CHALMERS
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Community Noise as a Factor in the National City Planning Process

A review of the municipal work

Master's thesis in the Master's Programme Sound and Vibration

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Department of Civil and Environmental Engineering
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Abstract

During the last couple of years, the importance of noise as a factor in the City planning process has significantly increased. Densifying City centres in order to solve housing shortages increases already high noise levels in relation to existing guideline values.

The European Union has generated a directive for community noise, 2002/49/EC, stating that every City above 100 000 residents shall conduct a strategic noise map and create a noise action plan. The number of cities, or municipalities, in Sweden today affected by the directive are 15 and the number of completed action plans is 12.

Most obvious amongst the results from the study of the action plans together with the conducted interviews is that noise as a factor in the City planning processes is prioritized low. Additional results are for example that inconsistency in regulations lead to discrepancies in the work with noise matters, whereby the need of holistic approaches, resource shortages and the lack of actions against noise emissions from various sources are pointed out.
There is a need of regarding noise as a factor early in the planning phase in order to have a sustainable approach with noise issues in the future planning processes. Solutions could for example consist of inter-disciplinary task forces, acousticians as City planners and adequate resources.

Keywords: Noise, Community noise, City planning, Noise action plans

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Until next time – Ha det gött! / Philip Radtke
Gothenburg, 2016

1 Introduction

A study of how the City planning processes in Sweden are working, with regard to community noise, and being affected by new noise regulations. The thesis focus on noise actions plans amongst the Swedish municipalities and how municipal employees and consultants perceive today's work with community noise.

1.1 Background

On the 1st of June, 2015, the Government in Sweden changed the community noise regulations. By this act, many guideline values were increased in relation to its previous values. Given an example, for small apartments the guideline value was changed from 55 [dBA] to 60 [dBA] at the exposed side (Regeringskansliet, 2015). The change is aiming to promote an increased number of new housings all around Sweden. Processes for decision making and City planning with regards to community noise are now being rewritten, and therefore also in need of an overview.

There are two million people in Sweden, alone, being exposed to sound pressure levels above the old guideline values (Göteborg Stad, 2016). Due to urbanization a larger amount of people will move to the cities and will therefore be exposed to environments with high levels of community noise. The larger amount of people in the cities will also contribute to a higher level of traffic, a level that would likely increase by several percentages the coming years. Community noise in combination with other problems is a serious threat against the wellbeing of the population (Vägverket, 2007).

1.2 Purpose

The purpose of this thesis is to investigate and evaluate the City planning process in Sweden with regards to the factor community noise. Results from the study will act as suggestions on how to improve the processes for future City planning.

1.3 Delimitations

The work related to this thesis will not contain any investigations regarding City planning processes outside Sweden.

1.4 Research questions

- How is the National City planning process, related to community noise, working in Sweden today?
- What role do the factor community noise play in future City planning?

1.5 Method

Literature reviews will be conducted to gain further knowledge in the field of study. This will include literature regarding Sweden's City planning processes as well as its national laws and requirements. To obtain even more understandings about the City planning processes in practice interviews will be conducted. The interviewees will vary amongst consultants, municipal employees and other stakeholders involved in the planning processes.

2 Theory

This section of the report includes theory regarding National City planning processes together with basic knowledge about acoustics. Focus is to provide the reader with basic understanding about the subject for the discussion and conclusion.

2.1 What is sound?

Sound is defined as pressure fluctuations that propagates as waves. Two quantities are used for characterization of sound, frequency, f, and sound pressure, p. The frequency of sound describe the number of fluctuations per second and is measured in Hertz [Hz], hearable frequencies for humans are 20 – 20 000 [Hz]. Sound pressure describes the power of the sound and is measured in [Pa]. The strength of the sound is measured in the logarithmic scale, decibel [dB], and the metric used is L_p. Using a logarithmic scale mean that an increase by 3 [dB] is perceived as doubling the sound pressure (Liljencrants & Lindblad, 2016).

A list with different sound pressure levels in [dB] and real life references based on material by Andersson & Kropp is used to connect the theory and the perceptions of real life. The list is found below and all levels in [dB] are relative to 20 µPa.

- ”0 [dB] – Threshold of hearing”
- ”10-20 [dB] – Silent wood”
- ”30-40 [dB] – Library”
- ”40-50 [dB] – Whispering”
- ”60-70 [dB] – Normal conversation”
- ”80-90 [dB] – Noisy street”
- ”100 [dB] – Allowed equivalent sound pressure level at concerts in Gothenburg”
- ”115 [dB] – Allowed maximal sound pressure level at concerts in Gothenburg”
- ”130 [dB] – Jet take-off”
- ”140 [dB] – Threshold of pain”

(Andersson & Kropp, 2015)

2.1.1 A-weighting

In order to describe how humans perceive sound pressure levels, a weighting factor, A, is used for the frequency composition. The factor takes into account that people are not able to hear low and high frequencies as well as midrange frequencies. The metric [dBA] is often used to describe noise, seen in the table below are different weighting factors (Trafikverket, 2015).

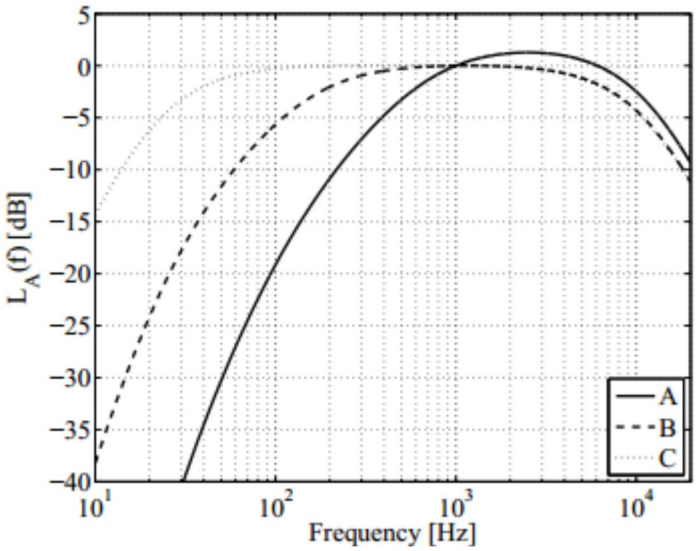

Figure 1: Weighting curves - A, B and C (Andersson & Kropp, 2015).

2.1.2 Definition of noise

Noise is defined as unwanted and disturbing sound. Noise is lowering the environmental quality and could in some cases damage the hearing of the exposed (Lindblad, 2016). Common noise sources that are included in community noise are listed below. Factors that affects the most people are traffic noise and noise from neighbours (Persson, 2014).

Table 1: Common noise sources (Persson, 2014)

Outdoor	**Indoor**
Road, railway and air traffic	Neighbours
Industries	Ventilation systems
Building sites	Other equipment
Restaurants	
Music and sport events	
Playgrounds	
Parking lots	

2.1.3 Metrics

To describe noise sources different indicators are used. The most common ones are found in the table below.

Table 2: Noise indicators

Indicators	Description
L_{eq}	The equivalent level (L_{eq}) is described as the averaged sound pressure levels for a period of time. L_{eq} does not considerate non-frequent sound sources and fast sound pressure variations. (Trafikverket, 2015).
L_{max}	It is the maximum sound pressure level measured in an interval, common is to measure the level when a vehicle passes by (European Environment Agency, 2010).
L_{den}	The average sound pressure level measured during every day in a year. Note, the evening value is reduced by 5 [dB] and the night value by 10 [dB] compared to the day value (European Environment Agency, 2010).

2.2 Health effects

Noise is one of the largest contributions to health effects as it disturbs the daily life. For example, noise is interfering with different activities such as concentration, communication, relaxation and sleep. The effects are not only psychosocial but it is also affecting the public health (Boverket, 2008). The sections below are describing five different effects, based on the publication "Burden of disease from environmental noise" (WHO, 2011).

2.2.1 Cardiovascular disease

Cardiovascular disease is an umbrella term for ischaemic heart disease, hypertension and stroke. Note, there are no scientific results relating noise and stroke.

Evidence have emerged during the last years linking traffic and aircraft noise to cardiovascular diseases. Studies have been conducted on both adults and children with focus on hypertension, mean blood pressure and ischaemic heart diseases to support positive association (WHO, 2011).

2.2.2 Cognitive impairment

Cognitive impairment is defined by Lopez as "delayed psychomotor development and impaired performance in language skills, motor skills, and coordination equivalent to a 5- to 10-point deficit in IQ" (Lopez & et al., 2006).

Conducted studies support the negative effects of noise on children's learning, memory and reading ability. The most affected abilities are reading comprehension, attention and memory; abilities connected to central processing and language (WHO, 2011).

2.2.3 Sleep disturbance

Habituation from sleeping disturbance could occur after several years of exposure, nevertheless not for physiological effects such as increased blood pressure and increased heart and pulse frequency (Boverket, 2008). Listed below are psychological and physiological effects related to noise.

Table 3: Sleep disturbances due to noise (Boverket, 2008)

Sleep disturbances related to noise
Problem of falling asleep
Waking up and changed depth in sleep
Increased blood pressure
Increased heart and pulse frequency
Contraction of superficial blood vessels
Changed breathing
Increased number of movements

2.2.4 Tinnitus

Sound perception that is not due to external sound sources is described with a general term, Tinnitus. Described in auditory terms, it is the inability of experience silence. Research has conducted that Tinnitus annoyance may lead to several disturbances, an excerpt is found below.

- Cognitive effects
- Psychological effects
- Sleep disturbance (WHO, 2011).

2.2.5 Annoyance

People exposed to noise may experience annoyance in different degrees. Research has shown that the annoyance could lead to consequences on humans' emotion and well-being such as anger, distraction and depression (WHO, 2011). Noise affect ways of communicating and performance which leads to annoyance, for example (Eriksson & et al., 2013).

