



# Noise, Social Housing and Sleep

A Social Science Review

**By:**

Sandra Lori Petersen, PhD in anthropology, scientific assistant in AnthroAnalysis,  
Dept. of Anthropology

**In collaboration with:**

Steffen Jöhncke, senior adviser  
Bettina Skårup, business relations officer

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## Contents

|   |           |
|---|-----------|
| <b>Executive summary</b> .....  | <b>3</b>  |
| <b>A Social Sciences Review on Noise, Social Housing and Sleep</b> .....                        | <b>5</b>  |
| <b>Introduction</b> .....   | <b>5</b>  |
| <b>Noise and life in the city</b> .....   | <b>7</b>  |
| <b>Noise and health</b> .....   | <b>8</b>  |
| <b>1: Noise degrades the quality of sleep in low-income housing</b> .....                       | <b>9</b>  |
| Chambers, Pichardo & Rosenbaum, 2016: "Sleep and the Housing..." .....                          | 9         |
| Hale, Hill, Friedman, Nieto, Galvao, Engelman, Malecki, Peppard, 2012: "Perceived ..." .....    | 10        |
| Hale, Troxel, Kravitz, Hall and Matthews, 2014: "Acculturation and Sleep..." .....              | 10        |
| <b>Summing up</b> .....   | <b>11</b> |
| <b>2: Domestic noise threatens the integrity of the home in the social housing sector</b> ..... | <b>12</b> |
| Weinhold 2016: "Sick of Noise: the Health effects of Loud Neighbours and Urban Din".....        | 12        |
| A & B Analyse, 2016: "Naboskab" .....   | 13        |
| Delholm & Jensen, 2015: "Chikane og problemskabende adfærd..." .....                            | 13        |
| Avlund & Kjeldsen, 2016: "Trygheden I danske byområder..." .....                                | 14        |
| Mee, 2007: ""I Ain't Been to Heaven Yet?..." .....  | 14        |
| Ureta, 2007: "Noise and the Battles for Space..." .....   | 14        |
| <b>Summing up</b> .....   | <b>15</b> |
| <b>3: Noise contains meanings</b> .....   | <b>17</b> |
| Stokoe & Hepburn, 2005: ""You can hear a lot through the walls'..." .....                       | 17        |
| Gurney, 2000: "Transgressing private-public boundaries..." .....                                | 17        |
| <b>Summing up</b> .....   | <b>18</b> |
| <b>4: Neighbour noise is perceived as a moral problem</b> .....                                 | <b>19</b> |
| Larsen, Frederiksen & Riemenschneider, 2016: "Potentialer I konfliktmægling..." .....           | 19        |
| Flindt, 2004: "The responsible tenant: housing governance and the politics of behavior".....    | 19        |
| Rosenberg 2016: "Shhh! Noisy cities, anti-noise groups and neoliberal citizenship".....         | 19        |
| <b>Summing up</b> .....   | <b>20</b> |
| <b>5: Noise is also a material problem</b> .....  | <b>21</b> |
| Power, 2015: "Placing community self-governance..." .....                                       | 21        |
| Dybro & Grønlund, 2005: "At fremtids sikre almene boliger fra 50'erne..." .....                 | 22        |
| Michelsen, 2013: "Fremtidsanalyse" .....  | 22        |

|  |            |
|--|------------|
| Landsbyggefonden, 2014: "Nye udfordringer for det almene boligbyggeri" .....       | 23         |
| Rasmussen & Hoffmeyer, 2015: "Lydisolation mellem boliger i etagebyggeri..." ..... | 23         |
| <b>Summing up .....</b>  | <b>23</b>  |
| <b>Conclusions .....</b>   | <b>25</b>  |
| <b>Literature .....</b>  | <b>257</b> |

## Executive summary

A growing body of research documents the harmful effects of environmental noise and the ways in which traffic noise especially affects the sleep and hence the health of individuals adversely. However, this review of social sciences studies of the relationship between noise and sleep among residents of social housing indicates a larger problem: Traffic noise and the health risks it implies is only one aspect of how noise affects the lives of people in the city and in social housing in particular. The review includes reports emerging from the Danish social housing sector touching upon the subject of noise nuisances. In these reports issues of noise nuisances are included as one aspect, albeit rarely as a concern with a high priority.

The studies and reports gathered in this review document that residents of social housing are often particularly exposed to noise from traffic as well as from neighbours. These noises represent a source of nuisance and a health risk due to a reduced quality of sleep and a generally increased stress level.

The studies and reports further indicate that environmental and neighbour noise are different in significant ways, especially because neighbour noise often contains a higher level of information than traffic noise and because subjects attach more meaning to it. The meanings attached to noise are manifold and produced through complex processes that are likely to be influenced by individual circumstances and by the relationship one maintains – or not – with the producers of noise. The nuisance of neighbour noise is not necessarily defined by the volume of the noises; the sound of others having sex, for example, is experienced as transgressive, not because of its volume but because of its intimate character, and sounds that are interpreted as stemming from violence or harassment are experienced as frightening and stressful, even if they are of a low volume.

The studies point at how most people consider their home as a private place, where they value feeling safe. When the noises of others transgress the borders of this space, it can be experienced as a severe violation of this privacy and as a threat to home safety.

Finally, the studies indicate that neighbour noise tends to be framed as a moral issue, to be solved through conflict mediation and the establishment of rules of conduct. This approach implies a risk of ignoring the material aspects that contribute to the amount and character of neighbour and environmental noise. When conflict mediation is conceived of as the solution to neighbour noise, for example, there is a risk of omitting the importance of making suitable material improvements. The implication is that social housing organisations tends to consider conflict mediation as the main solution to conflicts related to noise nuisances, but do not seem to prioritize an amelioration of the physical condition of buildings as a means of reducing environmental and neighbour noise.

The studies and reports brought together in this review document noise nuisances as a challenge with a broad spectrum and many aspects, and that it affects greatly on the life quality, sleep, and health of people living in the city in general and of residents of social housing in particular.

The limited quantity and irregular quality of existing studies in this field, and the heterogeneous results of the ones gathered and presented in this review, further indicate that this is an area that would gain significantly from further research and a diversification of the scientific approaches adopted. A stronger and broader research base in this field is likely to also create more attention from policy makers, relevant professionals, and the public at large towards this important social issue.

# A Social Sciences Review on Noise, Social Housing and Sleep

## Introduction

A growing body of research documents the harmful effects of environmental noise and the ways in which traffic noise especially affects the sleep and hence the health of individuals negatively. However, there is reason to assume that traffic noise and the health risks it implies is only one aspect of how noise influences the lives of people especially in the city. Therefore, there is a need for broadening the scope and doing more research on other forms of noise than traffic noise, and include perspectives not only on how noise may reduce the quality of sleep, but also of how noise is experienced.

