graded it with 5 or less. Scenario B. on the other hand has a more equal spreading, only a few have given it a 10 yet all the other respondents have spread their answers. One could say thus that the opinions on a silent scenario as scenario B are more differentiated and indecisive than on scenario A. Where the overall view is merely positive. A silent scenario with almost none redundant sounds is less preferred that the livelier environment where only dominating annoying sounds are removed. Most respondents do want to see some sounds that indicate a vivid sound environment. 98 of the respondents gave scenario A an 8 or higher. In contrast to 31 of the respondents who gave scenario B an 8 or higher.

Answer	Answers	Ratio
10/10 ★★★★★★★★★★	21	15 %
9/10 ★★★★★★★★★☆	26	18,6 %
8/10 ★★★★★★★★☆☆	51	36,4 %
7/10 ★★★★★★☆☆☆☆	20	14,3 %
6/10 ★★★★★★☆☆☆☆	7	5 %
5/10 ★★★★★☆☆☆☆☆	9	6,4 %
4/10 ★★★★★☆☆☆☆☆	1	0,7 %
3/10 ★★★★★☆☆☆☆☆	1	0,7 %
2/10 ★★★★★☆☆☆☆☆	1	0,7 %
1/10 ★★★★★☆☆☆☆☆	3	2,1 %

Figure 12. Scenario A

Answer	Answers	Ratio
10/10 ★★★★★★★★★★	7	5%
9/10 ★★★★★★★★★☆	12	8,6%
8/10 ★★★★★★★★☆☆	12	8,6%
7/10 ★★★★★★★☆☆☆	11	7,9%
6/10 ★★★★★★☆☆☆☆	19	13,6%
5/10 ★★★★★☆☆☆☆☆	18	12,9%
4/10 ★★★★★☆☆☆☆☆	14	10%
3/10 ★★★☆☆☆☆☆☆☆	20	14,3%
2/10 ★★☆☆☆☆☆☆☆☆	11	7,9%
1/10 ★☆☆☆☆☆☆☆☆☆	16	11,4%

Figure 13.
Scenario B

In order to monetize the willingness to pay of the respondents on a yearly basis for these two acoustical scenarios, the respondents were asked whether or not they would and how much they would be willing to pay for each scenario. 45 of the 140 respondents were willing to pay for scenario A. On the question how much they were willing to pay, they were rather indecisive. Many respondents indicated to having no clue, wanted to know the measures to come to this scenario or they assumed they were already paying for such a scenario through municipal taxes. There are though 11 respondents who addressed wanting to pay 50 euro's per year. The other respondents who answered this question do indicated some rather high ranging from 15 euro's to 1000 euro's. But why were most respondents not willing to pay for this scenario? 46% of them indicated they do not experience any hindrance, so there was no reason for paying for another scenario also 36% say they already pay enough taxes and there is no need for extra taxes. In the open answer question they also address that they believe this is normal scenario so no money should be paid for this but also this should be a regular task for the municipality. Also many believe that noise is not a problem that should be solved with interventions but with tackling the social problem. *'I believe that people themselves are responsible, no community money should be spend on this'*.

Only 18 respondents were willing to pay a contribution for scenario B. In contrast to scenario A for scenario B most of the respondents actually indicate that this scenario does not speak to them. Especially compared to scenario A. Which is also suggested by the 5.0 this scenario scored in contrast to scenario A with a 7.8. Again 27% did not experience hindrance. And also the *'I already pay much taxes'* was a common answer. For most of the respondents who filled in the other option *'Too much silence does not appeal to me'* and *'A silent living environment is boring and unnatural'* were occurring answers. To them not all sounds have to be removed especially natural sounds should remain hearable. Also they doubt the feasibility of such a scenario especially within the urban landscape. As only 18 people were willing to pay the answers on the amount were rather diffuse. They ranged from 10 to 500 Euros. 14 of the 18 respondents who were willing to pay for scenario B also were willing to pay for scenario A. Four of them were thus specifically willing to pay for scenario B whereas 31 respondents were specifically willing to pay for scenario A. The respondents were asked if they were certain about their answers on the scenarios. 80% of the respondents were fairly sure to really sure of the answers given when these scenario's become reality. Only six respondents of the respondents who were willing to pay were uncertain about their answers. For both scenarios it has been shown that people who rated the scenario lower than a 4.0 were all not willing to pay for the scenario.