The figure below shows the relation between noise and annoyance in cases with air, road and railway noise. Higher sound pressure levels lead to an increased percentage of annoyance (European Commision, 2002).

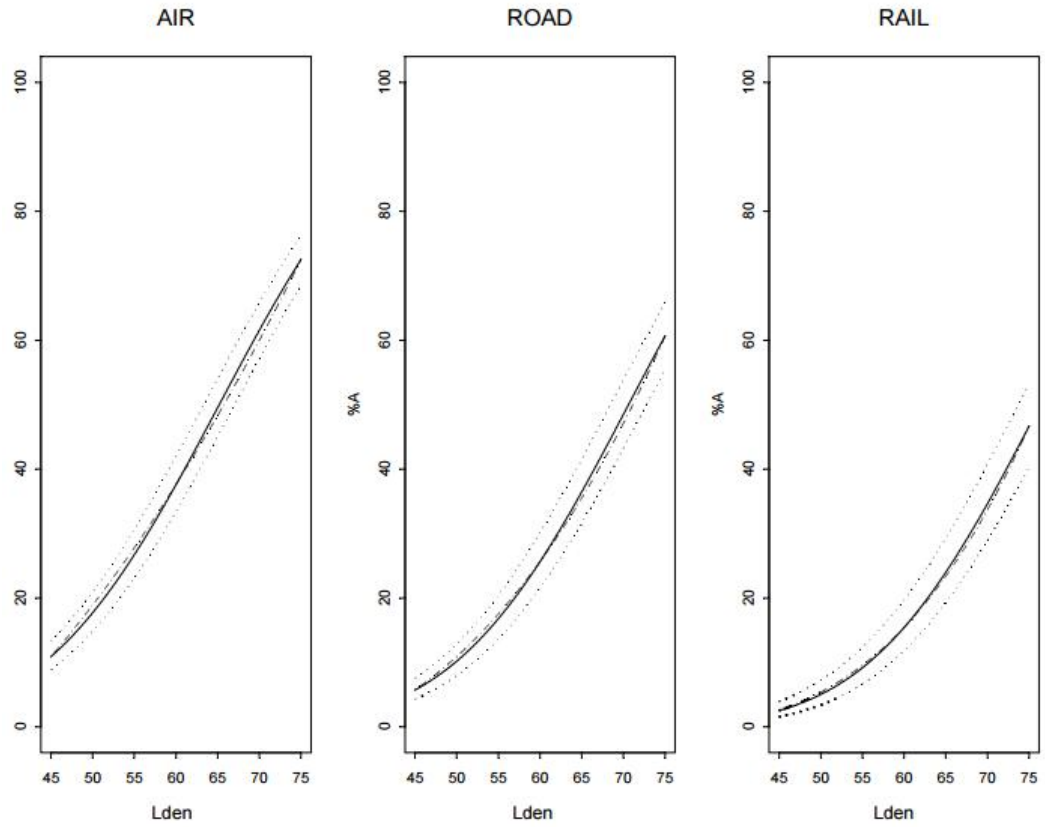

Figure 2: Annoyance due to noise (European Commision, 2002)

2.3 Laws and regulations

The following section describe legislation, guidelines and processes applied in Sweden. It includes both authorities and organizations involved in matters regarding noise.

2.3.1 The European Union

The highest level of decision making is executed by the European Union (EU). Since Sweden is a member of the EU, the country must obey the set directives. The most significant regulation for this thesis is the directive for community noise, 2002/49/EC.

2.3.2 The Swedish Riksdag

The Riksdag decides upon the Swedish laws, regulations, codes etc. It is the highest level of decision making in Sweden and the Riksdag can, for example, regulate guideline values or more general guidance documents regarding noise. Most common used amongst the regulations is the Plan and Building Act as well as the Swedish Environmental Code. More information is found in each of its specific sections.

2.3.3 The Swedish Transport Agency

Overall responsibility of the commercial transports lies upon the Swedish Transport Agency, the areas included are road, shipping, aviation and railroad traffic. Parts of the agency's objectives are to formulate regulations regarding commercial transports and work towards environmental friendly transports (Naturvårdsverket, 2016).

The agency's work is done in areas which include issuing permits for constructing new vehicles and infrastructure for railroads (Transportstyrelsen, 2016), flight routes (Transportstyrelsen, 2016) and decrease noise emitted from vehicles and tyres. The agency operates on national, European and global levels (Transportstyrelsen, 2016).

2.3.4 The Swedish Transport Administration

The Swedish Transport Administration is responsible for long-term planning of the national transport system (Naturvårdsverket, 2016). The Transport Administration work towards cooperation between municipalities and authorities as well as with targeted actions, research and decrease of noise emissions (Trafikverket, 2015).

2.3.5 National Board of Housing, Building and Planning

The National Board of Housing, Building and Planning is responsible for the general planning aspects regarding noise. One objective is to monitor work progress with the goals set up in one of the quality objectives called A Good Built Environment from the Swedish Environmental Objectives. Indicators used for monitoring are "Annoyance from traffic noise" and "Sleep disturbance from traffic noise" (Naturvårdsverket, 2016).

2.3.6 The Swedish Environmental Protection Agency

The agency has the national responsibility of being noise coordinator, which means that the agency, for instance, reports Sweden's work progress with the EU-directive for community noise. The objectives are to strengthen, increase effectiveness and clarify the authorities work with noise (Naturvårdsverket, 2016).

2.3.7 Public Health Agency of Sweden

The Public Health Agency works towards better health amongst the Swedish citizens. By generating general advices and handbooks linked to, for example, the Plan and Building Act the agency provide support municipalities to interpret directives etc. (Naturvårdsverket, 2016).

2.3.8 Swedish Standards Institute

Swedish Standards Institute is a non-profit organisation that is generating standards for authorities, companies etc. The Institute have produced a standard for classification of sound for residences, for example. The standard regulates recommended demands for airborne sound insulation, reverberation time, sound pressure levels at patios and impact sound insulation. Classifications are from D, the lowest demands, to A, the highest level of demands and most common to use by consultants and authorities is C (Swedish Standard Institute, 2016).

2.3.9 National Noise Coordination

To create a joint national view on authorities' work with noise problematics, a national noise coordination network is used. The coordination is structured with a steering committee leading the work, a network for administrators and working groups designated for certain projects. The steering committee consists of representatives from National Board of Housing, Building and Planning, Public Health Agency of Sweden, The Swedish Transport Administration, The Swedish Transport Agency, The Swedish Environmental Protection Agency and the County Administrative Board. The network consists of all authorities with responsibilities regarding noise (Naturvårdsverket, 2016).

2.4 City planning process

There is no framework for national planning regarding urban development. The state can only influence the directions by setting up national goals and interests. According to the Plan and Building Act, described in the next section, it is the county administrative boards that are surveying and coordinating the states interests in the planning process (Boverket, 2015).

The national planning process used for development is regulated on a local level by the municipality, i.e. there is a municipal planning monopoly. The monopoly ensures that there can be no building development from individual land owners without relating to the municipal plans. Even the state cannot change the municipal plans, with some exceptions. The municipality do have veto in matters regarding the planning processes (COMMIN, 2007).

2.4.1 Plan and Building Act

The Plan and Building Act (PBA) regulates the processes for planning land and water usage in Sweden. Regulations within the PBA strive towards a sustainable built environment for current and future generations. Examples of such regulations are the comprehensive plan, building permits and regional planning (SFS 2010:900, 2010).

2.4.2 The Swedish Environmental Code

On the 1st of January, 1999, The Swedish Environmental Code gained legal status. The code emerged from compiling 16 different environmental laws. The purpose of the Code is to promote a sustainable development for the current and next generations. It contain thousands of rules, regulations and actions, amongst those are regulations related to noise (Naturvårdsverket, 2015).

2.4.3 Regulation for traffic noise at residential development

In June 2015 the new regulation regarding traffic noise at residential development gained legal status. Guidelines values are increased in order to simplify residential development. The new guideline values are shown in [dBA] in the table below (Regeringskansliet, 2015).

Table 4: New guideline values for traffic noise (Regeringskansliet, 2015).

Location	Type of noise	L_{eq} [dBA]	L_{max} [dBA]	L_{eq} 22-06 [dBA]	L_{max} 22-06 [dBA]	Aircraft noise levels [dBA]	Maximum aircraft noise levels [dBA]
Façade at dwelling	Road and track	55					
Patio at dwelling	Road and track	50	70				
Façade at dwelling (max. 35 square meters)	Road and track	60					
Patio at dwelling (max. 35 square meters)	Road and track	50	70				

Protected side at dwelling with levels above 55 [dBA][1]	Road and track			55			
Façade at dwelling with levels above 55 [dBA]	Road and track				70		
Patio at dwelling with levels above 55 [dBA]	Road and track	50	70				
Façade at dwelling	Airport					55	70[2]

2.4.4 Municipal Comprehensive Plan

The municipal comprehensive plan is a tool to put the development of the physical environment in a larger scale. It sets the direction of long-term development with regard to the environment, wellbeing of residents and the municipality (Boverket, 2014).

All municipalities need to have an up-to-date comprehensive plan over the whole municipality. The plan is not legally binding but it acts as a guidance for decision making regarding land and water use, e.g. new building permits. Every four years, i.e. one term of office for the ruling parties, the comprehensive plan must be considered by the municipal council (COMMIN, 2007).

2.4.5 Detailed Development Plan

The Detailed Development Plan is used by the municipality in order to regulate how it will use its land and water as well as building design. The plan tells the residents whether or not certain building arrangements is prohibited within the plan area. It is the municipality that has the right to decide on new development plans as well as to interpret the plans (Boverket, 2014).

