Bridging the gap from soundscape research to urban planning and design practice: how do professionals conceptualize, work with, and seek information about sound?

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Abstract (English)

A quiet city is not necessarily an interesting or successful one. The soundscape approach, which implies that the sonic environment can have positive and negative aspects, applies to a wide range of urban scales, from individual buildings and parks to the entire city; the approach also applies to plans, designs, and decisions made both before and after an intervention is done. Soundscapes contribute to a sense of place and encourage activities appropriate for the environment (e.g. marketplace sounds encouraging conversation and purchasing). Yet, despite the quickly growing body of evidence supporting the potential for improved urban sound quality, virtually no world cities are adopting soundscape planning and design initiatives in earnest, reinforcing a research-practice gap on urban sound. The gap is widened by differences in vocabulary, training, conceptualizations, resources, and shared literature.

Shifting the focus from “city users” to “city makers”, this study aims at understanding the ways in which professionals of the built environment (PBEs) conceptualize and integrate soundscape concerns in their everyday practices. Twenty-two PBEs from six countries in Europe and North America and from both public and private sectors were interviewed in a semi-structured format in four parts: (1) questions about the workplace and daily responsibilities, and a listing of technical factors key to the participants’ work (e.g. historic preservation); (2) in-depth conceptual discussion on two factors from (1), one sound-related and one chosen at random; (3) setting the same two factors in context, i.e. how they were integrated in a recently completed project and one in progress; and (4) questions on information sources, demographic details, and a debriefing.

Participants reported a responsibility to consider and integrate many technical factors in their work, of which a sound-related factor was always one. In terms of the way urban sound is considered, four primary conceptualizations emerged ordered by the extent to which they were described as being interrelated with other technical factors: noise as level; sound as mediation; noise as environmental pollutant; and sound as opportunity.

Relevant participant characteristics affecting soundscape conceptualizations included organization size, location of work, and whether they identified as planners or designers. People were heavily relied on as information sources, and their strategies to access specialized knowledge depended on the size of their organization, among other variables.

Implications are discussed for ways to bridge described gaps between the academic research on soundscape and urban planning and design practice, particularly through resources that are sensitive to contexts of work and the other identified variables.

Résumé (Français)

Une ville calme n'est pas nécessairement intéressante ou réussie. L'approche de paysage sonore, qui postule que l'environnement sonore peut avoir des aspects positifs et négatifs, est applicable à une variété d'échelles urbaines, de bâtiments individuels et parcs à la ville entière ; cette approche s'applique aussi aux plans, conceptions, et décisions prises à la fois avant et après la mise en œuvre d'une intervention. Les paysages sonores contribuent à l'identité d'un lieu et encouragent des activités appropriées à l'environnement (par exemple, les sons d'un marché public encouragent à converser et à faire des achats). Or, malgré qu'un nombre toujours croissant de preuves atteste du potentiel de cette approche à améliorer la qualité sonore urbaine, presque aucune ville dans le monde n'adopte effectivement d'initiatives de planification et conception centrées autour du paysage sonore, renforçant ainsi l'écart entre recherche et pratique dans ce domaine. L'écart est encore élargi par des différences de vocabulaire, formation, conceptualisations, ressources et littérature partagée.

En se concentrant sur les « décideurs de la ville » plutôt que les « utilisateurs de la ville », cette étude cherche à comprendre les façons dont les professionnels de l'environnement bâti (PEBs) conceptualisent et intègrent les questions de paysage sonore à leurs pratiques professionnelles. Vingt-deux PEBs de six pays d'Europe et d'Amérique du Nord des secteurs public et privé ont été interrogés selon un format semi-structuré en quatre parties : (1) questions concernant leur environnement de travail et leurs responsabilités courantes, et une liste de facteurs techniques clés dans leur travail (par exemple, la préservation historique) ; (2) discussion conceptuelle en profondeur de deux facteurs listés en (1), un relatif au son et un choisi au hasard ; (3) placement de ces deux facteurs en contexte, c'est-à-dire comment ils ont été intégrés dans un projet récemment complété et un autre en cours ; et (4) questions sur leurs sources d'information, détails démographiques et compte-rendu.

Les participants rapportent une responsabilité de prendre en considération et d'intégrer de multiples facteurs techniques dans leur travail, parmi lesquels un facteur relatif au son est toujours mentionné. Au regard de la façon dont le son urbain est considéré, quatre principales conceptualisations ressortent ordonnées en fonction de la mesure dans laquelle elles sont décrites comme étant corrélées aux autres facteurs techniques : le bruit en tant que niveau sonore ; le son en tant que médiation ; le bruit en tant que polluant environnemental ; et le son en tant qu'opportunité. Les caractéristiques pertinentes des participants qui affectent leurs conceptualisations du paysage sonore incluent la taille de l'organisme, la localisation géographique du travail, et s'ils se définissent comme planificateurs ou comme concepteurs. Les participants rapportent recourir largement à d'autres personnes comme source d'information, et leurs stratégies d'accès au savoir spécialisé dépendent de la taille de leur organisme, entre autres.

Les implications de ces résultats pour trouver des moyens de combler les écarts décrits entre la recherche académique sur le paysage sonore et la pratique de planification et de conception urbaine sont discutés, particulièrement au travers de ressources sensibles aux contextes de travail et aux autres variables identifiées.

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1 Introduction

1.1 Motivation

This thesis is about urban soundscapes and the people who make them. Urban sound, called just "noise" by some, is comprised of sounds that annoy, distract, and hurt us; but more rarely discussed are the positive sounds that interest us, orient us, and sooth us. Today's urban regulations leave little room to consider these positive sounds on purpose. More than half of the world's population lives in urban areas, and many more visit cities on a regular basis. According to the United Nations, 23% of the world's population (or 1.7 billion people) live in cities with more than one million inhabitants (Affairs, 2016), so concentrating even on our densest urban centers makes urban sound a far-reaching problem.

This manuscript relies on a dichotomy of "city users" and "city makers". While these categories are not exclusive (city makers are also city users, and vice versa), the literature has not converged on a single term. "City user" (used, for example, by Lavandier, Aumond, Gomez, & Dominguès, 2016; Raimbault & Dubois, 2005; Ricciardi, Delaitre, Lavandier, Torchia, & Aumond, 2015) is a term I have settled on to refer to 1) the traditional "object" of study in the soundscape literature and 2) the person(s) city makers conceptualize when they plan or design a space. "City makers", in turn, refers to the ensemble of actors that influence the city's form and function including, but not limited to, architects, urban planners and designers, citizen groups, and politicians. The bulk of research on urban sound has been conducted by researchers and is focused on the city user and their perceptions. But a critical and underappreciated component is the role of the city maker, those who shape our cities and ultimately decide what kinds of sounds our cities will make. Unfortunately, most of the sounds our cities make, the "good" ones and the "bad" ones, were chosen unintentionally.

I am driven by the idea that our cities can sound *better* and be more acoustically appropriate for its planned activities. The idea that the acoustic environment can be

actively shaped is paramount to a field called *soundscape*. Soundscape also necessitates integrating user perceptions and advances sound planning. I am interested in helping the shapers of our cities - people like urban planners and architects - make more informed decisions about the acoustic environment, toward thinking about soundscapes, which can result in higher quality urban environments and overall more livable cities.

The concept of soundscapes emerged in British Columbia, Canada in the late-60s as an ecological and sociological concept but has grown to connect with other related research areas like community noise, acoustics, and psychoacoustics. I came to soundscapes myself after a number of years working as a researcher in the hearing aid industry after training in psychoacoustics and music perception. But hearing the chaos of our urban spaces through the hearing aid was confusing, loud, and disorienting - I realized I was more interested in working on these environments than on the technologies needed to navigate them. This led me to the field of urban design, where I saw a wide-open opportunity to synthesize sounds and city making. Since there are only a handful of people in the world working on creating positive urban sound environments (rather than making poor environments less bad), I realized it was necessary to do a PhD to contribute something to the field. This manuscript describes some of this effort to bring these fields together.

1.2 Problem statement

Urban form has a profound influence on human perception and behavior. Poor urban environments have been named culprits in the obesity epidemic (Papas et al., 2007), sour oil politics (Krumdieck, Page, & Dantas, 2010), and other major societal health and safety issues (e.g. Bereitschaft & Debbage, 2013). Meanwhile, cities strive to be competitive on seemingly abstract notions like *quality of life* and *livability*[1]. Unfortunately, despite extensive academic treatment of these domains, the distance between research and

[1] E.g. The Economist Intelligence Unit Global Livability Ranking (http://www.eiu.com/topic/liveability); Mercer Quality of Living Rankings (https://mobilityexchange.mercer.com/quality-of-living-rankings)

practice is a major barrier to considering advances inspired by implications from research. The research-practice gap is further widened by the manifold disciplinary styles, constraints, vocabulary, and expectations of actors on both sides. Sound is also only one of an overwhelming number of factors that city makers need to account for when they work. Lastly, cities change on a very slow time scale; evaluating and responding to something can take decades.

While urban interventions have mainly been focused on the visual modality (as described by Pallasmaa, 2012, among others), one aspect of urban environments capable of playing a role in our overall perception is the auditory modality. Before we can even address "good" outcomes, we must first acknowledge that poor outcomes for soundscape can have extreme negative consequences. In the English-language, discourse on urban sound is generally focused on the "noise" aspect, the word itself implying its own negativity. According to a review by Passchier-Vermeer and Passchier, (2000), it has been known since at least the 1960s that noise exposure poses a public health risk for its ability to cause hearing impairment, hypertension, heart disease, annoyance, sleep disturbance, and decreased school performance. Despite the clearly established negative effects of noise, more pressing urban problems get solved first; it has been demonstrated that a lack of catastrophic failures in the domain of noise (as opposed to, for example, changes in public safety policy resulting from a factory explosion) has allowed the status quo to persist (Weber & Driessen, 2010; Weber, Driessen, & Runhaar, 2011).

But not all sounds have these negative effects on us, and some sounds even improve our lives and moods, orient us, and shape our understandings of a space. The most obvious example of this *good* type of sound is music, but there are many others: birds calling in a park, the splashing of a central fountain in a public plaza, and the muted conversations at a marketplace. And not all sounds need to be good in every context – the booming of Times Square is the sound of commerce and opportunity, but not when you are trying to sleep; the sound of your approaching metro is welcome when you are waiting for it, but not when you are running for it; and the sound of the snow removal equipment in

February is assurance that you won't slip and fall on your next trip out of the house. Understanding and mastering these various sources in the context of their appropriateness has immense implications for our cities.

Cities have traditionally taken this noise mitigation approach – and this work has played an important role in protecting public health. However, shifting to an approach that considers the positive role of sound will take what Kang (2006) has described as a "step change" in the policy domain. This step change is not just a matter of the continued production of supporting research. The same author (*ibid.*) also explains that noise abatement is more a policy problem than a scientific problem in that the harms of noise are well understood, but the ways to solve it are not. Further, city makers cannot be expected to stay current with research for every design and planning factor for which they are responsible.

As will be established in the review, soundscape is one area in which there is a wealth of underutilized research capable of informing significant change in the planning and design of the urban environment. Meanwhile, the professionals who work on and make decisions about the city lack many of the resources necessary to access and understand research about urban sound environments in order to change it themselves. It has become almost canonical to call this problem the "research-practice divide", or to identify "gaps", but I believe this characterization is appropriate here. Despite some limited efforts[2], no major world city has adopted a soundscape strategy in earnest and existing noise policies have been slow to adapt to changes in research and technology.

1.3 Professionals of the built environment

This introduction situates a number of fields with varying levels of disciplinarity and interdisciplinarity, all of which are necessary to establish the motivations of the study at

[2] http://forum.eionet.europa.eu/european-soundscape-award/library/cultivating-urban-sound-urban-identity/cultivating-urban-sound/download/1/MAAG_BOSSHARD_europeansoundscapeaward.pdf

hand. Specifically, the introduction covers the topics necessary to introduce an interview study conducted with professionals who intervene in the built environments of North America and Western Europe, and how those interventions affect urban sound environments.

So far, I have referred to "city makers". However, this "city maker" generalization is broad and can include people who don't plan or design interventions that influence the urban sound environment. Despite the rhetorical usefulness of the city maker-city user distinction, the more precise name I have given to the subset of practitioners and other professionals who intervene at urban scales where soundscape research applies is simply: **professionals of the built environment** (PBEs).[3]

Many of the outcomes for urban sound are influenced by the way these PBEs shape urban activity, program, form, and plan. As previously mentioned, these actors exist within many named professions and fields whose territorial boundaries can be difficult to resolve (see Figure 1). This study was originally conceived for only urban planners, but this limited subset failed to account for many who intervene in the city, in particular, those in adjacent

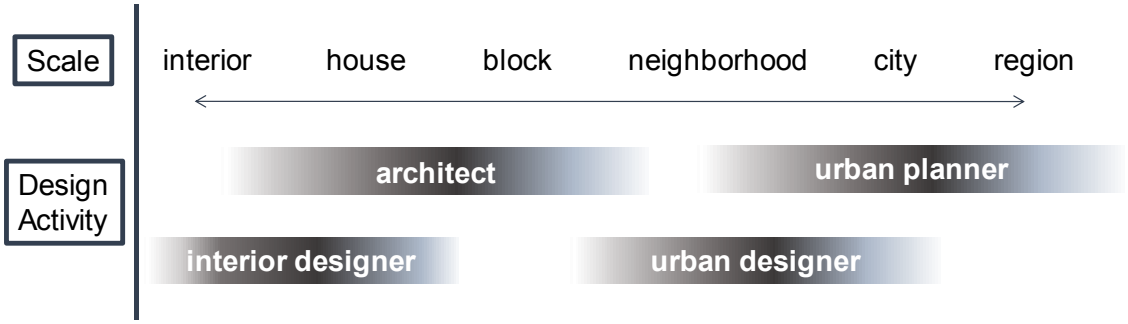

Figure 1: Practitioners in different professions work at different territories (or scales) of design. Adapted from Erickson, B. & Lloyd-Jones, T. (2001). Design problems. In M. Roberts & C. Greed (Eds.), Approaching urban design: the design process (pp. 3-7). Harlow (England): Longman / Pearson Education

[3] There is some tradition for a naming convention like this one. For example, the phrase *healthcare professional* is not uncommon to refer to the various professionals that intervene in the health space. A review study (Leckie, Pettigrew, & Sylvain, 1996) enumerated a few of these professionals (nurses, physicians, dentists) with respect to their unique information needs and behaviors.

fields with similar and often overlapping scales and responsibilities. This includes urban designers, landscape architects, environmental designers, architects, and others.

For the reasons that follow, there will not be a thorough discussion of each of these professional groups. Instead, in Section 4: Results, individual participants' emergent descriptions of their work will highlight the various roles and responsibilities that they have. First, urban planning, design, and architecture, for example, exist to some as different layers of design activity (Erickson & Lloyd-Jones, 2001), as shown in Figure 1. These layers can overlap significantly such that both urban planners and designers can work at the scale of the neighborhood, and both urban designers and architects can work at the scale of the block. As will be corroborated by the present study, these professionals themselves can also self-identify as being more than one type of professional at the same time. Further, (Schurch, 1999) demonstrated that, even for those who work in the fields, the terms "urban planning" and "urban design" are often used interchangeably. Meanwhile some studies of urban designers located them in architecture departments and firms (e.g. Makri & Warwick, 2010) rather than urban planning departments, and they are found across public, private, and academic sectors. It is my understanding from my work in this field that in general, urban planners tend toward public sector positions, regionally constrained projects, and long-term considerations while urban designers tend toward private sector positions, international portfolios, and project-based considerations; however, it is easy to find counterexamples of these tendencies as, for example, cities are increasingly hiring urban designers and larger and larger firms are increasingly hiring urban planners. Lastly, the titles given to the various fields can differ by country. Moudon (1994), for example, shows different territorial "boundaries" (or scales) for PBEs working with similar responsibilities, but coming from "Napoleonic" versus "Germanic" traditions. This study focuses on city makers in North America and Europe for reasons of language, access to sites, familiarity with the systems of government, and the availability of research to support a review.

1.3.1 Measures of control for sound

Today, cities in North America and Europe control sound primary through the measure called the decibel or dB. The decibel is a logarithmic measure of sound intensity, a logarithmic scale being used because of the wide range of intensities the ear can detect. A 10-dB increase represents a 10-fold increase in the sound level while a 20-dB increase represents a 100-fold increase in intensity; and, conversely, a doubling of the sound intensity increases the decibel level by roughly 3 dB. The decibel scale also follows closely the perceived growth of loudness of the human ear. On top of this dB measurement, a weighting scale called dB(A), or the A-weighted decibel, is often applied to the measurement. This weighting scale is one of the many measurement standards to account for the relative loudness perceived at different frequencies. It is based on the inverse of the equal-loudness curve and is applied to the measured sound levels in dB. A typical conversation between two people could be between 50 and 60 dB(A), depending on how forcefully they may need to talk with the presence of background noise, for example. For reference, the US Occupation Safety and Health Administration begins regulating workplace noise that is over 90 dB(A), saying that workers cannot safely be exposed to that noise for longer than 8 hours in one day[4].

Cities also exercise control over the sounds of the built environment. A search of most cities' official documentation for sound planning will return only one type of result: "noise ordinances" or "noise regulations". Looking at the complete noise ordinance of Cambridge, Massachusetts[5] will reveal simply a list of unwanted sounds followed by the rules governing those particular sources; sources like "sirens" are given blanket exemptions, presumably because of their importance in emergency operations. A brief

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4 https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9735

5 https://www.cambridgema.gov/Services/noiseordinanceinformation

review of downtown Montreal's noise regulations[6], for example, will show that the only type of measurement used is the dB(A). But, in some cities there are other measures of control, such as various indices that will be covered in the Review (Section 2.1.1), as well as the vague standard of "audibility" of annoying sources. Some municipalities, countries, and other bodies require noise studies to be conducted in advance of the project approval as a part of some larger plans. If the modeled project shows decibel levels that exceed the local regulation, the PBE is required to intervene.

Lastly, some municipalities, particularly large cities and regional governments have released noise plans that give a (non-legally-binding) direction for future considerations about local sound and sound planning. Even very recently updated documents frame sound planning from the negative - New York City rolled out new regulations for noise effective in 2007 and prefaced the document by saying it "establishes a flexible, yet enforceable noise code that responds to the need for peace and quiet while maintaining New York's reputation as the 'City that never sleeps'"[7]; the European Union has also suggested a policy to identify and protect "quiet areas"[8]. However, quiet in this document is only the "absence of disruptive noise" ("Good practice guide on quiet areas," 2014), returning the focus to noise.

1.3.2 PBEs and conceptualizations of sound

Given the limited legal framework for designing and planning urban sound, it would be reasonable to expect training and educational material to be consistent. In the Literature Review section called "Considerations of soundscape, expectations of knowledge, and the role of experts," some examples of the training material used with PBEs are shown to provide a baseline understanding. Of course, on-the-job experience, especially after years

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6 http://ville.montreal.qc.ca/portal/page?_pageid=7317,131789582&_dad=portal&_schema=PORTAL

7 http://www.nyc.gov/html/dep/html/noise/index.shtml

8 http://www.eea.europa.eu/publications/quiet-areas-in-europe

of planning and designing real projects, will change how PBEs conceptualize and work with sound, but this process has never been documented.

A reasonable question to pose is: *if a reasonably well supported approach (i.e. soundscape) is supported by a surge of academic literature, would that be sufficient to inform and change practices in cities around the world?*

In short, no, and this finding is supported by the experiences of other researchers, particularly in environmental topics. This issue has been called canonically the "gap" between research and practice (e.g. Bild, Coler, Pfeffer, & Bertolini, 2016). As will be discussed in Section 2 (Literature review), this study has, among other goals, sought to identify the role that research plays for PBEs. The literature is critical but optimistic. The titles alone of two papers from the last decade hint at the minimal role of research for PBEs in practice settings: "Innovation in Urban Design: Does Research Help?" (Forsyth, 2007) and "'Not a Lot of People Read the Stuff': Australian Urban Research in Planning Practice" (Taylor & Hurley, 2015). Other recent research (Pijpers-van Esch, 2015) has looked into the information sources of urban designers to uncover that while people, including subject-matter experts, are widely consulted on a regular basis, scientific literature is not. While these experts may themselves access scientific literature, designers may not necessarily encounter new information arising from academia that challenges traditional notions. While research-based solutions may exist for problems encountered by PBEs, there is the possibility that the research is inaccessible to them for one reason or another.

1.4 Noise, sound, and soundscape research

On the other side of the research-practice gap are the researchers, whose specialty knowledge can vary by sub-field and approach. For urban sound, the existing literature in the related domains, like soundscape, community noise, acoustics, and so on, presents a wide variety of terminology to refer to acoustic phenomena – the most common being

noise and *sound*[9]. There are many resources available that aim to differentiate "noise" from "sound", most of them are centered on the *wantedness* of the acoustic phenomenon under discussion: i.e. wanted phenomena are "sounds"; unwanted phenomena are "noise". However, the problem remains in establishing *for whom* is a particular sound unwanted. The ensuing debate touches on issues of class, race, power, sex, and beyond. Both academic (e.g. Radovac, 2011, 2015; E. A. Thompson, 2004; M. Thompson, 2017) and popular (e.g. Wagner, 2018) sources have studied these issues. In the interest of laying the groundwork for the present study, which seeks to identify principal, emergent conceptualizations, a deeper discussion of this important issue is out of the scope of this manuscript but deserves future attention.

Even among sound professionals, it can be very difficult to achieve consensus on the definitions of words that describe acoustic phenomena. Very few consensual terms exist for descriptions of acoustic signals. These ideas are discussed further in the Literature review Section.

To complicate matters, the acoustics research community has not entirely converged on the soundscape framework. As described above, the negative impacts of environmental sounds are well documented. Beyond simply the decibel level being significant, a review has shown that even low-level environmental sounds can pose long-term noise-induced health risks via the release of stress hormones in response to negative sounds (Ising & Kruppa, 2004). But what happens when the focus is no longer on negatively perceived sounds? In contrast, positively perceived sounds can have positive impacts. Positively perceived sounds have been demonstrated empirically to enhance a person's mood, provide a sense of community and information about activities, trigger memories, allow a person to relax, and so on (Coyne, 2010; Payne, Davies, & Adams, 2009). But these studies have received less attention by PBEs and regulatory bodies. Within the acoustics research community, there is growing evidence that solely physical measurements, that

[9] Many trees have fallen to produce the books dedicated just to explore the differences between these two words (Blesser & Salter, 2009; Coyne, 2010).

measure only decibels, for example, fail to capture various aspects of human experience (Dubois, Guastavino, & Raimbault, 2006; Schulte-Fortkamp, Brooks, & Bray, 2007), which has caused a shift in focus from noise control and annoyance to soundscape and sound quality. A short opinion paper from 1991, found in the acoustical engineering-focused Journal of Sound and Vibration, is titled, "Sound as an existential necessity" (Stockfelt, 1991). While acknowledging the progress on noise mitigation made by fellow researchers, Stockfelt suggests, "sounds constitute an indispensable basis for well-being…as an integral part of…normal living situations." This paper seems to be among the firsts of its kind in acoustics journals and certainly pinpoints and criticizes the noise-only approach being used by the acoustics field at-large. Beginning in the late 1990s, a surge of scholarship in urban soundscape studies began to emerge, and the most relevant of these will be covered in the review.

Soundscape, in the decades since its inception, is a word used broadly in many fields, contexts, and applications, from indoor to outdoor, musical to physical, and virtual to real environments. Its widespread and unfocused use as a term contributed to significant confusion amongst researchers about which concepts the word referred to, necessitating a consensual definition. Brown, Kang, and Gjestland (2011) briefly document these previous uses of the word and the emergence of the ISO Working Group 54 (*assessment of soundscape quality*), an international team charged with narrowing and defining the term. The use of *soundscape* had broadened significantly since its first conception (Schafer, 1977) in the context of human ecology studies and as an analog to the concept of landscape. More than forty years after its first appearance in the literature, *soundscape* has been given an ISO standardized definition as:

> "the acoustic environment as perceived and understood and/or experienced by people and/or society, in context" (ISO 12913-1: 2014, 2014).[10]

[10] Incidentally, the recent definition does not differ greatly from a definition proposed by Truax, a colleague of R. Murray Schafer, in 1978, modified in 1999: *an environment of*

Despite this definition, soundscape, as a term, may also be used throughout this document to refer to a conceptual framework for describing how to plan and design for urban sound, an approach or strategy that can be advocated with PBEs, as well as the body of literature dealing with all the above points.

Though "soundscape" does not come up much in the Results section of this manuscript (because, as will be revealed, PBEs don't explicitly use it), it is addressed out of necessity in the Review and will return in the Discussion and Conclusions.

1.4.1 The growth of soundscape studies

The last few years has seen the amount of soundscape research grow precipitously. According to a Scopus search performed by Kang et al., (2016), the amount of papers using the term *soundscape* surpassed 20 per year in 2005, 50 per year in 2010, and 100 per year in 2013. This growth has supported the call for new norms and standards[11], some of which have been published, but many of which are still under revision.

Kang (2010) describes the recent growth of research attention on soundscape networks, including several workshops, special conference sessions, and academic summer schools to support the growing community of researchers that focus specifically on the application of soundscape to the built environment. In general, soundscape is steadily growing into a full-fledged discipline with unique methods and an established community. The rise of international soundscape research networks, such as the Global Sustainable Soundscapes Network (Guastavino & Pijanowski, 2011) and the EU funded COST Action TD0804, Soundscape of European Cities and Landscapes, (Kang & Schulte-Fortkamp, 2016; Schulte-Fortkamp & Kang, 2010) and educational and training opportunities, such as a formal training camp as part of a Short Term Scientific Mission (STSM) in the COST

sound where the emphasis is on the way the sound is perceived and understood by an individual, or by a society. Handbook for Acoustic Ecology, (Truax, 2001).

[11] For example, the ISO standards (ISO 12913-1: 2014, 2014) and (ISO/TS 12913-2:2018, 2018)

network described by Fiebig et al., (2010), are evidence of this growth. In this growing community, members create and share knowledge through special sessions at international conferences (such as "Soundscape and Human Resources" and "Soundscape Design and Interventions" at the INTERNOISE2013), special issues of scholarly journals (e.g. "Soundscape Ecology" Special Issue in Landscape Ecology, November, 2011, & *Buildings* 2014, Acta Acustica united with Acustica 2006, Applied Acoustics, 2013), workshops (e.g. the NSF[12]-funded Global Sustainable Soundscapes Network[13], 2013, 2014, 2015) and summer schools. The emergence of the international research community around soundscape is important when viewed in contrast to the PBE fields, which, as described above, relies far less on scholarly publications for sharing and retaining knowledge.

This convergence on the soundscape approach by diverse communities of researchers is even more remarkable in light of the existence of soundscape at the intersection of many disciplinary fields. Brown et al., (2011) describes the "field of soundscapes" as intersecting with both acoustic fields (like sound quality, acoustic comfort, and music) and non-acoustic fields (like wilderness and recreation management, urban and housing design, and landscape planning and management). Hiramatsu (2006) recounts the first meeting of the Soundscape Association of Japan has having presentations from the subjects of philosophy, environmental study, musicology, sociology, environmental administration, aesthetics of music, and art. This breadth of disciplinary contributions makes it difficult to identify mutually agreed research terms and venues, and partially explains the length of time between the invention of the concept and the establishment of a definition for the ISO standard. Further, the disciplinary breadth of soundscape complicates the export of approaches and ideas outside of the field, to environmental acoustics, for example.

[12] National Science Foundation
[13] www.soundscapenetwork.org

1.4.2 Evidence- and research-based practice

One practice with a supporting body of literature that addresses the gaps between academia and practice is known as evidence-based practice. Evidence-based practice, according to the Academy of Medical-Surgical Nurses[14], is essentially a "method that allows the practitioner to assess research…and other information resources based on high quality findings and apply the results to practice," with an emphasis on the "conscientious use of current best evidence" (Sackett, Straus, Richardson, Rosenberg, & Haynes, 2000). The practice has been applied extensively in the healthcare sector, as that is where it originated (beginning with Guyatt et al., 1992) and has led to improvements in patient outcomes, costs, and other efficiencies.

More recently, especially in the field of information studies, there has been a slight shift toward the labeling of this process as *research-based practice* instead, favoring the word *research* over *evidence* in order to avoid a focus on strict empiricism, which some believe discounts qualitative findings that may not be considered "evidence" in the way it is understood in quantitative studies (Hjørland, 2011). As a formal term, *research-based practice* has grown in the field of information studies and is thus the term used in this document when referring to the body of literature in the review section.

However, this study does not address a traditional research-based practice problem. Cities change and respond more slowly to various inputs than students in a classroom or medical patients undergoing treatment. The criteria for what make a city *good* are extremely diverse due to all the stakeholders and needs of city users. Cities are also "real-world" settings with contexts that make it difficult to evaluate in a controlled way. The evidence- and research-based practice literature is reviewed for its potential applications to the problem of urban sound, but this section has established that the gap, more than being at the interface of PBE and sound research, is potentially that the research does not actually address the questions that PBEs need to have answered. In response, this study

[14] www.amsn.org

is aimed at understanding how PBEs think about and use sound in their work and how research may eventually support the problems they encounter. Considering the field-specific constraints, one must study practitioners directly in order to understand the contexts of their work and provide them useful information from research. This outlook on the problems outlined above actually situates the research partly as a problem in an information studies, where different types of situated knowledge and formations of the information play a role in how it is used.

1.4.3 Intervention, soundscape intervention, and intentional soundscape design

Interventions refer to any changes in the built environment; they are primarily physical but can even be economic or political. The concept of intervention can be easily applied to urban soundscape to refer to any change in the built environment that is done to change outcomes for the soundscape[15]. Indeed, the term *soundscape intervention* has been used in a number of soundscape studies (Liu & Kang, 2015; Mackrill, Jennings, & Cain, 2014; Payne et al., 2009). A slightly more specific term has also appeared in the literature to describe soundscape interventions done with the explicit intent to alter the soundscape; this is called *intentional soundscape design* (Raimbault, 2006; Yang & Kang, 2005).

1.4.4 Examples of potential soundscape interventions and expertise

Changes to the soundscape can come from interventions requiring acoustic expertise while others can come from interventions requiring only expertise as a PBE. However, most soundscape interventions require some expertise from each domain, suggesting the potential usefulness of more collaboration on sound-related issues. What follows are three examples detailing this range of expertise.

[15] Keep in mind that, given the definition of *soundscape,* a change in the soundscape can refer both to the change in the acoustic environment as well as the way it is perceived or understood.

1.4.4.1 Soundscape interventions requiring acoustics expertise

On the side of interventions more strongly requiring acoustics expertise are noise barriers. Noise barriers are a common noise control solution against traffic noise; however, ongoing research has produced new technologies that have helped their adaptability in some urban contexts. In their conventional configurations, their height (often more than 3-meters) constitutes a physical and perceived barrier that makes them inappropriate for use in the city center. Recently, researchers have begun to study the effect of low-height barriers that are potentially more appropriate for these dense urban applications. Koussa, Defrance, Jean, and Blanc-Benon (2013) found that barriers as low as 1-meter high were able to shield up to 8 dB(A). A similar study (Baulac, Defrance, Jean, & Minard, 2006) found between 6 and 10 dB(A) of noise reduction for users at the height of typical pedestrians. While a low-height noise barrier may not satisfy the needs of all users, for example, those in nearby elevated dwellings, this application could protect users in a park from excessive traffic noise.

1.4.4.2 Soundscape interventions requiring planning expertise

Public parks play an important role in city life and quality, and the role of soundscape in parks is well established in terms of their restorativeness (Payne, 2008). Urban planning research points to the idea that a park should have good permeability, or access from a variety of points to reduce barriers to access and entry (Van Herzele & Wiedemann, 2003). From the soundscape perspective, Gidlöf-Gunnarsson and Öhrström (2007) demonstrated, through a mailed residential questionnaire, residents who perceived that they had good walking access to a nearby park were significantly less annoyed by the annoying sounds they heard in their homes. Based on the finding that good walking access to parks is sometimes sufficient (all other things equal) to improve the evaluation of home soundscapes (Gidlöf-Gunnarsson & Öhrström, 2007; Irvine et al., 2009), it could be concluded that better park access alone would improve the soundscape for the residents in the neighborhood of the park. Using this research requires no expertise in sound. Also,

ensuring access to parks would fall under the responsibility of PBEs and not sound experts.

1.4.4.3 Soundscape interventions requiring collaboration

The combination of expertise from PBEs and sound experts has potential to achieve the positive outcomes promised by the soundscape approach. As sound is strongly interrelated with other factors, collaborating on these factors would allow PBEs to capture and articulate benefits. For example:

- The benefits of trees on urban streets are known in terms of their positive visual influence and effect on air quality, but they also effectively scatter noises like traffic noise
- The shape of the street canyon is a result of architectural decisions that respond to factors like sunlight, but can affect how sound reverberates (Kang, 2006)
- Public transportation moves large quantities of users down city streets, but the noise that it makes is a point of concern for PBEs; however, a previous study showed how questionnaire participants describing the city spoke positively about the sounds of *public transportation* while speaking negatively about *cars* and *traffic* (Guastavino, 2006), indicating a complex relationship between the vehicle and peoples' perceptions toward the sound it makes
- The selection of building materials plays a role for the appearance of the street, but materials also have different reflective and absorptive acoustic properties that can influence the reverberant character of the street

The complex interaction of these factors suggests the need for stronger collaboration. These interaction effects can also have very real consequences. Road design is a good example of how this collaboration could generate new solutions at the intersection of PBE practice and soundscape. The engineering of quiet pavements is a well-established field (Sandberg, 1999), yet simply intervening with a quiet pavement on a road, as a PBE might hire an acoustic consultant to do to mitigate noise, would miss the mark. Recent findings

suggest that interior sound levels in a car influence driving speed (Horswill & Plooy, 2008). The implication of this for the built environment is that quiet pavements are likely to not meet their full noise-reduction potential because drivers will operate their vehicles faster on them due to the feedback change. A noise-reduction intervention using quiet pavement should be included in a suite of other soundscape solutions aimed at changing driver behavior, such as narrower lanes.

1.5 Structure of the thesis

Bringing soundscape research to PBEs necessitates talking to them to understand what the prevailing concepts, challenges, and reasons are for dealing with sound. This study aims to document the perspectives of planners toward soundscape (whether or not they know "soundscape" as a term) and to see how important it is compared to other factors they consider on a regular basis. Lastly, it is a study of the types of resources that PBEs seek for information and their attitudes toward those sources.

The sections that follow are the Literature review, where these problem areas are discussed in the context of previous studies and formalized into research questions that address underexplored areas of inquiry. These problem areas are formalized into a research study, an interview study with PBEs, in the Methods section. A content and discourse analysis are presented on the transcripts of these interviews in the Results. Lastly, the results are discussed and put into a broader framework in the Discussion and Conclusion where the theoretical and practical contributions of the work are made clear.

2 Literature review

The introduction of this dissertation makes the case for a new way of dealing with urban sound (called soundscape) that takes into account users, the positive role of sound, and the relationship of sound to the greater functions of urban design and planning. It has been alternately called the *soundscape design strategy* (Bild et al., 2016) and the *soundscape management framework* (Kang et al., 2016), but in this review, this framework or strategy, and its associated body of research, will be called only *soundscape*. This literature review is organized such that it presents a subset of the soundscape literature as it contrasts with the traditional environmental noise literature. Then, in the many calls for applying the soundscape in practice, an explanation is given about who the professionals are that intervene in the city to define that practice. In the context of working with these professionals, emergent soundscape roles are identified in the context of reaching these relevant professionals. Lastly, gaps and potential barriers to sharing information about soundscape in urban environments are addressed by also looking at the information studies literature.

2.1 Review of academic literature on soundscape

2.1.1 Overview of methods and approaches

The *soundscape design strategy (SSD)* and the *environmental noise management strategy* (ENM) have been identified by Bild et al. (2016) as two opposing strategies for dealing with sound in the urban environment. In that study, the authors performed a review of 65 publications using a two-part search. In the first part, they used a backward and forward search of key soundscape studies to identify forty articles that addressed to larger debates in soundscape research or identified variables in the relationship between city users, user characteristics, user activities, and sound. In the second part, they used a keyword search in the SCOPUS database focused on noise legislation, soundscape design, and quiet areas to identify papers that addressed “sound-related policies and conceptual or applied strategies to integrate sound in the planning and design process of public

spaces" (pp. 3-4) resulting in a further twenty-five papers. SSD, which considers sound as a "resource" is considered a departure from ENM, which considers sound as a "waste". Describing the adoption of the SSD strategy as an imperative, the authors identify three gaps preventing this transition: a need for more user-centered considerations, a lack of standardized practices, and a lack of measures and technologies.

To better understand these gaps described by Bild et al. (2016), it is worth examining more deeply what exactly constitutes the departure of the SSD from ENM. There is no single source that covers this entirely, thus the analysis presented in the next section is a summary of a widely conducted review across many research methods, approaches, and fields. In particular, research on urban sound can be either object-centered, studying the physical properties of the sound itself, or human-centered, where the perception, experience, and understanding of the sound are the focus (*ibid*).

Within the object-centered research, the most relevant research to the soundscape literature is centered on the development of acoustic indicators where, informed by prior inquiries with humans, predictions about the soundscape can be made with only the acoustic information. Aletta, Kang, and Axelsson (2016) describe these indicators, starting with the most frequently used indicator, decibels (dB), which is a predictor for perceived loudness. The authors emphasize how that indicator is useful for simple, isolated sounds, but does not work as well in complicated environments, like urban environments. Developments in the research have led to more complex measures, such as various manipulations of the decibel called Leq. Marquis-Favre, Premat, and Aubrée (2005) discuss in great detail the various types of Leq and the purpose for their measurement, such as Lden, an indicator for measure the noise level over the entire day with a penalty for evening and nighttime noise. The most common of these indicators, however, is the dB(A), which is a correction applied to the dB measurement mimicking the range of human hearing at low-level sounds.

Within the human-centered approaches is a stronger reliance on qualitative and mixed approaches. In a study that puts forth a soundscape assessment framework, Aletta et al.

(2016) provide a review of these methods and the key studies that use them. These diverse methods include: soundwalks, narrative interviews, behavioral observations, questionnaires, semantic scales, interview protocols, physiological measurements, and observation protocols. They also identify that studies can range in the setting where they take place, particularly that they can be conducted in the laboratory with either simulated or reproduced sound, in-situ, or through memory recollection (e.g. with interviews after visiting a space). Often the same methods can be used in different settings. Guastavino, Katz, Polack, Levitin, and Dubois (2005) investigated concerns of ecological validity by looking at differences in responses to a questionnaire in response to an in-situ visit and sound reproduced in a laboratory under multiple playback conditions. Steffens, Steele, and Guastavino (2017) used the same rating scales (pleasantness, eventfulness, and familiarity) for both in-the-moment and retrospective soundscape evaluations. Using the Experience Sampling Method, where participants' cellular phones rang with alarms at various points throughout the day to indicate that it was time to take a questionnaire wherever they were at the moment; the same scale rating was used at the end of the same day and the end of the week while they were no longer in the same soundscapes to evaluate the effect of memory on these evaluations.