5 DISCUSSION AND CONCLUSION

5.1 Conclusion

In general the respondents value their acoustic environment rather positively, their acoustic environment is perceived as safe, pleasant and fitting the area. As suggested by the literature also in this research the natural sounds are perceived as pleasant whereas the traffic sounds are perceived merely as unpleasant, human sounds remain neutral within this spectrum. All these sounds are not experienced very intense in the three neighborhoods. Yet 56% of the respondents do experience noise hindrance. As already was suggested by the municipality traffic and neighbors remain the main source of hindrance. The moments when people experience hindrance are often the rest moments. These are often in the weekend and in the night, at these moment people try to relax in their gardens or at home and experience hindrance more thoroughly. The municipality can be seen as the one that is mainly responsible for tackling the noise problematic with 77%. This is in correspondence with what the expert of the municipality has told, that in many cases when it comes to noise and sound, the municipality is seen as the direct source to solve the problem. 46% of the respondents believe we as a society are responsible. Yet most of the respondents who did not believe the problem can be easily tackled note we, people, are the reason this problem cannot be tackled easily. According to them sound and noise is something personal and what one experiences as pleasant another can find interrupting.

A pleasant acoustic environment according to the respondents should definitely include (more) natural sounds. But a part of these respondents also indicate that this might not be feasible in a city-like area and think these aspects can be found more easily in rural areas. Most importantly, these natural sounds should not always be overly dominated by the more artificial sounds. Traffic sounds still remain something that does not have a place in a pleasant acoustic environment according to the respondents. But in general it comes down to the reduction of traffic sounds as these sounds belong to the city landscape. Key is to not have the traffic sounds dominate the more pleasant sounds. It can also be concluded that a pleasant acoustic environment includes way more than acoustical properties alone. When asking what a pleasant acoustic environment should look like it became clear that the visual aspect of the area, the social cohesion and safety in correspondence with the acoustics of the area contribute to how the acoustic environment is perceived. This is also in line with the in chapter 2 discussed theories of Raimbault & Dubois (2005) Yang & Kang (2005), Carles et al. (1998) & Viollon et al. (2002). The municipality as well as society should be responsible for the creation of this pleasant acoustic environment. Three quarter of the respondents see themselves as responsible for this pleasant acoustic environment but their responsibility often remains within their own house and backyard. On the question whether or not things should be changed in their acoustic living environment 52% of the respondents indicate that their acoustic living environment is fine as it is. But it may be clear to say when it comes to what people want to see changed in their acoustical environment it all comes back to traffic. As already is suggested in the literature (Yang & Kang, 2007) road traffic remains the main source of noise hindrance which is confirmed in this research.

From the scenarios though it has become clear that an almost silent living environment is not perceived as very pleasant. Most find it unnecessary and unfeasible to remove that much sound from his or her living environment. But removing dominant unwanted sounds and keeping the liveliness of the normal everyday life is perceived as pleasant. This is in correspondence with the soundscape model of Axelsson et al. (2010) where the more exciting soundscapes are located at the pleasant and eventful continuum. A big part according to the respondents on creating a sustainable and pleasant acoustic environment remains however is by taking each other into account. Social control and norms are key in order to solve a great deal of the sound annoyance and hindrance problematic.

'wat jij niet wilt dat u geschiedt doet dat een ander ook niet'
'do not do onto others that which you would not have them do onto you'

5.2 Discussion

In general it can be concluded after analysing the open questions per respondent that when a respondent has a problem when it comes to acoustics they will focus on it continuously. Every next open question is a follow up on the other previous open question. This leaves the researcher with a lot of specific data which cannot be traced back to the respondent only to the living area. Which is the benefit of the questionnaire yet the specific situation of the living environment and personal circumstances becomes secondary. Therefore when you want to gain more specific knowledge of the area other methods as focus groups might be a suitable solution as people get the chance to explain the situation instead of detailing it within four sentences. Suitable would then also be to only do one neighbourhood, it is not feasible in this research to investigate the acoustic scenario for every respondent or every zip code. But when wanting to gain more in depth insight a smaller case would be more suitable. As so many open questions were used, it was hard to code the answers in SPSS without losing data. Therefore the data was analysed by hand, linked to the neighbourhoods and coded as interviews. But no hard statistical analyses were used, as a lot of personal data would be lost. But this method does influence the strength of the data.