In Sweden, the legally binding instrument for land usage is the detailed development plan. It is the most important regulation in order to implement the overall goals of the comprehensive plan. Focus for the detailed development plan is to divide the rights and obligations between land owners and the municipality. During the implementation period of the plan, 5 to 15 years, it acts as a strong protection for the land owners' rights with regards to the plan (COMMIN, 2007).

[1] Half of the rooms in the dwelling must face the noise protected side
[2] If exceeded, not more than 16 times 06-22 and not more than 3 times 22-06. Exception for Bromma Airport between 06-22

2.4.6 Regional plan

In areas where cross-border decisions need to be taken, for instance in matters regarding infrastructure and environment, regional plans could be used. The purpose of such plans is to mobilize resources from several municipalities in order to solve these matters. Regional plans are regulated in the Plan and Building Act and the founding of a regional plan authority lies upon the Government. The regional plan authority could be ordained for a period of time or until further notice (Boverket, 2014).

2.4.7 Special area regulations

Special area regulations, which are legally binding, are used to make sure that the comprehensive plan is being followed outside urban areas. It is a simpler instrument to keep track of agreements of the comprehensive plan (COMMIN, 2007).

2.5 City Planning with regard to noise

There are several ways of planning with regard to noise, although most planning is based on the constitution regarding community noise, SFS 2004:675. The constitution, which is based on the EU-directive for community noise 2002/49/EC, states that the municipalities with more than 100 000 residents should conduct a strategic noise map and form noise action plans, before the 18th of July the year after the mapping, which should decrease the health effects from community noise.

Listed in the constitution is the content of the noise action plan that the municipalities need to follow. The content is presented below.

12 § A noise action plan shall include

1. information regarding that the action plan is created with accordance to this constitution and which authority or municipality that has created the action plan,
2. a description of what noise sources that the authority or municipality shall map according to 3-6§§ and the noise sources surroundings
3. a summary of the strategic noise map that shall contain an approximation of the number of people that are estimated to be exposed to noise,
4. a description of situations that are needed to be improved and problems that are assessed to be in need of being prioritized and the criteria of how they have been selected,
5. a summary of the fulfilled consultations according to 5 chapter 4 § the Swedish Environmental Code,
6. a description of the noise decreasing actions that have been taken or planned, including actions that are planned to be executed during the upcoming five years,
7. a description of actions to protect areas where the sound level is considered to compose a certain quality as in parks, recreational areas, resort regions and other nature and cultural environments,
8. a long-term strategy for handling noise and the effects of noise, if necessary also to decrease noise,
9. a description of how the execution and results of the action plan is intended to be evaluated,
10. an analysis of the cost in relation to the efficiency and benefit from the action plan,
11. a summary of the action plan restricted to maximum 10 pages (SFS 2004:675, 2004).

Municipalities with more than 100 000 residents are found in the table below. The municipalities are arranged from largest to smallest in terms of number of residents based on data from 2014-12-31.

Table 5: Number of residents in Swedish municipalities (Statistiska centralbyrån, 2015)

Municipality	Number of residents
Stockholm	911 989
Gothenburg	541 145
Malmö	318 107
Uppsala	207 362
Linköping	151 881
Västerås	143 702
Örebro	142 618
Helsingborg	135 344
Norrköping	135 283
Jönköping	132 140
Umeå	119 613
Lund	115 968
Borås	107 022
Huddinge	104 185
Eskilstuna	100 923

3 Results

The following chapter consist of the findings related to the noise action plans related to the regulation SFS 2004:675.

3.1 Comparison

Evaluation and comparison between the municipalities is conducted using the factors listed below. The factors were chosen in collaboration with Associate Professor Jens Forssén and Associate Professor Patrik Höstmad.

- Time span for the noise action plan
- Current and future number of residents[3]
- Long-term goals and visions for community noise (
- Responsible of monitoring and follow-up the action plan
- Content, i.e. what focus areas are the actions sub-divided into. A summary together with a visualisation is found in Appendix 1 and 2.
    - City planning
    - At the source
    - Around the source
    - Recreational areas
    - Residential areas
    - Particularly vulnerable segments
    - Areas with several noise sources
    - Alternative actions
- Indicators that measure progress
- Coherence to other policy's and strategies in the municipality
- Conducted strategic noise maps

[3] The numbers are in thousands, i.e. rounded to the nearest 1 000

3.1.1 Stockholm

Below are the results from the evaluation of the City of Stockholm's noise action plan. All data are collected from the City of Stockholm's noise action plan if not stated otherwise (Miljöförvaltningen, 2013).

Table 6: Evaluation of the City of Stockholm's noise action plan

Factors	
Time span	2014-2018
Future number of residents	From 912 000 (2014) (Statistiska centralbyrån, 2015) to 1 076 000 (2035) (Svenskt näringsliv, 2011)
Long-term noise goals and vision	Decrease noise levels by taking actions at the source
Instance for monitoring	The Environment and Public Health Administration
Responsible instances	· Municipal Assembly · Development Committee · Urban Planning Committee · Environment Department · Environment and Public Health Committee · Traffic and Waste Management Committee · Stockholm Public Transport (SL) · The City of Stockholm Traffic Department · Urban Transport Administration · The Swedish Transport Administration
Content	· City planning o The Stockholm Model o Industrial Noise · At the source o Track squeal · Around the source o Quiet road surfaces o Noise berms o Improvement of existing noise barriers · Recreational areas o Improve sound environment · Residential areas o Indoor levels · Particularly vulnerable segments o Nursing homes · Alternative actions o Research projects o Educational actions · Areas with several noise sources o Identify areas with several sources
Indicators	No measurable indicators

Coherence	· Promenadstaden – Comprehensive plan for Stockholm · Environment programme for Stockholm · Urban Mobility Strategy · Regional Traffic Supply Program
Strategic noise map	2013
Additional	
Other models and projects	The Stockholm model[4], Hosanna, Cityhush

3.1.2 Gothenburg

Below are the results from the evaluation of the City of Gothenburg's noise action plan. All data are collected from the City of Gothenburg's noise action plan if not stated otherwise (City of Gothenburg, 2014).

Table 7: Evaluation of the City of Gothenburg's noise action plan

Factors	
Time span	2014-2018
Future expansion	From 541 000 (2014) (Statistiska centralbyrån, 2015) to 585 000 (2035) (Svenskt näringsliv, 2011)
Long-term noise goals and vision (directly from the noise action plan)	· Residential environment - At least 90 percent of Gothenburg's population have by 2020 at the latest an outdoor noise level at home lower than 60 [dBA] daily equivalent level at the exposed facade · Schools including preschools - At least 95 percent of the City's schools, including preschools have by 2020 at the latest access to playgrounds with a maximum 55 [dBA] daily equivalent level · Parks and green areas - All City parks have by 2020, at the latest, levels below 50 [dBA] daily equivalent level in most parts of the park area
Responsible instances	Building Committee, Environmental and Climate Committee, Parks and Landscape Committee, Urban Transport Committee
Instance for monitoring	Environmental and Climate Committee

[4] The Stockholm model makes it possible to depart from noise target values when building dwellings close to public transports.

Content	· City planning o Noise Map · At the source o Noise from buses and trams · Around the source o Barriers and berms · Recreational areas o Sound environment in parks and green areas · Residential areas o Quite sides o Noise from buses and trams · Particularly vulnerable segments o Outdoor environments at preschools
Measurable indicators	· All City parks have by 2020 at the latest levels below 50 [dBA] daily equivalent level in the greater part of the park area · At least 95 percent of the City's schools, including preschools have by 2020 at the latest access to playgrounds with a maximum 55 [dBA] daily equivalent level
Coherence	Guidance for traffic noise in planning
Strategic noise map	2015 (Göteborg Stad, 2016)
Additional	
Proposed areas of investigation for next action plan	· Improve the strategic noise map procedure · Coordinate efforts and investigations in existing environments · Create a platform for discussion with other stakeholders, such as Universities or other cities

In December 2015, the Building committee, the Urban Transport committee and the Environmental- and Climate committee agreed upon new guidelines for planning with regard to traffic noise. The new guidelines will make it possible to fulfil the objectives of the City's comprehensive plan and the City documents "Strategy for development planning", "Transport Strategy for a close-knit City" and "Green strategy for a dense and green City". Other important aspects are the environmental goals, the environment programme and the climate strategic programme, all concluded by the municipal council. All guideline values in the new guidance are aligned with the ones decided on national level (Hammer & Werner, 2015).

3.1.3 Malmö

Below are the results from the evaluation of the City of Malmö's noise action plan. All data are collected from the City of Malmö's noise action plan if not stated otherwise (Gatukontoret, 2013). Factors as long-term goals and indicators are directly translated from the action plan.