Soundscape research also can be found across a wide array of scientific journals, not necessarily in the same domain. The studies cited in this review come from journals as different as Landscape and Urban Planning, Cities, Acta Acustica, Journal of the Acoustical Society of America, Journal of Planning Literature, and the Journal of Urban Design. The wide breadth of fields combined with the ever-increasing number of studies on soundscape (described above by Kang et al., 2016) in a growing number of languages has made a comprehensive review impossible. The following sections instead rely on the identification of emerging themes based on a literature search with the following criteria: studies identified by the above review papers; studies referencing or adhering to the ISO

definition of soundscape[16]; behavioral studies involving human participants; and studies in the expertise area of the author. While there are a multitude of soundscape studies in research domains like anthropology, media studies, sociology, a review of all these research areas is beyond the scope of the present study.

What follows is a list of principles emergent from the literature, focused more on a descriptive and consensual rather than exhaustive list. The list is organized such that the principle is stated as clearly as possible, and the existing literature supporting that viewpoint is introduced.

2.1.2 Soundscape principles identified

P1. *Urban sound can have positive outcomes as well as negative outcomes*

Summarized most succinctly by Raimbault and Dubois, they explain that the environmental noise management strategy leads to "an urban soundscape becoming less negative (less unpleasant) without being more positive (pleasant)" (2005, p. 346). The existence of the Positive Soundscapes Project (Davies et al., 2013), based at the University of Salford in Manchester, UK, also speaks directly to this opportunity to consider the positive effect of sound. In a summary publication of their findings, they addressed the issue of what makes a soundscape positive. Their team, among other methods, used focus groups to identify that positive soundscapes should: 1) include natural sounds, 2) include the vibrant "hubbub" of humans, and 3) support positive emotional states, such as relaxation. They also identified four factors that affect whether the soundscape is evaluated as positive: behavior/activity, attention, information, and individual differences.

[16] "the acoustic environment as perceived and understood and/or experienced by people and/or society, in context" (ISO 12913-1: 2014, 2014)

P2. *The decibel level, while important, is only a small part of a complete description of the acoustic environment and does not adequately explain users' perceptions and experiences*

Lercher and Schulte-Fortkamp (2003) demonstrated that methodologies used in the environmental noise management strategy, specifically sound pressure measurements, fail to account for more complex human perception mechanisms. While the dB-A decibel scale-weighting is loosely weighted to the frequency curve of the human ear, it takes no account of the context of a particular sound. The soundscape design strategy requires a focus on users and their evaluations before a sound can be determined good or bad in the context.

While studies have shown a trend where loudness negatively predicts pleasantness and/or overall sound quality (e.g. Ricciardi, Delaitre, Lavandier, Torchia, & Aumond, 2015), the relationship is not observed in every case, nor does loudness predict the performance of other soundscape descriptors. Several models of these descriptors have been proposed to account for soundscape evaluation. Aletta et al. (2016) have arranged them according to eight descriptor types: noise annoyance, pleasantness, quietness or tranquility, music-likeness, perceived affective quality, restorativeness, soundscape quality, and appropriateness. Each of these descriptor types is supported by empirical studies (see associated references). More commonly, recent studies have focused on finding which combinations of these descriptors sufficiently describes a given soundscape.

Toward that model, another study (Davies & Murphy, 2012) demonstrated that up to 65% of variance in soundscape quality judgments was described through just four words from a list posed to respondents: "relaxation", "vibrancy", "communication", and "spatiality". Lastly, (Axelsson, Nilsson, & Berglund, 2010) performed a principal components analysis on 116 soundscape attributes from laboratory evaluations of 100 recordings (N=50) and found that 74% of the variance in evaluation could be attributed to just three perceptual attributes: pleasantness, eventfulness, and familiarity. However, some of the same

authors proposed an eight-question questionnaire, called the Swedish Soundscape Quality Protocol (SSQP), using scale ratings on adjectives: pleasant, eventful, calm, monotonous, unpleasant, uneventful, vibrant, and chaotic (Axelsson, Nilsson, & Berglund, 2012).

Beyond holistic descriptors, relationships between users and particular sound sources can modulate perception. There is converging evidence (from lab studies, interviews and surveys) that soundscapes dominated by mechanical sources are perceived as less pleasant than those dominated by human sounds (Axelsson et al., 2010; Dubois et al., 2006; Guastavino, 2006; Hall, Irwin, Edmondson-Jones, Phillips, & Poxon, 2013). Dubois et al. (2006) observed that participants made use of a richer categorization and vocabulary when describing the human-dominated soundscapes.

There is also a significant movement to grow the use of quantitative measures like soundscape “indicators”, as described above, for their presumed ease of description and communication. (Aletta et al., 2016) explain that the topic of soundscape indicators is gaining increased attention because of an “urgent need for operational tools, like predictive models, aimed at implementing the soundscape approach in urban planning and design” (p. 66). However, few studies have conclusively achieved a high explanation of soundscape evaluations with indicators alone; for example, Brambilla, Gallo, Asdrubali, and D’Alessandro, 2013 could not significantly explain questionnaire data with acoustic indicators in a study of three urban, Italian parks, largely because of the weak relationship between sound level and pleasantness. Indicators, however, have been useful in revealing how, in given contexts, spaces exceeding certain measurements will no longer be rated as anything except negative by users. Nilsson and Berglund (2006) found that for any park in their study with an LAeq (a long-term average sound level reading with the A-weighted correction) greater than 50, users perceived the place to have poor sound quality. Zhang and Kang (2007) found a similar result, where, in more scenes than just parks, levels in excess of 65 dB(A) rendered the scene negative in all evaluations. More recently, Herranz-Pascual, García, Aspuru, Díez, and Santander (2016), were able to describe evaluations of

the related concept of acoustic comfort with indicators by comparing acoustic measurements with 120 observations at urban locations from each of 53 smartphone users in a Spanish city. In their study, they found that high sound levels were correlated with a lower feeling of an ability to use a space for relaxing, quiet, fun, and natural; interestingly, the presence of many sound events was not correlated with any qualitative measures of comfort or pleasantness.

Hall et al. (2013) in a summary paper of studies including soundwalks, focus groups, and laboratory evaluations, summarize that they "strongly agree with others [Dubois et al., 2006; Yang & Kang, 2005] that sound level measures alone fail to capture the rich complexity of the soundscape experience and should not be used as the only tool in the urban planners' armoury for assessing acoustic comfort." The evidence points to the idea that high sound levels are relatively predictive of negative evaluations, but in all other cases, there is not much guidance for urban planners and designers on what constitutes soundscapes that would be described as pleasant, appropriate, etc.

P3. *Acoustic environments should be appropriate for the intended uses and users of a space*

Some evidence points to a theory that soundscapes are perceived in relation to the activity that a user is conducting. Proposed first with relation to the acoustic design of outdoor spaces Brown and Muhar (2004) say that "the first step is to establish the activities that will occur at the site under consideration". Empirical studies are beginning to converge on the same idea. In Guastavino's (2007) free sorting tasks of recorded sound environments, participants spontaneously grouped soundscapes in terms of activities, describing them in terms of the actions performed (e.g. "do the groceries", "take a walk", "have a drink"), the type of locations ("market," "café", "restaurant," "park") and specific sound sources ("vendors," "music," "birds"), indicative of the activities. The aforementioned Davies et al. (2013) found consistently across four focus groups that "soundscapes that are compatible for one's own purposes and support one's own behaviors are…evaluated as positive".

Further evidence for an activity-centered approach comes from (Raimbault, 2006), which analyzed in-situ soundscape evaluations (measured with semantic differentials and free-response) across locations and demonstrated that activity has a stronger effect on the overall evaluation than spatial and temporal features. (Steele, Steffens, & Guastavino, 2015) also found a significant effect of activity on soundscape evaluations (pleasantness, eventfulness, and familiarity) for in-situ soundscape judgments performed using the experience sampling method. A study from Hong and Jeon (2015) found that seven factors (traffic sources, human sources, natural sources, pleasantness, eventfulness, visual quality, and "harmony of the environment") needed to be accounted for to describe evaluations made by participants in urban spaces in Seoul, Korea. The extent to which these factors described the evaluations varied by urban context: commercial, residential, business, and recreational. Others have proposed separate models of assessment based on whether the soundscape that is being experienced is from indoors or outdoors (e.g. Brown et al., 2011).

Related to activity is the notion of expectation, such that for given activities, users may have different expectations for the sounds of a space. On a questionnaire study of urban park users, participants who visited for the self-reported purpose of experiencing "tranquility" and "silence" were more likely to report hearing mechanical sounds and rating the overall sound quality of the park as negative than those who visited the same park for social reasons or to hear natural sounds (Filipan et al., 2017).

However, even after activity and expectation have been isolated, other contextual variables remain relevant, including personal and situational. Other variables that have been identified are, for example, mood (Davies et al., 2013; Steffens, Steele, & Guastavino, 2015), one's self-awareness about sound-making (Davies et al., 2013), noise sensitivity (e.g. Steffens et al., 2015), perceived proximity to a green space (Gidlöf-Gunnarsson & Öhrström, 2007), and the presence of hearing problems (Payne, 2008).

P4. *Sound should be considered in the early rather than late stages of a plan or design*

Adams, Davies, and Bruce (2009) call for a soundscape evaluation in the preliminary stages of a design project. A similar call is made by De Coensel et al., (2010), who claim that because noise considerations are only made at the environmental impact assessment stage of planning proposals, it is a missed opportunity to consider sound a resource. Brown and Muhar (2004), without explicitly calling for earlier considerations, do suggest, like the others, that designing and planning for sound should be complementary to the noise abatement approach, and more tightly integrated with traditional design and planning measures.

P5. *Added sound, whether from passive design elements or from technology, can play an important role in changing perceptions of a space*

The focus of planners and designers has been on removing harmful and annoying sounds, or "noise" (e.g. Brown & Muhar, 2004). However, in addition to mitigating the presence and effects of unwanted sound, wanted sounds can be added for various effects.

At the most basic level, added sound can work as a masker to other sounds. Brown and Muhar (ibid) claim that a space can be well designed in the sonic dimension when wanted sounds mask unwanted sounds. Added noise has been demonstrated to reduce annoyance to mechanical sound (Di, Li, Zhang, & Shi, 2011). An extension of this technique is to use positively perceived sound sources, such as a fountain in a park, to reduce annoyance. This effect has been demonstrated by others. (Ekman, Lundén, & Nilsson, 2015; Nilsson, Alvarsson, Rådsten-Ekman, & Bolin, 2010; Rådsten-Ekman, Axelsson, & Nilsson, 2013)

More complex sources can also change other aspects of the soundscape evaluation beyond annoyance and pleasantness. A study of an urban soundscape intervention using music in a Montreal park demonstrated that, in the context of a small, noisy park, added music increased the pleasantness and vibrancy and increased moods; meanwhile, the perceived calmness and appropriateness of the park soundscape did not change (Steele, Bild, & Guastavino, 2016).

P6. *A space's visual elements have an influence on the perception of the sound*

Hearing is not an isolated sense, and most city users do not evaluate the sonic dimension alone when they evaluate a space or the way it sounds. Urban soundscape is a multimodal problem. A study on pleasantness judgments of image-sound pairings of natural and urban scenes, found no relationship between ratings of pleasantness and the intensity of the acoustic signal, highlighting the need to explore more dimensions governing soundscape perception (Arras, Massacci, & Pittaluga, 2003).

Evaluation of sound environments is not limited to the evaluation of just the sound sources and sound scene because other modalities can play a role in the judgment. In the context of annoyance toward the noise from wind turbines, Pedersen and Larsman (2008) found a strong relationship between negative "visual attitudes" toward the noise source and the perceived noise annoyance. Their results support the idea that minimizing the effects of noise annoyance should include visual aesthetic considerations. In that case, visibility of the noise sources increased annoyance, but on the topic of noise barriers for high-speed rail noise, the opposite was true. Maffei, Masullo, Aletta, and Di Gabriele (2013) found that perceived loudness and noise annoyance were lower when the barrier was transparent instead of opaque, allowing participants to see the rail vehicles.

Outside of the topic of noise annoyance, a few studies have also looked at the relationship between soundscape and landscape. Carles, Bernáldez, and Lucio (1992), in a study mixing different presentations of visual and auditory scenes in a laboratory, found that sound dominated preferences judgments over the visual components of the presentations. The aforementioned study (Hong & Jeon, 2015) required a *visual quality* variable to describe soundscape evaluations; another study found that ratings of the tranquility of spaces changed significantly in a laboratory study when audio was added along with presented images (Pheasant, Horoshenkov, Watts, & Barrett, 2008). A study aimed at predicting the sound quality of urban spaces produced a much higher match for perceived sound quality (from 3400 *in-situ* questionnaires) when the model included a variable for visual amenity (72% v. 58%) than when it did not (Ricciardi et al., 2015).

2.1.3 Summary

Soundscape is a framework composed of many methods, approaches, and departure principles from the status quo. Despite soundscape not being one isolated thing, the framework has clear potential benefits, established in the Introduction and the Review to this point, that can be extended to the way we consider sounds in the city. As a largely academic framework, proven practical applications are few but growing. The rest of the review will cover the gap between this academic literature and PBEs and some of the efforts made to bridge this gap, with a short review of information studies literature.

2.2 "City Makers" as soundscape actors

This section deals first with *whether* PBEs consider soundscape, and then to what known remaining extent *how* they consider sound in general. Some resources may suggest that the "gaps" addressed by many may not just be theoretical, as suggested by Bild et al. (2016) above; the gaps may also arise from differences in motivation, scale, and the complexity of working in the built environment. Describing the global priorities of the field, Krizek, Forysth, and Slotterback (2009) emphasize that "planning practice is a reflective craft where skills of mediation, negotiation, listening, and framing are prominent."

In my reading of the literature, I have identified how the wide range of scales (buildings, city blocks, regions; see Erickson and Lloyd-Jones, 2001) over which soundscape principles apply and this has resulted in a wide array of professions and practices being identified. Pinpointing the actors responsible for soundscape practice is not possible, thus a wide search has been conducted here based on scale rather than on profession. This review will therefore include urban planners, designers, landscape architects, and occasionally engineers and policymakers.

Professionals at all scales of the built environment play roles in determining what the city will sound like. These actors are already shaping the city and its resulting soundscape, but as some in the soundscape community have pointed out, they are not necessarily

intervening in the soundscape *intentionally* (e.g. Kang, 2006; Raimbault, 2006; Yang & Kang, 2005). This means that, while a park may have morphological or topological features that protect it from traffic noise, that decision could have a consequence of other considerations, such as creating visual barriers for park users.

There are a limited number of studies where various PBEs have been evaluated for the ways they deal with sound, for example, urban planners (Adams et al., 2009), landscape architects (Cerwén, Wingren, & Qviström, 2017), and urban designers (Pijpers-van Esch, 2015). Raimbault and Dubois (2005) also claimed to have interviewed urban planners, but they actually interviewed a wider group that included engineers and other city makers. The ensemble of these actors in the city making process have been called *professionals of the built environment* (PBEs) for this study, and a justification for that description is given in the Section Professionals of the built environment.

This review has established the existence of a gap between an emerging strategy that is well supported by research (soundscape) and what has been described as the status quo (environmental noise). The gap is widened by a lack of understanding of disciplinary differences, different standard terminology to refer to sound and conceptualizations about sound, and a research-to-practice gap. The extent to which these are isolated or common problems are discussed below.

2.2.1 Known conceptualizations of sound

Bridging gaps between research and practice requires understanding the various vocabularies, discourses, and conceptualizations that divide actors. However, even within the various fields of study that consider urban sound, there is a lack of shared conceptualizations - a computational linguistics study (Niessen, Van de Cruys, Cance, & Dubois, 2013) was performed on the use of sound and noise as terms in scholarly publications from the community noise and the soundscape literatures. Analysis of the terminology and discourse showed a greater concern on the part of the soundscape researchers toward holistic acoustic environmental quality as opposed to a noise-

reduction focus. Raimbault and Dubois (2005) also showed differences in conceptualizations between what they called "planners" (which comprised 10 engineers, architects, planners, and landscape designers) and "city-users". In their linguistic analysis, they found that only the planners used technical vocabulary, like decibels, to describe sounds. No further known work has specifically studied individual and group differences in sound conceptualizations between members of the PBE sample, and certainly warrants further study given the research attention on the soundscape approach and its lack of applied studies. The following sections will cover the known research on vocabulary, discourse, and conceptualization of sound and analogous factors, like climate, as it pertains to PBEs.

2.2.2 Considerations of sound, expectations of knowledge, and the role of experts

This section will look into the existing conceptualizations that PBEs may have about sound based on the limited literature specifically addressing sound and then and a review of some educational materials identified by the American Planning Association[17] in their 100 Essential Books of Planning page[18]. The literature does not point strongly toward well-formed conceptualizations of sound; instead, many sources call for PBEs to consider sound at all. A recent article in the New York Times, called "Dear Architects: Sound Matters"[19] was a call to architects that they must begin to consider sound[20]. In the scholarly literature, there are a number of works for PBEs that make calls to better consider sound (e.g. Pallasmaa, 2012; Zumthor, 2006), but these existing works are largely phenomenological tomes on the importance of designing for sensory experience in

[17] An organization connecting nearly 40,000 members from more than 100 countries (https://www.planning.org/aboutapa/)
[18] https://planning.org/library/greatbooks/
[19] https://www.nytimes.com/interactive/2015/12/29/arts/design/sound-architecture.html
[20] As reviewed in the introduction section, architecture is similar built environment design on a different scale.

general and thus offer very little in the way of practical advice for planners and designers to follow and implement.

Further, the American Planning Association's American Institute of Certified Planners, which offers certifications for planners finding work in the US and Canada, provides outlines on its website for the topics covered in its examinations. For the general planning examination, 64 topics are listed in the exam outline[21], none of which include *noise* or *sound*. Two specialized examinations are offered in addition: one for environmental planning[22], whose topics list enumerates dozens of factors under examination - noise is mentioned only as a sub-topic of "public-health indicators"; and one for urban design – there, a list of hundreds of topics[23] exists, yet neither *noise* or *sound* is mentioned. However, in the urban design list, a rare positive exception is made for *music*, which is listed under the category of "Cultural Heritage: Sensibility and Understanding".

The certification examinations taken by planners and designers can include questions on acoustics, but that knowledge is considered strictly technical. Yet, it is telling that sound in any format is not articulated as a key factor. Additionally, regarding this technical aspect, the second edition of the seminal textbook *Site Planning* (Lynch, Lynch, & Hack, 1984), which is still widely used to train PBEs, has a chapter called "Light, Noise, and Air". The chapter includes only information on decibels, attenuation, and barriers in two and a half short pages. However, given the range of topics covered by this and similar texts, it is clear that PBEs consider and incorporate a large number of factors in their work, and sound-related factors must be considered in a constellation of these other factors.

In a more recent example, Riddell's (2008) 335-page *Sustainable Urban Planning* contains 12 mentions of the word "noise", 10 of which are adjacent to other types of nuisances, pollutants, and negative consequences, e.g. "soil, aesthetic, noise, and air pollution" (p. 154). Out of dozens of uses of "sound", only 2 of them refer to acoustical phenomena. In

[21] https://www.planning.org/certification/examprep/subjectmatter.htm
[22] https://www.planning.org/asc/environment/subjectmatter.htm
[23] https://www.planning.org/asc/urbandesign/subjectmatter.htm

one such instance, it refers to how urban development puts pressure on space "which leads to an engagement of surrogates for sound, vision, smell and taste reality" (p. 115). In the other case, it says that with density comes a degradation of "insulation against 'sights sightings and smells'" (p. 195). While no technical information about sound is given in this book, sound is treated exclusively as a risk to any project.

In another more recent example, Steiner and Butler (2012)[24] released a student textbook entitled *Planning and Urban Design Standards*, intended for the purpose of establishing planning and design standards for students preparing to work across various disciplines and sectors. The book, which is over 400 pages, has a total of 6 pages about the sound-related factor. Six of these pages are a section called "Noise and Vibration" under a sub-section called "Hazards" and within a section called "Environmental Planning and Management". Within these six pages, noise is introduced as "simply unwanted sound" (p. 110); nowhere does the book describe what a wanted sound would be. They cover seven different noise indices (Maximum Sound Level, Sound Exposure Level, Equivalent Sound Level, Day-Night Average Sound Level, Community Noise Equivalent Level, Time Above a Given Level, and X Percentile Exceeded Sound Level) after only a few sentences introducing the decibel. They cover how noise affects sleep, speech intelligibility, and classroom learning as an introduction to compatible zoning for different noise levels. Interestingly, 4 different "Activity Categories" describe the appropriate land uses under different noise level conditions; for example, under Category A, the Leq (1-hour) should be below 57 dB(A) to support "lands on which serenity and quiet are of extraordinary significance and serve an important public need" (p. 112). The only other topics covered in this short chapter include how noise regulations only regulate two perspectives (reducing noise levels at the source and zoning) and some technical interventions like

[24] Also identified by the American Planning Association as one of the "100 Essential Books of Planning". The original edition was edited by Klein and Lewis, but the edition reviewed here is a special student release.

sound barriers. A few dozen other mentions of noise throughout the book situate noise among a list of other factors, like odor, that can be detrimental to good projects.

In their university training, PBEs are often educated as generalists with a "concentration" in a more focused topic[25]. Outside of these specialties, to gather information on unknown topics, PBEs tend to talk to other people (Eliasson, 2000). Within environmental disciplines, it has been established that they access subject-matter experts (Pijpers-van Esch, 2015). The same study revealed that information seeking with experts is high upfront, but quickly decreases as the project moves forward. Speaking to experts early reduced the risk of getting information from them that would conflict with existing designs. Designers also strongly appreciated experts who were able to tailor information for the designers and grasp the goals of the project. Experts were otherwise seen as "too accurate" (p. 77) for practical purposes. Academics were not frequently consulted as experts for environmental topics.

Specifically, for sound, noise experts are consulted (G. Siebein, Bettcher, Fisher, Robinson, & Skelton, 2008; G. W. Siebein, Kwon, Smitthakorn, & Gold, 2007). What is not clear from the few studies on knowledge seeking by PBEs about sound-related factors, is where exactly PBEs feel that their knowledge is not sufficient and when they choose to reach out to colleagues and experts. Further, an open question is whether this point of knowledge seeking is roughly in line with their expectations for knowledge about the topic.

Cerwen (2017) gives an extensive review from the landscape architecture literature that seemingly contradicts this trend of paying little attention to sound by providing over a dozen examples of mentions of sound in the literature since the 1960s, starting with Rasmussen (1964), through Cullen (1961). However, it is unclear how Cerwen identified which literature belonged to landscape architecture. Interestingly, Lynch et al. (1984)

[25] For example, University of California at Berkeley lists four concentration areas for their students enrolled in a Master's of Urban Planning http://ced.berkeley.edu/academics/city-regional-planning/programs/master-of-city-planning/concentrations

identifies two design strategies for “sensory” design remarkably similar to the two strategies identified forty years later by Bild et al. (2016) for soundscapes. These strategies are: environmental protection and design. Of the examples identified by Cerwen, however, nearly half of them are calls to landscape architects to begin considering sound (e.g. Gehl, 2011; Pallasmaa, 2012; Southworth, 1967). These findings suggest that landscape architects may be more prepared to use soundscape, or at least they have been more primed to think about sound. Cerwen concludes that the few mentions in the literature remain short, scattered, *ad hoc*, and presented in relation to the visual; more importantly, this classic literature leaves few examples of how to proceed with designing soundscapes.

A study by Weber, Driessen, and Runhaar (2014), instead of focusing on education and literature, looked at some of the conceptualizations held by PBEs in practice, particularly how it has led to noise policy in the Netherlands. The authors of the study conducted interviews with policy experts and performed a document analysis of Dutch noise policies. In line with what would be expected from the educational opportunities, the Dutch planning approach for sound affords three “pillars” on which regulation is based: policies limiting noise sources, insulation of dwellings, and zoning. It remains an open question the extent to which these policy pillars apply outside of the Netherlands.

In this context of a focus on noise reduction, there are only very limited resources documenting PBEs using the soundscape design strategy in the “real world”. For example, Siebein et al. (2007), advising on the redevelopment plan of a small city, led focus group discussions with their design team members, city planning staff, residents, prospective developers, real estate agents, students, city officials, and regional planning staff to articulate a plan for a soundscape improvement strategy for a district in a Florida university town, naming zones and creating a nature area. Appropriate to the soundscape approach, the proposed improvements were to be made with a series of ecological, transportation, architectural, and sonic interventions, integrating a number of disciplines.

Other efforts by soundscape researchers to bring the soundscape approach to PBEs are discussed in the last section of this review.

2.2.3 Making priorities in professions of the built environment

Another open question centers on what kind of priority a sound-related issue gets when it arises for PBEs. Pijpers-van Esch (2015) found that while microclimate had a much lower than average importance than other planning factors like soil, water management, and users, within the sub-factors of microclimate, sound took the second highest priority of seven total factors, behind only solar irradiation. For PBEs who do not identify as urban designers, their focus may be more or less strong on environmental factors and remains an open question.

In the nearby body of literature on urban land use, large-scale (i.e. regional and national) decision makers on land use were given interviews and questionnaires to determine their approaches to work (Sutherland, 2010). Despite their mandate being described as helping to meet national targets (e.g. food security, climate change, and economic development), they tended to prioritize the factors of farming and private ownership in their decision-making process. The study, which took a broad recruitment strategy taking in many types on land managers, found 5 main attitudinal themes (production, diversification, environmental responsibility, ecological responsibility, and social benefits) and 3 main priority themes (stewardship, income realization, and community); while within each workplace and professional type, there was a heterogeneity of attitudes and priorities, the categories themselves were robust across professional types and regions. Similarly, for PBEs, a breadth of attitudes and priorities are expected, but they may not overlap strictly with their type of employment and may be more related to personal factors of individuals. This Sutherland findings also suggest a mismatch between prioritization of PBEs and decision-makers that is worth of further inquiry. In fact, a follow-up study with the same lead author (Sutherland, Barnes, McCrum, Blackstock, & Toma, 2011), again on land-use decisions, found a marked difference in prioritization based on the focus (e.g. stewardship, profit, or community) of the decision maker in question.

2.2.4 Evaluating soundscape outcomes

As established in the sections on soundscape, the evaluating the quality of plans depends on the appropriateness of the soundscape for the intended uses and users. However, the literature does not detail PBE practice where evaluations with users are the norm. While this idea is explored further in the Research-based Practice section below, suffice to say here that this problem has been consistently identified for decades. Talen (1996) explains, "The planning community has shown a curious lack of interest in developing methods to evaluate how successfully plans are implemented." Baer (1997) claimed similarly, "The planning profession has developed relatively few criteria for evaluating the quality of general plans." Regarding technical factors in a plan or design, Doick, Sellers, Castan-Broto, and Silverthorne (2009) have identified how developer-, funder-, or owner-centric notions of success have hindered similar evaluation on social or environmental impacts of a project; thus, the sector, profession, and other personal factors are likely to play a role in how plans are evaluated. While a sound-related factor was not specifically mentioned, no known work exists to support a different hypothesis. It remains an open question what could influence notions of good or poor outcomes for PBEs as they work with a sound-related factor.

2.2.5 Gaps and lessons from adjacent fields

Given the relative lack of research attention given soundscape and its application in practice, it is worth broadening the literature search to understand how PBEs deal with other factors, particularly environmental factors. Most critically, the broader literature has revealed the notion that as "any 'real-world' planning project has inherent uniqueness, and that "the likelihood that adequate data exist to support a scientifically-defensible decision is very low" (Kato & Ahern, 2008). This study, based on a review, identified, among other reasons, a lack of prepared scientifically-based guidelines and a lack of successful precedents and models in the field of landscape and environmental planning (including planners and designers) that would help those practitioners incorporate new knowledge and methods into their work.

In contrast, the existence of clear and concise guides will not necessarily lead to the use of the information. An interview study (Cooper & Crisp, 1984) with building designers revealed that of those designers who did not already exploit daylighting in their work, the provision of daylighting design aids (i.e. guidebooks) alone was not likely to extend their practice. They stressed rather the importance of education and demonstration, consistent with the verbal information needs identified by Innes (1998), described in more detail below. Kang (2010), specifically referring to soundscapes, includes both creating guides and performing outreach with policy makers in terms of addressing the gaps to PBEs.

In addition to the individual variables preventing the adoption of information on new topics are professional and contextual variables. In the field of urban thermal studies, some contextualizing influences have been identified as timescale, priorities, and application possibilities (Evans & Schiller, 1996). Thus, the context of a real project could, for example, expose a difference between perceived and actual prioritization of factors. Other mediating contexts of an existing project, according to the study, could be unsolved issues that extend the project's timescale.

In summary, not much is known about the way that PBEs think about and work with sound, except for information from a few limited studies that are sometimes isolated to smaller contexts (e.g. the Netherlands). PBEs are likely guided by the concepts they encountered during their training, which points to a focus on mitigating the negative impacts of sound on a project. For bringing new information about environmental topics, guidebooks and other tools are not necessarily useful on their own. Barriers and facilitators to the use of new information warrants a deeper look.

2.3 Actions for soundscape practice

While each of the departures from the environmental noise management strategy described in the sections above are well supported by mounting evidence, the knowledge remains largely constrained to academic contexts without widespread application in

practice. The adoption of the soundscape design strategy is also slowed by the barriers described in the previous section. As identified by Bild et al. (2016), there is a lack of tools and guidelines for applying soundscape knowledge and identifying the appropriate actors is a further challenge, described here.

There have been many calls to action to apply the soundscape approach in practice. Based on a reading of the literature, I have identified a list of these actions that come up most frequently. In light of the above discussion, some actions may apply more strongly to one or another sub-group of PBEs. Similar to the analysis above, some emergent themes pertaining to the application of the soundscape approach have been identified and are discussed here.

A1. It is important to promote awareness of sound concepts to PBEs

The potential benefits of the soundscape method have been established in the introduction and early sections of this review. One conference paper from leading researchers in soundscape summarize some of these needs and goals as they relate to "consequences for design", namely the need to identify target populations and involve them; account for the visual setting, general design, the role of attention, and users' prior knowledge of a space; and acknowledge compromises in design, users and expectations (Botteldooren et al., 2011). These authors also mention the need to bring this knowledge to practice by "translat[ing] knowledge from the lab to tools and methodologies that can be applied in soundscape analysis and design."

The "gap" between PBEs and soundscape researchers has been identified by many, as summarized in Bild et al. (2016). Contributing to the gap is a difference in terminology for talking about sound, particularly that people in different fields talk about sound in different ways (Niessen et al., 2013; Raimbault & Dubois, 2005). Interested in this gap relatively early in the soundscape movement, Augoyard and Torgue released a terminology guide specifically showing how to use terminology about sound in the built environment – this guide was produced in French (Augoyard & Torgue, 1995), and later in English (McCartney, Paquette, Augoyard, & Torgue, 2006). The consensus is that PBEs

largely rely on technical vocabulary to describe sound levels and rely on a vocabulary centered on protection from harmful sound sources, related to the ENM strategy. Researchers have begun to address the gap by providing definitions (e.g. ISO 12913-1: 2014, 2014) and handbooks (e.g. "Good practice guide on quiet areas," 2014). However, there is mounting evidence that interpersonal communication is needed in addition to tailored educational materials (e.g. Taylor & Hurley, 2015).

> *A2. Sound can be used as a diagnostic to understand and identify issues related to soundscape, but also to improve other factors, and can strengthen arguments for interventions, including economic concerns*

Sound is not an isolated factor with fixed considerations. Sound is the result of the users and activities of a space. Sound is inextricably linked to other planning factors – traffic planning decisions affect how much and where traffic noise will come from; zoning will determine which users will be affected by industrial noise; and so on. Sound is most often linked with health and well being (e.g. Gidlöf-Gunnarsson & Öhrström, 2007), but also orientation, atmosphere, and materials (Cerwén et al., 2017). Bild et al. (2016) identified the growing awareness of the interconnectedness of sound with other factors as one of the pillars of the soundscape design strategy. In this context, sound is not just a design and planning resource, but also a way to identify, for example, whether traffic or zoning have been implemented in a way that meets users' complex needs.

> *A3. Even in the context of the above points, technical interventions, including noise control technologies, can support the goals of an intervention.*

Incorporating human judgments into decisions about sound need not preclude the use of technological interventions. Such methods are common in the acoustic design of spaces like concert halls (e.g. Holden, 2015). More commonly, for urban sound design, technical solutions come in the form of noise reduction technologies. Poor sound environments indeed contribute to public health concerns (e.g. Ising & Kruppa, 2004). Harmfully loud sounds in the environment should be mitigated and even have non-auditory effects on

health (Basner et al., 2014; Stansfeld & Matheson, 2003). Zhang and Kang (2007) subsequently proposed a guideline of 65-70 dBA, and argued that, if the sound pressure level exceeds this limit, all sounds are disturbing and masking techniques are not relevant. In addition, as described in the introduction, the downsides of traditional methods of noise mitigation should be recognized, for example, building sound barriers can create obstacles that don't promote urban quality, and a proactive approach to noise management using preventive measures should be given priority over remedial measures.

A4. Providing access to quiet areas, both in the home and "green" areas, has proven benefits.

Converging evidence has pointed to the benefits of access to quiet. These include spaces in the home, where a "quiet façade" serves the purpose of giving occupants of dwellings areas within the home for conducting sensitive activities, like sleeping (Gidlöf-Gunnarsson & Öhrström, 2007; Kluizenaar et al., 2011; Öhrström, Hadzibajramovic, Holmes, & Svensson, 2006). Outside of the home, benefits of access to nature have also been found (Gidlöf-Gunnarsson & Öhrström, 2007; Pheasant et al., 2008). Acknowledging their importance, 2002 directive from the European Union specified that all member states should identify and form protection plans for quiet areas; however, the definition of quiet areas and specifics of their protections were left to be determined by each member state[26]. One questionnaire study asked participants to rank their agreement with 47 statements about quiet areas and found 3 major categories of participants, those value a quiet area's ability to support: 1) a need for social relationships; 2) a need for nature; and 3) a need for silence (Lavandier & Delaitre, 2015). These diverse expectations for quiet areas support a need for further research on how to identify, protect, and design them.

[26] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32002L0049

A5. it is important to promote awareness and knowledge of sound among a city's users.

City users themselves hold important knowledge about the places they occupy and are the key to understanding the appropriate soundscape for a space. It is therefore necessary to include them in both the planning and the evaluation of spaces. Participatory methods for soundscape planning are on the rise (e.g. Asdrubali, D'Alessandro, Baldinelli, & Schulte-Fortkamp, 2014) and projects like the Citi-Sense project, for example, maintain a citizen's page[27] on their website. On the theme of participatory methods, some aspects of perception and understanding of soundscapes has been demonstrated to be significantly different across cultures (e.g. Jeon et al., 2018, particularly for the "eventfulness" descriptor), thus input from city users could be variable even for well studied activities or spaces.

2.3.1 Lessons from information studies

2.3.1.1 Research to practice

As established in the introduction, research-based practice is one where practitioners in a given domain make use of research to inform their decisions and improve their practice. Given the information presented above, PBEs do not access soundscape research on their own *en masse*. This may be partially because of the regular use of experts and the existing literature on noise control. However, the literature on research-based practice will be reviewed to understand the barriers and challenges to bringing new strategies from research to practice.

In disciplines where the potential of research-based practice has been more deeply studied, like health and education, a number of facilitators and barriers have been identified that ease implementation of the practice. Hemsley-Brown and Sharp, (2003), for example, establish that research-based practice requires: an understanding of how

[27] https://co.citi-sense.eu/default.aspx

practitioners use research, which features of research encourage the use of findings in practice, the identification of barriers, and appropriate dissemination approaches. The study also identified that these factors vary across disciplines, thus there is a need to undertake new research to understand the extent of each factor as it applies in different professional contexts, such as with PBEs.

Some facilitators to research-based practice span across disciplines. Hemsley-Brown and Sharp (ibid) identified the common facilitator of *managers* across both education and medicine because of their role in changing institutional culture. Managers with an appreciation for research are viewed as key facilitators. Thus, it is important to determine if managers could play a similar role for PBEs. The same authors identified facilitators that were unique to a discipline. In the field of education, the following facilitators were determined to be key: making information readily available; enabling teachers to devote time to reading research; access to outside consultants; providing evidence of the benefits of using research; ensuring that research had practical application; and promotion of a collegial atmosphere between researchers and teachers (ibid).

Like facilitators, common and unique barriers to research-based practice exist. In health disciplines, barriers have been explored for practicing nurses using research in Northern Ireland (Parahoo, 2000), Finland (Oranta, Routasalo, & Hupli, 2002), Sweden (Kajermo, Nordström, Krusebrant, & Björvell, 1998), to name a few. For nursing, the barriers to research utilization have been identified chiefly as time constraints, lack of awareness of available research literature, insufficient authority to change practice, inadequate skills in critical appraisal, and lack of support for implementation of research findings (Hutchinson & Johnston, 2004). Another Swedish study on nursing by the same lead author (Kajermo et al., 2008) identified a few other barriers, namely: dissatisfaction with support from immediate supervisors for participating in research projects, having no academic degree, and unclear and unrealistic workplace goals. Lastly, a review paper (Meijers et al., 2006) covering ten such studies identified six contextual factors as being statistically significant: the role of the nurse, multi-faceted access to resources, organizational climate, multi-

faceted support, time for research activities, and provision of education. Further, Hemsley-Brown and Sharp, (2003) identified: insufficient time to implement new ideas; lack of co-operation from physicians; lack of time to read research; and inadequate facilities to support implementation. Within the education discipline, volume of research materials, lack of applicability, and the ambiguity of research materials were identified as the primary barriers. Thus, resources in the form of time and research applicability emerge as a common barrier.

Research-based design and planning practice (in the context of the built environment) appears to get scant attention. Research identifying the facilitators and barriers to use of research has been conducted in the analogous field of urban climate. The impact of climate evidence on the planning process was historically low over a long period (Lindqvist & Mattsson, 1989; Oke, 1984; Pressman, 1996). In response, a study (Eliasson, 2000) using 41 questionnaires and 11 semi-structured interviews with urban planners revealed five explanatory variables constraining understanding and use of climate knowledge: technical, conceptual and knowledge based, policy, organizational, and the market. The same study posed four key conclusions to address the various barriers to research-based practice, namely, the need to: develop tools and courses suitable for urban planners, improve awareness for urban climate, improve communication and argumentation, and improve institutional capacity. In the previously mentioned study, Eliasson (2000) identified three core aspects that constrained the conceptual knowledge of urban climate and its integration into planning practice: lack of knowledge, aspects on that factor are embedded in other factors, and planners feel uncertain about their own knowledge.

On the research side, not all researchers agree uniformly that research should include implications for practice. An Australian study (Taylor & Hurley, 2015) spoke with researchers about the research-practice gap in urban planning and researchers who had two primary concerns when engaging with practice: first, there was a concern that tailoring findings for practice would jeopardize the rigor of the research; second, there

was a concern that research rarely arrives at definitive agreement on topics and puts the burden of drawing conclusions on the practitioner.

In an extensive review of sound considerations in planning and design practices, Bild et al. (2016) recommend the use of the common notion of *activity* (e.g. the activities that users perform in a space and the associated two-way relationship between the sounds these places make and the activities afforded by a soundscape) as a framework and conceptual tool that would support the integration of different types of knowledge into practice. This idea has a strong foundation by identifying a common link to address the *applicability of research* problem, but the extent to which PBEs are capable of conceptualizing the relationship between sounds and activities is an open question.

2.3.1.2 Information sources and behavior

Beside the role of context affecting conceptualizations of noise and sound, information, information behavior, and information access play a role in PBEs' access to new information on sound. This section will cover the various factors that have demonstrated an effect in the literature on information behaviors in different professions, including built environment professions when the research exists.