The present review is commissioned by Rockwool A/S and its scope reflects the interests suggested by the company, namely social sciences perspectives on the relationship between noise and sleep in social housing. This focus is of particular societal relevance for the following reasons:

- Reduced quality of sleep caused by environmental noise is well documented as a health risk.
- There is almost no documentation of neighbour noise nuisance as a health risk even though research indicates that this kind of noise represents a threat to the sleep, health and general life quality of individuals.
- Research indicates that low-income households, often living in social housing are generally more exposed to environmental noise, as this form of noise is unevenly distributed across urban landscapes.
- Research from Denmark further indicates that residents of social housing experience noise nuisances from neighbours more often than residents of other forms of housing.

Only a very limited number of social sciences articles cover noise, sleep and social housing at the same time. This review therefore gathers a range of studies treating one or more aspects of these issues, mostly by describing at least two out of the three focus areas. The scientific studies stem from Australia, Chile, Great Britain, the Netherlands and USA, and they are supplemented by reports from the social housing sector in Denmark.

Acoustics studies play an important role in available knowledge of noise levels and in the development on noise policies. A discussion of these policies, and the research they are based on, is beyond the scope of this review, however a brief overview of the history of noise policies is given in the subsequent section “Noise and life in the city”.

Questions and issues arising from the field of medical research on noise, with its documentation of the negative consequences on health were part of Rockwool A/S’ inspiration for commissioning this review, and as such, this research represents the point of departure of the review.

The section “Noise and health” below gives a brief overview of the medical research on noise. Three medical studies are included in the review (Chambers et al. 2016; Hale et al. 2012; Hale et al. 2014). These three studies are included because each of them indicates correlations between social and cultural contexts and the quality of sleep of individuals. The three studies are strictly quantitative and do not offer much explanation to the correlations that they demonstrate. However, they point to how productive an integration of sleep studies with social science could be in supplementing the quantitative results with qualitative explanations.

The studies and reports included in this social sciences review on noise, sleep and social housing is organized in five parts treating the following important points:

1. Noise degrades the quality of sleep in low-income housing
2. Domestic noise threatens the integrity of the home in the social housing sector
3. Noise contains meanings
4. Neighbour noise is perceived as a moral problem
5. Noise is also a material problem

## Noise and life in the city

With industrialization and urbanization, noise has become a still more present feature of everyday life of city dwellers across the world. As noise is unevenly distributed across the urban landscape, low-income inhabitants are often exposed to louder noise levels than other residents of the city (Brainard et al. 2004; Ogneva-Himmelberger&Cooperman 2008; Branzini & Ramirez 2005). Especially, industrial noise mostly affects workers and poor communities who live in proximity to the industry (Rosenberg 2016:193). Aircraft noise is an important concern for people living near airports, but traffic noise from cars and trucks is the most widespread and important source of environmental noise (Rosenberg 2016:193).

Noise first began to be perceived as a societal a problem in the beginning of the 20<sup>th</sup> century, when the first anti-noise groups were formed. In 1906 the New York's Society for the Suppression of Unnecessary Noise was formed and in 1908 the German Association for the Protection from Noise (Rosenberg 2016:192). These groups were followed by others, and in general they perceived noise as a danger to mind and body; it was considered as disruptive to intellectual processes and therefore as a threat to civilization (Rosenberg 2016:193). These first groups were primarily interested in protecting the ears of the elite, and considered the boisterous lower classes to be sources of noise rather than people who should be protected from it (Ibid).

Around the 1920s and '30s, however, the debate changed, and noise began to be considered a general public health problem and a nuisance to the population at large (Ibid). Though some noise-abatement campaigns proved relatively successful with reducing noise in specific areas, general noise policies only really started to appear much later (Ibid).

In 1972, the United States introduced a Noise Control Act, in 1982 the funds for administering the act were phased out and the responsibilities were relegated to state and local governments though the Noise Control act was never rescinded and as such remain in effect today though it is unfunded.<sup>1</sup>

In Europe, noise was established as an environmental problem that demanded action in 1996, when the European Commission published a "Green paper on future noise policy" that clearly posited noise as a pollutant. The Green paper had the declared aim that no person should be exposed to noise levels that endanger health and quality of life and called for a regulatory approach towards noise as an environmental problem (Adams et al. 2006:2387).

Today, all member countries of the EU are obliged to map the noise levels of city areas and greater roads, and this demand is supplemented by recommendations on maximum noise levels (Jensen & Lorenzen 2016:23).

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<sup>1</sup> See: <https://www.epa.gov/history/epa-history-noise-and-noise-control-act>



## Noise and health

The World Health Organisation [WHO] estimates that at least 1 million healthy life years are lost each year to environmental traffic noise alone in Western Europe (WHO 2011: xvii). The documented health risks of traffic noise include increased risks of suffering from cardiovascular diseases, blood clots and strokes (Gadeberg 2016; Kluzenaar et al. 2013; Ouis 2001; Sørensen 2016:17-19; Sørensen et al. 2013; Sørensen 2013). Traffic noise is found to influence negatively on the cognitive abilities of children and recent studies indicate that traffic noise exposure might lead to children's hyperactivity (Sørensen 2016:17-19).

According to senior researcher at the Danish Cancer Society Mette Sørensen, possible correlations between exposure to traffic noise, diabetes and certain forms of cancer needs more thorough research in order to be fully documented. Overall, however, the negative health effects are well documented and estimated to cause 200-500 deaths in Denmark a year (for comparison 167 people died from traffic accidents in 2015) (Ibid).

Research indicates that nuisance from neighbour noise has negative effects on health at a magnitude comparable to the health issues related to smoking (Weinhold 2016:3). As we shall see in this review, however, the research in this field is very sparse. One reason for this might be that neighbour noise represents a nuisance for other reasons than its loudness: neighbour noise can contain a multitude of information about the doings of other human beings, and in this way, it is different from the uniform sound of traffic passing by. Hence, the nuisance from neighbour noise demands attention to other qualities than its decibel levels, and calls for other ways of examining and qualifying noise nuisance if we are to understand its effects on health.

## 1: Noise degrades the quality of sleep in low-income housing

Daily sleep is a biological imperative of all human beings, but broadly speaking, modern society's valuing of production tends to cast sleep as its antithesis, and sleep has therefore generally been relegated to a position of low value. However, over the last twenty years research on sleep has increased considerably across the globe, and has put sleep on the agenda as a central concern of public health (Dinges 2007:vii).

Sleep researchers consider sleep deprivation a widespread problem in contemporary society that is likely to be growing (Williams et al 2007:278). British research claims that the entire nation is sleep deprived and points out key disrupters of sleep being children, worry at work and noise nuisances (Williams et al 2007:279).