In this research it was also investigated whether or not we could monetize the willingness to pay for acoustical scenarios. With only 1/3 of the respondents who were willing to pay for scenario A and 1/8 of the respondents who were willing to pay for scenario B it is not feasible to make hard conclusions about this monetization. Of course some general remarks can be made and it gave us insight in the preferred scenarios. And the respondents were informed about the possibility to invest their money differently and most of the respondents indicated to be rather sure about their answers. But for future references it would be more suitable to create a research that would thoroughly investigate the scenario's and not only as being part of a research.

Also even though Heerenveen is a rather average provincial city, the results cannot all be generalized to the whole of the Netherlands. Yes most of the in this research found validation and pleasantness of the sounds and the sounds that cause hindrance are in line with the literature and therefore possibly also suit other areas in the Netherlands. But Heerenveen with its two highways, soccer stadium and railroad crossing the city, even though these characteristics of course can also be found in other cities, remains a case study. And with the movement of acoustics the situation of an area is a very important feature that should be kept in mind.

5.3 Recommendations for further research

For further research it would be recommended to further investigate into how we can implement the idea of not dominating the pleasant sounds but let the pleasant sounds dominate by means of the soundscape approach. Already research has been done, but it would be recommended to further investigate but also implement this by means of a small case study at which this could be done hands on. As is suggested in this research we as a society in combination with the government are thought to be responsible for creating a better acoustic environment. As the perception of sound and noise is for a great deal influenced by personal experiences and perception it is hard to solve such a problem with hard measures. Therefore the quote *'do not do onto others that which you would not have them do onto you'* is a good starting point. Yet where do you start if the perception of sound has such an influence on how it is experienced but is on the other hand so personal. Further research is needed to investigate how we can use this personal perception to implement this in the practice of acoustics. Also it would be suggested to further investigate, on a more specific scale, the monetizing of sound with a more in depth interview or questionnaire focussing only on trying to monetize the perception of sound.

6

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rijksuniversiteit
groningen

faculteit ruimtelijke
wetenschappen

Heerenveen, 2016

Afstudeeronderzoek en enquête plezierige akoestische leefomgeving 2016

Graag nodig ik u uit om deel te nemen aan een enquête over uw akoestische leefomgeving. Deze enquête behandelt vragen over hoe u als burger van Nederland de geluiden in uw leefomgeving ervaart en waardeert, of u geluidshinder ondervindt, hoe uw geluidsomgeving eruit ziet en waar er volgens u verbeteringen kunnen worden getroffen. In totaal zal deze enquête +/- 10 minuten duren. Deze enquête is opgesteld voor mijn afstudeeronderzoek aan de Rijksuniversiteit Groningen in samenwerking met ingenieursbureau Witteveen + Bos. De enquête bevat geen vragen die u als persoon kunnen herleiden en alle informatie zal vertrouwelijk worden behandeld. Wel kan deze geanonimiseerde data worden gedeeld met de Rijksuniversiteit Groningen en/of andere betrokken, of met geïnteresseerde partijen zoals bijvoorbeeld de gemeente Heerenveen, om zo in de toekomst beter in te kunnen spelen op de wensen van haar bewoners.

Wilt u de enquête online invullen via de volgende website:

<https://www.surveio.com/survey/d/plezieriggeluid>

Mocht u vragen hebben, of mocht u problemen hebben met de weblink dan kunt u contact met mij opnemen via het volgende e-mailadres: liesbeth.de.vries@witteveenbos.com

Wanneer u uitvoeriger uw mening wilt geven over dit onderwerp kunt u contact opnemen met bovenstaand e-mailadres voor meer informatie. Ook wanneer u belangstelling heeft in de resultaten kunt u dit e-mailadres benaderen.

Alvast bedankt voor uw medewerking.

*Met vriendelijke groet,
Liesbeth de Vries, BSc.*

Laatste antwoord

Plezierige akoestische leefomgeving, 2016

Geachte Heer / Mevrouw,

Welkom bij de enquête over een plezierige akoestische leefomgeving voor mijn afstudeeronderzoek aan de Rijksuniversiteit Groningen in samenwerking met Witteveen + Bos. Deze enquête behandelt vragen over hoe u als burger van Nederland de geluiden in uw leefomgeving ervaart en waardeert, of u geluidshinder ondervindt, hoe uw geluidsomgeving eruit ziet en waar er volgens u verbeteringen kunnen worden getroffen.