In urban planning, studies have been conducted showing just how important verbal communication is as an information source (Innes, 1998). Regarding scientific sources, "unless the scientific information was related to practical action or to the context and particular situation…participants rejected it" (ibid, p. 58). In a review, Anderson, Glassman, McAfee, and Pinelli (2001, and associated references) identify a more specific general trend in the information behavior literature, namely that people prefer interpersonal communication for non-routine, ambiguous, and difficult messages, and print media for routine, clear, and simple messages. Taylor and Hurley (2015) conducted a 3-part study of the information behavior of urban planners. They found that, due especially to time constraints at the workplace, Australian urban planners default to a

reliance on popular media, industry publications, and practice networks as their information sources informing their planning decisions.

In urban design rather than planning, Pijpers-van Esch (2015) conducted a study limited to urban designers in the Netherlands, about the ways they gather and use information in the context of urban microclimate information. Sixteen designers from public and private, and large and small firms were interviewed alone or in focus groups in a semi-structured format. The themes were on sources of information, actions when the knowledge requirement was beyond existing knowledge, use of experts, reconciliation of advice with plans and ideas, and preferences for information gathering. These interview responses were supplemented with fifty-eight email questionnaires that were extended additionally to architects and landscape designers. Regarding information sources, in line with other literature, urban designers relied heavily on "talking to other people", which included clients, aldermen, experts, and designer colleagues (internal and external). Almost equally, designers went to the internet, beginning with searches. On the theme of trustability of sources, they indicated websites of knowledge and research institutions, profession-related websites, and municipal and project websites as being reliable. The internet, interestingly, was also a gateway to finding experts. Some designers also relied on information coming from other designers' and firms' plans, generally as a source of inspiration. Lastly, they relied on maps as providing useful information. Less frequently mentioned sources were books, articles, workshops, policies, reports, site visits, and photographs. Not of importance to designers as sources of information are the residents/users of the spaces being designed. Instead of users, they focus on themselves as a reference in the evaluation of the design. When responding to arising information needs, designers tended to go first to their "people" sources. Consultation rounds with different actors were also used, and they would make assumptions based on experience or handbooks. The questionnaire results also revealed "official bodies" to be useful. Despite other sources reporting the contrary, these Dutch designers did not refer to laws and standards on a regular basis, likely because of the easy availability of experts.

In addition to a trust-based model, a field study of corporate professionals Culnan (1983) showed that a high perceived accessibility of an information source was positively correlated with its use; however, for more complicated tasks, participants would seek out less accessible sources. Another study (Savolainen, 2008) examined the preferences for information source types when seeking information on environmental problems. Though the study focused on these issues as they arose outside of the workplace, it was a search on technical and environmental information. The study found that people generally begin their information searches with human sources and the Internet, which were preferred because of their content, availability, and accessibility more so than their usability. User characteristics also played no role in determining the search pathway, but problem-specific factors did play a role. Searches generally progressed towards printed media to complement early gathering, and the information need was considered met after generally 3 or 4 sources.

In a study focused on the web-based information seeking habits of architecture and urban design students, Makri and Warwick (2010) found that in addition to information seeking behaviors similar to academics and practitioners in other domains, this group had a pronounced use of encountering information, and "visualizing/appropriating" information. These students also relied heavily on visual media for design inspiration. The authors suggest that architects and urban designers are in need of tools that encourage and foster creativity.

2.3.1.3 Individual and organizational factors influencing information seeking

In the field of information studies, many individual and organizational factors have been identified as playing a role in information seeking behavior, such as education and professional roles.

Talja and Maula (2003) explain that until the late 1990s, different rates of observed take-up between different users of electronic systemic in particular were attributed solely to

individual factors (e.g. attitudes and feelings) rather than also through discipline-specific constraints.

Education has also been found to play a role in information-seeking behavior. In a mixed questionnaire and interview study of manufacturing engineers, higher levels of education were linked to lower dependence on personal memories as a source of information, and higher dependence on libraries and external conferences (Kwasitsu, 2003). Overall, the following categories of information source emerged, in order of importance: people within business group, personal files, memory, internet, corporate library, people in other groups, conferences, external experts, internal conferences, professional associations, and standards organizations. The individual variable of education is expected to influence information seeking behavior as well as conceptualizations of sound, as PBEs can join the workforce with many types of degrees and training experiences.

Besides education, the level of professionalization of workers in a particular field plays a role in their information needs. In the Sutherland et al. (2011) study described earlier, those with low professionalization, such as those who work in small organizations without specialized teams, may experience lower information access, impacting the potential to adapt to or take on new opportunities. The generally smaller resources of these groups further exacerbated their information deficits, as they were likely those most in need of information services. This finding also emerged from a review covering lawyers' information seeking behavior based on organizational context, like firm size (Leckie, Pettigrew, & Sylvain, 1996). Thus, organization size and specialization are expected to also play a role in the information needs of PBEs, though no known study has explored that factor.

Disciplinary differences have also been observed in the literature. A review (Leckie et al., 1996) found differences between information seeking of different professionals, namely engineers, health care professionals, and lawyers. The authors found that, while engineers rely more on colleagues and internal sources of information, particularly oral sources, scientists rely on published literature and sources outside of their organization.

Engineers largely found journal literature irrelevant because while journal-based information was reliable, it was not necessarily original.

In the same review (Leckie et al., 1996), differences were identified in information seeking based on career stage (e.g. junior to senior) in engineering. Information sources used by those in managerial roles tended toward sources associated with "finding new contracts and customers, planning budget and personnel, coordinating work, making policies, and interfacing with different levels of government" (p. 166).

2.4 Contextual factors that influence information seeking

Lastly, searches for information vary based on the type of problem being explored, such as the context of the workplace. In a mixed-methods study (Freund, 2015) using questionnaires and focus groups, a number of contextual factors played a role in information-seeking behavior, namely: seniority, organization size, and work location/country.

Another study (Anderson et al., 2001) looking at the information seeking behavior of aerospace scientists and engineers (N = 872) used a written survey to test hypotheses about the use of and reasons for using oral and written information carriers. Their results found a presence for using personal technical information first, then oral sources, followed by literature and libraries, consistent with a model of least-effort information searches. Higher task uncertainty led participants to rely more on colleagues, but very high task uncertainty also led to a reliance on libraries and technicians. For written sources, perceived importance for the task at-hand was the only predictor of the source's use and was not related to the sources perceived quality or accessibility.

Studying engineering designers in a product-development setting, Hertzum and Pejtersen (2000) found a lack of attention in information seeking tools to the problem of information search with people as sources; for designers, people are especially important sources because they can advocate and argue for specific contextual properties of designs at-hand. They suggest that information retrieval tools should also account for searchers

where people lead searchers to documents and vice versa. Further, they identified the top five barriers to accessing both oral information (time-cost, social effort, confidentiality, memory, and appropriateness of advice) and written information (time-cost, relevance, availability of information, friendliness of tools, and intellectual effort).

In a review that compared the information seeking behaviors of various healthcare professionals, Leckie et al. (1996) found that rather than professional boundaries, information needs arose based on the task-at-hand, including: patient care, continuing education, practice management, administration, teaching, and research. While those activities vary by profession, for example the differences between activities in the public versus the private sector, the activity drove the information need. A similar context-based approach may provide interesting insights into the information needs of PBEs.

The resource-based challenges of project work can also pose unique challenges to information seeking. In the Pijpers-van Esch (2015) thesis questionnaires, “noise” was considered a sub-element of microclimate. Across 12 elements including microclimate, participants generally reported each element as having a higher importance than the amount of information they collected on the topic, suggesting a discrepancy in getting information, potentially due to a lack of resources like time. The topic of microclimate had the highest discrepancy between importance and information gathering of all of the topics. Of 7 sub-elements of microclimate, “noise” received the second highest importance, however, the information discrepancy was actually smaller than for the other topics (e.g. solar irradiation, and wind comfort).

In summary, information seekers rely on either people or textual sources for various reasons: career stage, stage of a project, sector, access to experts, and so on. The way these sources are accessed can roughly be described by a model following a least-effort approach, but also with some sensitivity to the problem of limited resources. Even for important problems, time limitations can prevent the collection of sufficient information to make completely informed decision.

2.4.1.1 Attitudes toward research

Beside individual and contextual factors that influence information seeking behavior, attitudes toward research have shown limited influence in the needs and use of information stemming from research-based resources. The Leckie et al. (1996) review paper also studied the information behavior of lawyers and found that a frequently occurring factor in the process if the individual lawyer's attitude toward legal research. Potentially affecting these attitudes are a "lack of comprehensive and user-friendly finding aids and retrieval systems for legal materials" (p. 175), though this particular problem has likely found some resolution with the growth in computational power in the decades since publication.

Some work with PBEs and attitudes toward research were conducted as well. Pijpers-van Esch (2015) reports that Dutch urban designers claim to almost never visit scientific journals, due partly to their lack of accessibility. In the Australian context Taylor and Hurley (2015), found that their planner participants, regardless of whether they were in the academic or professional sectors, "all supported the basic proposition that there is a potentially valuable contribution of research to practice", but conceded "Some practitioners may have simply been being polite about research in light of the question prompts" (p. 118). The same researchers found that research outputs competed with internet-based information, which was perceived as "bite-sized" and "eye-catching" and was consumed out of habit; however, when research was used, it helped them maintain competence and credibility while "present[ing] a strong case" when it came to defending their projects.

2.5 Known projects in soundscape application

For literature specifically how PBEs conceptualize sound, there are only three known studies (Cerwen, 2017; Pijpers-van Esch, 2015; Raimbault & Dubois, 2005); however a number of projects have begun to fill the soundscape gaps through practical intervention, documentation, and tool-making.

Pijpers-van Esch's (2015) study of Dutch designers using interviews and questionnaires suggests that efforts at filling knowledge gaps about an important scientific concept for designers should consider the designer's cognitive gaps and focus on appealing to intuition. This can be achieved through providing visual and spatial representations accompanied often by basic principles and guidelines with simple, short explanations in writing. While web-based information tools were considered appropriate, computer-based analysis tools were not as they are not considered compatible with the typical design process. In light of these findings, Pijpers van Esch proposes a support tool that meets the following criteria: supporting early design phases; linking information to common urban plan elements; enabling custom information selection; providing layers of detail; facilitating different design styles; pairing visual and written resources that minimize numerical information. An analysis of this tool is likely forthcoming from the author. The idea seems promising and provides an interesting and appropriate frame of reference for this study, and we will return to these themes in the conclusion.

In a very large public measure, The European Environment Agency's (2014) *Good practice guide on quiet areas* has been released and makes a very targeted effort with PBEs using case studies; however, it addresses only a peri-urban application where the goal is still largely to promote noise reduction.

More optimistically, there are some long-term projects, particularly in Europe that have sound researchers working directly with PBEs. At the scale of urban design, there are studies like: De Coensel, Vanwetswinkel, and Botteldooren (2011) used natural sounds like fountains to reduce the negative effects of traffic noise; and Aspuru, García, Herranz, and Santander (2016), who, as part of the CITI-SENSE project, worked with the Sestao Municipality to improve the soundscape design of a park.

There are also studies more at the scale of planning: Brown and Muhar (2004) outline the details of the acoustic design of outdoor spaces and how that might be achieved in the current planning framework; the Positive Soundscapes Project worked with soundscape research and municipalities to characterize and achieve positive soundscapes, even

bringing in the notion of activity (Adams et al., 2009; Cain et al., 2008; Jennings & Cain, 2013); and the SONORUS project (Alves, Estévez-Mauriz, Aletta, Echevarria-Sanchez, & Romero, 2015), who iteratively worked with planners at four test sites to improve soundscapes and experience. Projects aimed specifically for planners and the relationships between factors exist as well. HOSANNA (Forssén et al., 2014) was a collaboration between universities and the Stockholm municipality to plan and design effective roadway barriers to improve user experiences in places like parks. There are also movements toward trying to explain sound in terms of its contribution to ambiance, such as at CRESSON in Nantes (Amphoux, 1993).

2.6 Research questions

In the context of supporting a transition of strategies from environmental noise management to soundscape design, and with the soundscape principles identified above in mind, the following research questions have been generated:

RQ1) How do professionals of the built environment conceptualize sound in the urban environment?

RQ2) What are the personal, organizational, and contextual variables[28] that affect these conceptualizations?

RQ3) How do these conceptualizations about sound compare to other urban planning and design factors?

RQ4) Where do professionals of the built environment go for information about sound? What information sources could support PBEs in transitioning strategies from environmental noise management to soundscape design?

[28] The word “variable” has been borrowed from quantitative research approach terminology and used here because “factor” is already being used to describe planning and design factors.

3 Methods

The present study was conducted to identify and document the various concepts that professionals of the built environment (PBE) associate with sound, the contexts for sound in their everyday work and the information sources they rely on. Given the exploratory nature of these research objectives, a qualitative approach was used, namely a series of semi-structured interviews with professionals of the built environment (PBEs) in their workplace.

Of the two other known studies focusing on interviews with any PBEs about sound, Raimbault and Dubois (2005) conducted an unstructured interview about general planning challenges without mentioning noise in order not to bias participants. As a result, participants only discussed sound-related issues with the researchers for about five minutes in each of 10 two-hour interviews. Weber et al. (2014) also conducted interviews, however, this was with 25 established experts in Dutch noise policy (including local and national government employees, specialists at NGOs, and researchers) rather than general PBEs. Weber's interviews thus provided a detailed understanding of Dutch noise policy in practice but did not touch on the way that policy is understood in the daily work of the larger group of PBEs that intervene in urban environments. The present study is inspired by the methods of these two studies but departs in many ways.

The methods described below maintain Raimbault and Dubois' (2005) approach of not directly asking about noise, but increased significantly (to about 40 minutes per interview) the amount of time spent talking about sound. In addition, we also shifted the sampling frame to include urban planners, designers, and other PBEs, distinctly different from Weber et al. (2014), who focused on policymakers. Further, this is the first study using an international sample with interviewees from 6 different countries in Europe and North America to cover a wide range of practices and perspectives on sound.

Since the data collection phase of this study, another study has surfaced that includes questions posed to PBEs about sound. Pijpers-van Esch (2015) used a paper-based

questionnaire with Dutch urban designers with questions on a number of environmental design considerations. “Noise” was included in this list. In addition, Pijpers van Esch asked about information sources, which was also a series of questions in the present interview guide. While the results of the Pijpers van Esch study have been informative for the Discussion chapter, no retroactive changes were made. Additionally, the present study still includes a more diverse sample on a larger corpus of transcriptions.

3.1 Data collection instrument - semi-structured interview

3.1.1 Development of the interview guide

A pilot study was conducted in April 2013 with two PBEs in the Netherlands and one in Finland using a semi-structured interview. Preliminary findings were presented as a conference publication (Steele & Guastavino, 2013). The pilot interview guide was similar enough to the final interview guide that the three participants were included in the full data set. Rather than completely describing those methods here, only the pilot lessons are summarized in this section.

The pilot study confirmed that there was a diversity of conceptualizations regarding sound in urban planning (all three original participants were urban planners) and gave sufficient evidence that more data was necessary from more participants to understand the range of possibilities. For example, each of the three planners took a distinct general approach to sound: one considered sound as one factor in a collage of factors where one should search for good overall outcomes by balancing factors; one participant viewed sound as a nuisance (“noise”) that can compromise an otherwise positive project; and one viewed it as a quantitative environmental factor that needed only to be reduced in order to satisfy legal requirements. Because of these unpredictable and complex conceptualizations, the semi-structured interview remained the optimal data collection instrument.

The largest change to the pilot study was with respect to the study sample. The sample was expanded to include not just urban planners, but also urban designers, architects,

etc. Rather than specify the profession, a range of project scales was selected instead, and any relevant professionals were included as participants. The sample group was renamed PBEs (professionals of the built environment). As the three public-sector urban planners were responding to questions about noise in this primarily legal or environmental framework where minimizing noise for public-sector, legal concerns was important, it was clear that the study sampling was excluding some of those who were involved in the process of city making.

Next, in response to arising issues with the formation of a few initial questions consistently requiring clarification, some questions were adjusted. For example, a question phrased as “What is the best possible outcome for noise” was often answered simply as “no noise”, so the question was amended to include “what would the city look like [with the best possible outcome]?”. A question each on existing tools perceived as being useful and ideal future tools was added to expand on a question on information sources.

Lastly, a very small proportion of the PBEs were working on only a single project, usually for many years. In that case, the appropriate and answerable questions from the context section were posed, and the rest were skipped. A number of questions were also marked as low priority so that they could be skipped in the interest of time. Participant counts will be included in all results because of this and other contingencies.

3.1.2 Interview guide

The interview guide comprised four main sections: introduction, concept, context, and conclusions. The interviews were conducted in a single face-to-face session lasting between fifty minutes and one hour and fifty minutes, depending on the participant. The full interview guide is available in the Appendix (Interview guide).

3.1.2.1 Introduction

Interviewees were asked to speak about their particular role and its function in the municipal, regional, or national context (Q1.1-1.2). They were also asked to elaborate on their daily tasks (Q1.3). Finally, time permitting, they were asked about the structure of their department (Q1.4) and whether there was anything that was unique about it (Q1.5).

3.1.2.2 Listing of factors

At the end of the introduction, participants were asked to list technical factors (i.e. bicycling, transportation, safety) that they consider on some or all of their projects (Q2). This question was repeated or restated conversationally until they mentioned a sound-related factor (e.g. noise, sound, or soundscape). If a sound-related factor was not mentioned spontaneously, they were first asked to speak further on a high-level or broad factor (e.g. “You spoke about environmental factors. Could you list a few more factors you consider to be environmental?”). In the case that a sound-related factor was still not mentioned, participants were asked directly whether they consider it from a prepared list of other factors they had not mentioned (e.g. “some other participants mentioned geology, do you ever consider geology?”)

The listed technical factors were written on a piece of paper in plain view of the participant primarily to reinforce the idea that the list should be extensive, but also to facilitate discussion and examples throughout the course of the interview.

At the end of the factor listing task, the interviewer selected two of these listed technical factors seemingly at random, though one of the factors chosen was always the sound-related factor. As the use of “sound” and “noise” arise from different discourse (see Niessen et al, 2013), the particular wording that the participant chose was recorded and maintained throughout the interview (i.e. if the participant used the word “acoustics”, it was maintained for the course of the interview; if the word “noise” was used, that word was maintained.)

3.1.2.3 Concept

This section was intended to identify unique and shared conceptualizations of sound among PBEs. These conceptualizations were compared against conceptualizations discussed regarding the other chosen factor. Approximately 5 to 10 minutes were planned for the discussion of concepts of each factor. Further, participants were asked to avoid mentioning specific projects to ensure that they were unconstrained by practical considerations.

In response to the existing literature on the topic, a number of themes were selected for the conceptual discussion of each factor. They were the following: general or high-level considerations (Q3.1), expectations of knowledge (Q3.2), the role of experts in decisions (Q3.3), priorities among other factors (Q3.4), reactions to poor outcomes (Q3.5), envisioned positive or best outcomes (Q3.6, Q3.6.1), and perceived agency for change (Q3.7).

Each of the two factors was covered completely before moving on to the next. If the question did not apply or was already answered during a previous response, it was skipped. Responses with interesting or complex implications were explored further, time permitting.

3.1.2.4 Context

This section was intended to identify challenges and compromises that modify concepts when real projects are introduced. For example, conceptualizations of best possible outcomes may shift in response to practical considerations like budget or political situations. Participants were asked to come prepared to discuss two projects in which they were involved – one project that was recently completed, and one that was currently in progress.

In the formation of this context section, we were inspired by two retrospective interview techniques: the Critical Incident Technique (CIT) (Flanagan, 1954), where interviewers

who are familiar with the activities of the participants ask the participants to reflect on the facts and issues of past events, and make evaluations about them; and the Explicitation Method (Vermersch, 1990), where participants engage in reflection as in the CIT, but with an emphasis on having participants in a state of evocation where they describe previous events immersively[29]. These methods have both been considered for their applicability to studies of information behavior (Urquhart et al., 2003). Unlike the CIT and Explicitation Method, and in the interest of time, participants were only asked to speak extemporaneously, not asked to provide documentation to explain the projects unless they wished to do so, nor were they asked for explanations of their individual behavior(s) with regards to past projects. However, often the participant had extra documentation (e.g. images, maps) quickly available. In this case, they were encouraged to share and were not interrupted. The analysis of this data focuses entirely on the transcriptions, but we used the documentation provided to refresh contextual details when reviewing their responses. This supplementary documentation will remain a possibility for future work on this topic.

To situate the responses in a better context, some introductory questions for each project established their role on the project (Q4.1.1, Q5.1), the make-up of the team (Q4.1.2, Q5.1.2), some of the major considerations for the project (Q4.1.3), and whether they and their team were satisfied with the outcome (Q4.1.4). Next, for the same technical factors from the conceptualization section (the sound-related factor and one other), a new set of questions was cycled, particularly those questions from the conceptualization section that were applicable in the context of projects. For the recently completed project, these were, namely: an examination of priorities relative to other factors, the role of experts, the role of customers like the public or the city, their individual satisfaction with the outcome for the particular factor, and areas that could have been improved (Q4.2.2).

[29] The present study may not be strictly dealing with critical incidents due to the potentially long timescales of the projects discussed, nor is it necessarily Explicitation due to the rather short period of the interviews dedicated to reflection on each project as well as the directed questions on changing topics.

Because these were existing projects, there is a chance that the factor in question was not considered, thus the questions accounted for both possibilities. In this case, they were asked to describe whether that factor should have been considered for this project and whether the factor was left out for only this plan or in general (Q4.2.3). Whether the factor was considered or not, the participants were asked if the outcome for that factor played a role in their global evaluation of the project (Q4.2.4) and how their superiors considered it (Q4.2.5). For the project in progress, participants were asked about: remaining issues to be solved (Q5.1.3), the used of experts (Q5.1.4) how each factor was currently being considered (Q5.2.1), outcomes for that particular factor in the case of unlimited resources to work on it (Q5.2.2), and what would be cut in the case of resource constraints (Q5.2.3).

Lastly, in an attempt to link this study with other studies being conducted locally concerning the relationship between soundscape, activities, and evaluations, if it had not already been mentioned, participants were asked about the role of activity, program, or intended uses in the specifications and designs of their projects (Q5.3).

3.1.2.5 Conclusion

The conclusion involved questions that more directly posed the research questions to the subjects and focused first on information needs and sources and finally on soundscape.

In the information section, participants were asked where they go for information on unknown topics, both formal and informal sources (Q6.2). They were also asked whether they use academic research (Q6.3) and how they feel about academic research (Q6.4), about tools they use for their work (Q6.5) and whether they could envision a tool that they do not have that they would find particularly helpful (Q66).

In the final section, participants were debriefed on the project motivations, including an introduction to the soundscape topic and the goals of reaching PBEs with better information on soundscape. They were also asked if they were familiar with the soundscape concept (Q7.1) and if they had had any positive experience working with

noise or sound in their work (Q7.2). A short and spontaneous discussion regarding this new information followed.

3.2 Recruitment and sampling frame

In total, twenty-two (22) participants were interviewed for this study. Participants were recruited via an email[30] posing the study as a general interest study about spatial planning, urban planning and design decision-making, and information sources. To obtain email addresses, we relied on: each city's local hotline (e.g. Montreal's 311); PBE individual or team contact information found in public documents about recent projects, such as project summaries on city webpages; and personal contacts in the PBE communities.

Due to the difficulty of recruiting participants and the relatively small number of total available participants in each city, a hybrid of nonprobability sampling methods was used. In the sense that the goal of the study was to gain as much insight as possible about conceptualizations of sound in all PBE communities (e.g. public/private, planning/design, large/small cities, Europe/North America), this was a type of maximum variation purposive sampling. This sampling method is one where the researcher "selects a small

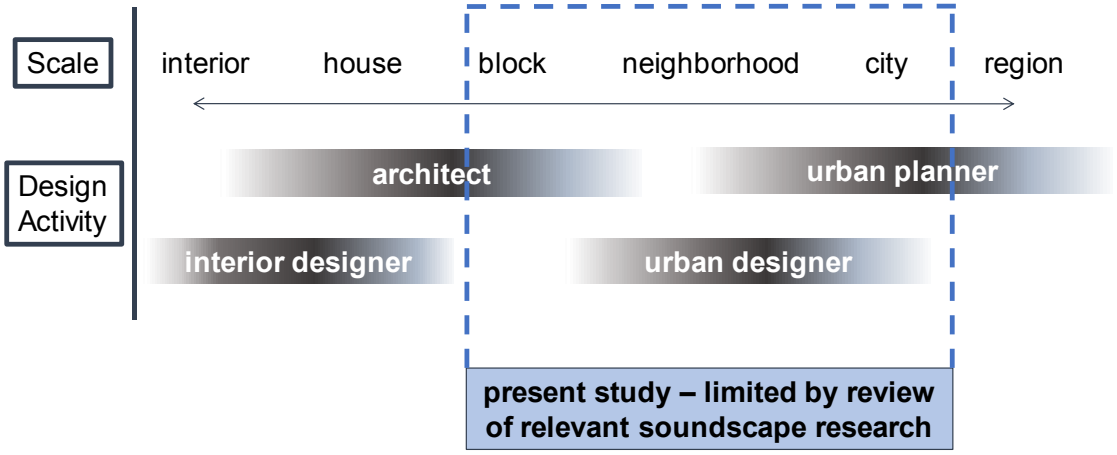

Figure 2: This study has sampled professionals of the built environment (PBEs) by approximating the urban scale of their interventions rather than by their titles, training, or workplaces.

[30] See Section 8.3 Recruitment letters

number of units or cases that maximize the diversity relevant to the research question" (Cohen & Crabtree, 2006). In the sense that the sample populations were difficult to recruit, this aspect of the sampling resembled convenience sampling. With respect to our study, using convenience sampling may have biased us toward participants who had favorable attitudes toward research, but this does not appear to have played out in the results.

Among all 22 participants, the following variables emerged as a result of the purposive sampling strategy: geographic region, management level, education, professional title, city size, organization size, and years of experience.

Despite the wide span of variables, the above sampling strategy was deemed appropriate primarily because saturation was reached on the data. Saturation is a concept describing the point when new data can be described using the existing thematic framework and no new categories would need to be created. Guest, Bunce, and Johnson (2006), for example, demonstrate the saturation principle on themes emergent from interviews with women in two West African countries where twelve interview participants were recruited using a purposive sampling strategy.

Regarding sample variance, as discussed above, PBE practices span a number of types of careers and workplaces, and there is no single job title for "city makers". Thus, in order to capture all of the professionals, rather than identifying each of the careers by title that we desired for an interview, we identified the appropriate scale of interaction (see Figure 2) and proceeded with the interview if they met the following criteria: *the participant must have recently worked on an outdoor, urban-scale project*. This scale was identified in response to the soundscape theories and interventions covered in the Literature Review. To ensure the participants reached were working at the appropriate scale, recruitment was targeted at specific departments and companies known to work on such issues, as well as through personal contacts.

Participants were also asked in advance whether they had a recent project to discuss. None of the participants asked in advance for significant clarification on the topics to be discussed, but the lack of specific information may have ultimately discouraged potential participants. None of the participants chose to discontinue their participation after they began the interview.

The interviews were either conducted in English (N =18) or French (N = 4). Only 4 of the 18 English interviews were conducted with native English speakers; however, the interviews were transcribed by native speakers of the language.

3.3 Procedure

Participants were asked to share between 50 and 70 minutes of their time for this interview. As most of the interviews took place in the office of the PBE themselves, they had all of their usual timekeeping devices. Many participants continued the conversations even after they had been informed we had reached the end of the requested time.

Some of the interviews were conducted in the presence of a research assistant. Four interviews were conducted in French, in which case they were led by French native-speaker research assistants who read from the interview guide while I was present to clarify any questions.

3.4 Ethics

A complete review of ethical concerns undertaken with the McGill Research Ethics Board. The application was submitted in March 2013 and accepted as REB450-0413 (see Appendix 8.2 Ethics certificate). It was renewed two times in order to be active over the study period.

The ethics application covered a number of potential issues regarding the purposes and uses of the data, the necessary consent forms, and the mild deception used. Participants are not named in this report, nor is any intentionally identifying information about them

revealed. Participants signed informed consent forms in advance, and their interviews were recorded with their knowledge. Participants were made aware that certain public information about their projects and the high visibility of public interventions may make some of their responses identifiable, though the written, public research report would focus only on details of their projects relevant to the analysis of the data.

During the course of the interviews, information regarding the soundscape expertise of the researchers was withheld, as was the knowledge that the interview was focused on this topic. This was done because announcing the focus on soundscape would potentially have changed the responses of the participants and provided a potential incentive for them to falsely inflate the importance of sound-related factors in their daily work. Participants were informed after the interview that the research team has a long-term interest in presenting soundscape research to them in a way that matches their expectations for information. As PBEs are necessarily generalists for their work, the amount of knowledge they can have on individual factors can be highly variable and dependent on their needs. Thus, there was little likelihood that there would be a stigma about ignorance on this topic. Further, soundscape is a new and arising field with a small number of researchers; thus, most PBEs would have little exposure to the few educational resources on this topic.

3.5 Analysis

At the first level of analysis, all interviews were transcribed in-full from audio file formats to written text. These text files served as raw data for analyses from grounded theory and multiple linguistic analyses. The present analysis focuses on content analysis (e.g. themes emerging from the free-format responses using the Constant Comparison Method) and discourse analysis (e.g. the use of “sound” or “noise”), described in sections below.

3.5.1 Level of transcription

As previously stated, all portions of the recorded interviews were transcribed because each question posed to the participant served to advance the research hypotheses. The

transcriptions were performed without a strong emphasis on non-verbal cues (e.g. pauses), as they were considered beyond the desired level of analysis. Minor grammatical errors were fixed in the final written texts of the transcriptions to clarify meaning and facilitate data analysis.

3.5.2 Content analysis – grounded theory

Content analysis is the primary data analysis technique. Large spreadsheets of responses have been generated with raw data, which were then collapsed into categories emerging from responses. In addition, categories derived from previous research identified in the Literature Review were tested, such as: organization size, and education level. This analysis makes use of the open coding procedure in the constant comparative method from grounded theory, where new data not belonging to existing categories birthed a new category of response (Glaser, 1965). Once these categories were formulated, the axial and selective coding procedures were used to establish relationships between response types including inter-categorical relationships and the influence of demographic factors. A content analysis was performed for: 1) noise concepts (across participants); 2) how noise concepts operate in context (across and within participants); 3) how noise concepts differ from conceptualizations of other factors (within participants only); 4) the different roles of context between noise and other factors (across and within participants); and 5) information sources and tools (across and within participants).

3.5.3 Linguistic analysis

In addition to content analysis, various levels of linguistic analysis were performed, mostly as discourse analysis. In particular, the discourse analyses observe incidents of lexical items used to describe sound-related factor descriptors, such as “noise”, “sound”, “acoustics” and related noun-noun compounds (e.g. “noise complaints”, “traffic noise”, “noise reduction”). To the extent possible given the size of the data set, noun-noun compounds were analyzed in terms of semantic relationships, such as cause (e.g. “car sound”) or time (“evening noise”), in the classification system proposed by Warren

(1978). A morphological analysis was performed on incidents of morphological derivation (Sobin, 2011), such as the cases in which “noise” becomes “noisy”, “noisily”, or “noisiest”; and a lexical analysis is performed comparing nominal groups “the complaints our residents make about noise” and “the noise produced by neighbors’ parties”, similar to a discourse analysis study on the formulations of noise regarding neighbor complaints (Stokoe & Hepburn, 2005). Due to the high proportion of participants speaking in their non-native languages, deeper syntactical analyses were not deemed appropriate.

These linguistic analyses extend the work done by Raimbault and Dubois (2005), which had previously included linguistic and content analysis, by increasing the overall amount of data in the transcript, and by posing specific, controlled questions to provide more contexts for response. These analyses are guided by textbooks on linguistic analyses, such as (Drisko & Maschi, 2015; Neuendorf, 2016; Sobin, 2011; Warren, 1978).

3.6 Perspective management

A discussion on the credibility, validity, and limitations of this exploratory interview study has been saved for the Discussion chapter, where they can be presented in light of the results. This section briefly deals with “perspective management”, the process defined by (Levitt, Motulsky, Wertz, Morrow, & Ponterotto, 2017) as one where the “investigators recognize and are transparent about the influence of their perspectives upon data collection and appropriately limit that influence to obtain clearer representations of their phenomenon-regardless of the researchers’ direct experience with or standpoint in relation to that phenomenon” (p. 11).

The researchers are engaged in soundscape research, a field that, as noted in the Literature review, has not been adopted by PBEs. Thus, it was assumed that those who were working with this practice would not be familiar with the term and the fundamentals of soundscape. Keeping this perspective in mind, the interview guide was designed to very carefully remain neutral – allowing the participants to choose their wording for the sound-related factor; using that wording throughout the interview; and designing questions that

allowed them to express their conceptualizations and experiences without leading. Another potential pitfall would have been in assuming an interest in scientific information about this topic. The researchers were careful to consider the practice perspective of the participants without assuming they held academia in high regard or needed academic information to perform their work. The long-term goal of this work is to understand the perspectives of PBEs in order to provide more relevant information to them about sound. The largest pitfall would have been to assume they needed or wanted that information and the researchers were careful to allow the possibility that this was not true.

4 Results

The results and analysis presented here are organized roughly along the questions posed to the participants. It begins with a demographic description of participants derived from both the introduction and conclusion sections of the interview guide in order to provide context and axes for understanding how various professionals of the built environment (PBEs) responded to the interview prompts.

Analyses are not constrained strictly to the discussion immediately following each question posed to the participants because they 1) often foresaw questions or inadvertently provided enough detail to skip some questions, 2) sometimes spontaneously started talking about relevant factors in nearby sections, and 3) sometimes did not answer the question at-hand directly. Along the same lines, the number of participants responding to each question can differ slightly due either to responses that had insufficient information to be categorized or other constraints presented at the live interviews.

When these common themes are identified, the number of participants sharing that idea will be reported in parentheses (e.g. 5), sometimes with an extra explanation. However, interesting exceptional events or participants will also be discussed, sometimes in detail. In this case, the participant's code will be used (e.g. M5). See Table 1 for demographic information about participants. Also see the Appendix for the full interview guide and associated questions to facilitate the reading of this section.

Regarding notations, this chapter will adhere to a few conventions to aid the reader. First, participants used many words to describe the factor related to sound issues. Though this factor was described at times in the introductory chapters as "soundscape", this word was never used in the interviews. As such, to describe this factor, the phrase "sound-related factor" has been chosen. When a factor that was identified by a participant is discussed, it is placed in italics (e.g. *public transportation*). Quotations of a few words or short sentences are placed in-line with the text, while longer quotations are set apart with

indentations or included as a footnote. All quotations are proceeded by the code of the participant who is being quoted. Since four of the interviews were conducted in French, any extended quotations from these interviews will be translated by the author in line while the original French is presented as a footnote. Short phrases and some terminology may be translated without comment for brevity (e.g. *matériaux* – materials).

Some terminology has also been adjusted and/or standardized to facilitate reading and discussion. In qualitative research, while "factor" is the term normally reserved for describing information about participants and the contexts that lead to different outcomes, the word factor was already used for the technical factors (e.g. *historic preservation*) considered by PBEs in their daily work. Thus, to disambiguate the terms, what are traditionally called factors are here called "variables", a term borrowed from analogous quantitative approaches. Also, in this document, the word "concept" is used to refer to isolated incidents where related topics are discussed (e.g. The participant brought up the concept of proximity while discussing noise); in contrast, the word "conceptualization" is used to describe global findings that incorporate multiple concepts, findings, and/or participants (e.g. A group of participants relied on a common conceptualization supported by the need to meet regulatory requirements). When these concepts are expressed with a common theme but are not necessarily direct quotations, they are italicized (e.g. 5 participants reported considering unicycles *because it's in the law*).

4.1 Participant profiles

From April 2013 to September 2015, 22 participants were interviewed from a diverse range of locations, experiences, sectors, and backgrounds, described in detail below. See Table 1 for a list of participants. The recruitment of participants remained broad, specifying "people who work in urban design or planning" in early materials and "people who intervene in the urban built environment" as it became clear the sample could be widened. The specific recruitment strategy is discussed in the Method chapter. As a result of this wide sampling strategy the participant profiles are diverse along many variables.

Table 1: Participant Table, including participant ID (P = Pilot; M = Montreal; N = New York; E = Europe), years of experience, self-reported professional training, management level, whether they had graduate training, and whether they were involved in academia

Participant	Years Experience	Professional Training	Management Level	Graduate Education	In academia
P1	10	P	M		
P2	6	P	T		
P3	32	P	T		
M1	7	P D	T		
M2	30	P D	T	■	
M3	34	P A	M		
M4	17	P D	T	■	
M5	25		M		
M6	6	P	T		
M7	1	D A	T		
N1	15	D A	E	■	■
N2	30	A L	E	■	■
N3	2	P	T		
E1	30	P	T	■	■
E2	8	P	T	■	■
E3	25	P	M	■	
E4	0	P	T	■	
E5	7	P	T	■	
E6	30	P A	E	■	
E7	8	P A	T	■	■
E8	15	P A	M	■	
E9	16	L	M	■	

■ True

P Urban Planner

A Architect

D Urban Designer

L Landscape Architect

E Executive

M Manager

T Employee

4.1.1 Locations

Interviews were conducted in-person at the place of work of the participants in 11 cities in 6 countries: Canada, Montreal (7); USA, New York City (3); the Netherlands, The Hague

(1), Amsterdam (1), Maastricht (1) Groningen (1), and Rotterdam (1)[31]; Germany, Berlin (3); Belgium, Antwerp (1), Ghent (1), and Ostend (1); and Finland, Vantaa (1). The interview with the Finnish PBE was conducted at a research facility in the Netherlands and the interview with the Rotterdam-based Dutch PBE was conducted over Skype from Toronto, Canada. This last participant was the only participant who was working full-time on a project outside of the country of their nationality and training, though one other participant mentioned an international project; the participant from Amsterdam spoke about a project abroad in Russia. Participants who were part of the private sector often worked on projects outside of their work locations. While all of these locations, including the off-site private-sector work, constituted urban spaces, they ranged from megacities to medium-sized regional cities, to suburbs of cities. As will be discussed, city size played a role in conceptualizations and contexts for sound.

4.1.2 Public and private sector

Participants were categorized based on whether they belonged to the public sector or private sector. In the public sector, a participant would generally be employed by the local government, typically at the city or provincial level, itself and work for projects only within that municipality; in the private sector, participants were generally employed by an enterprise or self-employed and worked on regional- or national-level projects. In total, 14 of the participants were in the public sector, 7 were in the private sector, and 1 (E6) was in an innovative public-private partnership responsible for much of one particular city's planning.

4.1.2.1 Organization size

A variable with a strong effect was organization size, but categorizing this feature required classifying it as a sub-category of public and private sector due to the very different nature and responsibilities of the work.

[31] This participant was on a long-term assignment in a large Canadian city.

Public Sector organization size was determined based on the population size of the city for which they were responsible[32]. For public sector organization sizes were too difficult to determine with any information publicly available, so it is an assumption that the number of city employees is roughly correlated with the number of residents. Administrative areas under 100,000 were considered small; cities between 100,000 and 500,000 were considered medium-sized; and cities over 500,000 were considered large.

Private Sector organization sizes were based on the size of the enterprise. Participants who worked for organizations under 10 people in size were classified as small; under 50 people as medium; and 50 or more was considered large. One exception was made for a freelancing participant (M7), who was contracting for a large company at the time and described being part of a large team there. Based on her temporary context working with a large team at a large company, she was classified as part of a large private company.