Sleep research has typically focused on specialized medical areas, whereas the "doings" related to sleep; how people sleep, under which conditions, with whom and how they experience the sleep has only been sparsely researched. The consequence is that central knowledge on the social and cultural conditions for how and why people sleep "well" or "poorly" are largely missing (Williams et al. 2007:276).

This section offers an overview of three studies from the United States, where the relationships between sleep and house and living conditions of low-income population groups of different ethnicities and migrant status is examined.

### Chambers, Pichardo & Rosenbaum, 2016: "Sleep and the Housing and Neighbourhood Environment of Urban Latino Adults Living in Low-Income Housing: The AHOME Study"

This study is based on data from the AHOME study, a cross-sectional study of 385 low-income Latino adults living in housing units in West and South Bronx, New York, USA. The participants were all above 18 and were eligible for federal low-income housing assistance, but some lived in public housing whereas others rented flats without federal renting assistance (Chambers et al. 2016:171).

The data was collected through in-person interviews, where the participants were asked about their sleep quality, sleep duration, sleep disturbances and prolonged sleep latency (Chambers et al. 2016:172). Participants were asked about their neighbourhood, their building and about household crowding. For all of these factors noise disturbances were a related issue.

The results of the study shows that neither sleep disturbances, sleep quality or prolonged sleep latency were associated with household crowding (Chambers et al. 2016:176). Sleep disturbances as well as sleep quality were associated with neighbourhood disorder and building problems, and extreme levels of both were associated with prolonged sleep latency (Ibid). Neither neighbourhood disorder nor building problems were significantly associated with sleep duration, here, on the other hand was a clear association with household crowding leading to shorter nights of sleep (Ibid).

The authors conclude on the importance of considering how various problems accumulate for residents of highly disadvantaged neighbourhoods and how this may connect to extreme levels of social problems, to noise, experiences of danger in the neighbourhood and to physical deterioration of the environment (Chambers et al. 2016:182).

Hale, Hill, Friedman, Nieto, Galvao, Engelman, Malecki, Peppard, 2012: "Perceived neighbourhood quality, sleep quality, and health status: Evidence from the Survey of the Health of Wisconsin"

This study considers whether associations between perceived neighbourhood quality and health status are mediated by overall sleep quality, based on previous studies that consistently show that residence in neighbourhoods characterized by socioeconomic disadvantage is associated with poorer mental and physical health. Based on results from studies in the Southwestern United States this study use data from The Survey of Health of Wisconsin (SHOW) to test whether the results are extendable to this area.

The study finds that perceptions of low neighbourhood quality here are indeed associated with poorer self-rated sleep quality, poorer self-rated health and more depressive symptoms (Hale et al. 2012:16-17). A perception of neighbourhood quality here implies perceptions of crime, litter and pleasantness (Hale et al. 2012:17). It is noted that physical and environmental stress caused by a very noisy environment due to traffic and / or neighbour noise or by high levels of artificial light from for example street lamps can influence individuals' perceptions of their neighbourhood and affect their sleep negatively (Hale et al. 2012:17).

The authors call for further research on whether the associations between neighbourhood context and sleep are caused by physical or psychological factors. Finally, they call for ways of translating findings into ameliorations of neighbourhoods and especially of the sleep and health of residents (Hale et al. 2012:21).

Hale, Troxel, Kravitz, Hall and Matthews, 2014: "Acculturation and Sleep among a Multiethnic Sample of Women: The Study of Women's Health Across the Nation (SWAN)"

This study explores the relationship between women of different ethnicities (the study employs the term "race" as well) in the United States. Specifically, it investigates the differences in self-reported sleep quality between immigrants and US-born Hispanic/Latina, Chinese and Japanese. Most previous studies connect immigrant status with sleep complaints reporting multiple awakenings and / or a typical night's sleep as restless or very restless (Hale et al. 2014:314).

The study is based on data collected through questionnaires distributed amongst 1180 respondents in Oakland, Los Angeles and Newark. The findings of the study indicates that US-born whites and non-whites have higher rates of sleep complaints than first generation immigrants, and offers a range of hypothesis as to why this might be.

The overall conclusion on the finding is that it might be explained by language acculturation and unmeasured factors associated with language acculturation, however more studies are necessary to define these reasons more precisely (Hale et al. 2014:312). Hence, the study does not offer fulfilling explanations to its own findings. The authors underline that knowledge on the contextual and cultural causes of poor sleep are lacking. It is known, they write, that individual factors such as education, ethnicity and employment influence sleep quality and duration, but much more knowledge is needed on how sleep is affected on a contextual level especially through neighbourhood, noise and light levels, a sense of safety and through cultural influences (Hale et al. 2014:315). Only very little is known, the authors underline, of the cultural dimensions of sleep (Ibid).

## Summing up

Overall, the studies related in this section examine the relationship between sleep quality, neighbourhood and ethnicity, and find that societal and cultural contexts influence the sleep quality of individuals. Specifically, in the 2016 study by Chambers et al., the authors point out noise as a factor contributing to problematic sleeping environments for residents of highly disadvantaged neighbourhoods.

The 2012 study by Hale et al. show that negative perceptions of the quality of one's neighbourhood is related to poor self-reported sleep quality and poor self-reported health. Hale et al. 2014 analyse data on women of different ethnicities living in the United States, and finds that US-born individuals of similar immigrant descent have higher rates of sleep complaints than first generation immigrants. The authors point at acculturation of language as a possible explanation to this. It is, not overly convincing, but it sheds light on the importance of exploring the cultural meanings of sleep. This study as well as the two others here cited is based on self-reported quality of sleep, and this form of data demands a thorough understanding of what respondents consider as "acceptable", "good" and "bad" sleep.

Overall, the studies indicate that the social contexts of disadvantaged groups represents a challenge to their sleep quality, that sleep might be an important element in understanding the generally poorer mental and physical health of these groups and that noisy environments are likely to play a role. However, questions of ethnicity, cultural and social contexts influencing these issues are only beginning to be explored and needs further and more qualitative research.

## 2: Domestic noise threatens the integrity of the home in the social housing sector

This section brings together studies and reports shedding light on how noise from neighbours and from the outdoor environment can be experienced as a nuisance to residents of social housing.

The category of social housing somewhat differs depending on the regional context. It is often used in Western Europe and most often refers to post-war industrially build estates, housing from the very poor over low-waged working class families to members of the middle class in some countries (Whitehead & Scanlon 2007:6). In Denmark alone, the social housing sector (*alment boligbyggeri*) makes up 18% of all residences. These are residences often exposed to high levels of environmental noise, especially traffic noise (Rogaczewska et al. 2015:20). Furthermore, residents of social housing more often than others report of domestic noise nuisance caused by neighbours (A & B 2016:9). Whereas the influences on sleep and health of traffic noise is well documented, and the limited research on neighbour noise as a health nuisance indicates that it has important negative effects, just like neighbour conflicts in general are indeed proven to be harmful to the health. In fact, a recent study indicates that recurrent fights with neighbours double the risk of an early death.<sup>2</sup>

The reasons for why neighbour conflicts and neighbour noise is likely to have such negative effects are probably related to the great importance given to how the home should be a safe and private space. Social sciences studies of “the home” and of “home making” describes how it is central for individuals and families in most cultures to be able to create a place for themselves that is experienced as a safe haven from the public realm (Mee 2007:208). This status means that noises that are beyond ones control and that penetrate the home can be experienced as a radical intrusion on a personal space.