Deze enquête bevat geen vragen die u als persoon kunnen herleiden. Alle informatie zal vertrouwelijk worden behandeld.

In totaal duurt deze enquête +/- 10 minuten.

Alvast bedankt! Uw reactie wordt ten zeerste gewaardeerd!

Met vriendelijke groet,

Liesbeth de Vries

Vul hier uw wijk en postcode in

Bent u het met de volgende stellingen eens of oneens?

	Helemaal oneens	Oneens	Neutraal	Mee eens	Helemaal mee eens
Ik ben erg betrokken bij de buurt/wijk waarin ik woon	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik ben erg gevoelig voor geluiden	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Een goede geluidsomgeving is voor mij erg belangrijk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik vind de geluidsomgeving waar ik woon goed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik vind de geluidsomgeving van mijn wijk goed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik vind de huidige geluiden in mijn leefomgeving passen bij het gebied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Hoe zou u de algehele geluidsomgeving van uw leefomgeving omschrijven?

	1	2	3	4	5	
Onplezierig	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Plezierig
Bedreigend	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Veilig
Niet gebiedseigen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Gebiedseigen
Niet continue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Continue
Vervelend	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Ontspannend
Saai	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Levendig
Kunstmatig	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Natuurlijk
Chaotisch/Ruuoerig	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Kalm

Geef bij elk geluid aan hoe intens u het geluid ervaart in uw leefomgeving en of u deze geluiden als prettig of onprettig ervaart. U kruist dus per rij 2 vakjes aan.

	Niet intens	Beetje intens	Gemiddelde intensiteit	Hoge intensiteit	Extreem intens	Erg onprettig	Onprettig	Neutraal	Prettig	Erg prettig
Verkeersgeluiden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Auto's	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Treinen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Scoters/bromfietsen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Constructie geluiden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sirenes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Geluiden van mensen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Geschreeuw	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spelende kinderen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Geluiden van de natuur	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wind & bladeren	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vogels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Heeft u in uw leefomgeving op bepaalde momenten last van geluidshinder?

- Ja
- Nee

Welke geluiden in uw omgeving ervaart u specifiek als hinderlijk?

Waarbij hindert u dit en op welke momenten van de dag?

Denkt u dat geluidshinder een goed aan te pakken probleem is?

- Ja
- Nee

Wie is volgens u de juiste partij om dit probleem aan te pakken?

- De nationale en provinciale overheid
- De gemeente
- Het bedrijfsleven
- Wij, als maatschappij
- De weggebruiker
- De buren
- Anders, namelijk:

Waarom is het geluidshinderprobleem moeilijk aan te pakken volgens u?

- Het is te duur
- Het is niet belangrijk genoeg
- Anders, namelijk:

Kunt u de volgende aspecten op volgorde van hoog naar laag zetten naar wat voor u het belangrijkste is in een fijne leefomgeving?

Plezierig sociaal contact	<input type="text"/>
Goede luchtkwaliteit	<input type="text"/>
Geen geluidshinder/fijne akoestische leefomgeving	<input type="text"/>
Verkeersveiligheid	<input type="text"/>
Voldoende parkeerruimte	<input type="text"/>
Schone leefomgeving	<input type="text"/>
Veiligheid op straat	<input type="text"/>

Hoe klinkt/ziet een plezierige akoestische leefomgeving er volgens u uit? Waar zou dit volgens u aan moeten voldoen volgens u?

Wat zou er volgens u moeten gebeuren om de geluidsomgeving van uw leefomgeving te verbeteren?

- Niets het is prima zoals het is
 Het volgende, namelijk:

Wie is volgens u verantwoordelijk voor het creëren van een goede geluidsomgeving en het beperken van geluidshinder?

- De nationale en provinciale overheid
 De gemeente
 Wij, als maatschappij
 De weggebruiker
 De bureu
 Anders, namelijk:

Voelt u zichzelf verantwoordelijk voor een betere akoestische leefomgeving? Leg uit..

De volgende paragraaf beschrijft twee FICTIEVE scenario's. Deze scenario's beschrijven twee mogelijke verbeterde akoestische situaties in uw leefomgeving. Wij vragen u vervolgens of u met de scenario's in zou stemmen, hoe plezierig u deze vindt en of u daar een geldelijke bijdrage voor wilt dragen door middel van belasting.