Using this classification scheme, the participants comprised:

- 4 from small organizations, including 2 public sector (M5, M6), one private sector (N2), and one public-private (E6)
- 4 from medium-sized organizations, including 3 public sector (P2, P3, E1) and 1 private sector (N3)
- 14 from large organizations, including 9 public sector (P1, P2, P3, E1, E2, E3, E4, E7, M1, M2, M3, M4) and 5 private sector (M7, N1, E5, E8, E9).

The slight over-representation of participants from large organizations is due to the sampling strategy, which focused on larger cities where the researcher was able to travel and find consenting participants among a larger pool.

[32] City size is correlated with the size of the office, making the comparison with the private sector appropriate. However, getting an accurate count of public sector employees implicated in PBE-type work was not feasible.

4.1.3 Educational background and discipline

Of the 22 respondents, 17 said they had had training in urban planning, 5 in urban design, 7 in architecture, 2 in landscape architecture, and 1 in architectural technology (M5), which she emphasized was different from architecture. It was possible to have training in multiple fields, though no participant ever mentioned having training in more than 2 fields at the same time. The most frequent co-occurrences were planning-architecture (4) and design-architecture (2). In addition, three of the French-speaking respondents indicated that they were trained in *urbanisme*. This was categorized as being both urban planning and design since the academic culture in French-speaking systems does not emphasize the difference between the two disciplines when applied to urban scale interventions (Moudon, 1996).

All but one Montreal and one Dutch planner had completed a bachelor's degree (M5 and P3); the Montreal planner had graduated from a local, pre-university college program unique to Quebec (CEGEP) in architectural technology while the Dutch planner had attended a Dutch civil service academy. Fourteen of 22 had also completed master's degrees. Those who had master's degrees and above were put into a category "has graduate degree" for later analysis.

One planner (E2) had completed a PhD, and two other planners (E1 and E7) had PhDs in progress. All 3 of these planners with doctoral program experience were in Europe. An additional 2 participants (N1 and N2), both in New York, were in the academic sector by way of professorships at colleges and universities. Together, these 5 participants warranted a variable called *in academia*, explored further in the Results and Discussion sections for important differences in conceptualizations.

4.1.4 Professional experience and seniority

Professional experience ranged from 3 months to 34 years, with a mean of 16.2 years. The variable *professional experience* (in years) has been operationalized instead of

seniority (i.e. the amount of time people have worked at just one company) in this analysis for the following reasons:

- The participants that changed workplaces relocated to similar positions with similar responsibilities. This would suggest a continuity in their growth not normally seen when gathering institutional knowledge from multiple private organizations. At least two participants had moved from a provincial planning office to the city administrative office located in the same city. Also, participants were likely to continue their memberships in their professional orders with similar access to continuing education and resources like trade magazines, lending further to the idea of continuity.
- The work of the participants tended towards project-based work with short timescales relative to their seniority. Thus, capturing the concept of time dealing with technical planning factors (normally captured by seniority), was more related to the extent of their project experience, more closely measured by years of experience than seniority.
- Few of the participants had ever changed jobs. The two with the most experience had changed jobs after 10 to 15 years' experience in their previous, similar positions. Thus, chopping the number of years in half to measure seniority would inappropriately represent their extensive project experience. For example, P3 had worked 16 years in his previous position and 16 years in his current position.
- Participants themselves generally volunteered the information about past employment when probed about *years of work experience*, suggesting they think of their work experience as a single trajectory.

4.1.5 Management level

Participants were put into three categories: *executive*, *manager*, and *employee*, based on their type of responsibilities at their organization. In total, there were 3 executives, 6

managers, and 13 employees. Examples of *executive*-level positions included “director” and “principal/founder”; manager-level positions included “team leader” and “project manager”; employee-level positions were “planner” or “associate”.

There was only a mild relationship between management level and years of experience: there were no executives with fewer than 15 years of experience, and no managers with fewer than 10; however, there were several employees with more than 30 years of experience. Thus, this category of analysis has been considered separately from years of experience, despite not having a strong tradition in the literature[33], as it resulted in distinct findings.

4.2 Planning and design factors

With 22 participants, 21 lists of “technical factors” were made (E3 and E4 made theirs simultaneously). The length of these lists highlights the breadth of factors that planners consider and show how the sound-related factor is just one of many considerations over the course of a project. On average, planners listed 28 factors (ranging from 10 to 53) in the few minutes that were dedicated to the listing exercise. Often, participants used previous projects to help them remember what to include in this factor list. Among the most common factors listed were: transport, water, public space, parking, environmental factors, and ecology. Frequently, in the interest of time, the interviews would proceed before the lists were complete, thus the number and content of listed factors should not be considered comprehensive, only demonstrative. The factors that were not sound-related are discussed in Non-sound factors selected for interview below.

Sometimes the generation of the factors list was not constrained to the short period that was allotted. Participants often continued to add to their list over the course of the interview by saying they think it should have been included earlier, or also frequently,

[33] Leckie et al. (1996) found, across three domains, that managers had different information sources based on having different needs from employees. No known study exists describing sound concepts as a function of management level.

they pre-empted the question by spontaneously naming factors when describing their responsibilities on the job. Both aspects suggest that managing many technical factors is a significant part of the job. These (pre- and post-prompt) diversions from the task are not indicated in the results as separate data because the factor-making prompt was not designed to elicit a specific order and participants were not always encouraged to finish or control their lists. It was also still partially an icebreaker question and the tone was kept conversational.

In total 15 of the participants made lists that contained some sort of hierarchical structure (e.g. population was a sub-factor in the parent category of social factors). If this hierarchy was relevant to the sound-related factor, it is described in the next section below. For example, E7 spoke about issues in the category of *spatial quality*, which included the factors: *building size, building look*, *color*, and *look and feel*.

4.2.1 Sound-related factors

In all 21 instances, participants agreed that a sound-related factor of some sort belonged in their list of factors, although there was a wide range of ways that this was indicated or confirmed. A summary of the sound-related factors listed is provided in Table 2.

4.2.1.1 Spontaneous mentions

Only 9 participants listed noise explicitly without prompting in their list of factors that they consider. Of those 9, 5 (P3, E1, E3&4, and E6) included their sound-related factor in a hierarchy. For those 5, the sound-related factor was considered a sub-factor of the environmental factors category. And all 4 of these planners were part of the European sample. Of note: E3&4 separately listed *traffic noise* and *industrial noise*; E6 separately listed *noise quality* and *noise and vibration*. Interestingly, none of the North American planners spontaneously mentioned their sound-related factor as part of a hierarchy.

4.2.1.2 Spontaneous listing as part of a prompted category

Three further participants listed their sound-related factor spontaneously after being asked to elaborate on a named factor (e.g. “can you provide more information about the environment factor you listed”). Twice, this parent factor was *environment* (E5 and E8) and once it was *pollution* (E7). E8 used the word *acoustics*. E5 and E8, who listed it as an environmental factor point to an emerging relationship between the European sample and consideration of sound as an environmental problem.

4.2.1.3 Confirmed as a factor when prompted

In the case that mentioning a parent factor (e.g. *environment*) did not result in a sound-related factor being named, participants were asked specifically if they dealt with particular factors that other participants had listed. From a prepared list of factors, ones that had not been named were read aloud, and *noise* was on this list. (e.g. “some other planners mentioned that they work with noise or geology. Do these ever come up in your work?”).

The remaining 10 participants confirmed a sound-related factor after being asked explicitly if they worked with it. In all cases, *noise* was the prompted factor, however, M6 amended it to say *noise complaints* and N2 amended it to say *noise and acoustics*. Three participants said spontaneously that while it had come up in their work, they considered it to be a low priority; all of them were part of the North American sample (M4, M7, N1).

4.2.2 Non-sound factors selected for interview

As described in the Methods: Introduction section, two factors were chosen for further discussion, one of which was always the sound-related factor. As the factor lists were generated on-the-spot, it was impossible to systematically select this second factor for a balanced analysis; nonetheless, the other factor chosen was selected to represent a wide range of considerations. Sometimes, the participant themselves asked to speak about a specific factor since they knew it would be an in-depth discussion. These factors ranged

from technical (e.g. *circulation*) to more abstract (e.g. *social factors*), and specific (e.g. *architectural materials*) to broad (e.g. *pleasantness*). For the same reasons, as well as the need to maintain a natural conversation, it was also difficult to systematically control the order that the factors would be presented in. In some cases, the same factor was selected multiple times for different participants (e.g. *architecture*-related, *program*); however, even when the same factor was chosen, different aspects of the factor were generally discussed. For example, with the *program* factor, N1 spoke of its technical aspects in terms of whether the plan called for zoning that was residential or commercial in nature.

Table 2: List of factors, both sound-related and non-sound, selected for the interview, by participant. Interviews in French show the original factor in italics. (*) Listed a sound-related factor in response to a prompted category (e.g. Environment). (**) Confirmed a sound-related factor in response to being asked directly

Participant	Factor (sound-related)	Factor (Non-sound)
P1	Noise **	
P2	Noise	Social factors
P3	Noise (Environmental)	Public safety
M1	Noise - *bruit*	Quality of life – *qualité de vie*
M2	Noise – *bruit* **	Traffic - *circulation*
M3	Noise	Architecture
M4	Noise – *bruit* **	Materials - *matériaux*
M5	Noise	Architectural Details
M6	Noise complaints **	Neighborhood Feel
M7	Noise – *bruit* **	Program (as activities) – *animation/programmation*
N1	Noise **	Program (as zoning)
N2	Noise and acoustics **	Program (as events)
N3	Noise **	Pedestrians
E1	Noise (Environmental)	Fit and atmosphere
E2	Noise **	Social infrastructure
E3&4	Traffic and industrial noise	Neighborhood fit
E5	Noise (Environmental) *	Pleasantness
E6	Noise quality and Noise and vibrations (Environmental)	Landscape
E7	Noise (Pollution) *	User needs
E8	Acoustics (Environment) *	Program (as function)
E9	Noise **	Street furniture

N2 used *program* to describe how active management of a site animated through planned events (e.g. a children's soccer league or musical events) may be necessary. While participant P1 did make a factor list, a single non-sound factor was not chosen for further discussion to due time constraints. The list of non-sound-related factors is found in Table 2.

4.3 Concepts associated with the sound-related factor

The following section is organized such that questions from the interview guide are analyzed individually and smaller concepts are introduced as they emerge from the responses. At the end of the section, the many localized concepts are pulled together to identify four overarching conceptualizations about sound expressed by the participants. These conceptualizations and underlying concepts will reappear in all the subsequent sections as the unit of analysis, where various contexts of the participants' work and background shift the way these units function.

4.3.1 General considerations of the sound-related factor

Participants were asked to talk about *considerations* they make about sound when working on an urban space. This section allowed participants to speak freely about their sound-related factor in hopes of understanding free associations they make about sound, such as important top-level information situating the sound-related factor among the others. This was often asked as the question "what sorts of considerations do you make about [your sound-related factor]?" (Q3.1); however, a few participants even spontaneously started speaking freely about this without being specifically prompted. These spontaneous sections have also been added to this content analysis on considerations.

The purpose of this analysis was to uncover the primary concepts that are accessed when the topic of sound is approached. There is a slight overrepresentation from those who said more during this section as they were able to discuss more concepts. Nevertheless,

these concepts and categories of concepts are introduced, and the following interview questions gave more opportunity to refine those concepts with more structure.

The most frequently used word when discussing general considerations of the sound-related factor was, of course, “noise”, which was mentioned by all participants in this section. Besides “noise”, “level(s)” was the most frequently used word (by 13 participants), and level was often found paired with noise (i.e. “noise level”).

Other concepts frequently mentioned along with the word “level” were legal terms. These came in a few formats, like “legal levels” (N1). But also referring to levels and legal terms were the words “laws” (P1, P2, P3, E5), “bylaws” (M3, M4), “regulation” (M4), and “planning law” (E3&4).

Participants were quick to name specific sound sources. 17 of the participants named 26 individual sound sources a total of 47 times. These sources were most often collective nouns that described sound sources that would negatively affect the project (e.g. traffic, cars, neighbor noise, railroads/trains, airport/planes). Fifteen of the 22 participants mentioned some form of road traffic (e.g. traffic, cars, trucks). Two participants (P1, M1) mentioned that they consider sources in general. Only two participants (N3, E8) mentioned sources of sound that they consider to be positive; in both cases this was “fountain”. However, E9 also mentioned that some people may like the sound of airplanes, even though he was trained to treat their sounds negatively.

The sound-related factor was often referred to in the negative. Frequently used were words “noise pollution” (P1, M5, E3&4, E7), “problem(s)” (P1, P2, M6, E7, E8), “noise issue” (P1, M2, M4), and “nuisance” (N3, E8). Other participants used more euphemistic descriptions, also in the negative sense, like “daily reality”[34] (M1), “point of interest” (E8), and “noise situation” (P2).

[34] *« réalité quotidienne »*

Frequently mentioned were the places where sound has an effect. This included, of course, the “city” (P1, M7, E3&4, E6). Much more often, these abstract place nouns were related to the project: “building” (P1, P2, N1, E1, E3&4, E9, E9), “area” (P2, M2, M5, N2, E1, E2, E6), “place” (M4, N2, E1, E9). Considerations also focused on more localized areas where sound would be a problem for, for example, residents’ “houses” (P1, P3), “backyard” (M5, E2), “outside” (M3, E1), “apartments” (M3), “bedroom” (M4), and “balcony” (M3). As will come up later, only the two landscape architects (N2, E9) concerned themselves with the sounds of the “surrounding area” and “open space”, referring to the need to evaluate the surrounding area to understand the sound-related needs and actions to be taken on their particular project. Related to where the sound would be a problem was the issue of the type of zone that was being dealt with. Seven participants mentioned some sort of zoning, such as “housing”, “residential”, “industrial”, or “quiet area”.

In addition to where sound was a problem, participants frequently mentioned types of known solutions to the issue they were working on with the sound-related factor. These solutions came in the form of nouns describing what or how would solve the problem: “windows” (P2, M1, M3, M4, N1, E2), “walls” (P1, P2, M3, M4, N1, E7), “corridors” (M3, E9), and “entrances” (N1), or occasionally more specifically, “building wrap or curtain wall” (N1). Sometimes, these solutions were more specific to acoustical engineering: “sound barriers” (M3, E9) and “building noise insulation” (M1). And sometimes, a solution would even affect other factors on a project: “building placement” (M1). Solutions also came in the form of verbs: “control” (N1, N2, E6), “compromise” (P1, M5), “orienting” (N1), “mediate” (P1), and “mitigate” (N3). Only one participant (N3) suggested adding noise to support his project: “adding ambient white noise.” Oddly, two participants (M3, M4) suggested using “logic” to solve their noise problems.

There was also a regular reference to expertise. “Recommendations” and “noise studies” were mentioned by most participants, as well as acousticians (P2, M4). Besides experts,

other professionals implicated in thinking about the sound-related factor were “project promoters” (M3, M4) and “architects” (M4, E9).

Only a few of the participants mentioned any of the effects, evaluations, or reactions to sound for users. The most frequent of these were those participants who acknowledged that there were those who were “impacted” (P2, M2, M3, M5, N2), “affected” (N1) or “influenced” (E3&4, E9) by sound. Sound also affected “health and well-being” (P1) and “quality of life” (M1); or it was a “safety issue” (M7). If the effect of sound on users was considered, it was most often viewed in terms of its negative properties. One exception was N2, who sought to design “comfortable” sound environments. N2 expressed the goal, in reference to a particular project, that users should “be able to have a conversation”.

Users themselves who were capable of being affected by sound were made up of “people” (P1, M4, N2, E8, E9), “business” (M5, N2) “residents” (M6), “citizens” (P1), “parties” (P1), and “schools” (P3). The various activities that users conduct capable of being affected are “living” (P1, M5, M7, E9), “work” (M5, N1, E2), “activities” (M6, E1), “shopping” (N1), and “picnics” (M5).

From participants from the smallest cities, they appeared most worried about the potential for sound to generate “complaints” (M5, M6). References to the effects of sound on users were rare for participants from Europe.

Some participants, during the first question, spontaneously described themes that would re-emerge later, but that hinted at their primary conceptualizations (to be discussed at the end of this section) of the sound-related factor in their work. These were, most frequently: *environment* (e.g. “they just look at the possible influence on the environment…So that’s the element of noise” (E6)); *expertise* (e.g. “very specific disciplines are outsourced. For instance, acoustics” E8)); and *legal concerns* (e.g. “Noise, that’s always a big issue, we have laws here for that, of course. So that always plays a role, almost always plays a role” (E5)).

4.3.1.1 Knowledge expectation and use of experts

This section collapses two questions posed by the interview guide, as the questions were frequently answered in combination, usually by the participant foreseeing the following question. The two topics covered revolve around their expectations for knowledge and use of experts and expertise.

Participants were posed the question: "Is [sound-related factor] something that urban planners and designers are expected to know something about?". To this, 9 participants explicitly said yes (P2, P3, M5, M6, M7, N1, N2, E3&4), some using justifications such as *because it's in the law* (P2, P3, M6) (all three of these participants are urban planners), *because it's a source of problems* (M5, E3&4) (again, all urban planners), or simply that *it's something that requires sensitivity* (N1). A further 9 participants said, yes, they needed to know about noise, but *not in a technical manner* (P1, M1, M2, M3, M4, N3, E2, E5, E8). One Montreal planner further added that it was important to be able to learn new unknowns quickly (M2). Only 3 participants explicitly responded that, no, there was not an expectation of knowledge on the sound-related factor. One of these 3 (E6) did not elaborate, but the remaining participants clarified, for example, that people in the field tended to specialize in one particular domain and use experts for unknowns (E9), or, interestingly, one Dutch planner expressed the idea that there is no expectation for knowledge about noise because:

> "A planner knows actually near to nothing. That's the point. He only knows about integrating things…. We can deal with…the chunk of the information from noise, this is the chunk of information from traffic. When you put these chunks together, you don't have a real plan. You only have a sheet of information. And the urban planner makes a synthesis of this." (E1)

Mixed in among all of these responses was the explicit acknowledgement that experts were available when expectations for knowledge exceeded their expertise (M3, M4, E2,

E8, M7, N2, E9). All of these participants who mentioned access to experts work for large cities or private firms that presumably have greater resources.

Before a question on accessing experts was posed, many of the participants previously indicated that they had access to experts for their sound-related factor. In total, only one participant indicated that they had not used either internal or external noise expertise: M6, the lead and only planner of a very small Montreal borough who indicated that she could hire a consultant if she needed to but had not yet.

When asked more specifically about it ("What role do consultants or internal experts play in your decision-making process?"), a variety of responses emerged. A few of the responses indicated that the expert had a positive effect on the design. E9 reported working with noise experts to build a dike that doubled as a park rather than a simple noise barrier. In his philosophy, people "know one thing really well" and for him, he knew feasible shapes for the dike and the plant species that would thrive on it in those conditions. Other colleagues and consultants brought different knowledge that contributed to the design.

In the end, everyone says roughly the same thing, namely that they know a little about the sound-related factor, but not a lot; participants report that PBEs do not feel pressured to know a lot about the sound-related factor because the possibility of hiring an expert is always available if a solution can't otherwise be found. The resources of the organization appear to play a role in the ease of access to expertise when it's needed.

4.3.1.2 Priority

While some of the participants had already spontaneously identified a priority, a specific section on this concept came about later in the interview guide. In this section, participants were asked to give a realistic expectation of the priority that the sound-related factor gets relative to the other listed factors. Of 20 responses, 8 reported a fixed (i.e. not situationally dependent) priority level for noise (4 high, 2 average, and 2 low, described below), while the remaining responses either indicated that priority was

conditional on some properties of the project or suggested a more complicated relationship.

Of the fixed-priority responses, 4 participants listed the priority as high or among the highest (P2, M5, N2, E1). Interestingly, each of these responses were followed-up with a different justification. P2, lead planner of a large Finnish suburb, claimed that the priority stemmed from pressure from city authorities to constantly increase density and build in noisy areas. M5, lead planner of a small town adjacent to Montreal, considered it a priority to deal with resident complaints quickly with solutions. E1, a planning advisor for a Dutch city, claimed a high priority for sound because it was in the law and not up for debate like quality factors ("you can have a discussion on urban quality, but not about noise"). N2, a New York-based landscape architect, provided a very different style of justification, suggesting that people who were not capable of performing their desired activities because of an undesired sound outcome would not want to use the space ("[If] you can't have a conversation, you don't want to be there. Can't read a book? No quiet? It's a problem. Reverberation. [It can even] be bad for business"). There is no clear relationship between those participants who identified a high priority for the sound-related factor.

Two planners, both from Montreal, suggested the sound-related factor held an average priority (M4, M6). Two planners, each from European cities, reported a low priority. They suggest that "people don't pay attention to it" (E6) and "you don't see noise pollution on a map" (E7).

Among the 10 participants who reported a conditional priority level for sound, 7 said it was dependent on some aspect of the project (M2, M7, N3, E2, E3&4, E8) like its mandate or location; two focused on the stage of the project (M3, E5), both saying that it is not important at the beginning but is at the end; one considered the users being affected (N1), saying residents were more sensitive than commercial users.

The two remaining participants said the question was a "complex and ever-present issue" [35] (M1) and that it's another "layer" of design considerations that can be important (E9). He continued to suggest that when sound was important, they would hire an expert, as they do when encountering unknowns in the various "layers"[36].

4.3.1.3 "Good" and "poor" outcomes for the sound-related factor

In this section, participants were asked in two questions to envision good and then poor outcomes for their sound-related factor. Each is presented, followed by a combined outcomes summary.

4.3.1.3.1 Poor outcomes

Participants were posed the question, "Let's say you had a poor outcome for *sound-related factor* in your project, how would it play a role in your evaluation of the whole project?" This particular question had earlier raised interesting issues with pilot participants because, in the context of a binary regulatory requirement (e.g. *is the noise above/below the legal limit?*), the question of evaluating negative outcomes didn't make much sense. If the noise level did not meet the regulation, the project did not move forward; thus, there was no such thing as a poor noise outcome if the project proceeded. If the project moved forward, noise was no longer something that needed to be considered and it would not be an issue again until long after the project was completed. If this type of response was given, the question was rephrased to, "If you went to your project site after everything was completed and the outcome for noise bothered you, how would you feel about the project as a whole?"

Another unforeseen aspect of some participants' responses was the very persistent idea that their project did not necessarily make sound, but rather that their project was negatively impacted by more abstract and generalized city noise coming in from outside

[35] *"Le bruit est une notion complexe qui est toujours présente"*
[36] This was E9's term for planning and design factors.

of the physical envelope of their project (P2, P3, M1, M2, M3, M4, M5, M7, N1, E5, E6). When speaking about potential poor outcomes, this was the facet that they focused on.

From this question, three main categories emerged: that a poor sound-related outcome would not have a serious effect on the success of a project; that it would have a significant impact, but the project would still be acceptable; and that it would be extremely negative or even fatal to the success of the project.

Among the 6 who believed a project with poor sound-related outcomes would still be a good project (M7, N3, E2, E6, E7, E8), the justifications were varied. Two said that it would be a good project with one poor outcome (M7, E8), while another (E2) said that personally he would find the outcome acceptable, but professionally, he would potentially feel obliged to intervene. Similarly, one participant (M6) said that, compared to other factors that could negatively affect a project, she would consider a poor sound outcome "average to a bit lower."

Those with a stronger feeling that the project would be less successful (P2, M1, M2, M3, E1, E5) also had diverse justifications. These ranged from the idea that simply not everything can be solved (M2), to the idea that project occupants would perceive that the project was "not pleasant" (P2, M1) or "not good for health" (E5).

The remaining participants (P3, M5, N1, N2, E1, E3&4, E9) implied that there would be more severe negative impacts to the project. Some suggested it would be fatal to the project (P3, and E3&4). Two of the participants, both private-sector landscape architects (N2, E9), said that it would bother them to have a poor sound-related outcome since they would not have met their goals. For private-sector and more design-focused actors, it is conceivable that their reputations would be at stake if the experiential outcomes of their projects were noticeably negative. E9 is quite strong on this point, saying that he would have failed certain criteria if the sound-related outcome were poor. N2 further clarified the point, saying that it was based on the context of the project whether or not a negative sound outcome had a more or less severe negative impact on the whole project. Lastly,

one participant (N1) suggested that a poor outcome could open him up to litigation from clients.

Some participants clarified their responses on poor outcomes by offering some of the actions they would take for correcting them as well as some potential consequences in the case of poor outcomes. However, it is worth mentioning again that for many participants, especially planners, they interacted with sound after the point when the sound levels were modeled by acousticians based on their physical designs, so that a poor outcome would be one where the model came back with a number that was too high. At that point, some changes would be made to the plan and the system would be re-modeled. Rarely did a poor outcome for sound imply that the sonic experience of the place was determined to be poor. Also, rarely was the physical site planning blamed for producing an unacceptable outcome for the sound-related factor.

In this context, among those who said a poor sound outcome would not negatively affect the project, half of the six clarified with actions or consequences: M7 said that the problems would need to be solved if possible or the site would be unpleasant; N3 said that the project would be easily fixed with a retrofit; E2 said that the project could be fixed by changing land uses or engineering the noise source or its path, otherwise “you can’t use the public space”.

Among the seven who said that the project would be less successful, all offered a clarifying response. M2, M3, and E1 all said the project must be studied more and/or adapted. Among the reported potential consequences were a higher residential turnover (P1), negative resident opinion (M1), and unpleasantness and poor outcomes for health (E5). M6 said plainly “Unfortunately, at the moment we do not have enough tools to help us have a real impact on these elements”.

Among the seven who said a poor sound-related factor outcome would be extremely negative or fatal to a project, all offered further comment. For all of them, this meant

major changes to the whole project or to the by-laws, but a poor outcome also brought the threat of lawsuits (N1) and unhappy users who may complain (P3).

4.3.1.3.2 Best outcomes

Participants were asked to identify what they considered to be the best outcomes for their sound-related factor. For many of the participants, who think of sound in terms of regulatory requirement, the best outcome meant satisfying the regulation or having as little noise as possible. In the case where they answered the question with either of these two responses, it was rephrased as "what would the city look like if it had good [sound-related factor] outcomes?" The intent was to also understand how they would conceptualize the experience of a city that also had "best outcomes for sound".

As mentioned, many participants deferred to the straightforward goal of meeting of regulatory requirements, namely not breaking the law. One participant said only that the best outcome was "the lowest level" (P3) though the concept of meeting the regulation as a baseline was expressed by others (P1, M1, M2, E1, E5). Linked to the desire to meet the regulations was an implied understanding for some that these regulations are linked to and result from concerns about public health (E2, E5). Linked to these ideas was the response that there should be "no noise" (M4, E2, E3&4).

Some other major themes to arise from this question on best possible outcomes revolve around the problem of the noise source and its path. These are the ideas that less proximity between noise sources and those affected by them would be best (M3, M4, M7, N1, E1), or that more or better barriers should be built (M3, E1, E7). Another theme was the idea, centered on the future space users themselves, that noise in good outcomes should not bother people, as evidenced by having no or fewer complaints (M6, N1), that the levels should be "acceptable" (M1, M2), or should not hinder users (M2, E1). The final concept to emerge is that a space should be well planned or designed (P1, M2, N2, E1, E6, E7, E8, E9). There was a sentiment that they wished to achieve their goals in a way that showcased their creativity and the individual features of their project.

Related to the above concepts, some participants implied the potential for positive outcomes, such as the audibility of positively perceived sources ("if you hear birds singing", P2; "attracting positive noises [like] fountains", N3; "it could be that noise is a positive thing for certain people. You need to give people that possibility as well" E9). Other themes were based on the satisfaction of the users ("That everybody's happy", M5; "make people smile…human interaction", N3); and for the appropriateness of the sound environment for the setting or activity:

> "What's the best possible outcome? That you've managed the acoustics to achieve whatever goals you set at the beginning of the project, and that's very vague, but you know, acoustics can mean lowering the noise or they can mean creating a place that's really good for projecting noise or music…So it depends on your criteria," N2;

> "It depends on the moment of the day. When people are all sleeping, it has to be quiet…You want noise, for instance, in the shopping street of the people shopping, but you don't want the noise of the car, of the bus passing by because that's impacting the environmental aspect of the quality of the shopping street," E8.

Other qualitative concepts were expressed, but in the context of perception and experience of sound by residents. E6 spoke of seaside wind noise and seasonal bird calls that are technically louder than airplane and highway noise, but that residents don't mind because our attitudes towards individual sound sources can modulate our annoyance to them. P1 suggested that people should be able to enjoy living at home.

Lastly, quite a few participants acknowledged that "no noise" wasn't possible (M1, M3, M4, M6, E3&4). This conceptualization is related to the idea that, as it is a city, it will make noise.

4.3.1.3.3 Summary of sound-related outcomes and goals

Through probing the concepts related to good and poor outcomes for the sound-related factor, several global categories emerged that will point toward the larger conceptualizations of sound, discussed later. There were three large categories and a few isolated smaller categories of concepts that governed the perception that an outcome was good or bad.

noise goal: within this category, the sound-related factor is conceived strictly as noise, where the level or quality of the noise should be minimized. The goal to minimize noise is linked to a desire to prevent negative health impacts on residents or users, to minimize complaints that may be generated, or to prevent needing to change the project via, for example, zoning. Good outcomes for noise goals include: sufficiently reducing noise levels until they have met the regulation; building noise barriers; and having noisy sources far enough away from sensitive users. Bad outcomes include: exceeding the noise regulation, receiving complaints from users, and needing to alter or change a project.

urban goal: within this category, the outcome for the sound-related factor should serve the city at large but is not necessarily related to the content of the sound itself. Within an urban goal, "no noise" isn't possible because it's a city. Projects that are received well overall by clients or users are desired. Good outcomes include: a sound-related outcome that does not distract from desired activities within the project and well-balanced outcomes where resources were not wasted on unnecessary planning and design. Bad outcomes could include: projects that people don't visit because it's too noisy, or a poor reputation for the organization.

experiential goal: within this category, the sound-related factor is viewed as an opportunity, either to improve sound quality or to improve the city. Good outcomes include: users who report enjoying a space or the use of sound design or planning to achieve a desired outcome for users. Bad outcomes could include: insufficiently mitigating noise complaints, or a failure to make an interesting design.

4.3.1.4 Agency to change

Participants were posed the question, “what do you feel you have the agency to change (regarding noise)?” Many of the participants asked for further clarification, so it was also sometimes rephrased as, “what do you feel you have the power to change with regards to outcomes for noise?”

Of all of the participants, only two (N2 and N3) suggested that they had a lot of agency. N3 said he had particular agency to add “positive, attractive noises”. These participants are both based in New York City; N2 is a landscape architect and N3 is a project associate at a non-profit planning consultancy. Two further participants further suggested that they felt they had strong agency, though not to the degree of the aforementioned participants: P3 suggested agency to change the sound’s path with walls for protection, or to change zoning (also mentioned by E8). E8, a designer, suggested many aspects to changing sound-related outcomes or at least identified important relationships, such as program, function, zoning, human behavior, local ordinances, transportation, materials, and aesthetics. 8 participants indicated “some” agency to change; these included: following the rules/ordinances/standards (M1, M5, E5), zoning/function/position (M2, M4), changing the noise source (M3, E1, E2). P1 reported that “maybe” he has some agency, but that is more on the level of his whole team rather than at the individual level.

The final 8 participants reported that they had little agency to change sound-related outcomes. These justifications included not having authority (e.g. “The master plan dictates where to build and there may be noise”, P2), suggesting that bylaws aren’t useful tools for foresight (M6, E3&4), necessitating expertise (M7), and the ability to mitigate but not control (N1, E6, E9). E7 did not elaborate.

4.3.2 Sound-related conceptualizations

Below is a summary of the major conceptualizations of sound as derived from concepts and quotations that emerged in the previous sections. They are presented in an order

representing the strength of consideration given to the interconnectedness of the sound-related factor with all of the other planning and design factors, from least to greatest.

Conceptualization 1: Noise as level.

Within this conceptualization, sound is thought of primarily in terms of its sound pressure level in decibels. More specifically, within this conceptualization, participants would be referring to the dBA-weighting scheme found most commonly in regulations. In order to proceed with a project, when it is time to consider sound, it is modeled or measured, usually by an expert; if the project's decibel level is above the acceptable limit, more intervention is required. Recommendations can be made by the expert, but they would not change the fundamentals of the original project. PBEs themselves feel they should know the basics of these measurements but do not think they should be required to have any deeper technical knowledge, especially because experts are available.

By far, there was more consensus on the use of the word "level" than any other concept, suggesting it is one of the most important features of the sound. The measurement of this level was of high importance, and the result of the measurement was often coupled with an implication that it is a truthful and complete representation of the situation.

Within this conceptualization are aspects of the *noise goals* and *urban goals* discussed earlier, specifically those related to maintaining urban quality of life through lower noise levels. This can be achieved by building barriers, changing sound sources, or taking other suggestions from experts. Under the assumption that the acceptable levels have been selected by the authorities in advance to protect public health and quality of life, there is no need to incorporate additional considerations or subsequent evaluations as the measurement is assumed to stand in for any future need.

Conceptualization 2: Sound as mediation

Within this conceptualization, sound is something that results from urban activity, but requires negotiation and monitoring. A poor outcome in this conceptualization would

entail getting complaints from residents who are unhappy. Under certain conditions, cities are obligated to act on and address noise complaints, so a risk-averse strategy to planning and design is prudent if this is the dominant conceptualization. Here, user perceptions are considered because some sound sources are viewed as riskier than others. For example, a factory or a bar may be subject to more scrutiny than a new home because noise emanating from those sources would be perceived as more annoying. Achieving a poor outcome could be linked to consequences like low interest in occupying the new development, lower prices for property or poor sales rates. A good outcome is to receive no complaints, and this could be aided by a strong public outreach strategy, for example, where the community is consulted about the details of a project.

As in the "noise as level" conceptualization, under this conceptualization, sound is still linked to quality of life, but in the sense that is protected when the risk of complaints is reduced, and potential annoyances are minimized. For tools, a noise map could help the PBE understand the areas where sound is potentially an issue. Another tool to fix problems arising in this conceptualization in zoning. Through zoning, the PBE can reduce the proximity of noisemakers from sensitive users.

This conceptualization can often operate in parallel with the previous one, however, they are inherently unlinked. While for "noise as level", meeting the regulation is supposed to achieve success, "sound as mediation" shows that there are concerns about sound can be quite independent of the regulation. When a mismatch between these conceptualizations arise, noise inspectors are dispatched, or other experts are consulted.

Conceptualization 3: Noise as environmental pollutant

This conceptualization is like the first one, where measuring or modeling the noise level is very important, but for a more specific reason: sound is a pollutant that negatively effects users. Unlike the *sound as mediation* conceptualization from above where sound is not inherently negative, this conceptualization treats all relevant sound as negative.

Regulations and bylaws are specifically meant to protect users and new projects are treated as needing protection from outside harm.

More so than the other two previous conceptualizations, this one is more proactive, both in time and consideration. Users are considered more strongly because rather than a blanket noise regulation, certain urban zones are considered more sensitive than others. Within this conceptualization, noise is more strongly considered when a project concerns a daycare than a factory, presumably because the daycare users have been identified as more sensitive. Considerations about sound in this conceptualization thus also necessarily come about earlier in time, closer to the conception phase of the project. For example, early models will quickly tell PBEs whether a daycare can be considered or not. With *noise as environmental* pollutant, quality of life is protected when noise does not harm users or activities in ways analogous to other types of pollution.

Conceptualization 4: Sound as opportunity

The primary aspect of this conceptualization is that sound is not considered positive or negative until the user and their context are considered; the emphasis is on the sound as it is perceived and its interactive effects with users and the project's other factors. Sound can be used to encourage desired behaviors (e.g. "fountains can encourage lingering", N3) or achieve comfort for users (N2 wanted users to be "able to have a conversation"). Some sounds generally considered annoying could also be positive for some people in some contexts (e.g. airplanes, E9). Sound is considered early in the project, but it can also play a different role once the users are defined and better understood. Sound is strongly related to other factors like the selection of materials, pedestrians, and transportation. Quality of life is promoted by considering the relationship of sound with the goals for the space. Sound is also in a delicate relationship with nearby uses and users.

4.3.3 Concepts associated with the non-sound factor

The same questions that had been posed about the sound-related factor were also cycled for the second chosen (non-sound) factor. Since these factors were different across

participants, more emphasis is placed on the relationship of these responses to the responses about the sound-related factor rather than on the responses themselves.

4.3.3.1 General considerations of the non-sound factor

The non-sound factors that were considered are listed in Table 2. As mentioned before, while it may appear that there are repeating factors, especially *program*, it became clear that there was not always a consistent use of vocabulary. We saw this for the sound-related factor as well (e.g. *noise*, *noise complaints*, *industrial noise*, *noise and acoustics*, etc.), however, it was surprising that inconsistency emerged even for key, high-priority factors. At first glance, it seems that the sound-related factor is like other factors in that, across participants in various fields, the factor, as named, does not necessarily correlate to a specific technical aspect.

In contrast to the sound-related factor, the common words used when describing the non-sound factor were: *public, context, neighborhood, urban, space, design, respect(ing), appropriate, atmosphere, user, integrating*. Legal and regulatory references were rarely made when speaking generally about non-sound factors, except in three cases: P3, *public safety*, E2, *social infrastructure*, and E7, *user needs*. *User needs* and *social infrastructure* were actually revealed to be similar factors, where geographic information systems (GIS) were used to determine, for example, if a school was needed in a particular development project. Thus, the considerations for these factors were considered largely quantitatively driven and straightforward legal objectives needed to be met. Similarly, for *public safety*, strong legal requirements needed to be met that had come about after a series of catastrophic public safety incidents that had happened years earlier in the country.

Another major difference between the sound-related and other factors was that participants did not refer to the non-sound factor in negative terms. While many participants referred to the “noise problem”, they did not refer to the “materials problem” or the “program problem”.

When speaking about non-sound factors, general considerations usually centered on the need for the factor to integrate with other factors, to respect the immediate context, or to be appropriate with respect to the neighborhood or plans for the project. In contrast, when speaking about the sound-related factor, participants tended towards using internal justifications, where the sound itself was the concern because of its potential impacts on people or the project. Solving the sound problem was the criteria for dealing with sound, while for the non-sound factors, it was more often being solved in support of the project outcomes.

While the non-sound factor had potentially technical aspects, the factor itself was viewed as more than just its technical components. For example, E1 says of *fit and atmosphere*:

> "That's [completely in another] set from noise. Noise is technical, you can calculate it. It's hard. You know, figures. And *atmospheres* is actually the most complicated and it's actually the core business of urban planning, I think. Then it's a good comparison. Yeah, actually, they're very different. Actually, atmosphere is the thing, when you, it's the technical issue which no one worries about, only our design department. We also have to convince our politicians that atmosphere is, economy is important, noise is important, but atmosphere is also very important. And you can only, you can't really make it in hard figures, you must convince someone about, we can't do this. Just imagine a McDonald's here in the heart of the historic town."

4.3.3.2 Knowledge expectation and use of experts

In general, participants felt that they were expected to have at least some knowledge about all of the factors discussed. This is not surprising given the context that they themselves provided the list of factors of things that they consider on the job. A commonly expressed sentiment was that PBEs are not expected to know much about one specific thing, but instead to integrate knowledge on many diverse points and find a

balance of factors that satisfies the laws and regulations in addition their other goals for the project and career.