### Weinhold 2016: “Sick of Noise: the Health effects of Loud Neighbours and Urban Din”<sup>3</sup>

“Loud and/or rude neighbours” Weinhold writes, “are an under-appreciated cause of misery and, apparently, health problems for many residents” (Weinhold 2016:21). This study has as its overall purpose to analyse the health effects of residential noise annoyance through data collected between 2008 and 2013 in the Netherlands. The data stems from 5000 adults, who have been answering Internet-based questionnaires after being recruited through repeated telephone contact and / or in person (Weinhold 2016:6). Weinhold notes that these surveys where not created to study noise pollution, and that a more focused survey design could achieve more precise and nuanced results on this matter (Weinhold 2016:22).

The study found that neighbour noise influence negatively on health in ways that makes them comparable to having a history of smoking (Weinhold 2016:3). She notes that moving costs in the Netherlands are high, and that as the presence of (or arrival of) loud neighbours cannot easily be

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<sup>2</sup> Medical researcher Rikke Lund has recently headed a larger research project on this issue. The project and its results are described here:

[http://nyheder.ku.dk/alle\\_nyheder/2014/05/drop\\_skaenderierne\\_og\\_lev\\_laengere/](http://nyheder.ku.dk/alle_nyheder/2014/05/drop_skaenderierne_og_lev_laengere/)

<sup>3</sup> This article is unpublished in a peer-reviewed journal, and available here:

<http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/10/Working-Paper-213-Weinhold.pdf>

Diana Weinhold is an associate professor of development economics at the London School of Economics.

observed or predicted in advance of moving into a new home, residents are left with little choice other than accepting a lowered life- and dwelling-satisfaction (Weinhold 2016:7).

The data at the basis of this study suggests that residential noise annoyance and specifically neighbour noise contribute to a number of health problems, such as cardiovascular disease, auto-immune diseases of bones and joints, fatigue and headaches and perhaps blood pressure and cholesterol levels (Ibid). Sleep disruption is found to explain some though not all of these health effects, why a generally increased stress level is assumed to be part of the explanation as well (Ibid). Importantly, Weinhold holds that the main conclusion of this paper is that “much more research is needed” in this area. She notes that research on the effects of neighbour noise has probably been sparse due to the difficulty in measuring neighbour noise, but underlines that self-reporting of noise annoyance holds an important and valuable potential (Weinhold 2016:21-22).

#### A & B Analyse, 2016: “Naboskab” (*Neighbourhood*)

Quantitative research on the relationship between neighbours undertaken in June 2016 (week 23) in Denmark shows that 23,9 % of the respondents have experienced conflicts with neighbours during the last five years (A & B 2016:8). The research project is based on questionnaires from 1262 respondents, whose gender, age and region are matched to compose a representative sample of Denmark (A & B 2016:2). Out of the respondents who have experienced neighbour conflicts 32% live in social housing (*almene boligbyggeri*) (A & B 2016:8). Out of the general amount of conflicts, 49,8% were reported as related to noise, and for inhabitants of social housing this amounted to 71,1% of the conflicts (compared to 31% in owner-occupied residences) (A & B 2016:9). Finally, 52,9% of the respondents noted that the neighbour conflicts they had experienced were related to events taking place outside of their apartment and 33,8% inside, whereas inhabitants in social housing experienced 60,5% of conflicts to be related to their neighbours’ inside activities inside and 23,3% to outdoor activities (A & B 2016:11). The latter indicates that at least an important part of the conflicts related to noise nuisance in social housing were related to noise from neighbouring apartments.

#### Delholm & Jensen, 2015: “Chikane og problemskabende adfærd i særligt udsatte almene boligområder” (*Harassment and problem creating behaviour in particularly exposed housing areas*)

A report from 2015 by Mikkel Dehlholm and Mia Kathrine Jensen on harassment (*chikane*) and problem creating behaviour (*problemskabende adfærd*) in what is termed “exposed social housing areas” (*udsatte almene boligområder*) points to conflicts between neighbours as being more prevalent in these areas than in general in the sector of social housing in Denmark. “Exposed social housing areas” is a category defined by the Danish Ministry for Immigration, Integration and Housing, who also commissioned this report.<sup>4</sup>

The report is based on a combination of quantitative and qualitative surveys, and amongst its results is that there are 70% more complaints from residents of exposed social housing areas than from

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<sup>4</sup> In daily speech, these housing areas are often referred to as “ghettos”. The ministry annually compose a list of “exposed social housing areas” based on the employment rate, level of education and income, number of inhabitants from non-Western countries and number of inhabitants convicted according to Danish penal code. At the basis of this report is the list from 2014 available here: <http://uibm.dk/filer/bolig/ghettolisten/liste-over-saerligt-udsatte-boligomraader-dec-2014.pdf>

other residents in social housing, and that the complaints especially concerns “noise” and “problematic use of staircase, basement or common areas (including garbage)” (Dehlholm&Jensen 2015:9, my translation). Finally, the report notes that several housing associations have implemented processes of conflict mediation with great success (Ibid).

Avlund & Kjeldsen, 2016: “Trygheden I danske byområder 2. En analyse af trygheden og nabolagsproblemerne i 31 udsatte boligområder sammenlignet med andre byområder i Danmark.” (*Safety in Danish city areas. An analysis of safety and neighbourhood problems in 31 exposed housing areas compared to other city areas in Denmark*)

This report was made by Center for Boligsocial Udvikling (*Centre for Social Housing Development*) a national knowledge centre collecting and analysing data on social housing across Denmark. Like Delholm & Jensen above, this report is similarly concerned with the particularly exposed social housing areas in Denmark and is based on data collected by the Danish police on the experience of safety in exposed social housing areas.

The main focus of this report is on describing how safety is experienced in “exposed areas” as well as comparing the degree of crime, neighbourhood problems and unsafety experienced in these areas and in other areas of the city. Noise is introduced as an element more frequently reported as a problem in exposed social housing areas, where noise from neighbours as well as people being noisy in the outdoor facilities and surroundings make residents feel unsafe in their homes (Avlund & Kjeldsen 2016:5,15,17,18,34).