Table 8: Evaluation of the City of Malmö's noise action plan

Factors	
Time span	2014-2018
Future expansion	From 318 000 (2014) (Statistiska centralbyrån, 2015) to 365 000 (2035) (Svenskt näringsliv, 2011)
Long-term noise goals and vision	**First stage:** · Indoor climate - No one is being exposed to sound pressure levels above the guideline values: for equivalent levels, 30 [dBA] and maximum levels, 45 [dBA] · Prioritized areas – Preschool and school areas are being developed so that the areas fulfil the requirements of equivalent levels below 55 [dBA] and maximum levels below 70 [dBA] · Actions have also been taken at the most exposed parks and outdoor areas **Second stage:** · No residents or workers in Malmö are being exposed to levels above the guideline values for equivalent levels, 30 [dBA] and maximum levels, 45 [dBA] indoors, in educational facilities or healthcare facilities · Guideline values are reached for working facilities · Patios are well below the decided guideline values **Long-term strategy:** · Update noise action plan and strategic noise map at least every 5 years · Focus on actions towards the noise source
Instance for monitoring	Steering committee with representatives from each responsible department
Responsible instances	· Traffic department · Environment Department · Urban Planning Department · Property Management Department

Content	· City planning o Screening buildings and densifying o Routines for preschools and schools o Quiet areas · At the source o Noise from public transport o Noise demands for procurements · Around the source o Quiet road surfaces o Berms and barriers · Recreational areas o Sound environment at parks, squares etc. · Residential areas o Window improvements · Particularly vulnerable segments o Sound environment at preschools and schools · Alternative actions o Information campaigns o Traffic regulations and noise o Cooperation with other stakeholders
Indicators	· Number of residents and properties being affected by completed window improvements · Number of residents affected by some action · Number of preschools and schools where actions have been taken · Number of parks and recreational areas where actions have been taken · Number of traffic noise related complaints received by the Environment Department and the Urban Transport Administration
Coherence	· Environmental program for the City of Malmö 2009-2020 · Traffic Environment Program for the City of Malmö · Traffic Strategy for the City of Malmö · Programme of measures against nitrogen dioxide · Publication of application regarding traffic noise for the City of Malmö
Strategic noise map	2012

3.1.4 Uppsala

Below are the results from the evaluation of Uppsala municipality's noise action plan. All data are collected from Uppsala municipality's noise action plan if not stated otherwise (Hedman & Jönsson, 2015).

Table 9: Evaluation of Uppsala municipality's noise action plan

Factors	
Time span	2013-2018
Future expansion	From 207 000 (2014) (Statistiska centralbyrån, 2015) to 233 000 (2035) (Svenskt näringsliv, 2011)
Long-term noise goals and vision	**Vision:** No one, resident or long time staying, should be exposed to community noise that could lead to negative health effects or limits the possibilities of visiting the outdoor areas. **General goals:** · Decrease noise at the source · Decrease negative health effects from noise · Decrease noise exposure for particularly vulnerable · Improved sound environment in public areas · Increased knowledge amongst decision makers as well as the public **Long-term goals:** · Requirements are to be fulfilled for all residential properties, both indoor and outdoor · All preschools and schools must have lower or levels equal to the guideline value at 55 [dBA] (equivalent level) on 80 % of the outdoor areas · All residents need to have walking distance to a park or an environment with good sound quality
Instance for monitoring	Steering committee
Responsible instances[5]	· Town Planning · The Environment Administration · The Town Office · The Children, Youth and Labor Market Administration

[5] Translations are provided by Uppsala municipality and may differ from other translations

Content	· City planning o Traffic Management and Regulations o Prohibition against heavy traffic during night · Around the source o Quiet road surfaces o Berms and barriers · Recreational areas o Quiet places in urban environments · Residential areas o Monetary contributions for improving residences · Particularly vulnerable segments o Protective actions at preschools and schools · Alternative actions o Information campaigns
Indicators	Degree of annoyance from noise amongst residents, i.e. comparison between numbers of annoyed residents on a five year basis[6].
Coherence	Comprehensive plan 2010
Strategic noise map	2012

3.1.5 Linköping

Below are the results from the evaluation of Linköping municipality's noise action plan. All data are collected from Linköping municipality's noise action plan if not stated otherwise.

Table 10: Evaluation of Linköping municipality's noise action plan

Factors	
Time span	From 152 000 (2014) (Statistiska centralbyrån, 2015) to 166 000 (2035) (Svenskt näringsliv, 2011)
Future expansion	
Long-term noise goals and vision	
Instance for monitoring	
Content	
Indicators	
Coherence	
Strategic noise map	2011 (Linköpings kommun, 2014)

[6] Hävermark, Saga (Traffic planner, Uppsala municipality) mail correspondence with author 2016-02-03

3.1.6 Västerås

Below are the results from the evaluation of Västerås municipality's noise action plan. All data are collected from Västerås municipality's noise action plan if not stated otherwise (Västerås stad, 2014).

Table 11: Evaluation of Västerås municipality's noise action plan

Factors	
Time span	2014-2018
Future expansion	From 144 000 (2014) (Statistiska centralbyrån, 2015) to 149 000 (2035) (Svenskt näringsliv, 2011)
Long-term noise goals and vision	**Strategy:** · Conduct a strategic noise map and a new noise action plan every 5 years · Move towards actions to reduce noise at the source · Identify additional noisy areas · Identify quiet areas · Investigate noise from other sources than traffic **First stage:** · Noise protective actions at all residential properties with levels over 65 [dBA] (equivalent level) · Actions at outdoor areas at preschools and schools in order to reach national guideline values · Installation of noise barriers at patios in residential areas resulting in maximum levels below 70 [dBA] · Not exceeding maximum levels, 45 [dBA], indoors during night more than 5 times between 22-06 **Second stage:** · No resident or active in Västerås are being exposed to noise levels above guideline values · All residents have access to patios with noise levels below the guideline values
Instance for monitoring	Technical Services Committee
Responsible instances	· Technical Services Committee · Building Committee · Environment and Consumer Committee · Property Management Committee · Municipal Executive Committee · Child and Youth Committee

Content	· City planning o Traffic planning o City and building planning o Damping at surrounding environment o Action plan o Information about noise in detailed development and comprehensive plan · At the source o Procurement demands for public transport o Quieter vehicles · Around the source o Quiet road surfaces o Noise berms and barriers · Recreational areas o Inventory of recreational areas o Inventory of quiet areas · Residential areas o Façade improvements · Particularly vulnerable segments o Inventory of preschools and schools · Alternative actions o Research projects o Mobility management-projects · Areas with several noise sources o Identify “hot spots”
Indicators	No measureable indicators
Coherence	· Noise action plan for 2014-2016 · Comprehensive plan 2026
Strategic noise map	2011

3.1.7 Örebro

Below are the results from the evaluation of Örebro municipality’s noise action plan. All data are collected from Örebro municipality’s noise action plan if not stated otherwise (Örebro kommun, 2013).

Table 12: Evaluation of Örebro municipality's noise action plan

Factors	
Time span	2013-2020
Future expansion	From 143 000 (2014) (Statistiska centralbyrån, 2015) to 156 000 (2035) (Svenskt näringsliv, 2011)
Long-term noise goals and vision	**Vision:** All residents are entitled to a good living environment and are not being exposed by unacceptable health risks due to community noise. Focus areas for the vision: · Planning · Damping · Screening

	Stage goals, by 2020: · Noise protective actions have been taken at all residential properties with levels exceeding 65 [dBA], equivalent level, and/or 85 [dBA], maximum level during night, at the façade · Noise protective actions have been taken for at least half of the residential properties, with no current noise protection, that are being exposed to levels between 60-65 [dBA] at the façade
Instance for monitoring	Technical Services Committee
Responsible instances	· Technical Services Committee · Environment Committee · Program Committee for Planning and Community Development · Municipal Executive Committee
Content	· City planning o Traffic Management o Surveying traffic flows · At the source o Noise demands through procurements · Around the source o Program for noise berms and barriers o Quiet road surfaces · Recreational areas o Noise mapping over City parks · Residential areas o Monetary contributions to property owners · Particularly vulnerable segments o Noise mapping over preschools and schools · Alternative actions o Supervision of properties o Dialogue with The Swedish Transport Administration o Reward developers with higher ambitions than the noise guidelines o Inform the Public o Improve internal resources
Indicators	Yes, measurable
Coherence	· Örebro municipality Environmental Program · Transport Plan · Comprehensive Plan · Policy for New Development
Strategic noise map	2011-2012
Additional	
National guidelines	Noise policy based on The Swedish Environmental Protection Agency – not being followed

3.1.8 Helsingborg

Below are the results from the evaluation of the City of Helsingborg's noise action plan. All data are collected from the City of Helsingborg's noise action plan if not stated otherwise (Helsingborg stad, 2014).

Table 13: Evaluation of the City of Helsingborg's noise action plan

Factors	
Time span	2014-2018
Future expansion	From 135 000 (2014) (Statistiska centralbyrån, 2015) to 151 000 (2035) (Svenskt näringsliv, 2011)
Long-term noise goals and vision	**Vision:** · Plan for healthy environments with good sound environments · Plan for healthy outdoor areas · Strive against 50 [dBA] or less in all City parks · Strive against good sound environment on all public places **Long-term goals:** · Create a noise policy · Raise and create awareness regarding noise
Instance for monitoring	Urban Planning Committee
Responsible instances	Urban Planning Department
Content	· City planning o Early stage noise planning o Accessible material on the web o Traffic Planning o Improve the City's noise analyses · Recreational areas o Investigate prioritized noisy City parks o Investigate prioritized noisy nature and recreational areas o Identify quiet areas · Residential areas o Monetary contributions to property owners · Particularly vulnerable segments o Prioritize outdoor areas at preschools and schools o Decrease noise at nursing home patios · Alternative actions o Cooperation with internal and external partners
Indicators	No measureable indicators
Coherence	Comprehensive plan 2010
Strategic noise map	2012

3.1.9 Norrköping

Below are the results from the evaluation of Norrköping municipality's noise action plan. All data are collected from Norrköping municipality's noise action plan if not stated otherwise (Norrköpings kommun, 2013).