Responses to the question on expectations of knowledge ranged from a firm yes, to partial yes, to, in only two cases, no. Thirteen participants confirmed that they are expected to have a deep knowledge on their topic (P3, public safety; M5, architectural details; M6, neighborhood feel; M7, program; N1, program; N2, program; E1, fit and atmosphere; E2, social infrastructure; E3&4, neighborhood fit; E5, pleasantness; E6, landscape; E8, program). Four participants believed they should have partial knowledge, but more importantly, know how to rely on experts and integrate that knowledge into the plan or design (M1, quality of life; M2, traffic; M3, architecture; M4, materials). Another variant on needing partial knowledge revolved around needing to know only the basics about the factor, but that it is not a priority (P2, social factors; E9, street furniture). The two participants who did not believe that there was an expectation for knowledge both provided clarifications to suggest that while PBEs in general need not know much, they themselves had a high expectation for their own practice. N3, on pedestrians, said "I think [PBEs] are expected to know very little," but implies later in the interview that knowledge on and analysis of pedestrian behaviors is a core expertise of his organization. E7, on user needs, says that the important skill that needs to be developed on-the-job is mixing the quantitative research learned in school with a qualitative understanding of the area being considered; but this is a process with colleagues of multiple competencies.

For the use of experts, most of the participants had utilized internal and external expertise to some degree, whether it was through a conversation with a knowledgeable colleague or the formal hiring of a consultant. Largely, this was related to the details of the workplace rather than the individual factor in question or the participant. Small, public offices with few resources relied mostly on infrequent external consultants, whereas large public offices and large private offices generally had the expertise in-house. In some cases (e.g. N3, pedestrians, E9, street furniture), the participant claimed no need for expertise because they were, indeed, the experts that were being consulted. N2, from a

small, private firm emphasized that she considers work with experts outside of her firm to be more "collaboration" than consulting.

Compared to the sound-related factor, these findings on expectations for knowledge and use of experts were quite different. None of the participants said that they needed a deep knowledge of the sound-related factor, while 13 did for their non-sound factor. For sound, 3 justified needing to consider it because it's in the law, while this justification was not used to the non-sound factor. However, a shared consensus has emerged such that for factors that are not central to their expertise, PBEs are expected to have a basic understanding of the factor, enough to integrate expert knowledge into the project. Almost all had used experts at some point.

4.3.3.3 Priority

Twenty participants responded to a question on the perceived priority of their non-sound factor. Twelve of these participants noted that their factor was high priority (P2, social factors; M5, architectural details; M6, neighborhood feel; N1, program; N2, program; N3, pedestrians; E2, social infrastructure; E3&4, neighborhood fit; E5, pleasantness; E6, landscape; E7, user needs). These high priority responses included justifications like, "it's central to the plan" (E3&4). Further justifications for determining high priority were noteworthy in that the factor was important because of its relationship to the clients, investors or users of the plan or design:

> "I think programming is quite high. When you are designing a project and you're presenting it to the community, the program is something they can understand…But if you were to try to demonstrate or show the underlying geology, they don't care. It's important, it's all important. But the program maybe is really the way that a project is going to connect best with the community" (N2).

> "Two or three years ago, we had the design for a new housing development where the analysis of the landscape made us decide to re…so this was a formal agricultural area where there were some remains of creeks and so the landscape

> specialist could really redesign those creeks and show where they came from and what was their role in the past. And we restored those creek systems into the design of the built area. So, then this, all of the elements, we tried to introduce. So therefore, the developer was not convinced and said, "this will cost me a lot of money" and so on, [but] because we had the landscape study, we could make a story of it. And this story was a layer into the design of the area. And it gets accepted in this way" (E6).

> "In my work [pleasantness] gets a lot of priority. And in the Netherlands in general it's on the rise because of public opinion. Public opinion can also sway us from the best solutions we've concluded as expert." (E5).

Two participants claimed that their non-sound factor neither had a high nor low. Both of these factors have rigorous technical requirements. Their justifications centered on the idea that no priority was necessarily high or low:

> "It's not more important, also it's not less important. Very often, you can do what you had planned to do, build what you planned to build, but [sometimes it's] not possible, so we…have to skip one part of the plan" (P3, *public safety*).

> "It's one factor among others. One factor among lots of others. So, in the planning process, it's one element among others."[37] (M2, *traffic*)

Only one participant (M4, *materials*) claimed a low priority for a non-sound factor. His justification centered on how, as he explained it, materials are not at the top of the priority list, especially because the choices are "minor" and do not constitute a significant price difference when changes are made.

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[37] *"C'est un facteur parmi d'autres. C'est un facteur parmi tant d'autres. Donc, dans un processus de planification, c'est un élément parmi d'autres." (M2)*

The remaining five participants gave an answer suggesting that the priority was somehow conditional. Three of these participants said that priority was determined by the project or client (M7, program; E1, fit and atmosphere; E9, street furniture). For example,

> "In fact, I think this factor also comes from the client. So, it's the notion that the client also wants, you know, I want to say, we don't decide everything there, it's their project anyway. It's like, he has a part in it, that it's not necessarily in the others, you know. I don't think that noise, he'll tell us 'make a plan that cuts the noise' but he will tell us 'make a plan for the children'. You know, that's more a factor that includes the client, I think. It's like that from the beginning. Because I think, listen to the client, it's important"[38] (M7).

Two participants said that the issue was too complex to assign a priority, for example: "I think quality of life is a global objective that captures several of these factors here [on the list]. It's a little like, if we end up trying to solve noise or some nuisance, actually, we're still also dealing with quality of life"[39] (M1, quality of life). Thus, the factor is considered too inter-related to understand it in terms of a single priority.

In terms of actual priority levels comparing sound and non-sound factors, non-sound factors were more often rated as high priority (12 times versus 4 times). Similar numbers of participants reported that priority levels were conditional on some aspect of the project. From these responses, a trend is clearly emerging where non-sound factors are more likely to be considered as being more globally related to users and other factors and

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[38] *"En fait, je pense que ce facteur-là vient aussi du client. Donc c'est la notion que le client veut aussi, tu sais, je veux dire, on décide pas tout là, c'est quand même son projet. Fait que, lui a une part là-dedans, qui n'est pas nécessairement dans les autres, tu sais. Je pense pas que le bruit, il va nous dire 'faites un aménagement pour couper le bruit' mais il va nous dire 'faites un aménagement pour les enfants'. Tu sais, il y a plus un facteur qui inclut le client, je pense. Fait que c'est pour ça qu'il est au départ là. Okay. Parce que je pense, écouter le client, c'est important.*

[39] *"Je pense que la qualité de vie est un objectif global qui reprend plusieurs de ces éléments-là. Un peu, si on arrive avec le bruit ou la nuisance, après on est encore dans la qualité de vie."*

tied to the success of the project than the sound-related factor. For E5, there was such a level of user integration that public opinion could be at odds with his expert conclusions and have an effect on the project. For M7's project, noise needed simply to be reduced because it was a responsibility but considering the *program* factor was being considered "for the children".

4.3.3.4 Outcomes

Fifteen participants responded to a question about how they would evaluate an entire project if the outcome for their non-sound factor were poor. Evaluations of such poor outcomes appear to be linked to the priority that the factor itself plays. Nine of the participants said that if they had a poor outcome for their factor, it would be a poor outcome for the whole project. Some said that a poor outcome for their factor would mean that they had not actually completed the project (M2, M7, N3, E5, E6, E7); for others it would mean a project cancellation (M6, N1). One said that while he may consider the project a failure, people in other departments might not agree (E1). Three others said that a poor outcome for their non-sound factor would not be bad for their project, one because the priority for that factor is low (M4), two others because they expressed that not every project can be perfect and requires a balance (M5, E9). There were three other responses: one believed that a poor outcome would consist of an opportunity for lessons learned (P3), one saw a poor outcome for *program* as acceptable because the program is changeable after the project (N2), and one believed that a poor outcome for *social infrastructure* would balance itself in time (E2).

Compared to the sound-related factor, while there was a roughly even mix of responses about mild and moderately negative effects of poor outcomes on a whole project, participants were much more likely (8 versus 2) to say that a poor sound-related outcome would be fatal to the project. While it may initially seem counterintuitive that the sound-related factor is playing a stronger role here than other factors, a poor sound-related outcome is actually quite easy to define and has clear negative consequences: exceeding

the legal limit in decibels requires intervention. Thus, this poor outcome is more likely to require the project to change in substantial ways.

Participants were also asked to describe the best possible outcome for the non-sound factor. Despite the diversity of factors, a few common themes arose, particularly that the factor should integrate with its surroundings (M4, *materials*; M5, *architectural details*; M6, *neighborhood feel*; M7, *program*; E3&4, *neighborhood fit*; E9, *street furniture*); that the factor should meet the plan or design goals (M7, *program*; E6, *landscape*; E8, *program*); that the factor should be good for the user or be well evaluated by the user (P2, *social factors*; M1, *quality of life*; M7, *program*, N2, *program*, N3, *pedestrians*; E1, *fit and atmosphere*; E5, *pleasantness*; E7, *user needs*); that the outcome be positive according to the PBE's evaluation (M2, *traffic circulation*; N1, *program*; E1, *fit and atmosphere*); that the outcome be unique in its implementation (M6, *neighborhood feel*; E9 *street furniture*); that the factors should be balanced (P3, *public safety*); that the project should satisfy a market need (N1, *program*); and that the outcome should be appropriate (N2, *program*; E5, *pleasantness*; E6, *landscape*; E8, *program*).

Compared to the sound-related factor, best outcomes were much more likely to be suggested for the non-sound factor that had the goal of directly satisfying the user, or seeking an appropriate, balanced outcome for the factor, and integrating the factor with others. The goal previously identified as *noise goal*, where the PBE wished to meet the regulation to achieve success did not have an analogue in the non-sound factor. In other words, no participants identified meeting the regulations as the best possible outcome for the non-sound factor, though that was a common response for the sound-related factor.

4.3.3.5 Agency to change

As with the sound-related factor, participants were asked to discuss their perceived agency to change outcomes in relation to the non-sound factor. Thirteen reported that they have a strong agency to change outcomes: M1, *quality of life*; M4, *materials*; M5,

architectural details; M6, *neighborhood feel*; N1, *program*; N2, *program*; N3, *pedestrians*; E1, *fit and atmosphere*; E3&4, *neighborhood fit*; E5, *pleasantness*; E7, *user needs*; and E8, *program*. An additional five participants reported a moderate agency to change outcomes: P2, *social factors*; P3, *public safety*; M7, *program*; E2, *social infrastructure*; E9, *street furniture*. Only one reported having a low agency to change outcomes: M2, *traffic*.

The justifications for high, moderate, or low agency varied greatly. M6, speaking on *neighborhood feel*, thought that she had high agency to change, but finds problems in the "subjective" nature of the factor and the related difficulty in justifying decisions to stakeholders. Regarding *traffic*, M2 feels that he has low agency because this factor is not integrated with others and the planner is not involved early enough in the decision making.

With regards to how much agency they perceive that they have, the previously identified priority of the factor played an apparently large role. For factors that play a low priority role in the design, such as street furniture, the agency is perceived not necessarily as low or high, but as something that is not worth investing extra resources on. Agency to change also appeared to be a function of the participants' individuality and comfort with each factor.

As was the case during other conceptual questions, many of the participants relied on examples to describe their agency (e.g. M4, M5, M7, and E8) though they had been asked not to rely on recent examples during this section. This result suggests that PBE's conceptualizations are, in fact, shaped by their experiences in the workplace.

Compared to the sound-related factor, where 8 reported that they had little to no agency to change outcomes, participants were much more likely to report having a high to moderate agency to change non-sound outcomes.

4.3.4 Summary of non-sound factors and comparison with conceptualizations

In summary, there were a few aspects of both factors that had common features and a few where the sound-related factor varied markedly from the others. For both sound-related and non-sound factors, there was an inconsistent use of vocabulary to refer to the factors themselves. Other similarities included the way that, for factors that were not core competencies of the participant, they felt an expectation to have basic knowledge of the factor, enough to be able to integrate expert knowledge into a project. Whether a participant thought a particular factor deserved high priority was strongly related to the project at-hand.

Among the differences between the sound-related and non-sound factors, the sound-related factor was often evaluated independently from the other factors such that, for some, once it was solved it could be ignored; the other factor was more likely to be inter-related with the other factors and have a complex relationship to the project (as the sound-related factor would be in Conceptualization 4). Another major difference between the sound-related and other factors was the way it was referenced as a “noise problem” or “issue”, yet not the “materials problem” or the “program problem”. While for other factors, user perspectives were considered to such an extent that studying them warranted extra resources and were even considered a type of expert knowledge on some projects.

When speaking about best outcomes for the sound-related factor, participants often expressed a desire to successfully get the noise level under the requirement, prompting the follow-up question of what that might entail for spatial outcomes. The need to rephrase the question for the non-sound factor arose much less often. A poor outcome for the sound-related factor had clear implications – if acceptable levels were exceeded, intervention was required. Thus, ensuring that did not happen was of very high importance. Other factors had much more complex failure modes and thus the severity of poor outcomes was not so clear. Because of the complexity, participants also had a higher agency to change outcomes for the non-sound factor.

4.4 Contextualization of factors - specific projects and factor considerations

The next section put into context the previously discussed concepts about each factor by invoking real projects. Participants were asked to report both on a project that was recently completed and a project in progress. The section is organized such that all of the sound-related factor results are presented first for both the recently completed and ongoing project. This is followed by the non-sound factor results, where comparisons to the sound-related factor are discussed in-line. While this presentation of these results does not follow the interview guide, they are grouped by factor to facilitate comparisons to the conceptualizations.

4.4.1 Range of projects

Recently completed projects reported by participants ranged many scales (from a small addition to a historic home to an entire town's pedestrian vision plan), intentions for planned uses (pedestrianization to public concerts), and goals (rules for new housing to a landscape intervention). Each particular project was, unsurprisingly, linked to their position at their organization – landscape architects were involved in landscape projects, provincial-level planners were involved in long-term and large-scale vision plans, and so on.

After giving brief descriptions of projects, responsibilities, and project associates, participants were asked whether each of the previously identified two factors was considered on their two projects (e.g. "Was *noise* considered on this project?"). Different questions were given (see Methods: Context) depending on whether each factor was considered. As a result, the number of responses to each prompt varies greatly in the following sections.

4.4.2 Sound-related factor in context

The first six sections below detail the sound-related factor for the recently completed project. 19 participants spoke about a project in progress. It is interesting to note that

most of the projects considered complete had not actually been constructed at the time of the interview. This suggested that PBEs may consider their projects complete not when the space is in use with users, but at some other point like the final approval of the documentation.

The following two sections are about the sound-related factor for the project in progress. 20 participants spoke about a project in progress. The final section is a summary of the sound-related factor considerations in context and the effects that these contexts have on the sound conceptualizations identified earlier in the chapter.

4.4.2.1 Recently completed projects – general considerations

Asked whether and a sound-related factor was considered on each project, of 19 responses[40], 9 said that sound was considered, 4 said that sound was considered very little (or "yes and no"), and 6 said explicitly no. Among the reasons that obliged participants to consider sound on their project, of the 9, 7 said that it was because of concerns that the project was in proximity or adjacent to a significant noise source like a railway, highway, or airport (P2, P3, M3, N1, E3&4, E6); 2 of the participants suggested that it was a normal part of their workflow in that it was just another aspect they should consider (E2, E9); finally 1 participant (N2) said because of the importance of sound in that particular project (i.e. it included a performance venue, outdoor movie viewing area, and public art space adjacent to an indoor concert hall), "the acoustical relationship between this open space and that concert hall was incredibly important. It was like it could not be bad." This last justification suggested a specific attention to sound in relation to activities, which is referred to as appropriateness in the Literature Review and Discussion chapters. Of the 4 who said sound was considered very little, 2 (M1, M2) said that it was discussed because of nearby trucking and other industry, but that no specific

[40] *Due to 2 participants interviewing simultaneously, one participant who lacked time to discuss two projects, and one participant who did not follow the interview guide, only 19 of 22 interviews contained data on a recently completed project.*

decisions were being made; 1 (N3) said that extreme traffic noise was one of the inspirations for the project that had helped them attain sizeable funding from the national government, but that it was not playing a role in the redesign except as an "externality[41]"; 1 (M7) said that it was considered on the project, but not in this particular phase.

Among the 5 participants who reported that their sound-related factor was not considered, justifications for its absence were diverse. Participants were asked two follow-up questions (Interview Guide, Q4.2.3) regarding whether they believe their sound-related factor should have been considered and whether it was left out just for this project or more generally. Justifications are reported here by participant.

> M4 was responsible for an addition to a rooftop in a protected neighborhood where "Noise, it wasn't an element in this case[42]". He believed that it should not have been considered in this case and that, in general, they do consider it and only this specific site did not call for considerations. The mechanism for making this decision is not clear.
>
> M5 said that "noise is more of an on-the-site problem" rather than one she could control in advance through housing rules; according to M5, noise is a problem of construction and neighbors.
>
> E1 said that because a highway was being put into a tunnel, there would no longer be any traffic noise and, thus, it should not have been considered. Otherwise, "noise is always taken into account", presumably because of the law.
>
> E5 said that in this city's new transportation plan, the sound-related factor was not considered, but it perhaps should not have been because it was a "strategic"

[41] *Perhaps by this statement, N3 means that noise is not being considered explicitly, but it does not discount the potential two-way relationship between the soundscape of the space and the functions of the area.*
[42] *"Le bruit, ça n'a pas été un élément dans ce cas-là".*

plan. He suggests that other projects of this type would normally not get sound considerations.

E8 said it was not explicitly considered for his project but acknowledged the relationship of sound to other factors and interventions: sound was considered "Maybe on the level of material choice, …so no cobblestones creating noise in the city or in the street. And we had some visual and acoustic accents with sprinklers and fountains. But it wasn't a major issue." When asked, he believed that soundscape should not be considered as a primary aspect. The sound-related factor was not purposely left out of this project and he could not say whether similar projects would or wouldn't contain sound considerations.

Among the 13 participants that did consider sound in their projects, they were asked to speak on the priority of sound, use of experts, satisfaction with sound-related outcomes, and speculations about possible better outcomes.

4.4.2.2 Recently completed projects – priority

The priority that the sound-related factor took in each of the projects ranged from very high to low. Among the 6 participants who said it was high, 5 (P2, P3, M2, E3&4) said that it was because of proximity to noise sources. In the case of E3&4, their project (a hardware store and large construction market) was actually the noise source, and they were making considerations on behalf of neighbors who would be affected by its daily operations. One participant (P3) explained that sound was generally a high priority because if the legal limits are not met, "you have no project." The other participant (N2) said that the soundscape factor was a high priority because it was a public space that was designed specifically to accommodate sound.

3 participants (M3, N1, E6) said that sound had a mid-level priority compared to other factors. M3's large highway-adjacent housing project had some moderate concerns about a noise barrier as well as balconies on those buildings. N1, who was constructing a new park, was concerned about an adjacent elevated highway; while they did not have the

authority to reduce traffic, they considered ideas for mitigating the noise, yet “none were implemented.” E6 was concerned about a nearby airport as well as measures to make sure users would take bicycles and public transportation instead of private cars to reduce traffic noise.

3 participants (M1, N3, E2) said that soundscape had a low priority. M1 said that, in his project on turning an old industrial area into an arts quarter, sound played a very minor role compared to preservation and quality of life. N3 previously explained that this town visioning study was inspired by a noise problem but didn’t play a role in the redesign. E2 said that is was a normal part of the workflow and was not important beyond that because it was in a “non-housing area.”

2 participants gave responses that suggested a mismatch between perceived and realistic priorities for the sound-related factor. M7 explained that sound had been playing a very minor role in design considerations until their client realized the project’s proximity to industrial noise sources would mean that no one would buy a house there after it was developed; after this, sound took a much higher priority. E9’s explanation was roughly the opposite: sound had taken an important role in the design phase, where soft, absorbent materials were chosen. However, on inspection from public safety officials, the project’s material choices had to be changed for fire safety (and in his opinion, reduced in quality). Thus, in the context of other factors, the priority of the sound-related factor was significantly lowered.

Compared to the section on sound concepts, these findings on priority in context are not surprising. A few more participants had identified the sound-related factor as a high priority than either medium or low priority. However, more than assigning fixed priority, participants had said in the concept section that priority was determined by the details of each project rather than by some fixed feature of the factor itself. Consistent with this, all but two of the above justifications for priority level (P3, E2) were related to aspects of the project rather than routine aspects of the workflow.

4.4.2.3 Recently completed projects – use of experts

Participants were asked whether they used experts to assist with the sound-related factor. Of 12 participants to respond to this question, 9 said that they used an expert (P2, P3, M2, M3, N1, N2, E2, E3&4, E9); 3 did not (M1, N3, E6). Of the 9 that used experts, all used external experts, but one additionally used an internal expert (E9). Further, all but one of the participants (N2) who had consulted experts were from large organizations, the effect of which will be discussed later in this chapter. Of the 3 organizations that did not consult experts, 2 (N3, E6) were organizations that themselves were offering expertise.

4.4.2.4 Recently completed projects – evaluating outcomes and improvements to the sound-related factor

Twelve participants responded to the question about whether they were happy with the particular outcomes for sound on their completed project. Eight participants were completely satisfied (P2, P3, M7, N2, N3, E2, E3&4, E9). Justifications for satisfaction included satisfactorily balancing the needs of various factors (M7, E9), achieving any positive outcome (N3), and successfully negotiating better windows for residents at the promoter's expense (E3&4)[43]. 2 participants were neither satisfied nor dissatisfied for either not receiving any negative feedback to date ("No one congratulated us for the noise but neither did anyone lash out as us for it"[44], M1) or because adjacent noise sources are still present despite achieving good outcomes internal to the project (E6). Two participants were not satisfied because they either did not ease residents' concerns (M3)[45] or because they believed the design could have been better (N1).

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[43] "The neighbors got new windows, noise-proof windows. And the investor had to pay for it" (E4)

[44] *"personne ne nous a félicité pour le bruit ou personne ne nous a lâché des roches pour le bruit. Donc, on est plutôt neutre au niveau quant à ce point là"* M1

[45] "They were asking for a wall, a noise barrier, to reduce to noise level outside" (M3)

Participants were asked what they thought could have been better about the sound-related factor on their project. For many, this question took a rephrasing because they believed that because they had met the legal requirements to be under a certain decibel level, there was no need for additional improvements. On pressing, 5 of 13 respondents to this question were still certain that they had already achieved the best possible solution (P3, M1, M2, E2, E3&4). One of these (M1) had been neutral with the previous question on satisfaction with sound-related outcomes; all others were satisfied. Of the remaining 8, better outcomes for the sound-related factor could come in the form of better environmental outcomes (M7, N1; e.g. if there were less noise from nearby sources), better planning or design outcomes (M3, E6, E9; e.g. if they had achieved more measures to discourage car use), measurement (N3; e.g. if sound level measurements could have been taken to support intervention), cost (P2, e.g. if sound level had been less costly to satisfy), and process (N2; e.g. with more satisfactory project management and construction).

These previous two questions corresponded roughly to the sound-related concepts questions on evaluating good and poor outcomes. While the reasons for being dissatisfied ranged urban, noise, and experiential goals, when it came to potential improvements to the project, the goals no longer included experiential goals, and at least 5 had no further goals for their project. A project's potential failure modes included user-centered problems, but potential improvements to the project were only noise and urban goals. This is somewhat consistent with the way sound was discussed in the concepts section, where the highest number of respondents (12) said that a good outcome would be having the lowest noise levels (without reference to the user). However, many also reported that they wanted the sound-related factor to be "well designed" (8) or expressed some experiential goal (7) that did not have a strong equivalent when they spoke about potential improvements to a real project, except the 3 that had identified wanting better planning or design outcomes. What this contextualization reveals, then, is that there seem to be more opportunities to have a poor outcome than a good outcome, and that there are not many tools available to PBEs to work toward better outcomes. What may

contribute to this problem is the way that the noise issue can be "solved" by satisfying the regulation may prevent further effort toward better solutions in the context of needing to work toward so many other factors. The outcome reported here is also consistent with the relatively low reported agency to change outcomes from the concept section, where only 2 participants reported having a lot of agency and 8 reported having little to none.

4.4.2.5 Recently completed projects – sound-related outcomes in whole evaluation

Participants were asked if they believed that the sound-related outcome played a role in the way they evaluated the whole project. In roughly equal proportions, 17 respondents either answered "no", "very little", or "yes." Of the 6 participants (P3, M4, E1, E2, E5, E7) who said the sound-related outcome did not play a role in their evaluation of the whole project, only one of these (P3) was also a participant who indicated being satisfied with the sound-related outcome. Five participants (M1, N1, N3, E6, E8) also said that the sound-related outcome had very little influence on their evaluation of the whole project, with justifications ranging from being satisfied and not requiring extra attention (E8), the other factors being much stronger (E6), and that the intervention solved their noise problem without explicit consideration (N3). Lastly, 6 participants (M2, M3, M7, N2, E3&4, E9) indicated that the sound-related outcome played a significant role in their evaluation of the project, with justifications like expressing pride in understanding and successfully applying difficult technical literature on the topic of acoustics to solve a lingering project problem (E3&4), considering the poor sound outcome one of the main factors that made them dissatisfied with the project (M3, M7), conversely, a factor with a less than perfect outcome that still supports a good project (E9), and a strong outcome that supports a strong project (N2).

For those who did not feel the sound-related outcome played a role in the whole evaluation, it is interested that most were not satisfied with the sound-related outcome in the project. Perhaps for them, the priority is sufficiently low that it does not warrant needing a positive outcome. For those who thought sound did play an important role in

evaluating the whole project, sound seems to have been an exceptional factor, necessitating extra time, learning, or opportunities. Compared to the question on the perception of poor outcomes from the concept section, there was a very similar balance of equal parts between those who felt that they poor outcomes would have no serious effect (6), mild effects (6), or strongly negative effects (8) on their projects.

4.4.2.6 Recently completed projects – role of decision makers

While PBEs are responsible for the plans and designs of the spaces they are charged with, whether a project proceeds and with what elements can often be influenced by separate decision-makers, e.g. mayors, elected councillors, private project promoters. As such, participants were asked whether decision makers took the sound-related factor into account. Of 18 responses, all but 5 were variations of no: “no specific attention at all” (M4, M6, N3, E1, E5, E6, E7, E8, E9) or “no extra attention beyond satisfactorily meeting the law” (P3, M2, N1). In one other case, the participants suggested the decision-makers downplayed some factors because of their strong desire to have the project built, thus they were responsible themselves to make sure at least the law and local residents were satisfied (E3&4).

For one participant’s decision-makers, sound was not a major consideration, but it did play a role in the way they thought about the role of the changing district in evening and night-time hours, thus is received some small concern (M1). In another case, the planner deliberated with higher authorities to secure a sound barrier between his project and a highway (N3). In 3 other cases, sound played a salient role in the decision-making process: the decision makers realized the poor sound-related outcome would negatively affect sales on the project (M7), in the context of a large city redevelopment, decision-makers felt obliged to address sound (E2), and in the case of one project that had a very specific need for well-designed public music space, the project promoters were very concerned and involved in sound-related decisions (N2).

4.4.2.7 Project in progress – general considerations

20 participants responded to questions about a project that they had recently completed. Considerations about factors for projects in progress generally varied along two dimensions: strength of consideration and motivation for consideration. Strengths of considerations were emergently categorized as being light, average, or strong. Motivations for considering factors also came in three emergent types: as a regular part of the workflow, as a factor requiring heightened sensitivity due to potential problems, and as a planning or design opportunity to achieve better outcomes.

For those who identified the sound-related factor as requiring strong considerations in the decision process, 3 identified it as an opportunity (M7, N2, E2) and 2 considered it a serious potential problem (M4, E6). For those who identified the sound-related factor as playing a normal role, one considered it an opportunity (P2), 2 considered it a normal part of the workflow (P3, N1), and 2 considered it a potential source of additional problems requiring heightened sensitivity (M5, E3&4). Of those that identified sound as playing a small role, 5 identified is as a regular part of the workflow (M1, M2, M3, M6, E7) and one identified it as an opportunity (E8) in that it was not important except in the way it was related to other factors like transportation and materials, which were important. 3 participants (N3, E1, E5) described sound as not playing any role at all in their current project.

Unsurprisingly, no participants described the sound-related factor as being strongly important if it was also described as a typical part of the workflow.

4.4.2.8 Project in progress – outcomes in ample and constrained resources

19 participants responded to questions about a project currently in progress[46]. Participants were posed a series of hypothetical questions on potential outcomes for their

[46] *E9 had just completed a substantial multi-year project and had not yet started the next project.*

project in progress. In one case, it was to imagine the project's outcomes in the case that there were unlimited resources to work on the factor at hand. The follow-up question was to identify the sorts of cuts that would be made to the project in the event of constrained, rather than unlimited, resources.

For the sound-related factor, 6 participants (P2, M1, M2, M3, E1, E3&4) said that if they had unlimited resources, nothing about the project would change. They had achieved their best-imagined outcome and would redirect extra resources to other factors. M1 articulated that he did not believe sound-related considerations applied to this project. E1 believed that since a highway was being put underground and that the city that remained above the underground highway would have much less noise, no further solutions would be required; however, upon further pressing, he claimed that what remained above ground would have achieved the perfect solution if it had "no more noise than a lively city would produce."

Other participants gave responses that varied in the amount of complexity they attributed to the potential for sound interventions; some participants gave multiple ideas. Interventions could be regulatory/paperwork, complaint reduction, physical, user-centered noise mitigation, and positive soundscape ideas; for example:

- *Regulatory* - M5 would introduce new bylaws more quickly;
- *Complaint reduction* - foresee complaints (M5, M6). M6 further specified this would be accomplished by thinking about large elements and about the duration of the project;
- *Physical interventions* - M7 would completely remove a railway. Other infrastructure interventions included purchasing land and moving sources far away (P3) or covering a submerged highway and improving public transport (E7);
- *User-centered noise mitigation* - Other participants aimed to achieve a better outcome by considering users, e.g. putting a buffer between activities (E6), reducing unpleasantness and other residential impacts (N1, M4, N2);

- *Soundscape* – E2 would use extra resources to have fewer streets and "better outcomes through good planning" that doesn't require technical interventions (e.g. noise barriers); N2 in addition to using some noise barriers and thicker windows for neighbors' houses, would "create a quiet zone" and implement strategies to "lessen impact on the neighbor", especially using integrated landscape architecture solutions; N3 would accentuate sea noise and other positive natural sounds, such that visitors to the site had the "feeling of being on the water".

There were two other participants that, rather than suggesting discrete interventions, implied that sound could be improved through indirect means: E5 suggested ensuring the place is nice, pleasant, well-designed, and safe – and since noise is not pleasant, the factor would improve. E8 said indirect benefits would come through good solutions with the materials and transportation factors.

In the opposite case from unconstrained resources is the case of constrained resources. Participants were asked what sorts of things would be cut from the factor if the budget were reduced. According to the responses, the items that would be eliminated appear to not be related to the unconstrained resources scenario. Participants identified 4 general areas where resources could be cut:

- *Less-built infrastructure* (M1, M7, N2, N3, E1, E5, E7) – e.g. the highway won't go underground, switching to a cheaper material, eliminating proposed noise barriers;
- *Reduced personnel costs* – hiring fewer acoustics experts or reducing their workload (P2, N1) or cutting employee costs for this factor more generally with fewer work hours (M3, M4, M6);
- *Lower standards* – paying attention to fewer details (M3, M6, E2), working towards a minimum standard rather than a maximum (N1);
- *Changing the project* – i.e. change the zoning from residential to commercial to take advantage of more relaxed rules (P3).

The remaining participants claimed that budget cuts would not affect the sound-related factor for one of two reasons: that because they have to meet the law, the budget is inflexible (E6, M2, E3&4); or that they generally did not have budgetary concerns: “Whatever I want I get. I just tell council I need this, and I get it” (M5); “The investors will have to pay for it of course” (E3&4); and “acoustics is not really a primary issue now. I can’t imagine something to be cut. I think we will have an ideal balanced solution at the end, so we won’t have to cut choices…I don’t think we will have a non-optimal final design” (E8).

4.4.2.9 Summary of sound-related factor context

The strong correspondence between the concept and context sections suggests that concepts are shaped by the work. However, this section revealed the extend to which PBEs do not have tools to address sound-related issues beyond noise control and hiring experts. Decision makers are not driving sound-related factor considerations except in exceptional circumstances where there are unresolved concerns that could hold up the project or when the project’s main goals concern sound, as was the case with the construction of an outdoor music venue. In other words, sound is a problem when it’s a problem, and it’s not a problem when it’s not a problem. In the context of real projects, there was an increase in the use of *sound as opportunity*; however, PBEs appear to be limited by their training and agency to generate and complete solutions. The presence of an achievable noise level limit also discourages continued work on the problem in light of the need to work on other factors.

4.4.3 Non-sound factor in context

4.4.3.1 Recently completed projects

As with the sound-related factor, the non-sound factor was discussed with 19 participants. Interestingly, compared to the only 9 of 19 who had considered the sound-related factor in their recently completely project, 18 of the 19 participants said that the non-sound factor was considered. The one exception who said that their factor was not

considered was E2, referring to a very large city-state development plan where social infrastructure was not considered because it was being considered strongly on a separate phase of the same project.

Of these non-sound factors, they were identified as being high priority by 10 participants (P2, M2, M4, M5, M7, N3, E1, E3&4, E6, E8), medium-high priority by a further 5 participants (M1, M3, N1, N2, E7), medium (E9), and low (P3, E5). The highest priority factors were social factors (P2), traffic (M2), materials (M4), architectural details (M5), program (M7, E8), pedestrians (N3), fit and atmosphere (E1), neighborhood fit (E3&4), and landscape (E6). The low priority factors were public safety (P3, because it was largely a building where public safety laws did not completely apply and had been solved in a different phase) and pleasantness (E5, it was not a goal for the project and he did not have a clear understanding of how the promoters would take it into account).

Regarding expertise, most participants reported that they consulted experts for the identified non-sound factor. Those who did not were M5 (architectural details), who claimed she could consult an architectural committee if she needed, E5 (pleasantness) for not having financial resources for more expertise, and lastly, N2 (landscape), N3 (pedestrians), and E9 (street furniture) as those were respectively the core expertise of the organizations.

Participants were asked whether they were happy with the outcome for the particular non-sound factor. Overwhelmingly, they were satisfied. 15 of 18 participants reported being satisfied for various reasons from not encountering roadblocks (P3). Within this group of satisfied participants, some warned, for example, that while they were currently satisfied it may take another decade or two before it is clear that *quality of life* has been achieved (M1), or that for *program*, it could get worse as it's built and used (M7). Two participants (M4, *materials*; N1, *program*) were moderately satisfied, N1 suggesting simply that it could have been "more interesting." One participant (M3, *architecture*) was "not completely" satisfied, but only specified that the architectural outcome could have been better.

When asked what could be better about their completed projects regarding non-sound factors, a few categories of response emerged. Unsurprisingly, the most common response was based on addressing details regarding that particular factor (P3, M3, M4, N1, E3&4, E5, E7). For example, M3 (architecture) was dissatisfied with some of the architectural elements that he had to agree to in deliberations with a committee and promoters; E3&4 (neighborhood fit) were concerned about the end results for building height. Other common themes concerned having limited resources (P2, N3, E9), such as running out of money to build preferred aspects of the project, integration with other factors or nearby features (M7, E1, E9), and legibility, or connections with residents (M1, M5). 4 participants said that nothing needed improvement concerning that particular factor (M2, N2, E6, E8).

4.4.3.2 Projects in progress – general considerations

This section summarizes the non-sound factor for the projects in progress using the same matrix as for the sound-related factor (i.e. high, medium, or low priority; standard workflow, potential problem, or design opportunity). In this case, the non-sound factor was always considered. 9 participants considered their non-sound factor a high priority (M3, E1, M2, E3&4, M1, N1, N3, E6) and 8 participants considered it a mid-level priority (M7, E7, P2, M4, M6, N2, E5, E8). Only 3 participants (P3, *public safety*; M5, *architectural details*; E2, *social infrastructure*) gave an indication that their non-sound factor was a low priority – and these were all considered a part of their standard workflow. These three participants also had very specific reasons that their factor was low priority: public safety was considered on a separate phase of the project; architectural details would be reviewed and decided by a committee; and social infrastructure concerns were to be entirely financed by the promoters as the city specified. Of the remaining participants who viewed their non-sound factors as a part of the workflow, they were for the high priority factors – M3, *architecture*; E1, *fit and atmosphere* – and mid-level – M7, *program*; E7, *user needs*. 6 participants identified their non-sound factor as requiring heightened sensitivity due to potential problems either as a high priority (M2, *traffic*; E3&4,

neighborhood fit), or a mid-level priority (P2, *social factors*; M4, *materials*; M6, *neighborhood feel*). 7 participants identified the non-sound factor as a potential design or planning opportunity, either as a high priority (M1, *quality of life*; N1, *program*; N3, *pedestrians*; E6, *landscape*) or a mid-level priority (N2, program; E5, *pleasantness*; E8, *program*).

4.4.3.3 Project in progress – outcomes in ample and constrained resources

Participants were also asked what they would do with unlimited resources if they were applied to the non-sound factor. A few key themes emerged across factors. Most frequent was the concept of better *integration* at 10 mentions (P3, *public safety*; M5, *architectural details*; M6, *neighborhood feel*; M7, *program*; N1, *program*; E1, *fit and atmosphere*; E2, *social infrastructure*; E5, *pleasantness*; E6, *landscape*; E7, *user needs*). This could be either in the sense that the specific factor would better integrate with the other factors (e.g. P3 said extra resources would be useful for *public safety*, but that if that factor dominated, the resulting outcome would not be "city or urban development"), or that the project itself would connect better to the city at-large using that particular factor (e.g. to improve the *pleasantness* factor (E5), efforts would be made to create better public transportation links to the rest of the country, especially of the type where transfers in the city center wouldn't be necessary.)

Also mentioned frequently was the concept of *improving details* through more hours or effort dedicated to that particular factor, (M1, *quality of life*; M3, *architecture*; N3, *pedestrians*; E2, *social infrastructure*; E3&4, *neighborhood fit*). This included potentially doing extra "work around the cornice" (M3, *architecture*) and to "formalize and encourage further pedestrian use in the design" (N3, *pedestrians*).

A third and frequently mentioned concept making use of additional resources focused on directing more resources towards *infrastructure and demolition* (M4, *materials*; M5, *architectural details*; E1, *fit and atmosphere*; E6, *landscape*; E7, *user needs*). This included extending an underground highway tunnel further (E1, *fit and atmosphere*), adding a

green space (E6, *landscape*), and demolishing an adjacent crumbling building (M4, *materials*).

Less frequently mentioned uses of additional resources included *involving the public* (P2, *social factors*), having *more time* (M4, *materials*), using *incentives* (M5, *architectural details*; E5, *pleasantness*), considering *resident concerns* about density (M6, *neighborhood feel*), adding *installations* (M7, *program*, e.g. adding a sound system), doing more *analysis* (N1, *program*; N3, *pedestrians*), and hiring more *employees* (N2, *program*). Two of the participants said that for their particular factor on this project in progress, their budget was unlimited (M2, *traffic*; E8, *program*) and thus the exercise was not hypothetical.