Scenario A: In dit scenario worden alle overheersende hinderlijke geluiden in de buurt gemaskeerd, maar geluiden die behoren bij het dagelijkse leven zoals menselijke en natuurlijke geluiden blijven aanwezig. Met dus als resultaat een levendige geluidsomgeving.

Scenario B: In dit scenario wordt een stille geluidsomgeving gecreëerd, waarbij het geluid van de meeste geluidsbronnen worden gereduceerd of verwijderd. Een stille omgeving met vrijwel geen overbodige geluiden is het resultaat.

Wees u ervan bewust dat u het geld voor deze belasting ook aan andere dingen kunt uitgeven. Zoals andere omgevingskwaliteiten, maar ook privé-zaken. Het is dan ook goed mogelijk om één of alle vragen met 'nee' te beantwoorden.

Hoe plezierig vindt u scenario A op een schaal van 1-10?

Vraag instructies: *Scenario A: In dit scenario worden alle overheersende hinderlijke geluiden in de buurt gemaskeerd, maar geluiden die behoren bij het dagelijkse leven zoals menselijke en natuurlijke geluiden blijven aanwezig. Met dus als resultaat een levendige geluidsomgeving.*

☆☆☆☆☆☆☆☆☆☆ / 10

Bent u bereid per jaar een geldelijke bijdrage te betalen voor scenario A?

Vraag instructies: *Wees u ervan bewust dat u het geld voor deze belasting ook aan andere dingen kunt uitgeven. Zoals andere omgevingskwaliteiten, maar ook privé-zaken. Het is dan ook goed mogelijk om één of alle vragen met 'nee' te beantwoorden.*

- Ja
 Nee

Welk bedrag bent u bereid om hieraan jaarlijks bij te dragen?

U heeft gekozen geen belasting te willen betalen voor scenario A. Waarom?

- Niet belangrijk genoeg
 Geen geld voor over
 Ik betaal al zoveel belasting
 Niet mijn pakkie-an
 Ik ervaar geen hinder
 Dit scenario spreekt mij niet aan
 Anders, namelijk:

Hoe plezierig vindt u scenario B op een schaal van 1-10?

Vraag instructies: *Scenario B: In dit scenario wordt een stille geluidsomgeving gecreëerd, waarbij het geluid van de meeste geluidsbronnen worden gereduceerd of verwijderd. Een stille omgeving met vrijwel geen overbodige geluiden is het resultaat.*

☆☆☆☆☆☆☆☆☆☆ / 10

Bent u bereid per jaar een geldelijke bijdrage te betalen voor scenario B?

Vraag instructies: *Wees u ervan bewust dat u het geld voor deze belasting ook aan andere dingen kunt uitgeven. Zoals andere omgevingskwaliteiten, maar ook privé-zaken. Het is dan ook goed mogelijk om één of alle vragen met 'nee' te beantwoorden.*

- Ja
- Nee

Welk bedrag bent u bereid om hieraan jaarlijks bij te dragen?

U heeft gekozen geen belasting te willen betalen voor scenario B. Waarom?

- Niet belangrijk genoeg
- Geen geld voor over
- Ik betaal al zoveel belasting
- Niet mijn pakkie-an
- Ik ervaar geen hinder
- Dit scenario spreekt mij niet aan
- Anders, namelijk:

Hoe zeker bent u van de hierboven ingevulde antwoorden, mochten deze FICTIEVE plannen werkelijkheid worden?

- Zeer onzeker
- Onzeker
- Redelijk zeker
- Zeker
- Zeer zeker

Wat is uw leeftijd?

Wat is uw geslacht?

- Man
- Vrouw

Wat is de samenstelling van uw huishouden?

- Alleenwonend
- Tweepersoonshuishouden
- Eénoudergezin, jongste thuiswonende kind onder de 12
- Eénoudergezin, jongste thuiswonende kind 12 jaar of ouder
- Gezin, jongste thuiswonende kind onder de 12 jaar
- Anders, namelijk:

Wat is uw hoogst voltooide opleiding?