Table 14: Evaluation of Norrköping municipality's noise action plan

Factors	
Time span	2013-2017
Future expansion	From 135 000 (2014) (Statistiska centralbyrån, 2015) to 144 000 (2035) (Svenskt näringsliv, 2011)
Long-term noise goals and vision	**Long-term goals:** Being able to plan and build in a way that allows to densify the City and build in new areas without compromising with the living environment **Strategy:** To take actions at the source and protect the most vulnerable
Instance for monitoring	Municipal Executive Committee and responsible committees
Responsible instances	· Urban Planning Department · Technical Services Department · Building and Environment Department · Centre of Procurement
Content	· City planning o Strategy to decrease exposed residents o Decrease traffic in the City centre o Overhaul the speed limits in the City o Local noise guidelines · At the source o Noise demands for procurements · Around the source o Investigate quiet road surfaces · Recreational areas o Investigate the sound environment in parks and recreational areas · Residential areas o Routine for monetary contribution to property owners o Routine for monitoring the Swedish Environmental Code · Particularly vulnerable segments o Sound environment for preschools and schools

	· Alternative actions o Campaign for tyre choices o Improve internal cooperation o Improve external cooperation with the Swedish Transport Administration o Improve internal knowledge o Inform the Public
Indicators	Yes, measurable
Coherence	· County Administrative Board · Comprehensive plan
Strategic noise map	2012

3.1.10 Jönköping

Below are the results from the evaluation of Jönköping municipality's noise action plan. All data are collected from Jönköping municipality's noise action plan if not stated otherwise (Jönköpings Kommun, 2013).

Table 15: Evaluation of Jönköping municipality's noise action plan

Factors	
Time span	2014-2018
Future expansion	From 132 000 (2014) (Statistiska centralbyrån, 2015) to 144 000 (2035) (Svenskt näringsliv, 2011)
Long-term noise goals and vision	**Vision:** To reach on of the goals stated in the Environmental quality goal from "A Good Built Environment". – "There are no inconvenience for human health or negative effect in general due to noise from the transport systems" **First stage:** A situation where the municipality's work is halfway on its way of creating an acceptable sound environment. **Second stage:** The existing guidelines are being reached. **Strategy**: · New strategic noise map and noise action plan every five years **Existing action plan:** · Create a systematic way of working · Noise protective actions **Future action plan:** · Map and analyse several problematic areas · More concrete actions with, hopefully, greater effect
Instance for monitoring	Yearly basis · Urban Planning Department Overall monitoring · Urban Planning Department · Environment Department

Responsible instances	· Urban Planning Department · Childcare and Education Department · City Department · Environment Department · Jönköping County Traffic · Technical Services Department
Content	· City planning o Investigate effects from Traffic Planning o Cooperation regarding traffic and road planning · At the source o Control and follow-up on public transports o Noise demands at procurements · Around the source o Quiet road surfaces · Recreational areas o Noise mapping of parks and recreational areas o Noise mapping of quiet areas · Residential areas o Monetary contributions to property owners o Noise mapping for residences close to larger roads · Particularly vulnerable segments o Noise mapping at preschools and schools · Alternative actions o Supervision of fans and compressors o Informational brochure about noise o Inform about quieter tyres, vehicles and driving styles o Task force and cooperation with other stakeholders o Cooperation with the Swedish Transport Administration
Indicators	No measurable indicators
Coherence	· Municipality program 2011-2014 with care for the future · The City Development Vision · Development Planning Strategy 150 000 residents
Strategic noise map	2011

3.1.11 Umeå

Below are the results from the evaluation of Umeå municipality's noise action plan. All data are collected from Umeå municipality's noise action plan if not stated otherwise (Umeå kommun, 2013).

Table 16: Evaluation of Umeå municipality's noise action plan

Factors	
Time span	2013-2018
Future expansion	From 120 000 (2014) (Statistiska centralbyrån, 2015) to 127 000 (2035) (Svenskt näringsliv, 2011)
Long-term noise goals and vision	**Long-term goals:** · Residents are not being exposed to indoor noise levels above the guideline values of 30 [dBA], equivalent level, and 45 [dBA], maximum level during night · Sound pressure levels on schoolyards shall not exceed the guideline value of 55 [dBA], equivalent level, from road and train noise. Sound pressure levels from traffic noise shall not exceed the guideline value of 30 [dBA], equivalent level, in educational facilities · Half the area in the City parks shall have noise levels below 55 [dBA] **Strategy:** Update every five years
	Enterprise and Planning Sub-Committee
Responsible instances	· Environment and Public Health Committee · Municipal Executive Committee · Umeå Municipal Companies · Building Committee · Technical Services Committee
Content	· City planning o Traffic management o Traffic regulations o Regulations for distribution of goods o Overhaul of application for advices and guidelines regarding traffic noise o Routine for bus stops o Routine for construction sites · At the source o Noise demands for procurements o Increased number of electrical and hybrid vehicles · Around the source o Noise barriers and berms o Quiet road surfaces · Recreational areas o Sound environment for parks, recreational areas and squares

	· Residential areas o Monetary contribution to property owners o Supervision of noise around properties · Particularly vulnerable segments o Sound environment at preschools and schools o Supervision of traffic noise around preschools and schools · Alternative actions o Supervision of noisy businesses/industries o Digitalize performed noise protective actions o Cooperation in the municipal noise group o Information to property owners regarding façade and window design, window improvements and noise barriers o Campaigns towards the Public regarding sustainable transport solutions
Indicators	Yes, measurable
Coherence	· Comprehensive plan 2030 with six development strategies embedded · Umeå municipality Procurement Policy · Umeå municipality Public Transport Strategy
Strategic noise map	2012

3.1.12 Lund

Below are the results from the evaluation of Umeå municipality's noise action plan. All data are collected from Umeå municipality's noise action plan if not stated otherwise (Lunds kommun, 2014).

Table 17: Evaluation of Lund municipality's noise action plan

Factors	
Time span	2014-2018
Future expansion	From 116 000 (2014) (Statistiska centralbyrån, 2015) to 131 000 (2035) (Svenskt näringsliv, 2011)
Long-term noise goals and vision	**Long-term goals:** · Residents are not being exposed to indoor noise levels above the guideline values of 30 [dBA], equivalent level, and 45 [dBA], maximum level during night · Decrease the number of trips with noisy transports

	· Low noise levels at recreation areas, park and schoolyards **Strategy:** Update strategic noise map and noise action plan on a five years basis
Instance for monitoring	· Environment Department · Technical Services Department · Urban Planning Department
Responsible instances	· Environment Department · Technical Services Department · Urban Planning Department
Content	· City planning o Traffic Management o Municipal noise group · Around the source o Guidance for support to build noise barriers · Recreational areas o Define parks and recreational areas o Road and railroad noise levels at parks and recreational areas o Revise actions against noise in "The green structures and environmental protection plan" · Residential areas o Information and routines for monetary contributions to property owners o Supervision of noise exposed tenement buildings · Particularly vulnerable segments o Traffic noise levels at outdoor areas at preschools and schools · Alternative actions o Information campaign, from LundaMaTs, regarding sustainable transports o Ensure that the Swedish Transport Administration presents an overview of noise exposed residential areas o Organize meetings with the Swedish Transport Administration to discuss noise from road and railways
Indicators	No measurable indicators

Coherence	· Noise Decontamination Plan (1992) · Environmental Building Plan South – Strategic platform for collaboration · Lunda Eco – Ecological Sustainable Development · LundaMaTs – Sustainable transport system · Regional Environmental Goals for Skåne
Strategic noise map	2011

3.1.13 Borås

Below are the results from the evaluation of City of Borås's noise action plan. All data are collected from City of Borås's noise action plan if not stated otherwise.

Table 18: Evaluation of the City of Borås's noise action plan

Factors	
Time span	
Future expansion	From 107 000 (2014) (Statistiska centralbyrån, 2015) to 114 000 (2035) (Svenskt näringsliv, 2011)
Long-term noise goals and vision	
Instance for monitoring	
Content	
Indicators	
Coherence	Guidelines for traffic noise
Strategic noise map	2011

3.1.14 Huddinge

Below are the results from the evaluation of Huddinge municipality's noise action plan. All data are collected from Huddinge municipality's noise action plan if not stated otherwise (Huddinge kommun, 2015).

Table 19: Evaluation of Huddinge municipality's noise action plan

Factors	
Time span	2017-2024
Future expansion	From 104 000 (2014) (Statistiska centralbyrån, 2015) to 122 000 (2035) (Svenskt näringsliv, 2011)
Long-term noise goals and vision	**Purpose:** Improve the sound environment and decrease the number of residents disturbed by traffic noise. Create forms for a structures and continuous work with noise matters in the municipality
Instance for monitoring	· Environmental and Building Department · Planning and Community Development Committee · Municipal Executive Committee Department - Planning and Community Development Department · Childcare and Education Department

Content	· City planning
	  o Traffic planning for heavy vehicles
	  o Support for City planning regarding noise
	  o Municipal noise group
	  o Routine for building permits
	  o Guidelines for traffic planning
	· Around the source
	  o Noise berms and barriers
	  o Quiet road surfaces
	· Recreational areas
	  o Investigate and prioritize parks
	· Residential areas
	  o Investigate and prioritize the most noise exposed residential areas
	  o Window improvements
	· Particularly vulnerable segments
	  o Sound environment at preschools and schools
	· Alternative actions
	  o Communication with the Public
	  o Forms of collaboration with external parties

Indicators	Business objectives divided into four categories with measurable and non-measurable indicators: · Investigate and adjust existing · Organization and routines · Physical planning · Communication
Coherence	· A sustainable Huddinge 2030 · Comprehensive plan 2030 - Guidelines · Traffic strategy · Detailed Development Plan · Building Permit Process
Strategic noise map	2012

3.1.15 Eskilstuna

Below are the results from the evaluation of Eskilstuna municipality's noise action plan. All data are collected from Huddinge municipality's noise action plan if not stated otherwise.

Table 20: Evaluation of Eskilstuna municipality's noise action plan

Factors	
Time span	
Future expansion	From 101 000 (2014) (Statistiska centralbyrån, 2015) to 110 000 (2035) (Svenskt näringsliv, 2011)
Long-term noise goals and vision	
Instance for monitoring	
Content	
Indicators	
Coherence	Guidelines for actions against traffic noise in existing environments (Enesved, 2011)
Strategic noise map	

4 Interviews

The following chapter include summaries from the conducted interviews divided into subchapters based on the interviewee's line of work. In total, ten interviews have been conducted.