Mee, 2007: ““I Ain’t Been to Heaven Yet? Living Here, This is Heaven to Me”: Public Housing and the Making of Home in Inner Newcastle”

In her analysis based on 213 questionnaires distributed among tenants of public housing in inner Newcastle, Australia, Kathleen Mee (2007) explores the experiences of home of a group of marginalized Australians, many of whom have a past that includes homelessness. Because of the very insecure housing situations, they have had prior to the public housing they are now settled in, several of Mee’s respondents greatly value the sense of home and security these houses provide them with. However, these feelings are challenged when noises penetrate their homes (Mee 2007:221). When noise from neighbours or from the outside environment enters the homes of these tenants, they feel the integrity of their homes to be threatened; they experience an inability to control the boundaries of their homes, and to some of them this makes experience these homes as insecure and estranged.

Ureta, 2007: “Noise and the Battles for Space: Mediated Noise and Everyday Life in a Social Housing Estate in Santiago, Chile”

Based on ten months of fieldwork, focusing on 20 low-income families living in the social housing estate “Tucapel Jimenez II” in Santiago, Chile, sociologist Sebastián Ureta (2007) explores the role of noise in everyday life of the residents. Ureta describes how the residents experience the noise of their neighbours to intrude into their homes and challenge its intimacy. Noise is here perceived as a spatial and material issue related to poor quality houses and as a social issue that becomes a nuisance due to a lack of solidarity between residents (Ureta 2007:104).

Social housing estates in Chile, according to Ureta, are built by private entrepreneurs with a main concern of minimizing costs, and in almost half the houses (48,6%) residents report of poor acoustic isolation as a serious problem. The noise issue is further problematized by a general increase in the noise level of the city, in 2001 at an average above 75 dB (Ureta 2007:112,113). The residents of Tucapel Jimenez II experience the noise of their neighbours to be intrusive; it prevents their children from falling asleep and themselves from enjoying the privacy of their homes. Because of the poor quality of the buildings, neighbours can often hear each other, especially when music is played aloud. However, the residents who reports of being disturbed by the music of others admit to play music themselves; because the noises of others are constantly present due to the poor quality of the buildings, the production of noise can be a way of establishing the limits that materiality does not secure (Ureta 2007:119). Playing loud music, hence, is a way of manifesting one's territory even though this noise is experienced as intruding to neighbours and even though the person who plays music might experience the music of others as equally intruding (Ureta 2007:118).

### Summing up

The studies quoted above indicates that domestic noise represents a problem in the social housing sector in Denmark and beyond and that noise is experienced as a nuisance to individuals' experiences of their homes.

Weinhold (2016) describes the negative health effects from sleep disturbances and general stress caused by neighbour noise. She calls for more research on this matter and suggests that it might be done through self-reporting of neighbour noise. As previously mentioned self-reporting is also the method used in a significant amount of the research on sleep available, including the studies listed in this review. It is a method that gains from being combined with qualitative data describing the broader context of how respondents perceive the issues they are asked to report on. Concerning neighbour noise, it would be important to explore the respondents' understanding of "neighbour" and of "neighbourliness" for instance.

A & B Analyse (2016) documents that neighbour conflicts are a recurrent problem in Denmark that is particularly significant for residents of social housing, and that 71,1% of these conflicts are related to noise. The report by Delholm and Jensen (2015) as well as the one by Avlund and Kjeldsen (2016) on harassment and problem creating behaviour and on safety respectively indicates that noise nuisance are co-producers of feelings of unsafety and insecurity. Mee (2007) describes how a group of tenants of public housing in Australia – much like the residents of social housing in Denmark – experience the noises of others in their homes as generating feelings of insecurity and unsafety. Finally, Ureta (2007) zooms in on the workings of neighbour noise in a social housing complex, and as such is a particularly interesting study in the context of this review. Ureta concludes that when residents play loud music is a way of demarcating one's home, and is used to compensate for the inability of the walls of these homes to keep out the sounds of others.

Overall, these studies unfold the particularities of neighbour noise nuisance. Furthermore, the reports of Delholm et al., Avlund and Kjeldsen and the study of Mee includes noise from people in the outside environment as potentially producing feelings of unsafety. Noise from people in the



outside environment, seems to be experienced in very different ways than for example traffic noise, probably due to what Weinhold calls the high level of information this kind of noise holds.

In general, terms, more research is needed to better understand the societal consequences of neighbour noise as a nuisance to individuals, as a generator of stress and as a source of sleep disturbances. More knowledge on the cultural dimensions of notions of home and home making in relation to noise would allow a better understanding of how the sounds of others becomes a nuisance.

### 3: Noise contains meanings

As indicated above, noise from neighbours is experienced in ways that are very different from noise from traffic and other forms of environmental noise. However, the label of neighbour noise can cover a range of very different sounds that are experienced in different ways.

It seems fair to assume, that the feelings generated when listening to people fighting are different from the feelings inspired by calm jazz music as well as by the sounds of cars passing by on a nearby road. It is crucial to gain a better understanding of these differences, if we are to paint a fuller picture of the influences noise has on the lives of individuals. This section list two examples of studies describing feelings generated by specific forms of neighbour noise.

#### Stokoe & Hepburn, 2005: “You can hear a lot through the walls’: Noise formulations in neighbour complaints”

With a discursive approach, Elizabeth Stokoe and Alexa Hepburn (2005) compare their material on neighbour dispute mediation from three different residential areas in Great Britain and from neighbour’s calls to the National Society for the Prevention of Cruelty to Children [NSPCC], Britain’s principal child protection helpline. The authors explore the overlaps and differences in the qualitative descriptions of noise in their material, and conceptualize noise as the result of social constructs, products of interpretation and as “descriptive-evaluative practices” (Stokoe & Hepburn 2005:648). As sound, noise gains its meaning through its “embeddedness in *temporal, spatial and moral orders*” and sounds become noise, when it transgress private-public boundaries and leak into spaces that it should not (Ibid, *original italics*).

The analysis is based on about 30 hours of neighbour dispute discourse and about 100 hours of transcribed telephone calls to the helpline. The material shows how similar noises might be framed as respectively a source of nuisance and disturbance or as concerning and frightening sounds of abuse (Stokoe & Hepburn 2005:649). When describing what they heard, complainers and helpline callers alike mirrored the noises in the words they used to describe them (Stokoe & Hepburn 2005:670). In both cases, people reporting the noise made an effort to appear as “reasoned, ordinary, objective persons,” without interests in “creating conflicts or making accusations.” (Ibid). Rather, they constructed themselves as “passive recipients” of noises, they could not “listen away” from (as opposed to how one can look away from a visual phenomenon) (Ibid). Neighbours, the authors point out, are in a particular position, as they are spatially close enough to hear each other, without necessarily being relationally close (Stokoe & Hepburn 2005:671).