- Geen opleiding
- Lagere school
- Middelbaar algemeen voortgezet onderwijs (MAVO, MULO)
- Hoger voorbereidend voortgezet onderwijs (HAVO, HBS, MMS, VWO, Gymnasium)
- Lager beroepsonderwijs (LTS, LEAO, huishoudschool)
- Middelbaar beroepsonderwijs (MBO, MTS, MEAO, MHNO, INAS, VMBO)
- Hoger beroepsonderwijs (HBO, HTS, PA(BO)SA, HLS, HEAO)
- Wetenschappelijk onderwijs (universiteit)
- Anders, namelijk:

Op welke momenten bent u veel thuis en/of in de wijk te vinden?

- In de ochtend
- In de middag
- In de avond
- In de nacht
- Gedurende de gehele dag
- Anders, namelijk:

In wat voor soort woning woont u?

- Flat/appartement
- Vrijstaande woning
- Rijtjeshuis
- Twee onder één kap woning
- Anders, namelijk:

Hoe lang woont u al in deze woning? (in jaren)

Hoe lang woont u al in deze wijk?

In welke categorie valt uw bruto maandinkomen?

- 0 - 1500 euro
- 1501 - 2500 euro
- 2501 - 3500 euro
- 3501 - 4500 euro
- 4501 euro of meer
- Geen antwoord
- Anders, namelijk:

Is uw huidige woning een huur of een koophuis?

- Huurwoning
- Koopwoning
- Anders, namelijk:

Wat is de waarde van uw koopwoning?

- 0 - 50.000 euro
- 50.001 - 100.000 euro
- 100.001 - 200.000 euro
- 200.001 - 300.000 euro
- 300.001 - 400.000 euro
- 400.001 - 500.000 euro
- 500.001 euro of meer
- Geen antwoord
- Anders, namelijk:

In welke categorie valt de huur van uw huurwoning?

- 0 - 250 euro
- 251 - 500 euro
- 501 - 1000 euro
- 1001 - 1500 euro
- 1501 - 2000 euro
- 2001 euro of meer
- Geen antwoord
- Anders, namelijk:

APPENDIX III. OPEN QUESTION CODED AND ANALYZED

Question: Do you experience sound hindrance within your living environment?

Codes:

Sound of the A32 highway
Soccer fields
Traffic
Neighbors
Youth (nightlife crowd)
Mechanical garden and landscaping sounds
Festivals/funfair
Children
Construction work

- Geluid van de weg Leeuwarden-Zwolle is soms een beetje hinderlijk.
- verkeersgeluiden van de A32. Blaffende honden.
- Voetbal (SC Heerenveen)
- 's avonds en 's nachts het verkeer op de auto snelweg - het claxoneren van trucks tussen 23.00 - 07.00. Op bv de snelweg of als teken voor het thuisfront in heerenveen. De geluidsinstallatie van vv heerenveen. Ivm leren kinderen. (Soms als ze veel moeten leren.)Soms tot 22.00 uur.
Er wordt dan soms weer afgesloten met muziek. Het grasmaaien van de burens na 21.00 uur.
Burens die 's avonds hard praten.
- ruzie, stappende jeugd, kinderen die niet ophouden met ruzie of schelden
- Verkeer op de A32.
Dance feest op parkeerplaats Abe Lenstra stadion.
- Snel optrekkende /hardrijdende motoren en auto's. Snel rijdende auto's over de klinkerweg. Zware voertuigen vroeg in de ochtend op de klinkerweg. En een stationair draaiende taxibus vroeg in de ochtend (6.00 uur, 10 min lang)
Bij bepaalde windrichting(en) de geluiden van de rijksweg A32.
- Autoverkeer van de snelweg in de vroege ochtend. Hoewel onze woning zeker 1000 meter van de weg afligt en gescheiden door bossages wordt ik elke dag rond 06.15 uur wakker van de autoruis. Alleen op zondagochtend is het echt natuurstil.
- Geschreeuw in de nacht.
Hard rijdende auto's
Machinale geluiden (metaal slijpen, kettingzaag)
- verkeers geluid en gereedschappen die in de tuin worden gebruikt.
- Verkeerslawaai van de snelweg
- Geschreeuw van jeugd op hangplekken. Bij bepaalde windrichting toch het geraas van auto's over de snelweg.
- zagen van hout voor de open haard e.d.; dat snerpende geluid duurt soms een paar dagen. Gelukkig gebeurt dat maar een enkele keer in het jaar en is van voorbijgaande aard.
- op vrijdag en zaterdag nacht komen hele hordes dronken jongelui uit het centrum al schreeuwend en toeterend door de wijk rijden op weg naar de omliggende dorpen.
Er wordt gebouwd achter in de wijk waardoor er vanaf 7 uur sochtends zware vrachtwagens en trekkers door de wijk denderen met bouwmaterialen.
Bij westen en noordwesten wind kunnen wij de snelweg goed horen, met name 's nachts geeft dit soms overlast.
Tenslotte is het groenonderhoud voor onze deur dusdanig intens dat er elke werkdag , met name in de zomer vanaf 7 uur 'sochtends wel een of ander apparaat gestart wordt, grasmaaier, kantenmaaiers, heggescharen, veegmachines, bladerblazers etc. Dit geeft elke dag weer ergernissen en flinke geluidsoverlast. In de winter zijn het met name de stooiwagens die snachts met veel lawaai de 4 wegen en 2 fietspaden voor ons huis komen bestrooien.
- De snelweg geluiden en treingeluiden bij verkeerde windrichting
- Traktoren Nordwin College.
- Vrachtverkeer
- Kermis, Muziekpodiums etc vooral als de wind noord noord-oost is.
- Elektrische tuinapparatuur, maaimachines e.d.
- Komt af en toe voor...vliegtuig in de nacht die heel veel herrie maakt.