In order to have an open conversation with the interviewees the questions were of an open character. This gave the participants a possibility to reflect and not answer direct questions with an absolute answer. The interviewees were asked the following questions:

- How does your line of work consider the factor noise in City planning? Whose responsibility is it to consider noise and is it done?
- What regulations are used?
- What is needed for a sustainable urban development with regard to noise?
- What is functions well/not as well with today's regulations/guideline values etc.?

4.1 Municipalities

Interviews were conducted with Martin Knape, the Environment Department, on the 29th of January and Peter Comnell, the Urban Planning Department, on the 17th of February. The both interviewees are representing the City of Gothenburg.

Additionally, interviews were conducted with Jacquelin Nilsson, the Traffic Department, on the 15th of March, and Robert Nykvist, Urban Planning Department, on the 1st of April. Nilsson represents the City of Malmö and Nykvist represents Jönköping municipality.

4.1.1 Martin Knape

Interview with Martin Knape, Environmental Investigator at the Environment Department at the City of Gothenburg.

4.1.1.1 Intro

The City of Gothenburg have produced a new guidance with regard to the new regulation for community noise and the City's environmental goals for noise, intending to make the work easier for the municipal staff. The guidance has emerged from the problematics with every instance monitoring noise from different perspectives and the fact that noise has been taken into account too late in the City planning processes. The guidance is produced by Environment Department, Urban Planning Department, Traffic Department, Property Management Department and the Parks and Landscape Committee. The Urban Planning Department is the owner of the document. If, instead, the Environment Department had owned the document it would not have been as powerful, explains Knape, due to the fact that the Urban Planning Department is responsible for the City planning. In the process of implementing the document trainings will be held for the municipal planners.

The work with the guidance started off as an update of the noise policy, which later led to the fact that the policy was withdrawn and replaced by the guidance. All instances that participated agreed upon that it was necessary to have a holistic approach. The guidance emanates from planning documents, environmental goals, development, and traffic flows.

An agreement was needed for the new guidance and we are moving in the right direction with it says Knape.

4.1.1.2 City planning

The guidance is not the only tool that is used, the Green Strategy for a dense and green City is for example an important regulation that states that it should be 300/400 meters to a square or a so called “residential close” park. Hence, only valid for residences with levels above 55 [dB]. The strategy works almost as a policy.

The processes are running and there are some plans with noise pm. The pm states which priorities and actions regarding noise that have been taken into account in a detailed development plan. A framework to work with noise pm will be produced by the Urban Planning Department.

The Traffic Department is responsible for putting up demands on the noise emissions from buses and trams. Responsible to take noise into account in the City planning processes is the Urban Planning Department, due to the fact that they own the responsibilities for the comprehensive plan. The Environment Department is responsible to point out the good sound environments. The City planning is divided and executed both by the Traffic Department and the Urban Planning Department, which constructs a dilemma regarding areas of responsibility.

4.1.1.3 Regulations

The new regulations are good, they are better than the infrastructure proposition, states Knape. Although, there is a need of more right to interpret it.

4.1.1.4 Final words

Knape states that noise is not only a question of environment but also quality.
His final comment was regarding the statement “build away the noise”, Knape believes instead that actions are needed at the source!

4.1.2 Peter Comnell

Interview with Peter Comnell, Noise Specialist at the Urban Planning Department at the City of Gothenburg.

4.1.2.1 Introduction

Noise is one factor that is weighted in the preliminary assessments of a planning area. With the former regulations could one decide to not continue with the planning process due to too high levels at the exposed side. The former policy stated that it was not allowed to build in areas with noise levels that exceeds 65 [dB]. Those regulations are removed in the new guidance.

It is up to every administrator to take noise into account in the City planning processes. Additionally can the County Administrative Board review the detailed development plan and the Environment Department reject exploiter's proposals.

The processes could be improved, giving the example that when an exploiter want to build somewhere they often deliver a sketch to the municipality. Habitually, with no regard to noise in the proposal which makes it difficult for administrators to come up with changes in the proposal.

Almost all initiative comes from exploiters and not from the municipalities. Noise is subordinated compared to many other aspects in planning, explains Comnell.

4.1.2.2 Today's regulations and guidelines
A problem is that there have been no ad interim provisions, tools or other aids in order to interpret and use the new regulation for administrators. It is easier for all exploiters to build with the new regulation states Comnell.

4.1.2.3 Examples of how to plan
Comnell declare that we have come far with visualisation techniques, now we need to develop auralizations and combine these tools in order to plan better.

Further he argues that noise is a factor that should be included in the planning process and should not be a problem that needs a solution on already finished projects. Signals from the National Board of Housing, Building and Planning are that technical solutions shall be avoided, instead planning and design should be the solution.

4.1.2.4 Final words
Comnell adds finally that we cannot just build without thinking, but we cannot not build at all on the other hand! It is possible to solve the noise problems if you only plan well.

4.1.3 Jacquelin Nilsson
Interview with Jacquelin Nilsson, Traffic Environment Coordinator at the Traffic Department at the City of Malmö.

4.1.3.1 Introduction about Malmö
The City of Malmö's noise action plan focus only on traffic noise explains Nilsson, fan and industrial noise were earlier included. In the City is it mostly traffic noise that is mapped but industrial noise might be mapped as well in the future.

Malmö has got a municipal comprehensive plan that states that the City shall contain green areas, be dense and not exploit on the surrounding areas dedicated for agriculture. This puts the City planning on its edge, how the City will manage this asks Nilsson herself.

It is stated in the action plan that there will be an annual report regarding the progress with work related to noise, however no report was delivered last year due to resource shortages, explains Nilsson.

Nilsson continues by adding that the City use indicators to track progress for the work with noise. They have not managed well enough yet even though the action plan was introduced in 2013. The City is not in phase when comparing the indicators to the goals that have been setup.

The forecast for actions related to physical planning in order to reach noise reduction is not as good as wanted. The actions that are easier to reach is instead the ones with information campaigns.

4.1.3.2 Examples of City planning
In the process of working with noise as a factor, excluding the action plan, most of the work is done in the detailed development plan processes, owned by the Urban Planning Department. In some cases, the acousticians are involved from the beginning in the City planning.

In 2007 was a noise policy created but it was substituted in 2013 by an application writing for traffic noise. Nilsson says that the writing is being revived at the moment. She adds that the writing is an advantage for the work in Malmö, and not only for noise matters.

It has contributed to a better cooperation between the departments in the City. It is also a tool and contain joint definitions.

Nilsson remarks that it is important that we start questioning the car as a factor in the City. There are many interests that share the same area and all factors are needed to be weighed in the City planning.

Regarding City planning, Nilsson believes that the level of knowledge for correlation between noise and health is low, although an increase in the level of knowledge is on its way. Furthermore, Nilsson adds that during the last couple of years the interest for sound environments and sound design has increased.

4.1.3.3 Today's guidelines

Regarding today's regulations, Nilsson believes that we are in a transition phase where the new regulation has not yet settled and that the guideline values that we have are not working if we do not practice them.

Additionally, raises Nilsson the problematic with many different regulations, and asks how it is possible to create one uniformed regulation?

4.1.3.4 Final words

Work related to noise is not prioritized internally in the City of Malmö. Nilsson explains that everyone works with their own part of the detailed development plan and not with a holistic approach. The path forward is to not work on your own but to collaborate and work with common matters.

4.1.4 Robert Nykvist

Interview with Robert Nykvist, City Planner at the Urban Planning Department at Jönköping municipality.

4.1.4.1 Introduction

Noise has historically not been prioritized in City planning but is nowadays a natural part in the planning processes and is regarded in every new development plan, Nykvist describes.

Jönköping municipality work two ways with noise, partly in new detailed development plans and for building permits together with the work that is related to the noise action plan. There is an up going trend regarding to take noise into account, the fact that the municipality has decided to employ an acoustician indicates that it is a prioritized subject. Appointing a City planner that knows noise has helped the municipality to think more about noise matters in the City planning.

4.1.4.2 In City planning

The municipalities have been forced to plan with regard to noise ever since the EU-directive for community noise gained legal status. The fact that the demands have been tighten up also triggers that progress.

In the City planning process is it the architect responsible for the plan that need to take noise into account and Nykvist considers it to be done in all processes.

Regarding the control measures used for planning, Nykvist points out that the municipality, before the new regulation was produced, made own interpretations for quiet and damped side together with compensational measures in areas with high noise levels. Today are they administering the regulation for traffic noise for new development of dwellings.

The municipality's noise action plan must improve the stage goals, since they are not measureable today. In order to evaluate the stage goals, every indoor level in the municipality must be measured and that is too time consuming according to Nykvist.

4.1.4.3 Future planning

The next step for the municipality is to structure their work regarding noise. Nykvist believes one objective is to create a network where noise problematics is being discussed.

Furthermore, to have a sustainable way of working with noise a sustainable regulation is needed. The current regulation is vague in too many means. Nykvist states that what is needed is a regulation that more clearly prioritize noise. Otherwise we will be forced to weigh weak factors against each other which can undermine the priority of noise.

It is important to have a better connection between research and actions that really matters in the future, tells Nykvist. He continues by adding that it is of importance that the present cross check between The Swedish Environmental Code and the Plan and Building Act gain effect in the future.

Nykvist mentions that the municipality is planning to procure software for calculations and modelling in order to work more internally with noise matters. Since they will be able to try, plan and analyse more alternatives internally they will also be able to improve their work with noise in City planning.

4.1.4.4 Regulations and guidelines

A disadvantage with the new regulation is that it has not yet been trialled in the highest legal instance, which leads to uncertainties in how it should be interpreted.