#### Gurney, 2000: “Transgressing private-public boundaries in the home: a sociological analysis of the coital noise taboo”

Based on qualitative interviews with 15 university students in Great Britain, Craig M. Gurney (2000) has described a particular example of how the sounds of others can be experienced as transgressing the boundaries of one’s home, namely when the sounds heard belongs to the realm of taboos as does sounds emitted from sexual acts, what he terms “coital noise”. Gurney sheds light on the aural aspects of privacy, that becomes apparent when they are violated in the form of “unasked-for intimacy”, when intimidating sounds of others intrude into one’s personal space (Gurney 2000:39). “Real and symbolic boundaries which determine private space are fragile,” Gurney notes, and he

adds that transgressions of them “can have profound consequences for the listener’s sense of self and identity” (Gurney 2000:40).

### Summing up

The studies quoted in this section give examples of the vast variation in the sounds that make up neighbour noise. Stokoe and Hepburn (2005) offer an intriguing view into (or an ear on) the challenges of describing noises and how contextual knowledge becomes part of the interpretation when qualifying what the noise of neighbours are an expression of (annoying behaviour or maltreatment of children).

Gurney’s study (2000) exemplifies how the sounds of others having sex is experienced as transgressing. Gurney’s study is of a limited scope, but brings forth an example that resonates in most of us, and thereby effectively demonstrates how some sounds are more intimate than others.

Overall, the studies here quoted offer examples of how the meanings of neighbour noise are entwined with the contexts of the noise. However, much more research is needed if we are to understand the nuances in how the sounds of the people next-door turn into disturbing or even stressful noise that can influence negatively on sleep and health. The timing of noise, the relationship people entertain with the noisemakers, as well as actual descriptions of these noises is just some of the elements that it would be crucial to include in further research on the subject.

#### 4: Neighbour noise is perceived as a moral problem

As earlier mentioned, in the process of producing this review, I have been in contact with various organizations within the Danish social housing sector, who have generously shared their experiences with noise problems. Complaints of neighbour noise is a recurrent issue brought up in this context and social housing organisations often take measures of conflict mediation to try to solve these issues.

Conflict mediation as a means of solving problems of noise nuisance testifies to a framing of the problem as one that pertains to individuals rather than to the buildings, they live in. Noise, in other words, is conceived of as a moral problem to be solved through conversation rather than an issue of poor housing facilities. That conflict mediation has proven to be an effective way of solving conflicts between neighbours is of course positive, only the risk is to omit material aspects of the problem. This section gathers reports and studies that in different ways treat noise nuisance as a moral transgression.

Larsen, Frederiksen & Riemenschneider, 2016: "Potentialer I konfliktmægling. Erfaringer med konfliktmægling som løsningsform i almene boligområder" (*Potentialities in conflict mediation. Experiences with conflict mediation as a solution in social housing areas*)

In a 2016 report on the potentials of conflict mediation by the Center for Boligsocial Udvikling (Centre for Social Housing Development) [CFBU] it is noted that conflicts between neighbours often are caused by noise, and by differences in life styles (Larsen et al. 2016:11). The report draws on a literature study, qualitative interviews with key persons in Holland, where conflict mediation is an established practice and with a mapping of similar experiences in Denmark (Larsen et al. 2016:9). The report explores the Dutch example, where volunteers act as mediators in neighbour conflicts and has a success rate of resolving 68% of the cases they engage in (Larsen et al. 2016:24; the Dutch example is described in Peper & Spiergings 1999).

Flindt, 2004: "The responsible tenant: housing governance and the politics of behaviour"

John Flindt (2004) describes the configuration of the "responsible tenant", a concept he dates back to the 1980 Housing Act in Great Britain, when tenants of social housing were reframed in governance discourse as "empowered and responsible individuals" as opposed to being merely conceived of as "passive welfare recipients" (Flindt 2004:895). This reconfiguration of the role of the tenant implies notions of self-agency and self-responsibility (Ibid). One consequence of this shift in discourse is that potential problems are perceived of in terms of the behaviour of the individual; the individual's lack of taking upon him- or herself the agency and responsibility necessary. Hence, policy solutions are framed as strategies to reshape individual self-conduct. In the case of neighbour disputes caused by noise nuisance, this means, "individual moral deficiency, rather than the poor noise insulation levels in social housing are predominant in policy discourse on neighbour disputes" (Flindt 2004:906).

Rosenberg 2016: "Shhh! Noisy cities, anti-noise groups and neoliberal citizenship"

Buck Clifford Rosenberg (2016) describes the online noise abatement group Quiet Australia. To this group "noise" is an ethical and moral problem to be solved through disciplining of noise making neighbours and others. To Quiet Australia, noisy people are perceived as breaking moral

conventions, preventing people from living “in peace” in their homes. The members of Quiet Australia describe noise makers as “uncivil”, “feral”, “garbage” – as “bad citizens” whom the activists dehumanize through a process of Othering (Rosenberg 2016:199). Rosenberg concludes that these activists’ couches their practices in “residential ethics” at a neighbourhood level and broader as a “moral geography of noise across urban landscapes”; in short, “[n]oisy behaviour by neighbours is deemed uncivil and immoral, carried out by those who lack an ethical awareness or care for others” (Rosenberg 2016:200).

### Summing up

When noise nuisances are constituted as a moral issue, noise-producing individuals are identified as the source of the problem rather than poor insulation or other material issues. Larsen et al. (2016) offers examples of good practices of conflict mediation in Holland and Denmark as a means of solving issues of neighbour conflicts in social housing – including conflicts around noise. Whereas these experiences are of course valuable and important to spread, it might be interesting to combine them with considerations of how the materiality of social housing transports noise. As we shall see in the subsequent section reports on the conditions of Danish social housing areas mention such considerations, but in general measures taken to lower noise levels in buildings merely appears as an aspect worth considering when renovating the buildings and their outdoor facilities in other ways.

Flindt’s (2004) article focuses on the creation of “the responsible tenant” and merely mentions noise making as a powerful example of one way of transgressing this role. His point makes for a strong argument of how such a structural calibration of a tenant who is responsible not only for himself, but also for the wellbeing of his neighbours can omit structural reasons for dissatisfaction. This perspective offers an interesting entrance point into exploring further the workings of individual responsibility and how it becomes related to noise, sleep and health in social housing estates.

Finally, Rosenberg’s (2016) analysis of an Australian noise abatement group offers examples of how the attribution of moral responsibility on noisemakers can lead to, them being dehumanized and exposed as “bad citizens”. When considering such drastic consequences for the noise makers, it would be interesting to explore whether noise makers in other contexts are subject to similar processes of othering and how that shape their lives.