- Carbidschieten in onze wijk (oud en nieuw en met vergunning ..maar alles trilt)
- grasmaaien voor het bijhouden van het park. hinderlijk maar noodzakelijk!
- Bromfiets lawaai, en voetgangers welke dicht achter de tuin langs lopen geven zomerdag hinder
- Als burens feestjes in de tuin hebben en tot laat hard praten en schreeuwen. Als er sirenes voorbij komen op de snelweg of wijk.
- Allebij niet vaak genoeg om echt hinderlijk te zijn.
- Muziek van VV heerenveen zaterdag/zondag morgen vroeg 8.00 uur luid spelend en na een wedstrijd s ávonds 21.30 tot 22.00 uur.
- Harde muziek, scooter/brommer (s nachts), terugkerend uitgaanspubliek
- (2x) Opgevoerde brommers motoren auto's met harde muziek, bassen en dan raam open. Zwaar verkeer zoals vrachtwagens.
- Blaffende honden
- verkeerslawaai, afhankelijk van windrichting A32 en soms maar minder intens A7
- activiteiten in het centrum van Heerenveen en in omgeving Sportstad na 23.00 uur.
- nachtelijk geschreeuw van jongeren op weg naar huis
- electrische klus- en tuingereedschap geluiden
- muziek uit apparatuur (binnen) door openstaande deuren of muziek vanuit de tuin
- geluiden van verkeer (auto's, motoren en brommers), en dan niet zozeer het verkeer op zich maar wel de hoeveelheid verkeer (dit is de laatste jaren enorm toegenomen met de aanbouw van o.a. de nieuwe wijk "Skoatterwald") en het lawaai van de snelheid van het verkeer. Er wordt ontzettend hard gereden (100 km is eerder regel dan uitzondering); vroeger was er in de straat een snelheidspaal, waardoor er nog enigszins rekening werd gehouden met de snelheid, nu is de straat (Burgermeester Falkenaweg een racebaan geworden) waardoor het woonplezier sterk is afgenomen.
- Buren die om half 6 's ochtends opstaan en hard met de deuren en kastjes klappen. En het lopen op laminaat.
- Verkeer, auto's, scooters, personen (praten, luid praten)
- de buurman heeft een zeer overheersende stem (leraar) dus hij praat luid wat over de zomer periode hindelrijk kan zijn.
- Verkeerslawaai, voorbij rijdende auto's, vrachtwagens en als het mooi weer is, motoren die veel te snel voorbij rijden.
- schoolkinderen die de hele dag schreeuwen en krijsen
- auto's en scooters
- Bouwgeluiden van renovate flatgebouw, auto's die te hard riden, roggelende achterbuurman
- De enorme verkeersdrukke als de scholen tegenover mijn appartementen beginnen en sluiten; veel kindjes worden met de auto gebracht, velen komen ook op de fiets en blijkbaar heeft iedereen haas. Het aanbod aan verkeer is veel groter dan de toelidingsroute kan hebben.
- Weekend lang internationaal toernooi voetbal maar dit past bij een voetbalvereniging en het is mooi dat ze het organiseren.
- tuinen heel dicht op elkaar dus je hoort/verstaat burens in tuin letterlijk
- bouwwerkzaamheden Muziek van festival.
- Trein en burens
- Verkeer
- We wonen in een wijk welke nog niet 'af' is. Dus nog veel nieuwbouw, wat gepaard gaat met daarbij behorende vervoer, etc. Is logisch, maar wordt niet alszijnde prettig ervaren, maar hinderlijk.
- De volièrre en klusgeluiden van de burens
- Stadionlawaai, kermislawaai
- Motoren/scooters
- Uitgaansavonden jongeren
- Het janken van de hond van de burens.
- Blaffende honden.
- Schreeuwende jongeren op de fiets.
- Ruziènde burens.
- schreeuwende kinderen
- Jankende kinderen. En dan heb ik het niet over wat geblèr hier en daar, dat hoort bij een jonge wijk. Maar echt BLEEEGHH op volume 110
- Leefgeluiden van de burens achter en naast ons. Ze hebben veel aanloop van vrienden en maken er met zijn allen een gezellige boel van. Zonder rekening te houden met stemvolumes e.d.
- Scooters en brommers, soms spelende schreeuwende kinderen
- tuinzitters s avonds laat