Regarding limited resources, using the same categorization scheme from the earlier analysis on the sound-related factor, similar trends were revealed, and it appeared similarly unrelated to unlimited resources. In the hypothetical case that the budget would be limited, participants believe cuts would be made to the non-sound factor in the areas of:

- *Less-built infrastructure* (M7, *program;* N3, *pedestrians*; E1, *fit and atmosphere*; E5, *pleasantness*; E8, *program*) – e.g. using fewer custom products, more common materials.
- *Reduced personnel costs* (M1, *quality of life*; M4, *materials*; N1, *program*; N2, *program*; E3&4, *neighborhood fit*) – e.g. cutting complementary studies, fewer design iterations with architects, making more decisions on intuition rather than with market surveys, salaries.
- *Lower standards* (P3, *public safety*; M2, *traffic*; M5, *architectural details*; M6, *neighborhood feel*; E7, *user needs*) – e.g. going as far as legally possible, then making the responsible decision, solve fewer perceived issues, compromise with a committee, concentrate on the big elements instead of the small.
- *Changing the project* (M3, *architecture*; E2, *social infrastructure*; E3&4, *neighborhood fit*) – e.g. reduce the density, change zoning.

A fifth category was added for one response: E6 (*landscape*) indicated he *would take resources from other factors* if landscape had a constrained resources scenario. P2 (*social factors*) was unable to think of a response to this question.

4.4.4 Summary of factors in context

When speaking generally about considerations, the concept of *neighborhood* came up three times as often for non-sound factor descriptions than it did for the sound-related factor. Neighborhood came up, quite obviously, when talking about the factors *neighborhood feel* (M6) and *neighborhood fit* (E3&4), but also the way one participant described *traffic* as a factor on the neighborhood level, while other factors are not (M2). M3 also spoke about neighborhood in relation to *architecture*. The concept of measurement came up for all but only a few participants with the sound-related factor, and never explicitly for the non-sound factor. Two other concepts were noticeably absent from the non-sound factor: the concept of not needing extra resources and the concept of being complaint-averse.

As opposed to the sound-related factor, where 3 participants said they did not consider it, none of the participants reported that their non-sound factor was left out. In the projects in progress, the non-sound factor was slightly more likely to get strong considerations, with 9 participants rather than 5 suggesting the non-sound factor played a major role. The non-sound factor was also much more likely to be a mid-level and strong priority. The non-sound factor was also slightly more likely to be identified as an opportunity to improve planning or design outcomes for the project, with 7 rather than 5 offering such suggestions (e.g. “developers, …the way they introduced landscape in their project was quite interesting” – E6.)

4.5 Variables affecting conceptualizations

4.5.1 Individual variables

The next few sections detail the individual variables of participants along which there were divergent conceptualizations and contexts for the sound-related factor. There are several distinct variable categories that play an observable role including educational background, field of study, and years of experience. The presented analysis uses conceptualizations and categories presented in previous sections and will only be briefly summarized as-needed in the sections that follow.

4.5.1.1 Educational

Along the lines of education, there were two variables that played a role in soundscape conceptualization: whether they had completed a graduate degree and whether they were in academia.

4.5.1.1.1 Graduate education

For those who had completed a graduate degree, they were less likely to conceive of their projects as only being affected by external environmental noise. In other words, they were more likely to believe that their projects made sound and was a part of the urban fabric rather than something that needed to necessarily be isolated and protected. Further, only those who had completed a graduate degree felt that they had no explicit expectations for knowledge in domains that were not within their specialty, for example, sound. Participants without graduate degrees all reported that they had some expectation for knowledge about the sound-related factor.

Those participants with graduate degrees, when discussing the best possible outcomes for the sound-related factor of their projects, were more likely to express a goal specifically about noise or noise levels (e.g. achieving the lowest sound level) than participants without graduate degrees, who expressed other goals not directly related to the technical aspects of the factor (e.g. having satisfied residents). Having a graduate

degree was not, however, related to the formulation of soundscape-related goals (e.g. that the sounds of the space would be positive or appropriate). Those with graduate degrees, in all sections of the interview, were also more likely to express the indirect benefit of good outcomes for the sound-related factor and the way it benefitted relationships between other factors (e.g. good sound-related factor outcomes would lead to fewer complaints and a stronger perception of quality of life.)

For finished projects, participants were asked about what they believe could have been better with regard to the sound-related factor. Those with graduate degrees were more likely to offer a concrete suggestion specific to the factor (e.g. isolating pedestrians better from traffic noise) than those without (e.g. better project management). However, participants with graduate degrees were also slightly more likely to believe that they had already achieved the best possible solution with the project as it is.

4.5.1.1.2 Academia

In a distinct category from graduate education was a variable called “In Academia”. In academia refers to whether the participants had either pursued a PhD or were teaching university courses. This included 2 active PhD students (E1 and E7), one who had recently completed a PhD (E2) and two teaching university courses (N1 and N2). This variable was tracked because, for example, of the high expectations to interact with and easy access to academic literature and, thus, exposure to the newest methods or theories.

The group “in academia” had very different conceptualizations of sound from the rest of the participants, even from the other participants who had earned graduate degrees. For example, the conceptualization of “noise as a potential problem” is present for all of those with graduate education, but not for those in academia. Those in academia relied on other conceptualizations like “opportunity” and “workflow”. They also were less likely to have the view that their project is only affected by existing environmental noise.

All but one of those in academia ranked their sound-related factor as a high priority, which was higher than the average rate that all participants had identified sound as a high

priority. However, as was also seen with those who had a graduate education, they do not necessarily indicate a higher expectation of knowledge about sound. Also consistent with these findings, those in academia were less likely to say that their completed projects had already achieved the best solution. They saw more opportunities in plans and designs, and we thus also more likely to suggest a soundscape intervention when offered unlimited resources.

4.5.1.2 Field of study

During the interview, participants were asked to identify whether they viewed themselves as planners, designers, landscape architects, etc. These categories were not mutually exclusive nor were they defined by the interviewer. See the Section Educational background and discipline for a breakdown of these categories.

4.5.1.2.1 Planning v. non-planning

Seventeen of the 22 participants identified as “planners”, which usually meant they had either “planner” in their job title or identified some sort of university training specifically in urban planning. This category overlapped with other professional training like design in 7 of the 17 cases.

Though many planners said sound was a high or very high priority, only participants who were planners rated sound as low or average priority. There were nine participants who felt that they should know a little about their sound-related factor, however, “not in a technical way” – all nine of these participants were planners. Four of the 5 participants outside of planning said firmly that “yes”, they were expected to know about the sound-related factor. Therefore, planners as a group, also have a lower expectation for knowledge about sound.

On good and poor outcomes, planners were also less likely to believe that a poor sound outcome would be very bad or fatal to a project – 3 of 17 planners versus 3 of 5 non-planners. Only planners considered the “procedure” strategy, where procedures would

be better followed, as a best outcome for the sound-related factor. This difference is also striking in context. For planners discussing completed projects, when asked about solutions that could have been better, 6 said they had achieved the best solution already, 2 wanted better planning-related outcomes (e.g. more negotiation with developers, discouraging car transport), 1 wanted lower cost, and one wanted better decibel measurements. None of these solutions was repeated for the 5 non-planners, 3 of whom wanted better design and environmental outcomes (e.g. safer pedestrians, higher quality surrounding urban fabric, and better materials for sound absorption) and 1 of whom wanted better project management and construction. None of the non-planners had claimed that the sound-related problems had already been solved, while 6 planners did.

Planners were less likely to have considered sound on their recently completed project. Four of 5 projects by non-planners considered sound whereas 10 of the 15 projects by planners did (2 planners did not talk about previous projects). For non-planners, the sound-related outcome was more likely to play a role in their overall evaluation of a completed site. Three of 5 non-planners who discussed previous projects said it played a significant role and the remaining non-planner described how sound had played a larger role at the beginning of the project but had been largely solved. Meanwhile, only 4 of 15 planners said that sound played a strong role in their evaluation of the completed project. Non-planners (2 of 4) were much more likely than planners (1 of 15) to encounter project decision-makers that took the sound-related factor strongly into account.

For projects in progress, only planners had small or no consideration strength for the sound-related factor, though some also had normal and strong consideration strength. Non-planners all either had strong or normal consideration strength for the sound-related factor.

4.5.1.2.2 Architecture

Seven participants identified as architects. As a group, architects were no more likely to rank the sound-related factor as a high priority; however, the justification they gave in

identifying the priority was more likely to be human-centered (e.g. concerns about resident sensitivity, or a desire to have users use the space without hindrance from negative sound sources) than other participants outside of architecture, who more often identified legal or development reasons.

Regarding the good and poor outcomes, architects rarely attempted to envision a best possible outcome for sound that included a procedural component (e.g. achieving the lowest decibel level or satisfying the regulations). Instead, they focused on holistic outcomes (e.g. reducing noise that bothers people) and optimizing spatial and environmental outcomes. Two architect participants clearly expressed a soundscape goal, saying that a best outcome would be having "used acoustics to achieve your original goals" (N2) and finding a "balanced, sustainable approach [where it is] quiet when people are sleeping, good noises for shopping" (E8). However, architects were no more likely than other participants to propose a soundscape (user-centered with potential for positive outcomes) solution.

Only those who identified as architects said that the outcome for the sound-related factor made them dissatisfied. Consistent with this finding, architects also never reported that they had achieved the best solution on the past projects. All but one of the seven architects had ideas for where to use extra resources for the sound-related factor if they were given to the project. The one architect (M3) who did not think that extra resources would be useful on their project in progress was working on a new, dense housing development nearby older, less-dense housing where there were resident concerns. Also related to their projects, architects did not identify a single project where sound took a low priority.

4.5.1.2.3 Urban design

In total, 5 participants identified as urban designers. All five of these also claimed another skill like architecture or planning, consistent with the fact that there are few opportunities for degrees in urban design, as discussed in the Introduction. 3 of the 5 participants who

identified as urban designers also identified as planners while the remaining 2 identified as architects.

Both of the urban designers who were also trained in architecture said they did have a knowledge expectation about their sound-related factor. All 3 of the urban designers who also trained as planners also said they had an expectation for knowledge, but “not in a technical way”.

Regarding conceptualizations of sound, all five of these urban designers held the belief that their projects were affected only by sound sources external to their project. For best possible outcomes, all but 1 of the 5 designers identified a noise goal (e.g. achieving the lowest noise level for their project). Expressing additional best possible outcomes, the 3 planner-designers also identified following procedures (e.g. meeting regulatory goals), and 3 also identified reducing proximity between sources and receivers.

None of the designers believed they had a strong agency to change sound-related outcomes, though the 3 designer-planners believed that had a slightly stronger influence than the 2 designer-architects. When speaking on unlimited resources for the projects in progress, none of the designers proposed a soundscape solution.

4.5.1.2.4 Landscape architecture

While there were only two participants (N2, E9) with training in landscape architecture, their responses were noticeably different from the other participants. To begin, both landscape architects clearly viewed their sound-related factor as one factor in a constellation of inter-related factors. E9 explained a theory of design “layers”, where each of the factors were various layers that overlapped to make a complete (and presumably high-quality) design. The same participant quickly thought of an example for his two factors (*street furniture* and *noise*), where the orientation of a bench was related to sound-producing activities like a nearby airport that some people may find interesting and want to face and other may find annoying and not want to observe.

Both landscape architects brought up the idea of “positive” or “interesting” noises and were also more likely to express other soundscape concepts via goals for best possible outcomes. For example, N2 claimed that her sound-related factor was more than just noise, and that it was instead *noise and acoustics*, suggesting in the proceeding justification that there was the possibility for sounds that don’t have a negative valence.

Neither of the landscape architects described their projects being affected only by existing and external environmental sound sources; both provided more complex descriptions of how their projects fit within and contributed to the existing sound environment. Both landscape architects also gave reasons for considering sound that included elements of the soundscape approach. N2 claimed that if you can’t have a conversation of read a book, people won’t want to use the space; this is related to the activity approach and the identification of “appropriate” soundscapes. She also claimed that poor outcomes for sound can be bad for nearby businesses:

> “if you can’t have a conversation in a public open space, then you don’t really want to be there...if you can’t read a book, or if you can’t just have some quiet, it’s a problem. And then the other issue is, if there’s too much noise happening in an open space, and there are too many voices reverberating around, maybe that’s having a bad impact on the neighboring businesses” (N2).

E9 also spoke on soundscape concepts, but more to the point that different people can perceive the same sounds differently. He explained that he installed multiple seating options because while airplanes were visible and audible from the project site, some people would enjoy the experience of paying them attention and others would want to try to ignore the planes and orient themselves away from the sight and sound.

Both had strongly negative views of poor outcomes for sound and proposed that physical interventions would be necessary to correct the problem. More importantly, for both landscape architects, poor outcomes referred to negative user experiences rather than poor physical measurement outcomes. N2 spoke on the importance of reducing the

impact of “negative” noises, and E9, the only participant to mention it, said that a Post-Occupancy Evaluation (POE) would give insight to the cause of and solution for the poor outcome. The user-centered focus also reappeared in descriptions of best outcomes. N2 linked best outcomes for sound to meeting goals for the space, whether it be lowering noise levels or “making something good for music.”

Both landscape architects also proposed advanced intervention techniques for dealing with sound rather than stressing the importance of sound measurement – E9 proposed changing materials, like using grass underneath a streetcar line; N2 proposed creating a “quiet zone” and, in the context of unlimited resources, using “landscape architectural” solutions (e.g. earthen barriers) to reduce the impacts of negative sounds on neighbors.

4.5.1.3 Years of experience

For this analysis, responses were sorted by years of experience. The median experience level was 15 years. Some analyses required categories, in this case, they were generally divided above and below the 15-year median. Unsurprisingly, the number of years of experience was related to the management level, such that often, those who had worked longer had achieved higher positions.

Among the more salient findings was a link between experience and attention to various aspects of the sound-related factor. Participants with more years of experience were more likely to think that a poor outcome for the sound-related factor would be bad for the project as a whole. Similarly, those with more experience were much more likely to identify the sound-related factor as being at the highest priority level. The same experienced participants were also slightly more likely to identify a good outcome as one that followed procedures (e.g. meet the legally required sound levels).

For justification on why the sound-related factor is a high or very high priority, less experienced participants gave justifications related to the annoyance caused by loud sounds, a need to meet regulations, and a general problem of environmental pollutants. More experienced participants instead emphasized a desire for strong project outcomes,

wanting to achieve user satisfaction, and the importance of the health of the company or organization (e.g. avoiding lawsuits).

Only the most experienced participants (those with more than 16 years) claimed that they were not expected to know anything about the sound-related factor. While this may have implied a stronger reliance on consultants and other experts with experience, there was not enough information to confirm this relationship. Despite not believing they had a stronger knowledge expectation, participants above the median experience level were slightly more likely to perceive that they had be a strong agency to change sound outcomes.

For completed projects, none of the participants above the median experience level rated the sound-related considerations as having been low priority – the lowest was medium. Less experienced participants were the only ones who claimed sound had a low priority.

Participants with fewer years of experience never identified being dissatisfied with the outcome. However, curiously, more experienced participants were more likely to say that their budget for dealing with the sound-related factor was inflexible, such that “unlimited resources” would not be hypothetical because sound-related issues must be solved.

4.5.2 Place-dependent variables

Participants also varied markedly according to the location of their education and work, both by individual country as well as continent. In all cases except two, the majority of the participants’ work took place in the same place as their training. E5, trained working in the Netherlands used a project taking place in Russia as one of the projects in context, but also worked most frequently in the Netherlands. E9, a planner trained in the Netherlands had been working only on a project taking place in Canada for the previous few years. Besides these two participants, no attempt is made to differentiate the location of their training and work because it was usually the same.

The differences, especially between European and North American participants, begin almost immediately in the interviews at the listing of factors. North American participants typically didn't consider sound part of a hierarchy of factors, whereas those in Europe typically did. If a participant in Europe thought of their sound-related factor as a sub-factor of something else, it was most likely environmental.

Participants trained in Europe were more likely to have a graduate education (9 of 12) than in North America. Regarding the field of training, there are small differences between countries. It remains unclear what is a result of sampling, inconsistent translations and correspondences between job and training titles in each country, and a small number of participants, relatively speaking, from each country. All Belgian participants simultaneously had planning and architecture training. None of the European participants claimed to have training in design, except E9 (the Dutch planner in Toronto) who also had experience in landscape architecture. Though similar recruitment techniques were used on both continents, the backgrounds of the North American participants were much more diverse in terms of job title and placement.

Country and continent had a strong influence on conceptualizations of the sound-related factor. Only in Belgium did participants say that the priority of the sound-related factor was low. For all other countries, this priority was medium or high (or "it depends"). Only planners working in Europe said that they weren't expected to have any knowledge of noise (including E9); all North American participants believed that they had at least a minimal expectation of knowledge on their sound-related factor. The idea that individual projects are affected only by external noise persisted most strongly in the Netherlands and Canada.

All three participants from New York justified their priority rating for sound by using an activity-centered justification, such as how office and retail users are less sensitive than residents (N1), adjusting the environment to be appropriate (acoustically) for conversations or book reading (N2), and mitigating noise only for highway projects, otherwise capitalizing on "good noise" and "encouraging lingering" (N3). Participants

outside of New York only gave activity-centered justifications in a small number of cases (E8 differentiating highways and pedestrian streets; M7 suggesting that a poor outcome will negatively affect programmed activities).

When talking about evaluating poor outcomes for sound, there was no relationship between the perceived magnitude of the problem and the location of the participant; however, European planners, especially in Germany, tended toward more specific actions they would take if they perceived something were wrong. For example, E3 would make agreements with the developer to spend more resources on the issue and E2 would change local land uses to match noise criteria (e.g. adjusting the zoning for less sensitive users). In Montreal, for example, M6 said that there was "not much that could be done" in the case of a poor outcome. However, these differences can likely be explained by the way these different PBEs are required to deal with their sound-related factor. For German participants, likely, advance modeling would predict that they would be in violation of a regulation, which can also be addressed in advance; in Montreal, a poor outcome would likely be nearby residents registering complaining about sounds that annoy them, which is too late for many interventions. For good outcomes, New York participants were much more likely to mention soundscape goals than other participants. European participants were more likely to express an urban goal.

Differences between country and continent were also observed on the projects in context. In total, there were six completed projects where the sound-related factor was not considered (E1, E5, E7, E8, M4, M5); 2 in the Netherlands, 2 in Belgium, and 2 in Montreal. Among those 6 projects, the 2 from the Netherlands had very specific reasons for not considering sound – in one, a highway was being placed underground and the funding for the project came about because sound levels from the highway had far exceeded legal limits in the pre-intervention, status quo condition (E1), and in the other case, because a plan was a transportation master plan offered in consultation to a city where noise was not part of the mandate (E5). The remaining projects left out sound-related considerations as part of a more systemic avoidance of the factor.

Interestingly, participants in North America were much more likely to consider a poor sound-related outcome to be detrimental to a whole project. All 3 participants in the Netherlands who discussed the sound-related aspects of a project in progress said that the outcome for the sound-related factor would not influence how they viewed the whole project. Of the two participants in Belgium who believed there was an influence, they both reported that it would only have a very small weight in their evaluation. Only E3&4 in Germany said that the sound factor had an influence on their evaluation because they were proud of the way they had resolved that factor in a recent episode. Meanwhile, five participants in North America said the sound related factor was important in their overall evaluation of a whole project (N2, New York; M2, M3, M7, Montreal; and E9, Toronto). Only one in North America (M4, Montreal) claimed it did not play a role. Along the same lines, participants in Europe were more likely to be satisfied with the sound-related outcome and also more likely to believe they had achieved the best possible outcome; this is likely related to the idea that if it didn't play a large role in their evaluation of the whole project, they didn't have a large stake in that particular outcome. While there were four participants in Europe who believed they had achieved the best possible outcome (all German planners, E2, E3&4, and one Dutch planner, P3) only 2 in Montreal believed the same (M1 and M2). Two North American participants were not satisfied with their sound-related outcomes (N1, M3) and one was neutral (M1) while only one participant in Europe had an outcome they believed was not entirely positive ("yes and no", E6).

For projects in progress, only three participants had claimed their sound-related factor was not playing any sort of role. Two of these were in the Netherlands (E1, E5) and one was in New York (N3). Of the 2 participants in the Netherlands, neither had specific strategies for addressing the sound-related factor in the case that they had extra resources while the participant in New York detailed a soundscape plan that included accentuating natural, positive sounds like sea sounds.

Interestingly, the idea that sound was being considered because it was a part of the standard workflow was more common with North American participants, especially in

Montreal. This is slightly in conflict with the relatively low agency perceived by North American participants to address poor outcomes in the conceptualization section.

4.5.3 Organizational variables

4.5.3.1 Size

Organization size was split between small, medium, large, and other. In almost all the largest organizations, the priority level of the sound-related factor was in the category of "high sometimes", whereas for smaller organizations, it was more likely to be identified as either a very high or a low priority. Similarly, in the smallest organizations, participants were more likely to report a firm yes or no with regards to their expectation for knowledge about sound, whereas for the largest organizations, participants generally reported that they should have some working knowledge but "not in a technical way". Best outcomes for sound were a matter of following "procedure" for participants from the largest organizations only.

4.5.3.2 Sector

Participants were categorized based on whether they belonged to the public sector or private sector. 14 of the participants were in the public sector, 7 were in the private sector, and 1 (E6) was in an innovative public-private partnership that does much of the planning and design work for a particular city, and thus, difficult to categorize. E6 will be omitted from this analysis.

The largest difference between these two groups of participants was that the public-sector employees only ever worked on projects in their administrative area, while the private-sector employees could take on work in distant cities. Private-sector employees were much more likely to have experience in architecture and less experience in planning while public-sector participants were almost uniformly trained in planning. Both participants who were landscape architects worked in the private sector.

Sector-based conceptualizations varied less than they did in other analysis like location and training. Among the conceptualization differences that persisted, user-centered themes (e.g. satisfaction, activities) were slightly more likely to emerge with private-sector participants, especially when describing best possible outcomes. None of the other sound-related conceptualizations were observably different except, interestingly, that private sector participants were slightly less likely to feel that they had an agency to change sound-related outcomes.

In the contextualization section on recently completed projects, private sector participants were more likely to say that the sound-related outcome had an effect on their overall evaluation of the project. Six of the 7 private sector employees believed this to be the case (except E5), while only 9 of the 14 public sector employees did (except E1, E2, E7, P3, and M4). None of the private sector participants felt they had achieved the best solution on their completed projects and none of them felt that everything had already been solved on their projects in progress.

4.5.3.3 Management level

As discussed earlier, in a departure from the literature due to a lack of precedents dealing with participants from multiple responsibilities within a company, participants were put into three categories of management level: executive, manager, and employee. This analysis is distinct from the analysis of years of experience; there was only a mild relationship between management level and years of experience.

Conceptualizations do not vary strongly across management levels, but prioritization and justifications do. Managers, more than executives or employees, were likely to consider the sound-related factor a high priority. Executives and managers were more likely to think about users as a reason to justify the priority of sound, whereas employees were more likely to focus on rules such as sound level regulations.

Of the three executives, two had strong negative reactions to the possibility of poor outcomes, perhaps due to their relationship to the organization – a poor outcome would

be bad for business or their reputation. Managers had a similarly strong reaction to negative outcomes, whereas employees were less concerned. Among employees, some suggested that poor outcomes wouldn't be their problem to deal with (M4), that not every problem can be solved (M2), or that a negative outcome for sound would still constitute a good project (E7, M7, N3).

For completed projects, only employees felt that the outcome for the sound-related factor did not play a role in determining whether a project was good; this is consistent with their evaluations from the conceptualization section. In line with the lower assigned importance, employees were also more likely to be satisfied with the sound-related outcome. Lastly, besides one manager (a "team leader", E3), only participants who were employees suggested that the best outcome had already been achieved in their completed projects and could not suggest improvements. The small number (3) of employees who did suggest possible better outcomes for their previous projects offered: better environmental conditions, namely that the existing sound environment should have been better from the beginning (M7), lower costs (P2), and better measurements (N3).

For projects in progress, none of the executives suggested that all of the sound-related problems had been solved (i.e. they would certainly make use of more or unlimited resources). All 3 of them would have directed those resources towards user-centered interventions.

4.6 Information sources and tools

Participants were asked to name the information sources ("including informal sources like people") that they use to inform themselves on a topic (Q40) as well as software and online tools perceived as helpful (Q43). Based on their responses, participants largely did not differentiate between sources and tools, using the terms interchangeably. For example, many tools that were named were actually information sources, like online repositories for regulatory information. As a result, these two questions have been

analyzed together and, while the distinction is made between sources and tools here in this analysis, they may have been provided as one or the other.

Among the sources that were listed, they fell largely into three categories: people, media, and institutional learning. Within the people category, there were two subcategories based on whether the information source was a professional or a user or client of the space where a project takes place. The professional subcategory included internal experts, most frequently specialist colleagues, and less commonly, interning researchers or students. The professional subcategory also included external experts, which was made up of personal networks, advice organizations, and consultants. Personal networks were professional connections accumulated by the participants who held similar positions in other locations. People who listed this type of information source were most often working for small organizations that did not have the resources for internal experts. Personal networks were used in hopes that someone else had encountered and solved similar issues in the past and could offer advice. Curiously, while all 22 participants claimed to have access to consultants, only four of them listed consultants as information sources. In the subcategory of user, two participants listed the community (i.e. “citizens” or “the public”) as information sources, likely referring to the importance of speaking to them to understand their local needs. Only one participant mentioned clients as information sources.

Within the media category, the most frequently identified source of information was “the internet”, at 15 participants. While the webpages of the internet may overlap as sources with some of the other identified sources (e.g. legal documents, advice organizations), the internet was explicitly named in that many cases. The participants also relied heavily on trade media, which were collected both individually and by their departments. Other media sources included legal documents and manufacturer websites. One participant working for a large multi-national corporation relied on well curated network files.

In the institutional learning category, 7 participants listed the library, which some explicitly noted carried important locally relevant documents, like historic blueprints. Five

participants mentioned courses and two mentioned schooling (these were the two currently working on their PhDs). Lastly, one participant from Finland described site visits to other cities, including internationally, organized and paid by her workplace as an important source of information.

The sources identified by participants are listed and categorized in Table 3. A broad number and type of helpful workplace tools were identified. The most frequently mentioned of these was on-line governmental (or internal) information viewers. Ten participants mentioned tools including organized repositories offering, for example, legal summaries (e.g. Quebec's MAMOT), government-hosted satellite images, geomatic information, cadastres, and other maps. Nearly as frequently mentioned as these government sources was also Google Maps. In a telling example, participants who spoke with me nearby their computers more often showed me their projects or other example spaces using Google Maps than any other format, due probably in part to its ease of use. Google (i.e. web search) and all of its associated tools and services were identified as tools by 7 participants. Seven participants also mentioned traditional office software as tools (e.g. Microsoft Word). Five participants named external guides, for example, those created by specialist organizations on specific topics, as tools.

The remaining tools identified were quite domain specific. 6 participants identified visualization and image manipulation software (e.g. Photoshop). Six also identified GIS viewing software (e.g. ArcGIS, QGIS). Less frequently identified were static image viewing software (3), geographic information manipulation software (2), and a traffic simulation tool (1).

Table 3: Information sources by category and number of participants having reported using them

Media (40)			*Web pages ("internet") (15)*
			Departmental media (electronic and print) (11)
			Personal media (electronic and print) (8)
			Legal documents/Acts/Guidelines (4)
			Manufacturer websites (1)
			Network files ("intranet") (1)
People/ Social (37)	Professional	Experts - Internal	Specialist colleagues (14)
			Researchers, students, interns (3)
		Experts - External	Personal networks (9)
			Advice organizations (4)
			Consultants (4)
	User		Citizens/public (2)
			Clients (1)
Institutional Learning (15)			Library (7)
			Courses (5)
			Schooling (PhD) (2)
			Site visits (1)

4.6.1 Use of and attitudes toward academic sources

Academic sources of information, like articles written by researchers in scholarly journals, was a particular concern for this study as so much of the literature on acoustics as well as soundscape is found in this format. Given the focus, it was important to understand not only whether academic sources are accessed, but what the attitudes towards these

sources is. As such, if academic information sources were not explicitly listed, then participants were asked if they used them (Q41). Following that, all participants were asked how they felt about these types of sources (Q42).

In total, 7 participants said, yes, they used academic research in their work. The factors that led to this use were fairly focused. For 4 of the participants, it likely stemmed from their exposure to academia – not coincidentally, these were 4 of the same 5 participants who were part of the *in academia* variable identified earlier that drove different soundscape conceptualizations. Of these 5, 2 were currently working on their doctoral degrees (E1, E7), one was actively teaching a university course (N2), and one had already completed a PhD (E2). Of those that were not involved in advanced research degrees or academic teaching, two worked for a large private company with many resources and brought a specific technical focus to the organization (E5 – transportation; E9 – landscape architecture), and one was the lead of a small, innovative, and well-funded firm (E6). Of those that said yes, none were from Montreal and all had achieved at least a master's degree. While yes was the most common response, it is worth considering that they may not wish to report to an academic researcher that they don't read academic sources. The remaining participant from the *in academia* group, N1, who did not say yes had achieved a very high executive position in a large company and, presumably, did not have the time or need to specifically access information from academic papers.

The other responses to whether participants ever looked at academic research were "sometimes" (4), "rarely" (3), and "no" or "never" (5). Among the participants who said they sometimes looked at academic literature was N1, whose response is reproduced in full:

> "Typically, I don't find what I'm looking for. We have a real problem in that there's just not been enough work in developing technical metrics and measures for these kinds of placemaking considerations. If you can't tell, most of our work is intuitive, anecdotal, not really based in a technical process. I totally understand. It's kind of like, if somebody put a red dot here instead of a blue dot, would that change our

> recommendation, no probably not. So, it's sort of like the red and blue dot exercise is more about having the public feel engaged that trying to create a sense of ownership. It's more campaigning than it is technical inputs. Personally, I would prefer to [access studies]; if they did exist, I would feel very comfortable and rely on them, lean on them very regularly. But the state of the research is pretty juvenile at this point."

Other participants who only occasionally or rarely look at research said it can be difficult to search, but if they "happen upon it" they will read it (M2, M3, M4). M7, on the other hand, claims that it does not occur to her to go looking for it.

Regarding attitude towards these sources, there were positive assessments indicating why they do access those resources and negative assessments indicating why they do not access those resources. Some of these attitudes fell into distinct categories.

Attitudes associated with a positive assessment included: that they have a respect for academic sources (6), that they do use academic sources and do apply it to their work (3), that they encounter academic sources via collaborations and interns (3), or conferences (2), or infrequently, that is necessary for their work (2).

Attitudes associated with a negative assessment included that they know about academic sources, but do not find them useful (11), that they have limited resources and do not have time to look for academic sources (6), that accessing the sources is not easy (5), that they do read academic sources but do not find them helpful (4), that it is not their responsibility (3), and that they don't know much about using academic sources (2).

Peculiarly, one participant, a manager of a large project, rather than specifying whether they use academic research suggested only that their project would eventually become an object of academic study in the future and not that they would be responsible for looking at academic research.

5 Discussion

This Discussion summarizes the main findings from the Results Section and situates those findings within the literature. The section is organized such that a brief review of the conceptualizations identified in the results chapter is given, followed by a comparison of those results with the strategies identified in the Literature Review. For each of the identified conceptualizations, the assumptions that led to these conceptualizations are identified and explained. For each assumption, a discussion is presented in the context of past literature when it exists. Information behaviors of the PBEs from this study are also discussed. This section is followed by an analysis of each the variables identified in the results affecting conceptualizations with a simultaneous discussion on those variables in the context of information behavior. The chapter ends with implications for connecting PBEs with soundscape research and a presentation of the limitations and credibility of the study.

5.1 Summary of sound conceptualizations

Our results indicated that, while some PBEs were using aspects of the soundscape approach, none were using it explicitly and none had heard of it beyond name. While the previous literature had identified two major strategies for dealing with sound (e.g. environmental noise v. soundscape design), the results instead showed four major conceptualizations of sound-related factors, differing primarily in the extent to which they

Table 4: Label, title, and sample quotation for each of the four identified conceptualizations

Label	Title	Sample Quotation
C1	Noise as level	"For the noise calculations, we actually need an expert from outside the municipality. So that's a consultant from an acoustic firm, for example, and we give them the plans and they will calculate the noise levels at different hours and with different plans. For example, if it works with a 4-storey building or if it can be just 2-storey. And they also give ideas for what we can put in the detailed plan description. What we described, for example, what sort of noise levels have to be taken into account in this area. And that depends what sort of construction you can have in the windows." (P2)
C2	Sound as mediation	"[The best possible outcome is] that everybody's happy. I have …neighbors who will say, 'oh it doesn't bother me this time' but because they don't like the neighbor…They hate the neighbor, so nothing is going solve the problem anyway." (M5)
C3	Noise as environmental pollutant	"We also had this *home improvement store* (*Baumarkt* from German)…It was a really big building, and it was placed into an area where the pollution and noise indices were exceeded. And normally this would have been the end of planning for us, [but] we fixed some regulations in the new plan. We fixed an agreement, that the neighbors get new windows. And we also fixed the materials of the facades in the agreement, so that we can manage the noise problem. Otherwise, we wouldn't get the land-use plan approved by the higher administration." (E3&4)
C4	Sound as opportunity	"What's the best possible outcome? That you've managed the acoustics to achieve whatever goals you set at the beginning of the project, and that's very vague, but you know, acoustics can mean lowering the noise or they can mean creating a place that's really good for projecting noise or music…So it depends on your criteria." (N2)

interact with other factors. These conceptualizations were: **C1: Noise as level, C2: Sound** have been summarized with example quotations in Table 4.

There are many assumptions that make up each of these conceptualizations, which are primarily discussed in the section Assumptions supporting the four conceptualizations. However, it is worth clarifying one point now concerning the names chosen for each of the conceptualizations. The focus on measurement instead of the content or experience of the sound sources by users, as well as the implicit assumption of its *unwantedness* is primarily the reason the word "noise" is used to name conceptualizations 1 and 3. "Sound" was chosen for conceptualizations 2 and 4 because some other aspect of the sound besides its pressure level, such as its ability to encourage lingering, plays a strong role in determining how it is problematized; for Conceptualization 2, rather than being unanimously unwanted, some sounds arise from positive social interactions and are negative only for particular others. For example, with *sound as mediation*, there may be an issue between a resident and a nearby bar. From the city's perspective, the bar may be an important resource for employment, culture, and other objectives, thus its existence as a source is acknowledged to be positive in some contexts, whether or not the neighbor agrees.

5.1.1 Situating the conceptualizations within larger strategies for handling sound

While these four conceptualizations emerged from an inductive analysis of the interviews, when compared with the open soundscape research questions (identified in the Literature review) there is an interpretation that situates them well. Namely, Bild et al. (2016) performed a review study of published research on sound and the built environment that identified two dominant strategies guiding urban practice and policy. These strategies are the *environmental noise management strategy* (ENM) and the *soundscape design strategy* (SSD). While both strategies are rooted in promoting

> "human well-being, the differences between them arise from their opposing conceptualizations of sound. ENM focuses on sound as a waste that must be managed to protect users of spaces from its deleterious effects. Contrastingly, SSD addresses sound as a resource…" (p. 6).

While some underlying themes for each strategy are identified by Bild et al., particularly regarding the way that users of the space are viewed, the review does not further specify what concepts might make up these strategies.

In a moment, I will make the case that the combination of C1, C2, and C3 comprise the environmental noise management strategy, roughly a description of the status quo. While I have previously acknowledged the way the C2 (sound as mediation) has the potential for positive outcomes and, thus, potentially don't belong in a grouping with the two "noise conceptualizations", the reasons for including it in the environmental noise strategy have some history in the literature. Bijsterveld (2008) explains with thorough historical research that

> "Experts and politicians increasingly promised to control noise by measuring and maximizing sound levels. Yet they defined some problems, such as neighborly noise, as difficult to capture in quantitative terms, and left it up to citizens to talk their neighbors into tranquil behavior, while wrapping other issues, such as aircraft noise, in formulas beyond citizens' reach. Citizens have thereby been made responsible for dealing with the most slippery forms of noise abatement and distanced from the most tangible ones" (pp. 3-4).

Bijsterveld seems to suggest that this *neighborly noise* is not necessarily valued by PBEs for its qualities, it is simply more complicated than other types of urban noise to characterize and work with.

The proposed grouping of these conceptualizations such that the SDD strategy extends the ENM strategy is as such: the first three conceptualizations (C1, C2, C3) treat sound as a waste that must be managed thus it is the *environmental noise management strategy*; while the combination of the four conceptualizations together would constitute roughly a *soundscape design strategy*, where sound can be a *resource*, dependent on the context of the sound (see Figure 3). In the *soundscape design strategy*, some sounds can also be

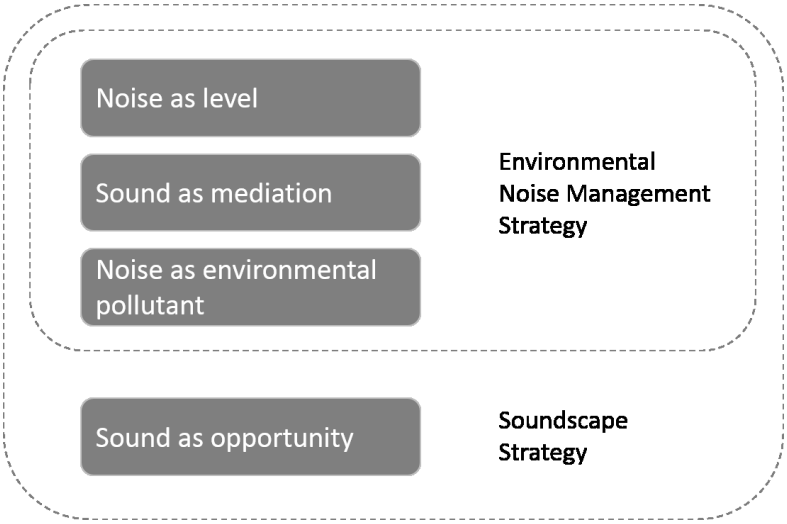

Figure 3: The four emergent conceptualizations about sound are placed into the Bild et al. (2016) framework of opposing strategies.

polluting or harmful, but many can also be pleasant, welcoming, orienting, and so on. The rare circumstances that led to PBEs using C4 make sense in the context of the way they were likely trained, will be discussed throughout this document. The rest of this chapter will touch on the reasons that C1, C2, and C3 are considered to treat sound as a waste, and Section 4 will introduce some of the historical aspects of treatment of sound that helped to shape this interpretation of the findings.

The discussion that follows will explore how these strategies and conceptualizations may have reached their current state to be used by the participants and PBEs at large. In using the word "design" as opposed to "management" in naming the SDD, Bild et al. hint at the notion of intentionality. However, the present study wishes to contradict the notion that the *soundscape design strategy* is necessarily opposed to the *environmental noise management strategy*; instead, one (SDD) can be viewed as an extension of the other (ENM). While identifying these strategies has been a significant theoretical advance in soundscape research, reframing them as an extension could lead to a more practical advance for those trying to bring soundscape research to the built environment, a pressing need that was described in the Introduction section: Noise, sound, and soundscape research. This reframing is supported by the data from the present study and

will be described in detail throughout this chapter. Primarily, participants who used the C4 (sound as opportunity) conceptualization used it in parallel with at least one of the other conceptualizations.

5.1.2 Originating the conceptualizations

It is worth postulating what resources may have helped contribute to the formation of the different conceptualizations. A literature review determined that "Incorporation of auditory issues in urban planning and design practice beyond the ENM strategy is not standardized, sound being considered mainly as a waste and not as a resource" (Bild et al., 2016, p.9). Confirming this finding is the frequency of the C1, C2, and C3 conceptualizations found in the present dataset.