Overall, the three studies points at a tendency towards framing neighbour noise as a moral problem, thus omitting the material aspects of the issue. The study quoted in a previous section by Ureta (2007) argues for an understanding of neighbour noise as a material as well as a social issue, as does Power (2015) in the next section. Further research needs to take into account this double bind of neighbour noise in order to avoid reducing it to an either – or, but explore the intricate connections between its morality and materiality.

## 5: Noise is also a material problem

Conflict mediation and a respectful social conduct concerning noise making are all elements in how tenants of social housing can avoid producing noise that becomes a nuisance to their neighbours. However, when tenants experience noise as nuisances the conditions of the buildings they live in also plays a role in allowing these noises to seep through their walls and windows and into their homes.

This section gathers international studies and reports that document the physical conditions of the social housing estates in Denmark. The reports all note noise nuisances as an element to consider when renovating estates, almost all of them as an extra element to include in an already planned renovation process. In other words, noise nuisance appears a rather marginal element in most of these reports.

### Power, 2015: "Placing community self-governance: Building materialities, nuisance noise and neighbouring in self-governance communities"

Emma R. Power (2015) argues for a more thorough exploration of the role of building materialities in relation to noise nuisance between neighbours. The study centres on the experiences of 23 people living with dogs in owned apartments in three different types of buildings across Sydney: new medium- to high-rise buildings, new low-rise buildings and older buildings constructed in the early to mid-twentieth century. The participants kept a photo diary and Power conducted qualitative interviews with them (Power 2015:251).

Since socio-political dimensions has taken centre stage in studies of neighbouring, Power notes, "the material space of residential estates has largely disappeared from view" (Power 2015:245). Noise, she argues, is co-produced by people and buildings, and an attention to such co-production allows for an opening up of the idea of responsible neighbouring (as described by Flindt 2004). Power suggests considering "nuisance noise as not simply a product of inconsiderate neighbouring but equally as residents betrayed by their buildings" (Power 2015:255).

### Gidlöf-Gunnarson & Öhrström, 2010: "Attractive "Quiet" Courtyards: A Potential Modifier of Urban Residents' Responses to Road Traffic Noise?"

This explorative study examines how courtyards, where the noise level from the surrounding city and especially from traffic is relatively low, influences on residents' experiences of noise annoyances. The study is based on data from a questionnaire stemming from the cross-sectional field study in the multi-disciplinary "Soundscape Support to Health"-program, whose overall goals is to optimize the acoustic soundscapes in traffic noise exposed residential areas (Gidlöf-Gunnarson & Öhrström 2010:3361-3362). 956 residents responded to the questionnaire, they were all living in blocks of flats, most of them 3 – 5 storeys high. These flats were exposed to between 45 and 68 dB (Gidlöf-Gunnarson & Öhrström 2010:3362).

The study concludes that, residents who had access to what the authors term "quiet" (in quotation marks) courtyards were significantly less annoyed of noise in their homes in general. This was especially true in cases, where the courtyards where deemed by the residents to be of "high quality" (Gidlöf-Gunnarson & Öhrström 2010:3370). Based on previous research the authors suggest this might be related to the pleasant aesthetic qualities of such courtyards (Ibid). The authors

recommends considerations of “quiet” areas to be integrated into city renewal projects (Gidlöf-Gunnarson & Öhrström 2010:3372).

[Kluizenaar, Janssen, Vos, Salomons, Zhou & van den Berg, 2013: “Road Traffic Noise and Annoyance : A Quantification of the Effect of Quiet Side Exposure at Dwellings”](#)

This study examines how “relative quietness” at the least exposed side of a residential building affects the residents’ annoyance from traffic noise and whether traffic noise at the least exposed facade of the residence affected the level of road traffic annoyance (Kluizenaar et al. 2013:2259). The study is based on data from 1967 residents of Amsterdam collected by the Public Health Service (GGD) of the Municipality of Amsterdam (Kluizenaar et al. 2013:2260).

Residents of large urban areas are known to have a need for quietness in order to be able to recover from the stress they have experienced during their daily activities. This study is based on previous studies indicating that a “quiet” side of dwellings can be beneficial to the residents. The study confirms that there is an association between road traffic noise annoyance and the availability of relative quietness at the least exposed side of dwellings, since residents with a residence where there was a 10 dB difference between the most and least exposed facade expressed to be significantly less annoyed by traffic noise, and that lower noise levels at the least exposed facade in general gave lower levels of annoyance (Kluizenaar et al. 2013:2265).

[Dybro & Grønlund, 2005: “At fremtidssikre almene boliger fra 50’erne – idékatalog på baggrund af 20 demonstrationsprojekter” \(To future-proof social housing from the 50s – a catalogue of ideas based on 20 display projects\)](#)

This report documents the renovation processes of twenty social housing estates originally constructed in the 1950s. The processes were all supported by Landsbyggefonden, an independent foundation established by Danish social housing organisations, who have commissioned this report. The examples documented in the report are meant as inspiration to other social housing organizations in the processes of renovating estates and outdoor facilities.

Noise reduction measures are mentioned as a possibility in relation to communal spaces, where the noise can become a nuisance for others and outdoor facilities, where traffic noise can be an issue to be ameliorated through the use of noise shields (Dybro & Grønlund 2005:30,67,68).

[Michelsen, 2013: “Fremtidsanalyse” \(Future analysis\)](#)

This report is part of a series of guidelines directed at social housing organisations (*almenvejledninger*) and is produced by the organization AlmenNet, a union of social housing organisations with the purpose of ensuring the future of social housing in Denmark (Michelsen 2013:4). The report offers an overview of tools for social housing organizations to use when considering the recommendable measures for assessing the housing needs of tenants and ensuring that the housing offered is up to date with these, for renovation of the buildings and outdoor facilities and for strengthening the social life of the housing estates.

When describing the measures organizations can take in future-proofing the conditions of the indoor environment of buildings, and elements such as temperature, draught, humidity, air quality, lightning and finally noise are mentioned (Michelsen 2013:27). Traffic noise, it is noted, can be an important

reason for deterioration of indoor environment of a residence, just like it is noted that almost all social housing has neighbours, and we understand that this might cause noise. Finally, the author notes that “noise can be experienced very differently from one person to another” (Ibid, *my translation*).

#### [Landsbyggefonden, 2014: "Nye udfordringer for det almene boligbyggeri"](#)

This report is a follow-up on earlier reports by Landsbyggefonden. Its overall purpose is to indicate ways in which social housing organisations can keep the homes they rent out attractive to tenants and up to date with the requirements of modern life. The report points out an increased attention on safety, on demographic challenges for social housing organisations situated in peripheral areas and the correct handling of environmental toxins as PCB used in older building materials.

Neighbour noise and traffic noise are part of a longer list of elements that the report recommends must be considered together if Denmark is to sustain a viable social housing sector (Landsbyggefonden 2014:9) Amongst other elements listed are quality of the residences, accessibility, safety and demolition (Ibid).