Nykvist finds it positive that the new regulation has gained greater legal status. It was weaker before and the guidelines gave even more room for interpretation. The new regulation has also increased the status of noise matters.

Further, it is clear regarding how noise levels should be calculated in the detailed development plan for future traffic flows, Nykvist explains. Hence, the technical development of future cars is not taken into account.

4.2 Consultants

Interviews were conducted with Jan Pons, Ramböll Sverige AB, on the 1st of March, Albin Hedenskog, WSP Sverige AB, on the 1st of March and Clara Göransson, Tyréns AB, on the 6th of April,

4.2.1 Jan Pons

Interview with Jan Pons, Head of the Noise and Vibrations Unit at Ramböll Sverige AB.

4.2.1.1 Working as a consultant

Pons starts by talking about the tasks they have as consultants, giving examples like noise mappings for clients, produce investigational reports or solving acoustical problems.

Pons claims that they, as consultants, could be able to do a lot more than they are doing today. However, due to the fact that they work towards a client, who decides when a project is terminated, they are not given the possibility. Although it differs amongst clients. Some only wants a report with a technical description while other clients want to understand the fact behind the numbers.

Pons explains that as consultants they try not to affect the client. Their reports are presented factual and that is essential since they sometimes work for a developer and sometimes for the municipality.

He also mentions other factors that are steering consultants work, like the noise regulation, municipal regulations, action plans or similar as well as the developer's specific plans.

4.2.1.2 City Planning

It is the responsible municipal officials' role to weigh in noise in the City planning process, but it should be the politicians, considers Pons. He continues by stating that the municipal officials' competence is lacking in specific factual questions, for example noise, in some municipalities.

Pons presents a proposal to create a classification on residences similar the ones on fridges. The classification should include indoor and outdoor noise levels. Considering that some persons are being heavily affected, the consumer should be informed about the risks simply by looking at the classification before making a choice regarding residence.

One example, in order to have a sustainable approach towards City planning, could be electric car zones to put the matter in a bigger picture. The most important part is just to put everything in a bigger picture and not isolate every part of the problem. An iterative process is needed to solve the problems regarding City planning, states Pons.

Another issue is predicting traffic data for the future. Pons explain that they are not taking into account the fact that the modern car fleet is getting quieter in the future and explains that the threshold limit values used today are based on measurements executed in the late 1970th.

Pons frames a question: Are we getting more noise in the future due to the increased number of vehicles or are the technical development of vehicles leading to a decrease of noise levels instead?

4.2.1.3 Regulations

Pons considers that the boundaries are distinct between different regulations, both regarding outdoor and indoor noise levels as well as new developments and reconstructions. Today's regulations are in general good, but unfortunately only outdoor levels are regarded in City planning.

Earlier, people were forced to sleep with the windows opened, but with today's technology and well-functioning ventilation system it is possible to obtain a good indoor environment with closed windows.

4.2.2 Albin Hedenskog

Interview with Albin Hedenskog, responsible for the Market and Technical Group for Community Noise Matters at WSP Sverige AB.

4.2.2.1 Working as a consultant

Most of the work as a consultant is assignment based, clients can be exploiters, municipalities or the state. The assignments characteristic can vary from infrastructure projects to detailed development plans and municipal comprehensive plans. Regarding detailed development plans can both the municipality and exploiters be in charge of the work.

One example working as a consultant, could be having the National Transport Agency (NTA) as a client. Noise investigations would in this case be executed with NTA's own guidelines, from the infrastructure proposal 1996/97:53, as a basis. A good support for coming investigations are the new guidelines from NTA. In the former guidelines, the track and road noise were separated in two different regulations. However, in the new guidelines the both types are included in one.

It is necessary as a consultant to relate to several different steering documents and regulations that may originate from the Riksdag, the Public Health Agency of Sweden or the municipality Hedenskog explains.

He continues by adding that it is quite easy to work in accordance to the different guidelines even though they in unique cases are contradictory. Giving one example when roads are projected in parallel with the work with a new detailed development plan. In that case the levels at façade for residences differs between the National Transport Agency's guidelines and the traffic noise regulation.

4.2.2.2 Examples of how to plan

One deficiency in the execution of noise investigations is the fact that they are not standardized. It contributes to the possibility that the same investigations can lead to different results in noise levels. The work done by the Environment Department in order to produce exact conditions for noise investigations is a step in the right direction for the City of Gothenburg. A proposal, from Hedenskog, could also be to publish well executed investigations on the web, as a template for future investigations.

It is important, in the long-term perspective, to identify what actions each national agency have the authority to execute. The municipalities have a small number or no possibilities to work with improvements of the source, in this case vehicles. There are alternatives where heavy traffic is prohibited during night time, but that will only help on specific roads though and not contribute to a holistic solution. One action, possible on regional level, is for example low noise emission demands on public transports from the municipality in procurement processes.

4.2.2.3 Final words

New guidelines including demands for accessing good sound environment for residents is a step in the right direction for the City of Gothenburg to create sustainable residential areas. However, a distinct description of a good sound environment is lacking. Hedenskog continues by stating that it would be interesting if the City enlightened the public regarding where good sound environments are located and not only provide noise maps.

4.2.3 Clara Göransson
Interview with Clara Göransson, Acoustician at Tyréns AB.

4.2.3.1 Working as a consultant
Acousticians work both in an early and late stage of the planning process. One example within the early stage is noise calculations for municipal comprehensive plans. Work could also include pre-studies of railway routes and its consequences. Göransson explains that it is mostly about comparing noise effects in different ways.

4.2.3.2 Guidelines and regulations
One of several difficulties with today's regulations, is the low amount of traffic needed to exceed levels of 55 [dB].

Although there has been progress in comparison to the old guidelines, it is still hard do manage with the new developments. Improvements are still not enough sufficient to allow a great amount of dwellings.

4.2.3.3 Today's City planning
Noise is one out of many factors in today's City planning, however noise as a factor is fairly low prioritized in comparison to other aspects. In today's City planning a great deal is about exploiting harbour and industrial areas. These areas are hard from a noise matter point of view and often must technical solutions, noise barriers for example, solve the issues.

How noise is taken into account depends, Göransson explains. Sometimes it is taken into account in the conceptual phase through environmental impact assessment (EIA). For those cases it is the one in charge for the EIA that have the responsibility to weigh noise as a factor against other aspects.

4.2.3.4 Future solutions
A given action related to sustainable City planning and noise is to prohibit traffic, which is the easy way according to Göransson. Other possibilities would be to investigate other transport solutions but the sustainable and durable solution is to attack the source.

4.3 Organizations
The following section include the interviews with representatives from different organizations. Interviews were conducted with Kerstin Blom Bokliden, the Swedish Association of Local Authorities and Regions, on the 2nd of March, and Magnus Lindqvist, the National Board of Housing, Building and Planning and Environment Department at the City of Stockholm, on the 22nd of March.

4.3.1 Kerstin Blom Bokliden
Interview with Kerstin Blom Bokliden, Expert in Environment at the Department for Growth and Built Environment at Swedish Association of Local Authorities and Regions (SKL).

4.3.1.1 Introduction
Blom Bokliden initiates by raising an important point in how Sweden defines the EU-directive regarding community noise. The directive includes cities and densely built-up areas. Sweden use the interpretation of the municipalities' instead of the cities', leading to that more municipalities are included in the directive compared to if only cities were included.

SKL originated a network for all municipalities affected by the directive, which has been and still is a good platform for discussion and knowledge building. Meetings are usually held two times a year with the purpose of informing, spreading news and experience transfer regarding noise mapping.

One part of SKL's work regarding noise, is to create platforms and networks to support the municipalities in the work with EU's noise directives and the Swedish regulation for noise mapping of community noise.

Further, Blom Bokliden tells that it is the Nation Sweden that is responsible on all levels regarding the EU directive. The responsibility to conduct strategic noise maps is delegated to the municipalities and the National Transport Agency is responsible for larger roads and railroads. However, Blom Bokliden states that there is no possibility to put pressure on the municipalities that are not following the directive.

4.3.1.2 Noise regulations

The problem with the new noise regulation is that there are no transition criteria in the regulation. Hence, the National Board of Housing, Building and Planning has recently announced on their webpage that the new regulation shall work as a guidance for plans started before the 2nd of January 2015. Further, Blom Bokliden considers that the new regulation shall be able to be implemented on all plans that are in progress, and not only for the ones started after 2nd of January.

The new noise regulation is good and contributes to the fact that noise is needed to be included earlier in detailed development plans. It is also good that we get a common regulation for the whole country and not different guideline values for different areas in the country Blom Bokliden states.

SKL considers, in general, that Sweden comes out well regarding taking noise into account in City planning. We have come a long way with the new regulation, noise is seen as an entirety, Blom Bokliden claims.

4.3.1.3 Examples of how to plan

The regulations must accept noisier areas and passages in cities. Hence, there must be compensation in forms of green areas close by residential areas. Blom Bokliden says that SKL considers that it must be built correct from the start, with respect to noise. By doing that it is possible to find solutions like placing residences right, locate bedrooms towards the damped side etc. Newly developed residences have well-functioning ventilation which lead to the fact that there is no need to have opened windows during night time for a good night's sleep.

One good example of technical development is the electric car in the dense environment, which contributes to a decrease in noise levels. Alternatives could also be to decrease the speed or create zones where studded tires are prohibited.

4.3.1.4 Final words

Finally Blom Bokliden adds that the noise matter has been integrated into the physical planning in a better way than before, but it has taken time to obtain a common view. Matters take time Blom Bokliden concludes.

4.3.2 Magnus Lindqvist
Interview with Magnus Lindqvist, Noise Specialist at National Board of Housing, Building and Planning and Environment Department at the City of Stockholm

4.3.2.1 Introduction
There have been major changes with the national regulations regarding community noise during the last couple of years. Something that have not settled completely, Lindqvist explains. He continues by describing the work together with the county administration regarding spreading the message of the weight of discussing noise. The work that has been done include articles, information through conference and information texts from the National Board of Housing, Building and Planning.