- Snelweggeluid. Crossmotoren
- Met oostelijke wind last van de snelweg. Herrie verplaatst zich over het voetbalstadion en over de tussen liggende woonwijk en over "Friesburg" naar onze tuinen en woningen (zie postcode)
- Momenteel veel last van machines voor grondverzet achter onze tuinen. (incidenteel)
- Trappen op en af rennen en met deuren slaan bij burens
- grasmaaiers, grasblazers, bouwactiviteiten, straatvegers, stoepenschoonmakers, booractiviteiten in flat etc.
- keiharde muziek
- af en toe een trein
- Motor die op hoge snelheid (meerdere keren achter elkaar) langs rijdt
- Bladblazer/automatische heggenschaar 's ochtends (bijna elke zaterdag of zondag ochtend)
- Blaffende honden, schreeuwende mensen, harde muziek, hard rijdende auto's, scooters, brommers
- Alle verkeersbewegingen op de A32.
- omroepinstallaties op nabije sportvelden die de gehele dag (of weekend) staan te schallen voor maar een paar honderd mensen terwijl een hele wijk daar best last van ondervindt, met name in de zomertijd
- treinen
- Festival Heavenly Outdoor. Erg harde muziek, meerdere dagen achter elkaar. Begint soms al in het begin van de middag en gaat tot middernacht door. Inmiddels besloten om volgend jaar tijdens dit festival elders door te brengen.
- Het geluid van de minaret van de moskee op 10 meter van ons huis kan ik soms als storend ervaren. Met name in de zomer als de ramen open staan of ik in de tuin zit. Het volume komt boven de radio uit. Ook als de ramen dicht zijn hoor ik het, maar minder. Eén keer per dag is voor mij het maximum, maar als er 2 keer per dag een oproep tot gebed uit de speakers galmt is dit voor mij te veel. De laatste tijd lijkt dit het geval te zijn.
- 's ochtends vroeg gemeente grasmaaiers, bladblazers en elektrische heggenschaar
- snelweg
- Incidenteel:
 - rijden met crossmotor of motorische skelter in weiland en erf dichtbij.
 - schreeuwende jeugd in weekend uit horeca die hier door de straat fietst
- verkeersgeluiden
- Verkeer (met name door de hoge snelheden die gehaald worden op de Burgemeester Falkenaweg) met name auto's en motoren, geschreeuw in de nacht van stappend publiek.
- Vooral bij Oostelijke / Noord-Oosten wind het continue geluidsniveau van beide snelwegen
- de huizen zijn erg gehorig, werd vannacht wakker van de burens die bezig waren.....
- elektrische grasmaaiers + BLADBLAZERS (kan blijkbaar alleen maar op een mooie zomerdag) en hogedrukspuiten
- Maaiwerk met handmaaier, intensief verkeer snelweg, voetbalwedstrijd die voorafgegaan wordt door muziek via luidsprekers over het veld.
- overlast burens.