#### [Rasmussen & Hoffmeyer, 2015: "Lydisolation mellem boliger i etagebyggeri – Kortlægning og forbedringsmuligheder" \(\*Sound insulation between residences in multi-storey housing – Mapping and possibilities for amelioration\*\)](#)

This report was made by the Danish Building Research Institute at Aalborg University Copenhagen by engineers Birgitte Rasmussen and Dan Hoffmeyer. It aims at contributing to the foundation for upgrading the sound insulation in existing Danish multi-storey housing in order to align them with sharpened requirements on this matter from 2008.

The report is a technical and richly detailed documentation of these issues. It maps the mass of Danish multi-storey housing, documents field research on the sound insulation in multi-storey housing and the possibilities for amelioration. It is noted that residents of multi-storey housing experience significantly more nuisance caused by the noise of neighbours than of traffic noise. However, the authors call for more detailed research on neighbour noise nuisance especially with regards to how the different types of noise are experienced (Rasmussen & Hoffmeyer 2015:8-9).

### Summing up

Overall, the study and the reports related in this section offers insights to how the conditions of housing estates influence the noise nuisances residents are exposed to. Power (2015) describes different housing estates and how the buildings can be understood to co-produce neighbour noise. Power's analysis is based on privately owned apartments, not on social housing estates. Yet, it is included as a central text in this section because it points to how materiality could take up a greater role in the literature on social housing and gives an example of one way of understanding noise nuisance as a problem that is both material and moral. The studies by Gidlöf-Gunnarson & Öhrström (2010) and Kluzenaar et al. (2013) show that relatively quiet courtyards or spaces within residences significantly lower the residents' general experience of noise annoyance.

The following three reports stems from the Danish social housing sector and all concerns renovation and keeping up to date of the mass of Danish social housing estates. These reports all list noise



nuisance as one amongst several factors to pay attention to when renovating these houses. However, it should be underlined that it is merely a mentioning in most cases; none of these reports focus particularly on noise reducing efforts, in fact, in most cases it is mentioned as a somewhat supplementary task to take on while renovating estates anyway.

This indicates that the social housing estates in Denmark could indeed be better constructed with regards to noise insulation from both outside and between apartments. It further testifies to a need of putting noise on the agenda as a central element to consider when assessing the condition of housing estates both when it comes to noise from outside of the buildings and noise seeping through the walls between apartments.

The last study quoted is highly technical and produced by engineers specialized in acoustics. It is included in this social sciences review because it points to how also this realm of professionals with highly specialized technical knowledge calls for qualitative research on how people experience noise nuisances in order to better qualify how they put their knowledge to use in the most effective way. In broader terms, there is clearly a lack of research connecting the materialities of buildings with the subjective experiences of different forms of noise.

## Conclusion

This review has brought together selected social sciences studies of noise, sleep and residents of social housing from Australia, Chile, Great Britain, the Netherlands and USA, as well as reports from the Danish social housing sector covering issues of noise, sleep and social housing.

Overall, the studies gathered in this review documents that residents of social housing are often particularly exposed to noise from traffic as well as from neighbours. The studies further indicate that these kinds of noise represent sources of annoyance and health risks due to reduced quality of sleep and probably a general increase in stress level also. They further indicate that environmental and neighbour noise is different in significant ways. Whereas traffic noise usually consists of largely undifferentiated noise, neighbour noise often contains a higher level of information, in the sense that it is the sounds of individuals talking and / or doing things nearby, and as such, it provokes more mental and emotional reactions than traffic noise usually does. The studies indicate that neighbour noise tends to be framed as a moral issue, which means that the physical conditions of buildings are overlooked as part of the reason for sounds of the outdoor environment or neighbours to become noise nuisances.

The studies brought together in this review especially point to the need for a change in attitudes towards neighbour noise as a serious source of nuisance that is likely to have severe health consequences.

A better understanding of the workings of neighbour noise represents a methodological challenge that is quite different from the studies that have been done previously, as predominantly they document the effects of environmental noise, especially from rail and road. As the studies in this review show, neighbour noise becomes a nuisance not solely due to its volume, but also due to its high level of information and the meanings attached to it.

The review is organized into five themes each documenting existing research. The intention is also that these five themes each outline a field for further studies. This would allow for the development of more thorough understandings of the implications of the various forms of noise on health and general life quality for the large group of residents of social housing.

Within each of the five themes, it is documented that:

- 1) Living in low-income housing (the scope of these studies are not on *social* housing alone) influences the sleep of residents in a negative way. Noise from the outside as well as from neighbours contributes to this negative effect.
- 2) Noise from neighbours is likely to represent an important health risk; neighbour noise is the source of the vast majority of conflicts between neighbours in social housing in Denmark, and we know that neighbour conflicts in general are harmful to the health.

Neighbour noise contains a high information level, and could be characterized as having a relational quality since it relates the person submitted to noise with the noise-producing neighbour. This relationship is often involuntary, and can be experienced as a serious intrusion into the home, which should be safe and private space.

- 3) The meanings of noise are manifold, and produced through the complex entwining of physical soundwaves, the relationship between the person subjected to noise, and the source and character of the noise – just as personal experiences will shape individual experiences of different noises heard.
- 4) Probably because of its particular relational character, neighbour noise is often framed as a *moral* problem to be solved through conflict mediation and the establishment of norms of good behaviour in the housing area, rather than as a practical and physical problem to be solved by other means.
- 5) However, buildings can be considered co-producers of environmental as well as neighbour noise, as the physical conditions of buildings partakes in amplifying or muting these noises.

The studies brought together in this review points out a range of needs for further research, especially with regards to the following five issues:

- 2) Qualitative explorations of the social and cultural contexts of sleep would help us understand different perceptions of when noise becomes a nuisance to sleep and hence what measures it would be most effective to take in order to ameliorate the sleeping conditions of residents of social housing.
- 3) A greater knowledge of neighbour noise and its consequences, including its health risks and the relational and subjective factors forming the individual experiences of noise, would help us understand when audible neighbours are considered as noise nuisances and why. It might also allow us to gain a better knowledge of different experiences of noise in different rooms of an apartment, and of how some audible noise might be acceptable in the kitchen but become a nuisance when heard in the bedroom.
- 4) A better understanding of the processes of ascribing meaning to noise, could shed light on why different kinds of noise give rise to different kinds of interpretations and reactions. Insights into these processes could help shape policies and practices towards preventing noise problems.
- 5) Further explorations of the consequences of framing neighbour noise as a moral issue would deepen our understanding of the role of not only how people experience the noise of others, but also of the moralities and motivations of the producers of noise.
- 6) A better understanding of the combined material and social aspects of neighbour noise, including how these can become more broadly acknowledged, would contribute to putting noise nuisances higher on the agendas of policy-makers and social housing organisations.

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