4.3.2.2 Guidelines
Regarding the new guidelines the objective is to produce a guidance as a support to interpret them, in the same way as for the old guidelines. The guidance will be finished within next year. Although, it is impossible to predict every scenario even with a guidance presence. Hence, it is important to discuss these matters to find common interpretations.

4.3.2.3 Planning today
Exploiters are often willing to develop in areas with bad sound environments, particularly in central parts of the cities with several noise sources. An easy option to avoid this situation is to not develop such areas.

The signals from today's politicians are to allow higher noise levels in order to be able to develop in all areas. It has been a demand from politicians to loosen the guideline values regarding noise.

There is a problem with the fact that noise is only regarded as a matter of comfort that is possible to spare while planning, even though it is a matter of health. Lindqvist considers that resource shortages or the lack of competence amongst municipalities are factors that could lead to the fact that noise is being down prioritized. It is a common fact that other environmental and health issues gain higher status than noise in City planning. Lindqvist continues by adding that there is a problem regarding that municipalities do not have the mandate to influence aircraft noise, since it is on a national level of decision making.

4.3.2.4 Final words
At last, Lindqvist adds that it is exciting that there are things happening in the noise area, the question regarding sound quality has gained greater attention the last years.

4.4 Researcher
The following section include the interview with a researcher. The interview was conducted with Björn Hellström, Royal Institute of Technology, School of Architecture, on the 19th of April.

4.4.1 Björn Hellström
Interview with Björn Hellström, Adjunct Professor and Associate Professor at Royal Institute of Technology, School of Architecture.

4.4.1.1 Introduction
Hellström begins by stating that at the moment, there is a serious will from the authorities to emphasize noise matters. Furthermore, even the county administrative boards have started to gain interest in these matters.

Hellström considers that the Plan and Building Act is pointless, regarding design and noise. The authorities are not willing to change the law, instead they wish for a guidance that lead to great possibilities for interpretations.

4.4.1.2 Today's City planning

Hellström continues by describing Citylab Action, a platform for sustainable City development where municipalities can connect their own projects. The platform consists of 17 sustainable goals, where sound environment is one. The demands are often harder to reach and contributes to challenge the projects. The platform also offers workshops for the projects where interdisciplinary groups can discuss noise matters.

One difficulty with today's way of working with noise matters is that the municipal responsible for those questions are given the possibility to influence fairly late in the planning process, and consequently making it hard to work proactive.

Hellström states that the ones generating the national guideline values do not take into account that noise is unhealthy, and adding that they are doing it wrong.

4.4.1.3 Final words

Finally Hellström mentions the two most important aspects for City planning and noise. That is, to think interdisciplinary and to take noise into account in the early City planning phases.

5 Discussion

To begin with is it noteworthy that 3 out of 15 municipalities are missing a noise action plan, this indicates the lack of importance for noise as a factor. Even though Borås and Eskilstuna are just a few thousand people above the 100 000 residents limit from the EU-directive, they are affected by the directive. Future expansions have indicated a population growth in these regions making it possible for forward planning in order to prepare the municipality to start working with noise matters. Regarding Linköping, the fifth biggest municipality in terms of population, there is doubtlessly evidence on how low noise is being prioritized.

The lack of mandate amongst municipalities regarding all noise sources is not only in disfavour but also confounds City planners. There must be an alteration on a national level to create a direction for municipalities to strive toward in strategic planning regarding all noise sources.

There is no explicit authority that has the mandate to take actions against municipalities that are not following the EU directive. The closest to have a mandate is the Swedish Environmental Protection Agency which acts as national noise coordinator. In order to put pressure on municipalities that are not doing what they are supposed to, a clear way of decision making must emerge from the government. Today the municipality monitors itself.

As stated in the conducted interviews, the lack of involving noise as a factor early in the planning processes makes it difficult to take the factor into account later on. Noise, together with other important factors in City planning, must be treated with respect to its importance and not be neglected.

Even though many of the municipalities do have structures and processes to work with noise as a factor, the resource shortage is a great obstacle to execute the routines. Shortage of resources and the lack of knowledge and competence amongst the employees is one of the biggest problems in order to have functioning processes for City planning. Additional, the lack of monitoring and non-measurable indicators lead to ambiguities in the overall work with noise matters.

One problem with today's noise action plans is the focus on actions toward existing environments far more than on strategic issues. The focus of the actions lies on technical solutions, such as noise barriers, rather than City planning.

Good examples of how noise is given greater attention are the ones from Gothenburg and Jönköping where the role of noise coordinators have been instituted. A role where, often, an acoustician is given the responsibility of the overall planning with regard to noise. The role is interdisciplinary in the meaning of the overall responsibility of not only noise but also other planning actions.

To be able to create a joint view on how to produce pilot studies a standardized national investigation model should be created. These models will contribute to a joint way of working amongst municipalities and consultants.

The EU-directive has forced the municipalities to work towards greater actualization of the noise issue. Which indicates the importance of involvement from higher level of decision making.

Concluded from the interviews is the importance of interdisciplinary task forces or groups. These groups spread knowledge between departments instead of solving each problem separately. One way of doing so is to create a joint guidance for the municipality with every responsible instance present in the collaboration.

Continuously are demands in regional procurement processes a tool for municipalities to influence noise emission levels from cars, buses and trams. There is one good example with electric buses in Malmö.

For the municipalities to be able to influence urban development a larger degree of initiatives must come from the municipality itself instead of from exploiters. Having exploiters, with other important aspects than noise, coming up with initiatives will interfere with adequately considering all the important factors in the planning process.

6 Conclusion

The conclusion is structured in categories with bullet points that introduce each conclusion.

Organizational work

- Interdisciplinary task forces and working groups are needed to discuss noise matters with a holistic view
- An increase in competence and knowledge amongst municipal administrators and officials is needed
- The shortage of resources must end in order to be able to improve the work with noise matters
- Mandate is needed amongst authorities to take actions or give away fines to municipalities that do not consider the regulations
- Monitoring is needed to follow up progress in the noise action plans

Planning

- Acousticians need to be a part throughout the whole planning phase
- A national guidance with less room for interpretation together with a more clear regulation will contribute to better support for City planners
- Focus must lie on all noise sources and not only traffic noise, which sometimes is the case
- Noise and quality of the sound environment must be prioritized higher amongst planning factors
- Standardized investigation models for community noise are needed to have a joint national work process

Actions

- Actions need to be taken at the source in order to lower the amount of noise emissions
- Indicators must be practically measurable in order to follow up progress
- Demands for low noise emissions shall be stated in the procurement phase from the municipality in order to affect long-term effects

Finally one can conclude that noise is given greater attention but as Blom Bokliden said, matters take time.

6.1 Further studies

The next step in reviewing the planning processes is to examine case studies where multiple exploiters share the same interests. An example of such an area is Kvillebäcken in Gothenburg where densifying, traffic management and the surrounding environment are a few factors that play an important role in the City planning. It is important in order to be able to give advices in future City planning with different prerequisites.

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Appendix 1 – Comparison in Excel

The factors listed below are used to evaluate the actions included in each separate noise action plan. A brief description for each factor is presented as well.

- Indicators, type of measurable indicators used for monitoring (Alteration in number of annoyed by noise due to change in traffic speed, Number of preschools and schools where actions have been taken)
- Alternative actions, list of non-physical actions and with long-term focus (Campaigns for tyre choices, Inform the Public, Increase internal knowledge)
- Several source, regarding all noise sources for noise emission (Traffic noise, Industrial Noise)
- Particularly vulnerable, consideration of particularly vulnerable segments (Nursing homes, Schools, Preschools)
- Residential properties, list of actions by responsible land owners (Window changes, Supervision of noise treatments, Monetary contributions from the municipality)
- Recreational areas, general overview of areas owned by the municipal (Quiet areas, Sound environments in Parks)
- Around the source, focus on physical actions (Noise barriers, Noise berms, Quiet road surfaces)
- At the source, decrease of noise emissions from the source (Noise demands through procurements, Track squeal, Increase electrical vehicles)
- Planning, focus on holistic actions (Traffic Management, Municipal noise groups, Accessible material on the web)

The tables below present data from the evaluation of the actions included in each noise action plan, both with numerical and graphical.

Municipality	Stockholm	Gothenburg	Malmö	Uppsala	Linköping	Västerås	Örebro	Helsingborg	Norrköping	Jönköping	Umeå	Lund	Borås	Huddinge	Eskilstuna
Indicators	0	1	1	1	0	0	1	0	1	1	1	0	0	1	0
Alternative actions	1	0	1	1	0	1	1	1	0	0	0	0	0	0	0
Several sources	1	0	0	0	0	1	0	0	1	1	1	1	0	1	0
Particularly vulnerable	1	1	1	1	0	1	1	1	1	1	1	1	0	1	0
Residential properties	1	1	1	1	0	1	1	1	1	1	1	1	0	1	0
Recreational areas	1	1	1	1	0	1	1	1	1	1	1	1	0	1	0
Around the source	1	1	1	1	0	1	1	0	1	1	1	1	0	1	0
At the source	1	1	1	0	0	1	1	0	1	1	1	0	0	0	0
Planning	1	1	1	1	0	1	1	1	1	1	1	1	0	1	0

Municipality	Stockholm	Gothenburg	Malmö	Uppsala	Linköping	Västerås	Örebro	Helsingborg	Norrköping	Jönköping	Umeå	Lund	Borås	Huddinge	Eskilstuna
Indicators															
Alternative actions															
Several sources															
Particularly vulnerable															
Residential properties															
Recreational areas															
Around the source															
At the source															
Planning															