These first three conceptualizations are consistent with what may be expected from urban planning textbooks reviewed as examples in the Literature Review section "City Makers" as soundscape actors. Specifically, the two short pages from the Lynch et al. (1984) textbook[47] on only decibels, attenuation, and noise barriers would lead to a C1 conceptualization (*noise as level*). This is because the only property of the sound source discussed is its sound level. No property of the user is mentioned and no type of sound source that wouldn't require attenuation is introduced.

Some other education sources for PBEs lead to the C2 conceptualization: *sound as mediation*. The more recent example of Riddell's (2008) textbook spoke of how increasing urban density leads to "degradation in the sonic dimension". This is considered *sound as mediation* for a few reasons: 1) there is an understood relationship with sound and another factor, in this case, density; 2) the use of the word "degradation" as opposed to, for example, "noisy" suggests conflict; 3) there is a suggestion that the PBE's task is to mediate the issue of sound degradation while promoting a factor like density. Within this

[47] The text, called "Site Planning" is listed by planning.org as one of the 100 Essential Books of Planning. One of fourteen chapters in this text is called "Light, Noise, and Air". The section on noise fits on two and one-half pages.

conceptualization, participants always gave project-based examples of mediation. The explanation for this may be that no known educational material for PBEs addresses ways to deal with mediating sound-related issues, like sharing information, negotiating mediations, or holding public consultations. The use of these methods would potentially be learned and borrowed from their training in other factors.

Material that leads to the C3 conceptualization (*noise as environmental pollutant*) is also commonplace and can even be found alongside material pointing toward other conceptualizations. In the same textbook (Riddell, 2008), other references to the sound-related factor where using the words “noise” or “noise pollution” in a list alongside other types of pollution like air and soil, reinforcing the conceptualization. In this case, the *unwantedness* (e.g. Bijsterveld, 2008) of sound was an unquestioned assumption. Yet, in the justifications for reducing “noise pollution” was a complex interrelatedness to other factors, particularly those of the user experience, like “quality of life”. The text by Steiner and Steiner et al. (2012) put the only sub-chapter on noise in the *Environmental Planning and Management: Hazards* chapter, reinforcing its potential to be an environmental pollutant.

As discussed in the Literature review, literature supporting C4 (*sound as opportunity*) intended directly for the PBE audience was sparse. While there were a few resources that called for stronger consideration of sound in general, like Pallasmaa (2012), the resources offering practical guidance to PBEs were much more limited, a finding supported by Cerwen (2017), who exhaustively searched the landscape architecture literature since the 1960s. This trend is changing, however, with a few efforts from soundscape researchers to produce practical guides. One such guide is the “Good practice guide for quiet areas” (2014), published by the European Environment Agency and the multiple research-to-practice efforts led by soundscape researchers, such as SONORUS and HOSANNA, discussed in the Review section Known projects in soundscape application.

5.1.3 Using the conceptualizations

This section is concerned with the way the participants used their conceptualizations to describe sound in their work. First, the data itself justified the naming convention used for C4, and which may be found to be in opposition to the literature. While there is a growing tradition of calling this *positive sound* conceptualization "sound as a resource", juxtaposing it with "sound as a waste" (COST TUD Action TD-0804, Schulte-Fortkamp & Kang, 2010, *inter alios*), I have chosen the label *sound as opportunity* for C4 for two reasons. The first is that the descriptions used by participants treated these types of considerations more as opportunities than resources (e.g. "I want people to be able to have a conversation", N2). The other reason is to minimize the potential that readers will treat *sound as opportunity* with *noise as environmental pollutants* as opposites. Using "resource" may suggest that these conceptualizations are at odds, when that was not the case for participants.

Participants relied on one conceptualization or another in various contexts that call for them. The extent to which they used a particular conceptualization depended on where they were trained, their level of education, which profession they identified with, years of experience, their management level, the size of their organization and whether it was public or private. These individual, organizational and place-dependent variables were identified in the Results section *Variables affecting conceptualizations* but are discussed in further detail in the context of the literature below both in relation to the sound-related factor and professionals' information behavior more broadly.

To some extent, participants even used more than one conceptualization at a time – they switched over the course of the interview based on the contexts of projects that they were discussing[48]. Without the context of a real project, one participant even used two

[48] Because many participants used anecdotes to relate sound concepts, there were many more projects discussed than the two that were a part of the second half of the interview.

simultaneous conceptualizations (1 and 2) when explaining general considerations about noise:

> "they say that you should keep a 40 dBA level in order to live quietly and healthy. But the ambient noise, even at night is 50. So, we have a bylaw saying that if you…[exceed] the ambient noise by 5 dBA…, you create a nuisance…So we have certain control but it's not easy to apply. I can tell you that even if we measure at 4 or 3 dBA, the neighbor will still complain…. People are living in cities, so what you're facing is needs and complaints about the fact that they are at home, they want to have a certain level of quietness, they want to have a certain level of peace" (M3).

In another story, the same two conceptualizations were at conflict with one another:

> "I had a fight between 2 neighbors that was really…bad…between two neighbors. One guy installed a heat pump and a pool heater. The pool heater, I made him insulate and ventilate all to his side …The reverberations were just way too high,…the bricks were really throwing the noise over…He said come over now and take a reading…I think I was over at his house 4 times that day and he'd [change] something and say 'come now' and I'd go over with my machine and I'd stand there and I'd take a reading. So, he'd put one of the panels on the wall…It reduced the noise completely. But the neighbor was never going to be happy in his house. So…he made a big complaint, he was suing the city. The new heat pump with all the barriers that he installed, it met the bylaw. I couldn't do anything legally; that was it. My part was done, but the person kept saying that it was ridiculous, that we should have more severe bylaws, and, in the end, the mayor said, 'hire a consultant'. Even if it's to help him figure out a solution for him. So, I called the consultant. He came and looked at this installation, and then he went and asked them, when he met them he was going to come and take readings in their house…and when he walked in he said…they had nothing. They had no carpet. They had nothing on the windows. Nothing, even talking, you had an echo because

> they didn't have a lot of furniture in the house. So, the noise was coming in and they didn't have an air conditioning, so they had their windows open and the noise was just bouncing around. He was saying, they need a lot of things in their house. Tapestries…. Like the consultant said to me, they're never going to be happy" (M5).

The idea that PBEs use multiple simultaneous conceptualizations of the sound-related factor was addressed by Raimbault and Dubois (2005). During their interview study they found that PBEs said both "too much noise is annoying" but also, "noise is life." While they describe this switching of conceptualizations as "ambivalence" (p. 344), the present study suggests instead that various assumptions, revealed by the above quotations, actually comprise multiple conceptualizations that are applied based on training, projects, and other variables. These composite assumptions warrant further discussion. On the other hand, Raimbault and Dubois (ibid) also describe as a "lack of consensual description: …a vocabulary to take stock of urban situations with regard to sound." This is supported by the present study, for example, the looking at the diversity of names given to the sound-related factor (e.g. "noise and vibration", "noise quality", "noise").

5.2 Assumptions supporting the four conceptualizations

In the Results chapter, the four conceptualizations were built up from many concepts discussed throughout the interview. These concepts have been re-examined here and formulated as assumptions. These assumptions are compared against the four conceptualizations to better demonstrate what differentiates the conceptualizations from each other. The assumptions have been grouped into three categories: assumptions

Category		Themes	Conceptualizations			
			C1: Level	C2: Mediation	C3: Environmental pollutant	C4: Opportunity
Category	Sound	*Sound outcomes for PBEs*	Less negative	Less negative	Less negative	Positive
		Good solution	Below limit	No complaints	No noise	Complex
		Noise is external to the project	Yes	No	Yes	No
		Importance of Sound Level	High	Moderate	High	According to context
		Reason to consider sound	Solve a problem	Solve a problem	Improve the project	Improve the project
	User	*Users are considered*	No	Yes	Indirectly	Yes
		Users can experience positive outcomes	No	Yes	No	Yes
	Working with sound	*Sound is interrelated with other factors*	No	Somewhat	Yes	Yes
		Agency for change	Low	High	Moderate	High
		Problem can be…	Solved	Addressed	Addressed	Addressed
		Priority	Moderate	High	High	According to context

Table 5: Assumptions supporting the four conceptualizations, categorized by whether the assumption is made about the sound itself, the user, or the experience of working on the sound-related factor

about sound (in terms of the acoustical phenomena), assumptions about the user, and assumptions about working with the sound-related factor. These are presented first in Table 5, and are discussed by category in the sections that follow. Comparisons to the literature are made when it is available and relevant comparisons to the other factors are made when they demonstrate sufficient agreement or disagreement.

This first category deals with the assumptions made about the sound itself or its direct contribution to a project. These assumptions were derived principally from the interview guide questions 3.6, 4.2.2, and 5.2.2 from Appendix Section 8.1 Interview guide, specifically: “What is the best possible outcome?”, “Are you happy with this specific outcome?” and “What could have been better?”, and “If you had unlimited resources to work on this particular issue, in a perfect world, what would the outcome be?”

The first assumption concerns the overall approach to the sound factor, whether working towards an outcome reduces the risk from negative impacts or increases the positive impacts of the project. For conceptualizations 1, 2, and 3, it was the former - a reduction of negative impacts. For Conceptualization 1, this goal is to achieve the absence of decibels exceeding the sound level limits that would require intervention; for

Conceptualization 2, the goal is to reduce noise complaints; for Conceptualization 3, the goal is to reduce pollution that negatively affects the quality of life of users. However, Conceptualization 4 uniquely considers the idea that sounds themselves could have a positive impact or support positive outcomes. Examples of this conceptualization were not as pervasive as others throughout the interview, and they were often presented as *common-sense* solutions:

> "Well one of the issues with noise also is that noise is something very, on the one hand, objective, you can measure it, but one the other hand very subjective, because your attitude towards noise can be very different. So, we already made some measurements of noise at the seaside, if it's quite windy, the noise level is very high there. But everyone who is living at the seaside doesn't care. But you have objectively, a noise level that's higher than along the highway. The sea is making a lot of noise, the wind is making a lot of noise. If you're living near to an area where you have some high trees and there is a lot of wind, they are making a lot of noise. Birds can make a lot of noise in May, April, at quite early in the morning, and the noise level is higher than that of a plane that's landing. But that noise, we don't care. We think it's not disturbing us. The other one is disturbing. So that's another one of the aspects of noise that's quite difficult. A very low level of noise can be irritating if someone takes, gets in his mind and it's taking attention to it. Then even almost no noise can be irritating. That's one of the discussions we often have also with people, who says, "oh that's very annoying" and the other says "I even don't hear it." But we have some kind of mental filter to noise that can be different" (E6).

This assumption was previously explored by Raimbault and Dubois (2005), who identified that sound was commonly treated by PBEs as something that should be less negative without being necessarily more positive. But this analysis has gone further by describing these assumptions systematically.

Support from the literature on the positive impacts of sound in the built environment is scant. While the academic literature tends to evaluate existing interventions, diminishingly few literature sources aimed at PBEs address the possibility. Zumthor (2006), for example, discussed in the Literature review, is abstract and offers little practical advice. Even the pioneering *Good Practice Guide for Quiet Areas* (2014) defines quiet areas as having the absence of disruptive sounds that would affect activities appropriate for a quiet zone, rather than promoting positive sources.

Another common concept that emerged was how often a project was under threat from external noise sources, specifically with Conceptualizations 1 and 3. Perceiving a project as being under threat from outside noise was identified through the use of words like "protect", "shield", and words related to distance (e.g. "close to a highway", "adjacent to [noise source]"). If a proposed project was perceived to also make its own noise, the PBE used Conceptualizations 2 or 4 to explain the problem in those rarer cases. In an example of Conceptualization 2, M5 spoke about how a proposed dog kennel would not be acceptable because it would annoy existing neighbors. In another example, E1 spoke about a café and its opening times and its potential impacts on neighbors despite its friendly ambiance for users. In a handful of cases, sound internal to the project, like N2's music venue was treated as an opportunity, using Conceptualization 4. This distinction between internal and external sounds has not really been explored in the literature.

The next assumption is related to the importance of sound levels, in terms of decibel values. Sound levels in some form, frequently measured in dB(A), were mentioned by almost every participant. Measurement is associated for some with an authoritative and complete representation of the sound environment. Demonstrating this quantitative focus was the preponderance of the word "level" as well as descriptions of expert services in "measurement" and "calculation". It is also in line with their training and what has been observed by, for example, Raimbault and Dubois (2005), who conducted an interview study in France and found a similar reliance on measurement over perception. Bild et al. (2016) also explained that "policy makers, planners, and designers mostly rely on

reductionist acoustic measurements and technologies to achieve their acoustic goals in practice" (p. 9).

For conceptualizations 1 and 3, the sound-level measurement was of primary importance; for some, the sound level alone was sufficient to understand the sonic dimension of the space. The idea that sound is primarily an environmental problem, and that a poor acoustic outcome is bad for a space and can be solved primarily through engineering, otherwise is leads to the cancellation of the project as it is currently conceived. This finding is consistent with the Bild et al. (2016) description of the *environmental noise management* approach that both their literature-based approach and this interviews study with PBEs show dominating today's PBE practices. Those that deviated from these conceptualizations had been trained outside of the mainstream planning tradition or were engaged in project-based or academic contexts that required them to adjust their practice. The primary difference in measuring sound levels between the *noise as level* and *noise as environmental pollutant* conceptualization is that the former satisfies legal requirements while the latter solves environmental issues that benefit the project in complex ways. For Conceptualization 2, the sound level can be important because, once a sound source causing nuisance has been identified, its sound level is the primary regulatory criterion by which a PBE can take action.

The last assumption visited concerns the motivations for considering the sound-related factor under each conceptualization. For times when Conceptualizations 1 and 2 and being used, the goal is about solving a problem in the sonic dimension; "noise" is a risk to the project and must be solved by working with the sound-related factor. In Conceptualizations 3 and 4, sound is considered because of its role in the outcomes of the whole project. Conceptualization 3 treats sound as a complete environmental problem with negative outcomes for quality of life if the environment is not good enough. Conceptualization 4 covers potential impacts to the project, especially with other factors, like lingering pedestrians, an example provided by N3.

5.2.1 User

This second category of assumptions is about the considerations given to users. Conceptualization 1 is unique in that by choosing strict decibel limits for situations, further consideration of future users and activities is removed. The decibel limit thus stands as a proxy for assumed future negative impacts of noise without context. Within the other conceptualizations, Conceptualization 2 allows for the PBE to consider particular types of users and activities, such as neighbors who may be sensitive to a bar. Within Conceptualization 3, certain users, such as schools, could be considered for more protection and investment and reducing noise is an ongoing act of protection. Within Conceptualization 4, sound can be used to support activities tailored very specifically for users. To this end, similar to the discussion in the previous section, good outcomes for users in Conceptualizations 1, 2, and 3 are limited to the reduction of negative impacts.

The concept of user considerations has been discussed extensively in the soundscape literature, largely as a criticism of the traditional approaches for failing to adequately account for users. In particular, Raimbault and Dubois (2005) talked about the failure of decibel measurements alone to describe and evaluate projects. The Bild et al. (2016) review of strategies also criticizes the *environmental noise management* (ENM) strategy for not taking users into account; there are also examples of calls for user approaches in areas like soundscape ecology (e.g. Truax, 2001). Nonetheless, Bild et al. (ibid) have described the present extent of user considerations in PBE practices, saying:

> "While technological advances have been made in the fields of remote acoustic sensing, noise and sound mapping, and modeling and participatory data collection as described, mainstream urban planning and design practice still largely rely on technologies that fall short of incorporating user knowledge and their activities and portray an incomplete 'image' of users' auditory environments" (Bild et al., 2016, p. 8).

5.2.2 Working with sound

The last category of assumptions is centered on the way that PBEs work with the sound-related factor in the context of projects. The first of these assumptions is the extent to which the sound-related factor is interrelated with other planning factors. As previously mentioned, the four conceptualizations have actually been ordered by the extent to which they are interrelated to other factors. The most frequently mentioned factor along with the sound-related factor was *quality of life* or similar. Discussed simultaneously is the extent to which the soundscape factor can be solved or only addressed according to the assumptions associated with each conceptualization.

With Conceptualization 1, sound is an isolated factor that needs only to be addressed a single, isolated time over the course of a project. Once it has been demonstrated to satisfy the regulation, there is no obligation to continue using limited resources to address the problem; there is thus little relationship between the sound-related factor and others. With Conceptualization 2, concerns about users can be addressed, but dissatisfied users making a complaint is an ongoing risk. Thus, there is an implication that something about the quality/qualities of the project are capable of influencing users' perceptions of sounds.

Conceptualization 3 considers this interrelationship yet more strongly. With *noise as an environmental pollutant*, not only does the identity of the noise source and the user play a role, factors like zoning and materials can influence sound propagation, quality of life, pleasantness, or environmental factors can be negatively affected by noise. When talking about potential solutions to problems, participants frequently mentioned that they could change zoning, functions, or uses. The soundscape literature supports the interrelatedness of factors under this conceptualization. Studies like Gidlöf-Gunnarsson and Öhrström (2007) had found a reduced annoyance to noise in the home when people perceived they had access to a green space. This study was concerned only with unwanted noise, but showed a relationship between noise, quality of life, and features of the urban morphology.

Conceptualization 4, however, relies on the explicit assumption that all of the factors are interrelated: traffic noise can have a negative effect on ambiance, but some people want to sit on a bench (factor: street furniture) to watch noisy airplanes (an example from E9). From the Results chapter, it was clear that a low agency for change was associated with the factor-at-hand not being strongly related to other factors. Interestingly, with the factors discussed by all of the participants, there was no analog of Conceptualization 1, where the best possible outcome for the factor was to satisfy the regulation. Thus, the low reported agency for chance for Conceptualization 1 is explained by this low level of interrelatedness with the other factors.

While the literature shows that the sound-related factor has a high priority for urban designers within environmental-climate factors, those factors in general had a low priority level among all factors (Pijpers-van Esch, 2015). The results presented here showed a bit more subtlety in that the priority given to the sound-related factor is highly variable. For about half our participants, it had a fixed priority, usually moderately high or medium priority; for others the priority was dependent on some aspect of the project, its stage, and the zoning. This finding is potentially analogous to the findings of Sutherland et al. (2011), where priority for land-use projects was based on the focus of the decision-maker and their professional context rather than being determined by their profession or region. Evans and Schiller (1996) had identified priority as one of three contextual aspects that played a role in adopting information on new topics, the other two being timescale and applicability. While participants were talking about priorities, it also became clear that when they are working with their non-sound factor, they are doing so to improve overall project outcomes and that the user was more likely to be considered.

Two participants (M3, E5) had expressed that sound is a low priority in the beginning of a project but becomes more important as the project comes to an end, after all of the physical amenities have been planned and positioned. In this case, the reliance on measurement drives this conceptualization. The soundscape approach advocates planning as far in advance as possible to avoid poor outcomes and to integrate sound

planning with other factors. This conflicts with Pijpers-van Esch (2015), who found that urban designers preferred to get their information up-front from subject-matter experts to reduce the risk that new information would negatively affect the existing plan. The difference here may be that the type of information that is helpful early on would help to plan the amenities while the later information is the modeling and measuring that would determine that the plan satisfied the regulations and can move forward. Another finding from the literature did not arise in the context of this study - Raimbault and Dubois (2005) reported that the process of dealing with the sound-related factor involves "town councillors who are interested in satisfying public opinion" (p. 344). While this specific justification did not come up, it is possible that pressure from elected councillors (often among the "decision-makers") would drive a PBE toward Conceptualization 2, to reduce the risk of complaints.

From the literature review, it was determined that while there are few resources available for evaluating plans after they have been completed (Baer, 1997; Doick et al., 2009; Talen, 1996), there are even fewer for the sound-related factor. In the analysis of poor outcomes, many wanted to take further action, but they were unclear on what those further actions would be or what they would amount to. This is related to the underlying assumptions supporting the conceptualizations and also their perceived agency for change. In preparation for this study, I had arrived at the literature about Post-Occupancy Evaluation (POE), where one evaluates the outcomes of completed projects with the goal of improving future project outcomes. But as only one participant mentioned POE, it became clear that it was not a standard part of PBE work. This is likely related to the way that projects are considered complete when the plan or design is complete. Another surprising finding was that many PBEs consider a project complete at some other point before it has been built, for example, when the design has been finished or when the plan will no longer have modifications.

With regard to evaluating the sound-related factor outcome, there were a limited selection of criteria that determined when an outcome was successful. While there were

many that wanted either to satisfy the regulatory requirement (6), to have “no noise” (4), or to use acoustical engineering to reduce the noise level (6), many also said that “no noise” wasn’t possible (6), which is a contradiction that had been identified by Raimbault and Dubois (2005), who charged that:

> “planners were suspicious about noise evaluation methods since there was no effective balance between either technical vocabulary or measure by experts and usual description of noises. This underlines the limits of the pervasive engineering focus on silence which appeared the most dominant aspect of current regulatory approaches to noise control management” (p. 344).

In very limited cases, participants identified positive outcomes unrelated to engineering and sound levels, such as user satisfaction (2), sound appropriateness (2), and the presence of positive sound sources (3). Upon re-examining an example from P3, it’s clear that this participant’s contradiction between assumptions about evaluating the sound-related factor led to them finding a solution based on intuition about the factor rather than rely on the first expert opinion from engineers:

> “the parking lot under the building was the critical thing. There were many cars going in and coming out of the parking lot… There the maximum threshold was exceeded, not even by a decibel. [We were] saved by a calculation error. The calculation software, it calculated with too many trucks, and trucks produce more noise. But we [realized we don’t have that] many trucks in the city, so when the calculation was corrected, it was just under threshold and it saved the project” (P3).

Nothing about the physical project actually changed, only the model, such that a project perceived as otherwise good would move forward. Another participant explained a similar inconsistency between the engineering solution and what they believed was appropriate:

> "We don't have any specific consideration about noise except if you want to build really close to the highway…We have some consideration, not in the bylaws, but in logic. If you have a balcony outside, of course you are impacted by the noise."

These internal contradictions were not observed for the non-sound factors. This conflict between assumptions presents a clear opportunity to propose better evaluation criteria for the sound-related factor. For example, PBEs are already using the methods for other factors that they could be using for sound. For example, E1, on *atmosphere*, says,

> "We can in the first place say, listen, this initiative is just the wrong thing on the wrong place. It must be elsewhere. That's one. Second would be, OK this initiative could be here, but then the entrance of the building would be put there because then it adds to the liveliness of the place and not put it back towards the situation, the thing. The parking solution should be inside the building or, and not in front of the buildings. That's more of the situation, you can talk about these things also, but people who come with the initiative. To fit in the building in the right urban space."

Compare this to the same question on agency to change regarding *noise*:

> "In the power to change is sometimes doing something about the source of the noise, that's also in our power, for instance. As I just said, bring back and then the level of the traffic in a certain road. That's one of the solutions we can work on. The other thing is physical measures, like a wall, which is not that high, but so high that it takes out the wheel noise anyway, so you can reduce the level of noise by that way. There are all sorts of measures you can think about and they're not…the noise department just makes the calculation. Ok this is the source, this is the noise, do what you want with it.

In limited resources, the idea of taking form other factors emerged for the other factor, but not sound. Sound is fixed and must be solved. Work is emerging in the soundscape literature that demonstrates the robustness of user-centered approaches for determining

outcomes of projects in advance through, for example, virtual laboratory techniques (Harriet, 2013).

5.3 Information behavior about the sound-related factor

This section covers the information behavior about the sound-related factor. To provide some context for their information seeking, participants in both the public and private sectors were generally working on one or more projects at a time, each lasting months or years depending on the scale. The projects involved the plan or design of impending physical interventions in urban spaces, though the interventions themselves could be decades away in some cases. It is clear from the interviews that PBEs are expected to have a wide breadth of knowledge on many topics and should be able to integrate multiple types of information into a single, coherent plan. This information could be qualitative or quantitative, could come from experts or the community, or could be legal or academic.

When asked, all had said sound is an important factor, usually with high priority, but only half had spontaneously listed it in their factor lists. Sound had been considered on only 9 of 19 projects while the non-sound factor was considered in 18 or 19. There may be a small bias in that slightly more "interesting" factors were the ones that they mentioned during the factor listing or were the factors they were willing to talk about (e.g. participant M6 was uncomfortable speaking at length about *density*, so the second factor was switched to *neighborhood feel*.) Nevertheless, given the relative priorities assigned to the sound-related factor, in practice, it does not get strongly considered. Frequently, sound was treated differently, by not quite being integrated with other factors; the sound-related factor could be solved and forgotten. As discussed in previous sections, this treatment was part of the assumptions that led to Conceptualization 1.

5.3.1 Expectations and experts

As has been discussed, the integration of knowledge is a primary activity for PBEs. For all factors discussed, PBEs were expected to have basic competence and were given the option to rely on experts to fill information gaps, as needed. PBEs frequently and easily

reach out to experts to help fill knowledge gaps. Sometimes experts are also consulted in the interest of time, to help projects move along faster. Specifically, for the sound-related factor, there is not pressure to know a lot outside of the basic "technical" details because the possibility of hiring an expert is always available if a solution can't otherwise be found.

In some cases, the factor being discussed was a core competency of the PBE in question (e.g. E9, *street furniture*; N2, *program*), or even one of the core competencies of their organization (e.g. N3, *pedestrians*). While not always true, when the factor was the core competency of the participant, they were often acting as a consulting expert to other PBEs who were managing the project. For example, N3's organization had been contracted to provide an updated street plan for promoting economic development and pedestrianization to a small American city. E8 was providing similar services for a small Belgian city. Consulting PBEs often emphasized the interactive or collaborative nature of their work with a customer, though the customer may not feel the same, as described here in response to the question about the role experts for *noise quality*:

> "It's one of the hard [factors] in this sense. The offices that are making those environmental assessments… It's an expert study and there is not enough interaction between those experts and the planners…. And also, the policy makers see this kind of work as a kind of necessary evil they have to pass through. Once we have done this, [they] put it on the shelf and go further as if nothing has happened. And that's one of the challenges for us also - to find ways to translate the expert language and expert findings into workable documents that also can be used on the level of building permits and so on." (E6)

5.3.2 PBE attitudes toward information sources, including academic

While the discussion up to this point has centered on the sound conceptualizations, another facet of this research, as posed by one of the Research questions (RQ4), looked into PBEs' information sources and the attitudes they extended to each. The Results chapter showed that, in general, media and people categories dominated over

institutional sources. Within the media category, internet and professional sources were the most consulted, while within the people category, specialist colleagues and personal networks were the most frequently consulted. Outside of these sources, library-based information sources were the most frequently consulted.

The results showed that only some of the participants look at academic sources; these findings are summarized in Figure 4. Consistent with the Pijpers-van Esch (2015) study with Dutch urban designers about environmental factors (including noise), our participants in this study frequently consulted subject-matter experts for their projects, but rarely went to scientific literature on their own. The exception to this were the participants who were in academia, either as doctoral students or as professors. Multiple interacting explanations for this exception can be proposed: it is easier access to academic literature through their university subscriptions; those in academia have increased familiarity and comfort with searching and scanning academic literature quickly for useful information; and/or those in academia are faced with a higher expectation for independent inquiry. Kwasitsu (2003) had previously linked higher education with lower dependence on personal memory and higher dependence on libraries and professional consensus, which potentially supports this last explanation.

Furthermore, Pijpers van Esch (ibid.) showed that even when subject-matter experts were consulted, they were not likely to be academics, especially for environmental factors (including noise). This is very much consistent with our findings. In all of the projects discussed by the participants, only two contained contributions from academics: e.g. a consultation with a sociological researcher who studied landscape use in a park (E6). P1 remarked that academic information occasionally passes through their organization via researchers, interns, and other guests. The same work by Pijpers van Esch (ibid) found that designers most appreciated subject-matter experts who were able to understand the goals of the project and adapt their recommendations to the project at-hand. As an explanation for the relatively few academic experts used, Innes (1998) similarly found

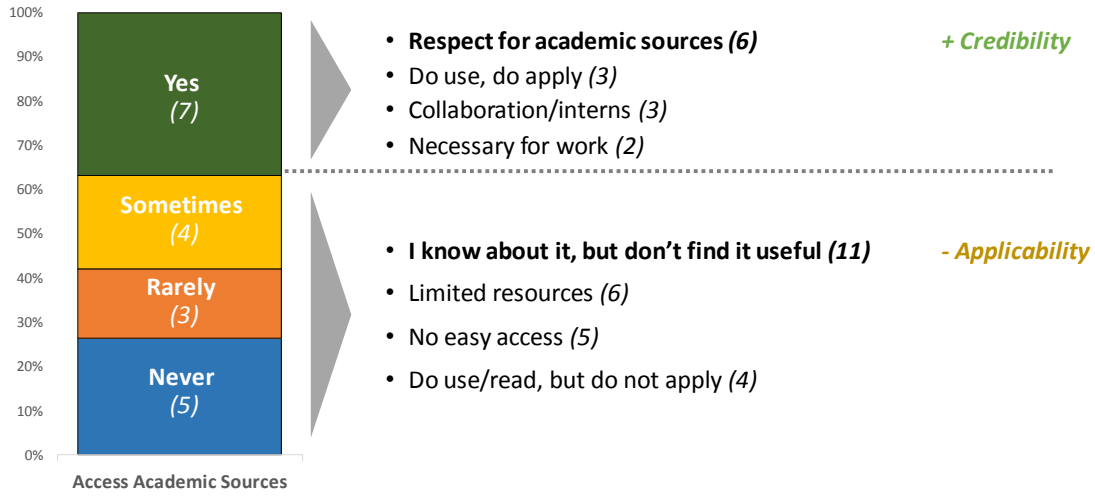

Figure 4: Frequency of academic source access and justifications for use

that information from scientific sources was rejected unless it had very high relevance to the unique factors of a project. The present results showed that roughly half of the participants (11) find academic information "interesting, but not useful". Thus, for PBEs, the lack of consultation of both human and written academic information sources can be explained by the idea that while the academic papers search for generalizable principles, PBEs are likely looking for sources that support specific applications and contexts. For the other half of participants, many spontaneously mentioned having a high respect for academic information sources (6); however, there remained some barriers, like time or resources (6) or easier access (5). While the other studies covered in the Literature review section on Research to practice, including those from the healthcare and engineering fields, identified time and resources to academic journals being a barrier, the identification of access problems had not been reported.

Supporting the finding of resource-constrained PBEs is a study of Australian urban planners (Taylor & Hurley, 2015). Those authors also caution that when research is presented as "evidence", it allows the potential for conflict in the process of reaching consensus with multiple stakeholders. In their interview and questionnaire study planners actually did want academic research to support various policies, assumptions and decisions, but in their resource-constrained work environments, planners largely relied on popular media, industry publications and practice networks. Unlike Taylor and Hurley,

however, none of the present participants in this study reported going to popular media to support their decisions, however, failure to self-report this type of source does not preclude it as a potential source and could also include a number of the "internet" responses. This study's findings with the added context of the literature suggest a gap between research and practice that is not unique, but this refined understanding leads to clearer implications for bridging this gap.

5.3.3 Information seeking of professionals outside of PBE fields

Outside of the PBE fields but still in professional settings, the literature shows varying levels of agreement with the present findings. When there are disagreements, the contexts of the work environments tend to be different. Primarily, many studies on the information behavior of professionals focused on one company at a time, and few other professions place so much value on the perspectives of so many stakeholders while also being beholden to the regulation. Thus, our categorization of information sources doesn't follow the oral/written dichotomy (Anderson et al., 2001), and instead relies on inductive coding.

While studies like Anderson et al. (ibid) predicted a preference for internal over external information sources, our participants named internal and external (people) sources at the same frequency. Holland, Stead, and Leibrock (1976) found that engineers and scientists tended toward interpersonal information sources when the uncertainty about the problem increased. Our study also demonstrated an effect of organization size on the use of internal or external information sources where, likely arising from necessity, PBEs at smaller organizations rely more strongly on external sources of information. Sutherland et al. (2011) found that, for decision makers in land management organizations outside of urban areas, media was consistently valued more highly than the internet as an information source. The same study also identified five primary types of land managers and showed how their focus (e.g. environmental v. economic) affected their information seeking behavior.

While traditional models that said for organizational communication, perceived accessibility was the major determining factor in determining the source of information used, Culnan (1983) departed from this to say that various contexts could modulate this relationship. Using questionnaires deployed over multiple organizations and management levels in banking and manufacturing sectors, they found that the use of sources was variable over different levels of complexity of the task at hand. Like the present study, personal subscriptions (equivalent to this study's "personal media" source) and peers were ranked particularly highly as frequent information sources. However, in the Culnan study, consultants were ranked very low as frequent sources of information but were considered important sources for single issues rather than a range of topics. In the present study, consultants were only listed spontaneously as an information source by four participants, but nearly all of them said they had access to and could use consultants on an as-needed basis in their everyday work. Indicating a stronger relationship, participants mentioned more personal sources of expertise with much more frequency: specialist colleagues (14) and personal networks (9).

5.3.4 PBE information seeking on sound as modeled by everyday life information seeking behavior

While the literature converges on the idea that domain expertise influences information behavior (White, Dumais, & Teevan, 2009), it has been established throughout this study that PBEs seek information from many sources about topics in many domains, including nonprofessional sources like citizen committees. PBE's information needs could also be described more as needing to build consensus toward a solution (Taylor & Hurley, 2015) more so than solving a specific technical problem. Given this and the impossibility of maintaining high-level knowledge of the dozens of factors that they are responsible for, it may be worth examining their information seeking behavior outside of professional information search framework and to instead look at an everyday life information seeking model. Such a model may provide a better fit for this multi-factor, multistakeholder

information need, especially given the amount of information that will be encountered outside of their core competence.

In terms of the order and priority of consultation of information sources, our findings are in line with the literature in other everyday settings. Savolainen (2008) had identified the internet and human sources as the first steps in information seeking on environmental issues, as was reported by these participants. Additionally, the more constrained sample here (PBEs rather than those seeking environmental information) had a high preference for industry-specific media like trade journals, both from their home and office collections.

5.3.5 Implication for bringing research closer to practitioners

While this study did not specifically probe barriers to practice informed by research, the barriers can be implied from the questions on information sources and tools as well as the section on attitudes toward academic sources mixed with findings from the literature. The literature had largely identified time-based resources and applicability as the primary barriers (Hemsley-Brown & Sharp, 2003), and these are consistent with the results here. There was an awareness of the literature but reading it would not add substantial benefit to their complex, time-constrained (Taylor & Hurley, 2015) practice. The work suggests that, in line with what Pijpers-van Esch (2015) found about interacting with subject-matter experts but not documents related to the same material, bringing research to practice involves people more so than documents. Another study (Cooper & Crisp, 1984) identified how building designers would not adapt new strategies in their work with the use of design aids like guidebooks alone; they needed further education and demonstration. This also converges with Eliasson's (2000) broader findings that suggest improving knowledge on specific technical factors (their factor at-hand was urban micro-climate) is possible through developing tools and courses suitable for PBEs, improving awareness for urban climate, improving communication and argumentation, and improving institutional capacity. While that study had identified that one barrier may be understanding the inter-relatedness of different factors (e.g. *quality of life* and *noise* are

related), this could be reinterpreted as a strength because it could reduce the number of factors that require complete, discrete educational campaigns. Importantly, Innes (1998) had found that information from scientific sources was rejected unless it had very high relevance to the unique factors of a project, so local experts who understand project constraints may fare better than those who don't.

Surprisingly, continuing education was not identified by participants as an information source. Nevertheless, while continuing education is widely available and likely even required for some of the participants with professional accreditations (e.g. the American Planning Association – Certification Maintenance: https://www.planning.org/cm/), the development of soundscape courses may be a way to bridge the gap. Only one participant, P2, mentioned any sort of continuing education as an information source. Neither were such offerings mentioned in other parts of the interviews. This participant (P2), rather than naming continuing education courses, mentioned only a very innovative program of site visits, where travel to distant cities is organized by the employer with the intent to inspire the planners to bring aspects of distant success back to their own districts; such a trip had brought her to the Netherlands where the interview took place. Otherwise, the failure to mention these offerings may suggest that mandatory offerings may not be an appropriate and lasting way to reach PBEs. The efficacy of these courses thus warrants further research.

5.4 Findings by variable

In the Results, participant variables related to their individual, place-dependent, and organizational variables and other contextual attributes were identified. They are discussed individually here in relation to the literature. In this section, these participant variables are discussed both in related to how it affects sound-related factor considerations and also their information behavior. A summary of these findings with respect to the literature is found in Table 6.

Table 6: Sound conceptualizations and Information behavior agreement with the literature, by variable. No marking is complete agreement, + is agreement with clarification, // is disagreement

Category	Variable	Sound-related factor	Information behavior
Individual	Education level		Kwasitsu (2003)
	Professional training	Cerwen (2017) +, Pijpers van Esch (2015),	Taylor and Hurley (2016), Pijpers van Esch (2015),
	Years of experience		//Freund (2015) Anderson (2001)
	Management level		Blandin and Brown, 1977) +
Place-dependent	City/country		Leckie et al. (1996) + Freund (2015)
Organizational	Organization Size		Eliasson (2000) +, Sutherland et al. (2011)
	Sector		Culnan (1983)

5.4.1 Individual variables

The first category of variables pertains to the individual PBE: their education level, professional training, years of experience, and management level. To some extent, all of these variables had an effect on the conceptualizations and information sources that they used. Some of these variables have already been visited above but will be described again here.

On education level, as revealed in the Results, there was a tendency of those with graduate education such that they felt comfortable expressing that they did not have an expectation of knowledge in fields that were distant from their specialty. Perhaps the specialized PBEs who pursue graduate degrees feel clearer about their expectations for knowledge within the organization. All except those who were *in academia* rarely went to scientific literature on their own. One study (Kwasitsu, 2003) supports an explanation

that those in academia and with higher education have lower barriers to access academic information and a higher expectation to access specialized information.

The professional training variable was based on the self-reported training that the participants identified. Participants could be classed as having more than one type of professional training based on having multiple degrees, having no available translation to English for a particular field or skill, or via extensive on-the-job experience in adjacent fields. These types of professional training were architecture, landscape architecture, urban planning, and urban design.

In particular, the two landscape architects in this study had expressed and used much more of the C4: *sound as opportunity* conceptualization than their peers. With both of these landscape architects, sound was addressed through recent personal examples rather than through a deep conceptual foundation, suggesting that they achieved their mix of conceptualizations on the job, through personal experience and reflection on the tasks at-hand. Since the present study was conducted, other research has been published reinforcing the significance of this finding. Cerwen's (2017) doctoral dissertation included an exhaustive list of mentions of soundscape in the landscape architecture literature, and the sum of these sources would not quite lead to the conceptualization of *sound as opportunity*. Indeed, in a separate part of Cerwen's study (ibid), the authors analyzed 109 entries to a Swedish landscape architecture competition and found that 25% of them did not consider sound at all. Within the remaining participants that did consider sound, 69% of them were focused exclusively on noise abatement. The rest used some sort of combination of "localization of functions" (related to pre-planning) and wanted sounds. Thus, *sound as opportunity* is not a standard in landscape architecture. The author further described how words like "quiet" and "tranquil" were used, but they were rarely followed by concrete actions – thus these landscape architecture contestants had a low agency for change. The strong Conceptualization 4 found in the present study with landscape architects may then potentially be attributed to other personal variables, such as management level, academic experience, or their work locations.

Other differences arose based on professional experiences and could be a topic for further studies. For example, only those who identified as architects were dissatisfied with their projects. It is unclear what factors led to this stark difference. Urban planners reported a lower priority and expectation for knowledge for the sound-related factor than others. Only urban planners considered that a best possible outcome was to follow the procedures. These findings make sense in light of the idea that planners tend to be public sector employees and that they are the city's protection against regulatory violations. Conversely, designers and landscape architects are more likely to use the *sound as opportunity* conceptualization, departing from the reliance on sound level measurement. Compare a landscape architect:

"[If] you can't have a conversation, you don't want to be there. Can't read a book? No quiet? It's a problem. Reverberation. [It can even] be bad for business." (N2)

To an urban planner:

"you can have a discussion on urban quality, but not about noise." (E1)

The only study directly comparing individual professional variables with sound conceptualizations is Raimbault and Dubois (2005). That study used interviews to explain the differences between descriptions of sound given by PBEs and "city users". While no findings were given relative to the differences between participants within those group, there was a strong effect across groups: PBEs much more frequently used vocabulary with technical descriptions while "city users" were more likely to talk about sound by describing human noise sources.

The variable of *years of experience* played a strong role in the results. The most experienced of the participants held a belief that sound had a stronger priority, were more likely to compromise a project, was important because of the space users, and more likely to feel like there were things they could do about it. Curiously, these same participants did not perceive that they needed to know very much about the sound-related factor. A possible explanation for this finding is the likely correlation of age (not

reported in this study) and years of experience. Noise sensitivity increases significantly with age (Schreckenberg, Griefahn, & Meis, 2010), and thus the most experienced participants may be assigning a higher priority to a problem they are more sensitive to as individuals; meanwhile, they have not been given extra tools or agency to deal with the sound-related factor. This is further supported by the finding that those with more experience were more likely to identify a good outcome as one that satisfies the regulation. Another potential explanation is that, with more experience, PBEs could be increasingly realizing the importance of sound to a project. Those with more experience have seen more projects built. Those with less experience may not have seen a project that they worked on built. Perhaps with the limited agency to consider the sound-related factor, the outcome is perceived as increasingly important with experience.

While Freund (2015) had found a relationship between seniority (like our variable *experience*), and information seeking behavior, no similar relationship was identified here. Instead, the present findings mirrored Anderson et al. (2001), a study that observed no significant role in information seeking with respect to “tenure”.

One variable that this study was able to control was management level. Scant research attention has been given to the role of management level and information behavior, and no known literature has addressed the way sound conceptualizations are affected by this variable. Having access to multiple management levels was an artifact of the present sampling strategy.

In the health literature, studies like Damschroder et al. (2009) have converged on the idea that managers have a strong role in determining whether their employees (usually nurses) are exposed to new research, because they shape institutional priorities and assign resources. The studies also found different attitudes toward research in general between managers and employees. One study (Blandin & Brown, 1977) showed that managers used more information sources as uncertainty increased. Consistent with our study, managers and executives were more likely to assign high priorities across factors, more likely to have negative reactions to poor outcomes, were more concerned with user

satisfaction, and were less likely to think that an ideal solution had already been achieved on projects in progress. A potential explanation for this strong relationship is that managers and executives have a larger stake in the business due to their positions.

5.4.2 Place-dependent variables

There is a relatively accessible body of literature on the differences between PBE fields in different developed countries, it is not a variable that has featured prominently in information studies or soundscape literature. For example, Moudon (1994) examined the traditional urban morphologies and practices of Italy, Germany, France, and the United States to reveal differences in those practices. While these differences were certainly at play in this study, it would be impossible to control for that variable given the sampling strategy utilized. Only one city from each of the United States and Canada was used, and one is a megacity. Some of the cities from the European sample were very small. The difference in these contexts played a potentially larger role than that of the country. Meanwhile, all three of the participants from New York used the *sound as opportunity* conceptualization at some point.

Between the European and North American sample, there were marked differences in the hierarchical categorization of the sound-related factor; seven of the European participants categorized the sound-related factor under the *environment* parent category (and one extra European participant in the *pollution* parent category) while all of the North American participants had the sound-related factor in no category at all. This distinction supports the idea that European PBEs are more likely to conceptualize *noise as environmental pollutant*. This conceptualization could be supported by European Union laws, which will be discussed in a later section.

5.4.3 Organizational variables

While Eliasson (2000) had shown that their (PBE-like) participants primarily sought other people as information sources, the data here extend that finding to show how organizational resources modulation that relationship. In this study, PBEs from small

organizations reach out to others with similar positions to see how similar problems had been solved, while at larger organizations, internal experts were generally available for consultation. This finding mirrors the Sutherland et al. (2011) study, described above, which revealed that, at larger (non-urban land-use) organizations with access to in-house professional staff there was a lower barrier to adapt and take on new opportunities. At smaller organizations, consultations with experts may be isolated to single occurrences.

Leckie et al. (1996) determined that task-at-hand was more important – variables such as those found here in the study, like belonging to the public or private sector and the goals of the project. Private sector and executives more sensitive to poor outcomes, likely because they are concerned about their business. who were the furthest from worrying about regulations were generally more flexible in their conceptualizations – private sector, executives, occasionally designers.

5.5 Going from four conceptualizations to soundscape

This research stems from a need identified in the Introduction and Literature review to reconsider the way cities treat urban sound. The resulting findings have pointed toward suggestions that can help to bridge this gap between research and practice. The most relevant of these findings is the identification of four conceptualizations that PBEs have about the sound-related factor in their projects. By examining these conceptualizations in the context of previous work, a refocusing of the “soundscape design” not as a departure from the “environmental noise management”, but instead as an extension of the approach, could ease the uptake of the soundscape design strategy.

Many would agree that even with a good implementation of the soundscape strategy, a continued focus on the elimination of annoying, harmful, and otherwise unwanted sounds should continue to be promoted. Considering the opportunities that sound can bring does not preclude the critical function of reducing noise for public health and safety, or even quality of life. These traditional environmental noise management strategies are bolstered by an industry that specializes in noise regulations, inspections, acoustic

engineering, and measurement. The model proposed here has soundscape design subsuming environmental noise management, but with the caveat that the problem-at-hand should guide which conceptualization will be chosen to address it. For example, for sounds loud enough to cause hearing damage, a contextual approach is not necessary; maximum sound levels can be established regardless of the content of the sound and the user. Mediation can always be used to appropriately diffuse information to concerned users, residents, and others. And the environmental pollution conceptualization can be applied to, for example, traffic noise, such that the consideration of its proliferation into quiet areas would have a negative effect; but not all sound should be treated as a potential environmental pollutant.

This proposal requires a more *intentional* decision to use the appropriate conceptualization. The word "intentional" has some history in the soundscape literature, and it usually carries the meaning that, while there are some *good* soundscapes, they have not necessarily been intentionally planned or designed, but they should be (Kang, 2006; Raimbault, 2006; Yang & Kang, 2005). I would like to propose an expansion of this intentionality concept to also include the intentional use of specific conceptualizations that are appropriate to the problem at-hand. This has been demonstrated diagrammatically in Figure 5.

PBEs are already using this contextual strategy to address problems they encounter with other factors. For example, E7, describing *user needs*, said that "it's important to blend the quantitative understanding of the factor learned at school with the qualitative understanding that comes along when working on-the-job". The sound-related factor could be treated the same way, where the goal is to use the appropriate conceptualization in the right context. Even down to the methods used to find these solutions for other factors, they can also be applied to sound. Examples of these methods include public meetings, questionnaires, and expert feedback. Further, this qualitative information can be used to improve quantitative measurements in a mixed-methods

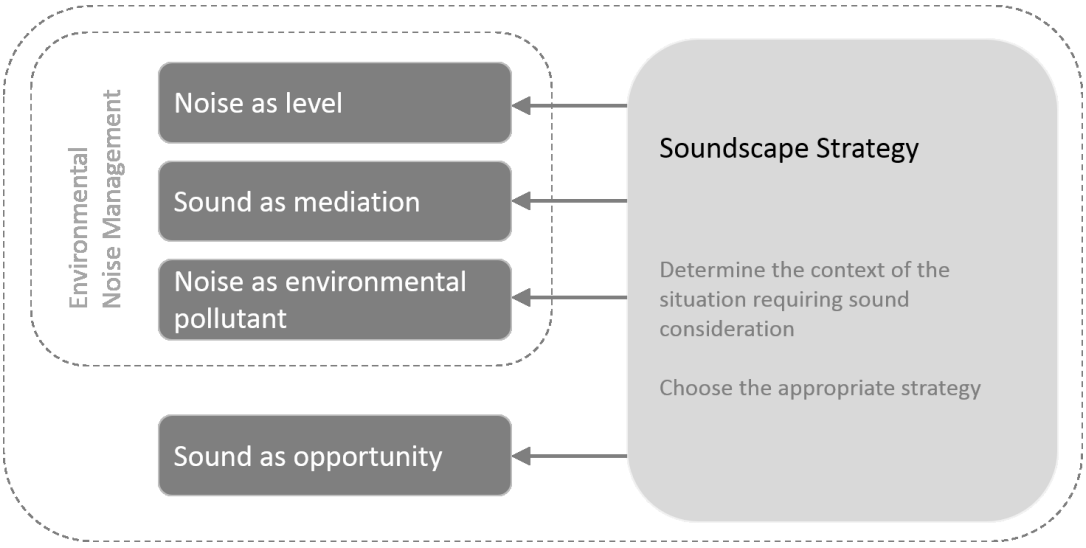

Figure 5: A framework for the soundscape design strategy that is a continuous extension from the environmental noise management strategy

format. The various combinations of this mixed quantitative-qualitative methods have been summarized for soundscape by Aletta et al. (2016).

A deeper implication here is that transitioning to a soundscape framework will not happen without collaboration with PBEs themselves. Practicing PBE rarely encounter academic information on their own, which is where soundscape literature is housed. As discussed in the Section on Gaps and lessons from adjacent fields, changing approaches for PBEs requires advocates, not necessarily in the format of continuing education, but in the trade media and websites they encounter and through personal experiences with colleagues and experts. This problem is made harder by the finding that one of the factors that discourage PBEs from using research is its lack of applicability to their specific problem at-hand, as discussed in the Review Section Research to practice, a finding reflected in this study when roughly half of the participants reported finding academic research papers “interesting, but not useful”.

Using this proposed framework for soundscape could also transform the problem of bridging the research-practice gap into one that requires fewer changes to the status quo and all of the resources associated with changing the status quo, is a potentially more encouraging approach than rebuilding every PBE’s sound conceptualizations from

scratch. This approach could happen continuously without disrupting projects or relationships.

Lastly, some of these conceptualizations may be reinforced by the regulatory framework in which PBEs are operating. One axis through which to analyze these conceptualizations is the extent to which there is a proactive versus a reactive approach to the sound-related factor. With *noise as level* and *sound as mediation*, PBEs react to perceived problems after they have been established. *Sound as opportunity* and *noise as environmental pollutant* are more proactive in seeking to model spaces and understand users while the project is still in planning.

To date, there are no known laws promoting *sound as opportunity*, except those that exist as strategic plans. Small exceptions to this can be found, for example, in Cambridge's City Noise Ordinance[49], which gives a blanket exemption in favor allowing "bells and clock towers" to ring.

5.6 Limitations of study

5.6.1 Methodological validity

While the method used was beneficial for greatly extending the corpus of "city maker"-focused interviews about sound, particularly with regards to the way it built on the literature of Raimbault and Dubois (2005), Bild et al. (2016), and Pijpers van Esch (2015), some limitations of the method should be considered when situating the findings in the context of this literature. The semi-structured interview was chosen as the data collection instrument to respond to the fact that very little is known about the way PBEs think about sound.

In particular, the method was designed to contrast how PBEs talk about the sound-related factor in general versus in the context of real projects. Despite an interview prompt

[49] https://www.cambridgema.gov/Services/noiseordinanceinformation

explicitly discouraging the naming of projects, many of the participants still relied on specific projects to convey their conceptualizations. This result may suggest that there is not a strong abstractly conceptual component to the conceptualizations of the sound-related factor; instead the conceptualizations are very much rooted in experience with projects. Further studies could potentially forego this comparison and instead focus on the way that existing conceptualizations would apply to a new project.

Other limitations of the study are discussed in the following list by topic:

- **Time:** PBEs have a wealth of knowledge and work for extended times on grand projects that transform the city and can take decades to realize. Designing the interviews around 70-90 minutes for talking about two or more of these projects may not have been enough to adequately describe the intricate complexities and complications that make these projects take place on such a timescale.
- **Documentation:** In addition to the recorded audio files and written transcripts of the interviews, many participants also furnished physical documentation for the projects they had discussed. While many documents were collected in this process, there was no formal procedure for asking for this documentation, referring to it, or analyzing it. There is potential for further analysis within these documents, but since the collection was ad-hoc, there isn't a clear application to the present analysis.
- **Non-sound factor:** The non-sound factor was analyzed, but not at the same level of detail as it was for the sound-related factor. This was primarily because each non-sound factor was different for each participant. This comparative analysis may be of interest to other researchers but was outside of the scope of the present discussion.
- **Locations studied:** The study was centered on urban areas in North America and Europe, chosen primarily based on the financial feasibility of a visit, but also for the presence of a soundscape research community. The study could

easily be extended to other cities, regions, and continents. There are a number of Asian cities where soundscape research has been performed, even with the cooperation of official bodies. Further, I was careful not to generalize any practices as "American" because the only American city with participants is New York, which is not a representative sample of national cities and practices.

- **Recruitment:** The sampling strategy was a mixture of maximum variation purposive sampling and convenience sampling. Recruitment was difficult in the sense that even successful requests for interviews required finding an appointment in the narrow window of a visit to that city, which was not always possible.
- **Language**: Half of the participants (all from the European sample) were not speaking in their first language. Boundaries between "noise" and "sound" differ across languages and words such as accepted translations of environment (e.g. *environnement* and *umwelt*) have different connotations in different languages. Further, while most of the interviews were conducted in English, four participants in Montreal elected to have their interviews in French.
- **Deception:** Light deception was used by withholding the expertise in sound of the interviewer. It was not clear that the deception was necessary to conduct the study as many of the participants were frank in saying that they did not know much about particular topics and are only expected to know a few details about each factor.

Based on our findings and these limitations, a closed-ended questionnaire or other instrument could be deployed to further explore/validate the relationships outlined in this chapter between variables, assumptions and conceptualizations on a larger sample of participants.

5.6.2 Trustworthiness, credibility, transferability

While great effort has been taken to provide consistent vocabulary in this study covering broad topics, extensive borrowing of terminology from quantitative research may have a negative effect on the trustworthiness of these results. For example, *factor*, was a term used to refer to technical planning and design factors rather than factors about participants that play a role in determining their conceptualizations; for this concept, the word *variable* was used.

Despite the study limitations discussed above, the large amount of agreement between the findings discussed here that were emergent from the data compared to the studies that inspired this one (Pijpers-van Esch, 2015; Raimbault & Dubois, 2005) suggest a high level of credibility. Diversions from standard findings from the literature had explanations based on the variables and contexts under study. Efforts in member checking, discussed below, have reinforced this case for credibility.

Dependability (a quantitative analog of *reliability*, Bloomberg and Volpe, 2012) of these results was established through multiple conversations with my research supervisor, Catherine Guastavino, and two research assistants (Cynthia Tarlao, Baptiste Guastavino), with whom limited inter-rater analyses were conducted at different stages of this analysis, and through presentations given about the data set for doctoral and other student colleagues.

The findings of this research could be transferred to the larger fields of not only soundscape, but also urban studies and information studies. As this study was compared to other studies on the application of environmental factors to the urban built environment (e.g. Eliasson, 2000; Pijpers-van Esch, 2015), it is likely that, in the contexts of the dozens of factors considered in many urban plans and designs, this study's use of the comparison between the sound-related factor and others will improve its transferability. Described in more detail in the Contributions section, this research has implications theoretically, methodologically, and practically across domains.

5.6.3 Present activities and member checking

The results of this study have been used to support further research since the completion of the analysis, particularly in the context of Sounds in the City, a McGill-based project that supports sound-related decisions at the City of Montreal. The team developed a workshop for planners designed around themes identified by planners, namely highlighting practical aspects of research in presentations, the creation of exercises dealing with sound in formats recognized by practicing PBEs and the creation of a website highlighting and reiterating this content. The workshop was highly rated by participants, one of whom was also an interview participant from this study. This work has resulted in lasting collaborations with local and international collaborators.

While meeting with individual participants in person from this study isn't feasible, they will have been sent a presentation of the results. This study has also been presented at conferences with audience members in the fields of soundscape, information studies, and urban planning and design. Changes have been made accordingly, especially in relation to the presentation of the potential benefits of soundscape for PBEs and in the description of PBEs by scale rather than by profession.

6 Conclusion

The conclusion is structured in four sections: answers to the research questions, recommendations and implications of the research, original contributions to the research, and opportunities for future work in relation to the findings and implications.

6.1 Research questions

> RQ1. How do professionals of the built environment conceptualize sound in the urban environment?

There are four primary conceptualizations, supported by assumptions about sound phenomena, users, and contexts. These four conceptualizations are:

- Noise as level – where the measured level of the sound dominates the considerations and decisions
- Sound as mediation – where the impacts of sound, particularly negative, are negotiated across stakeholders until a solution is achieved
- Noise as environmental pollutant – where the propagation of noise from sources is treated as a risk to overall mental and physical health for city dwellers
- Sound as opportunity – where sound is considered for its ability to contribute to the project and interact with other factors

The first three of these conceptualizations are strongly supported by educational materials made for PBEs as well as the regulatory systems of the cities where they work. S*ound as opportunity* is inspired by these sources to a much lesser extent, despite its strong support from the reviewed academic research. Instead, C4 is used as a conceptualization by those who have encountered design thinking that necessitated dealing with sound in more complex ways (e.g. working on an outdoor music venue), or through mismatches in the expectations of the project and regulations with what common-sense tells them about how users may experience a space (e.g. the birds are above the limit in the spring, but why would that bother anyone?)

RQ2. What are the personal, organizational, and contextual variables that affect these conceptualizations?

The extent to which each of the conceptualizations is used is dependent on the PBE's individual education level, professional training, years of experience, and management level. While previous studies had demonstrated an effect of professional training only on sound conceptualizations, this study found these variables to have an effect for both sound conceptualizations and information behavior. Those with more advanced degrees (i.e. masters and doctoral) felt they had less expectations about knowledge on sound or other factors if it was not their specialty. Those with more years of experience were more likely to consider the sound-related factor risky to the success of their projects. Those in management and executive positions were more likely to show concern across all project factors, consider user satisfaction, and be averse to poor outcomes, likely in response to their increased stake in the organization. However, the sound-related factor was rarely the concern of decision makers like politicians and developers.

Within the organization where the PBEs worked, both the sizes of the company or the city where they worked, and the sector played a role in affecting conceptualizations. In particular, larger cities and organizations had access to more resources, especially in-house resources for expert information. Those in smaller companies and cities relied on their networks. An effect of conceptualization was also found for the country where the PBE was working and some of the contexts of the project. Those in Europe were more likely to focus on the environmental aspects of the sound-related factor.

RQ3. How do these conceptualizations about sound compare to other urban planning and design factors?

Compared to other planning and design factors, the sound-related factor is much more often treated as an isolated factor that can be solved rather than optimized in the constellation of other interrelated factors. Occasionally, the sound-related factor is considered part of an environmental parent category of factors, in which case it is treated

as a type of pollution risk (i.e. Conceptualization 3); or, the sound-related factor is linked to health and well-being in the sense that less sound indicates higher health and well-being.

Compared to other factors, sound can take a high priority, but the reason it gets a high priority is different: when the sound-related factor is not satisfactorily addressed, it can cause the project to be greatly altered or canceled because it does not meet regulatory targets; those with the most years of experience had likely encountered these kinds of problems more than others, and thus gave the sound-related factor a higher priority too. Relative to some other factors, the amount of educational material about the sound-related factor does not seem to address the elevated importance the factor takes when it is a problem for a project.

More than for many other factors, the sound-related factor is treated as a technical factor that requires solving through mitigation, but it does not require continuous care once it has been dealt with. In general, PBEs often specialize in one or two factors, but are required to be able to think about the complex relationships between all factors and balance them to make a good plan. None of the PBEs encountered had this specialized expertise in the sound-related factor, and the literature does not support the widespread availability of such an expert.

> RQ4. Where do professionals of the built environment go for information about sound? What information sources could support PBEs in transitioning strategies from environmental noise management to soundscape design?

This study and numerous others have established that academic research does not play a major, direct role in the regular information seeking behavior of many PBEs. There are numerous exceptions at the individual and group level - those PBEs who themselves have worked in academic contexts via PhDs or university teaching are more comfortable using academic research. At the group level, PBEs are comfortable accessing sources derived from academic research, but that are better adapted for their context. Particularly

adaptable to context are the human sources, like field experts, that they consult for information; but trade-specific periodicals, governments reports, and other websites also play a role. In general, there is a high level of trust in the quality of academic research. The research supports the idea that the publication of tailored information would support a transition of design and planning strategies, but that human intermediaries are necessary to advocate and translate that information into contextualized solutions.

6.2 Recommendations and implications

Recommendations and implications derived from the results are proposed here in the context of the "real-life" situation(s) described by the Literature review, the participants themselves, and my own experiences with PBE studies at a university. The themes of these recommendations are the research-practice gap, training and education on sound, and the appropriateness of the four conceptualizations for various project-related contexts.

6.2.1 The research-practice gap with sound

Soundscape has numerous potential benefits for PBEs, however, its use is not widespread. Multiple sources from the literature had identified a research-practice gap for sound, particularly the review from Bild et al., (2016), which further specified this gap particularly in relation to soundscape research. In the present study, this gap was evidenced by participants' reliance on experts and low perceived agency to change sound-related outcomes.

Despite the gaps, a few PBEs are already using elements of the *sound as opportunity* conceptualization, which has been described as one of the cornerstones of the soundscape framework (e.g. Schulte-Fortkamp and Kang, 2013), even though they do not call this *soundscape* by name. Thus, it is necessary to revisit Kang's (2010) assumption

that using soundscape requires a "step change"[50] in thinking about the urban sound environment. Rather than suggesting that using soundscape requires a discontinuity from today's approach, the way these conceptualizations have been outlined imply that various solutions to urban sound problems simply need to be better contextualized in relation to the problem being solved. Incorporating soundscape could thus be a smooth transition, reducing the resources and effort required to change practices.

Rather than having soundscape researchers emphasize the "gap" between current practice and soundscape and emphasizing the contrasting nature of the conceptualizations, there could be an emphasis on an appropriate balance of the factors being used purposefully and strategically. The continuous approach is supported by the participants who switched in and out of Conceptualization 4 (*sound as opportunity*) without necessarily viewing it as a contradiction with, for example, environmental protection. A continuous approach to incorporating *sound as opportunity* is also supported practically by being sensitive to the resources and reality of work in PBE fields. Some examples of these potential contexts will be described below.

Meanwhile, soundscape researchers should continue to push for new laws and regulations that incorporate advances in the research, but they should be sensitive to the information sources and behaviors of PBEs. Soundscape researchers should strive to understand the "realities" of PBE's work to facilitate collaboration. The 2002 Environmental Noise Directive (EU, 2002) established a common framework for environmental noise management for EU countries with goals for noise mapping, information for the public, and the adoption of noise action plans. Part of these action plans are the establishment of "quiet areas", for example (EEA, 2014), but these top-down directives may continue to reinforce rather than close the gaps, even if they are founded on good ideas.

[50] "Step change" refers to a mathematical principle where a path change is immediate and discontinuous.

6.2.2 Training and education about sound

The literature suggests that city makers are moving away from hierarchical approaches to getting their information. Muller et al (2005), in a study on collaboration styles, suggest that to solve ecological problems, design, science, and deliberation need to come together as equal stakeholders in a transdisciplinary learning model. They stress that each of these stakeholders should "accept the superiority of common learning over disciplinary rigour". Weber et al (2012), talking about noise policy, suggest that the framework has shifted from top-down government to bottom-up governance. Similar transdisciplinary styles have been the subject of research on city making with respect to sound as well. Andringa et al. (2013) claim that the impact of soundscape research can be improved for urban planners if they understand how it can be used to address health and pleasantness; they also stress that local optimization requires the development of tools for citizen involvement.

Responding to this need for stakeholder engagement, a new push for "knowledge mobilization" is a potential outlet for soundscape research and its application. Acknowledging the severity of the researcher-practitioner gap and highlighting the importance of the potential contributions from research, governmental funding agencies, like the Social Sciences and Humanities Research Council of Canada (SSHRC), have devoted new funding schemes toward what they call *knowledge mobilization*. This term has been defined as "the reciprocal and complementary flow and uptake of research knowledge between researchers, knowledge brokers and knowledge users—both within and beyond academia—in such a way that may benefit users and create positive impacts…and, ultimately, has the potential to enhance the profile, reach and impact of…research." (sshrc-crsh.gc.ca, 2015.) The growth of these types of strategies is a good opportunity to take information on urban sound and reflect on the ways it can improve urban environments to practical ends.

Educational material for PBEs has been strongly focused on the technical aspects of sound, as demonstrated by the examples given from planning textbooks. However,

practicing PBEs report that their knowledge about sound need not be “in a technical manner.” There is, thus, a mismatch between what they are taught and what their practical expectations are. New materials for PBEs could stress potential outcomes for effective sound design and planning and the way the sound factor integrates and resonates with others, rather than a standalone concept that is a risk to otherwise good projects. While participants reported that they worked on the sound-related factor in order to improve the outcomes for that factor, they worked on other factors to improve the project as a whole. This perspective could also be taught for sound. In this context of considering other factors and planning a sound ambiance, the opportunity to incorporate technological or engineering interventions, particularly with the help of an expert, could be pursued.

Lastly, the findings support a curricular change in the teaching of sound. Compared to the visual modality, PBEs are able to leave their university training programs with very little knowledge about the auditory modality. Consistent with the review and findings, the focus of sound education should be less on a brief unit in acoustics and more demonstrative principles of sound being used to advance project goals in relation to other factors.

6.2.3 Appropriateness of the conceptualizations

As covered in the Discussion section (5.5) on Going from four conceptualizations to soundscape, each conceptualization has a role to play in solving particular problems for PBEs, so long as they can be used in the appropriate contexts of a project. Below, each of the four conceptualizations is revisited to suggest examples for when a particular problem encountered could be solved by thinking about sound with that conceptualization.

- *noise as level* – thinking about noise with this conceptualization would be appropriate for situations where the sound level has been determined to be high

enough to cause hearing loss. Organizations like OSHA[51] regulate safe exposure times for various sound levels for factory workers, for example. More relevant to everyday urban environments, however, is the sleeping environment. Disturbance from urban noise during sleep cycles seems strongly linked to its level (e.g. Muzet, 2007). Therefore, this straightforward conceptualization may be useful in identifying or planning sleeping and other sensitive environments.

- *sound as mediation* – When nearby residents experience anxiety about new interventions near their homes (e.g. a new bar), public consultations can be an important source of information sharing such that the city can learn about very specific local issues and residents can be put at ease with mitigation measures.
- *noise as environmental pollutant* - The establishment of accessible quiet areas has been proven beneficial in the literature, and an environmental strategy could be used to identify and protect potential quiet areas from encroaching sources and identify the most important sources to be mitigated, particularly from traffic and industrial noise.
- *sound as opportunity* – this conceptualization has numerous potential benefits, explained particularly in the Literature review. Positive uses of sound can contribute to the functioning of other factors (e.g. interesting water sounds can encourage the lingering of pedestrians) or prevent wasted space (e.g. by selecting activities that are appropriate for the existing soundscape).

In the end, all four of the conceptualizations can and should coexist and be used for the appropriate strategy and problem at-hand; it is worth evaluating the sound outcomes of a project in the earliest stages, when the appropriate strategies and solutions can be planned. This calls for a much stronger emphasis on the proactive rather than reactive side of thinking about sound. According to Pijpers van Esch (2015), urban designers preferred to get their information up-front from subject-matter experts to reduce the risk that new information would negatively affect the existing plan. The opportunity for

[51] https://www.osha.gov/SLTC/noisehearingconservation/

soundscape research is that this information also belongs up-front and that it's the way the expertise is consulted that could be updated and harmonized with the way that other factors are dealt with, including the consideration of qualitative aspects of the plan. While there has been a long history of regulation and training that reinforces existing conceptualizations about sound, many of the components of the soundscape strategy are already embedded.

Bringing together these findings on the appropriate use of each conceptualization and about the information needs and expectations of PBEs, we have, along with a newly established research group, begun conducting workshops and other collaborative efforts with the City of Montreal to bring this sound knowledge to practice (Steele et al., 2017). These efforts, part of a project called Sounds in the City, will be a framework for future research, described in the final section below.

6.3 Contributions

This study makes theoretical, methodological, and practical contributions to information studies, urban planning and design, and the growing collection of studies in soundscape. They are organized below in terms of contributions, first, to the research by field and, second, to practice.

6.3.1 Research

6.3.1.1 Information studies

The present study offers a rare comparison of information sources along such variables as management level, sector, organization size, and others. While many previous studies had focused on one or two organizations at a time, this study focused on a range of job types and interviewed participants in many organizational contexts. Further, the study demonstrated an effect of management level both on the way problems were conceptualized in the workplace and what information sources were consulted. An

explanation was offered concerning the relationship of the participant to the company, such that more executive participants were motivated by concerns about business health.

As discussed in 5.6.2 Trustworthiness, credibility, transferability, the findings of the present study are transferable to other fields. Immediately applicable are the nearby fields of environmental studies with active research communities. While, for example, the importance of human intermediaries is known in Information Studies, some guidelines have been laid out for establishing communication networks and understanding the variables that may lead to use of research knowledge, especially in these fields far from Information Studies.

6.3.1.2 Urban planning and design

This study took a cross-cutting look at professionals who intervene in the city, but who perform at a wide range of scales. Interviewing these PBEs as a group rather than isolating one profession at a time has allowed comparisons across professional training, countries, and sectors. This study offers a general resource on the information sources of PBEs across the same variables and offers a comparative look at the way different planning and design factors are conceptualized and worked with.

Methodologically speaking, it does not seem feasible to speak to PBEs about their conceptualizations of the sound environment without having them reference specific projects. The extent to which this is true for other planning and design factors remains a question for future research. However, the reliance on project-specific references may indicate that sound conceptualizations may not be completely abstracted from project-specific scenarios, with implications for both future methods and practical outreach.

6.3.1.3 Soundscape

The present study has greatly grown the corpus of descriptions and evaluations made by city makers on the topic of sound. Rather than isolate one PBE sub-profession at a time,

this work highlights more global principles and issues based on projects and offers a way to categorize the ensemble of actors that influence the sound environment.

Further, the sound-related factor was compared to another factor offering a direct comparison of operating concepts. Thus, for various criticisms of practice that have been made by soundscape researchers, this work could help determine the extent to which problems facing soundscape researchers are isolated to sound only.

6.3.2 Practical

This research has identified and outlined a potential pathway for stepwise adoption of soundscape techniques from existing conceptualizations. It offers clear insight into ways to reach PBEs with this new approach, for example, focusing on materials that encourage known methods used on other factors (e.g. surveys) to accomplish user-centered outcomes for city users. Further, this work could lead to the development of recommendations and guidelines for using soundscape that are sensitive to particular barriers and facilitators to research knowledge encountered by PBEs.

6.4 Future research

There are numerous opportunities and directions for future research on this topic. While there are many questions raised by the data that could be addressed with more participants in a similar study, such as more countries, I will focus on the opportunities for future research based on the implications of the findings.

The results of this study have paved the way for multiple local projects in Montreal. The first of these was the Musikiosk project, installed in the summer of 2015 in a Montreal pocket park (Steele et al, 2015; Steele et al., 2016). An unsupervised sound system was placed in the gazebo of a busy and active park in the center of a lively neighborhood. The installation required the approval of the city and made use of all four conceptualizations to demonstrate both benefits and lack of harm to residents and users alike:

- C1: noise as level – the Musikiosk adhered to local regulations for maximum sound level for event noise.
- C2: sound as mediation – the research team worked with neighbors and existing park users to minimize local concerns and ensure that no existing users would be displaced.
- C3: noise as environmental pollutant – the Musikiosk research team established that the Musikiosk would not be louder than the latent traffic noise at 10 meters and more from the gazebo where it was installed, and it would not propagate noise at night during sleeping hours because the system would automatically shut down.
- C4: sound as opportunity - Musikiosk users and other park users would perceive the installation as pleasant and eventful, while not having a negative effect on the park's calm and appropriate soundscape. Musikiosk users appreciated being able to share music in a public setting, where it is normally illegal, and having the background noise of the city as a background for their music (Bild et al, 2016).

Using the positive results of Musikiosk, a similar research team has been formed, called Sounds in the City[52], where a long-term collaboration with the City of Montreal has been established to try and identify and protect the quality soundscapes of Montreal (emphasizing heavily the *sound as opportunity* conceptualization) while simultaneously ensuring that the other uses of other conceptualizations is in-line with support from the research and other best-practices worldwide. Sounds in the City has, for example, culminated in workshops that bring researchers, PBEs, and other stakeholders to the table to collaboratively plan and design the sounds of spaces (Steele et al., 2017). The open questions are as much a question of planning and design processes for considering sound as they are a need for fundamental research in soundscape evaluation and understanding for city users.

[52] www.sounds-in-the-city.org

7 Works Cited

Adams, M. D., Davies, W. J., & Bruce, N. S. (2009). Soundscapes: An urban planning process map. Presented at the Internoise 2009, Ottawa, Canada: INCE. Retrieved from http://usir.salford.ac.uk/2465/

Affairs, U. N. D. E. S. (2016). *The World's Cities in 2016*. Retrieved from https://books.google.com/books?id=UE88DwAAQBAJ

Aletta, F., Kang, J., & Axelsson, Ö. (2016). Soundscape descriptors and a conceptual framework for developing predictive soundscape models. *Landscape and Urban Planning*, *149*, 65–74. https://doi.org/10.1016/j.landurbplan.2016.02.001

Alves, S., Estévez-Mauriz, L., Aletta, F., Echevarria-Sanchez, G. M., & Romero, V. P. (2015). Towards the integration of urban sound planning in urban development processes: The study of four test sites within the SONORUS project. *Noise Mapping*, *2*(1).

Amphoux, P. (1993). *L'identité sonore des villes européennes*. CRESSON; IREC (Institut de Recherche sur l'Environnement Construit).

Anderson, C. J., Glassman, M., McAfee, R. B., & Pinelli, T. (2001). An investigation of factors affecting how engineers and scientists seek information. *Journal of Engineering and Technology Management*, *18*(2), 131–155. https://doi.org/10.1016/S0923-4748(01)00032-7

Arras, F., Massacci, G., & Pittaluga, P. (2003). Soundscape perception in Cagliari, Italy. In *Proceedings of the 5th European Conference on Noise Control–Euronoise*. Retrieved from

http://www.inquinamentoacustico.it/_dowload/la_percezione_dei_paesaggi_sonori_di_cagliari%20-%20arras.PDF

Asdrubali, F., D'Alessandro, F., Baldinelli, G., & Schulte-Fortkamp, B. (2014). From the soundscape to the architectural redevelopment of an outdoor public space. In *Forum Acusticum,(2014, Krakow, Polonia).[Links]*.

Aspuru, I., García, I., Herranz, K., & Santander, A. (2016). CITI-SENSE: Methods and tools for empowering citizens to observe acoustic comfort in outdoor public spaces. *Noise Mapping*, *3*(1).

Augoyard, J. F., & Torgue, H. (1995). *À l'écoute de l'environnement: Répertoire des effets sonores*. Editions Parenthèses.

Axelsson, Ö., Nilsson, M. E., & Berglund, B. (2010). A principal components model of soundscape perception. *The Journal of the Acoustical Society of America*, *128*(5), 2836–2846. https://doi.org/10.1121/1.3493436

Axelsson, O., Nilsson, M. E., & Berglund, B. (2012). The Swedish soundscape-quality protocol. *The Journal of the Acoustical Society of America*, *131*(4), 3476–3476.

Baer, W. C. (1997). General Plan Evaluation Criteria: An Approach to Making Better Plans. *Journal of the American Planning Association*, *63*(3), 329–344. https://doi.org/10.1080/01944369708975926

Basner, M., Babisch, W., Davis, A., Brink, M., Clark, C., Janssen, S., & Stansfeld, S. (2014). Auditory and non-auditory effects of noise on health. *The Lancet*, *383*(9925), 1325–1332.

Baulac, M., Defrance, J., Jean, P., & Minard, F. (2006). Efficiency of noise protections in urban areas: Predictions and scale model measurements. *Acta Acustica United with Acustica*, *92*(4), 530–539.

Bereitschaft, B., & Debbage, K. (2013). Urban Form, Air Pollution, and CO2 Emissions in Large U.S. Metropolitan Areas. *The Professional Geographer*, *65*(4), 612–635. https://doi.org/10.1080/00330124.2013.799991

Bijsterveld, K. (2008). *Mechanical sound: Technology, culture, and public problems of noise in the twentieth century*. MIT press.

Bild, E., Coler, M., Pfeffer, K., & Bertolini, L. (2016). Considering sound in planning and designing public spaces: A review of theory and applications and a proposed framework for integrating research and practice. *Journal of Planning Literature*, *31*(4), 419–434.

Blandin, J. S., & Brown, W. B. (1977). Uncertainty and management's search for information. *IEEE Transactions on Engineering Management*, (4), 114–119.

Blesser, B., & Salter, L.-R. (2009). *Spaces speak, are you listening?: Experiencing aural architecture*. MIT press.

Bloomberg, L. D., & Volpe, M. (2012). *Completing your qualitative dissertation: A road map from beginning to end*. Sage Publications.

Botteldooren, D., Lavandier, C., Preis, A., Dubois, D., Aspuru, I., Guastavino, C., … Andringa, T. C. (2011). Understanding urban and natural soundscapes. In *Forum Acusticum 2011* (pp. 2047–2052). European Accoustics Association (EAA).

Brambilla, G., Gallo, V., Asdrubali, F., & D'Alessandro, F. (2013). The perceived quality of soundscape in three urban parks in Rome. *The Journal of the Acoustical Society of America*, *134*(1), 832. https://doi.org/10.1121/1.4807811

Brown, A. L., Kang, J., & Gjestland, T. (2011). Towards standardization in soundscape preference assessment. *Applied Acoustics*, *72*(6), 387–392. https://doi.org/10.1016/j.apacoust.2011.01.001

Brown, A. L., & Muhar, A. (2004). An approach to the acoustic design of outdoor space. *Journal of Environmental Planning and Management*, *47*(6), 827–842.

Cain, R., Jennings, P., Adams, M., Bruce, N., Carlyle, A., Cusack, P., … Plack, C. J. (2008). SOUND-SCAPE: A framework for characterising positive urban soundscapes. *Journal of the Acoustical Society of America*, *123*(5), 3394–3394.

Carles, J., Bernáldez, F., & Lucio, J. de. (1992). Audio-visual interactions and soundscape preferences. *Landscape Research*, *17*(2), 52–56.

Cerwen, G. (2017). Sound in Landscape Architecture: A Soundscape Approach to Noise. *Swedish University of Agricultural Sciences, Department of Landscape Architecture, Planning and Management: Alnarp, Sweden*.

Cerwén, G., Wingren, C., & Qviström, M. (2017). Evaluating soundscape intentions in landscape architecture: A study of competition entries for a new cemetery in Järva, Stockholm. *Journal of Environmental Planning and Management*, *60*(7), 1253–1275.

Cohen, D., & Crabtree, B. (2006, July). Qualitative Research Guidelines Project. Retrieved June 21, 2018, from http://www.qualres.org/index.html

Cooper, I., & Crisp, V. H. C. (1984). Barriers to the exploitation of daylighting in building design: U.K. experience. *Energy and Buildings*, *6*(2), 127–132. https://doi.org/10.1016/0378-7788(84)90067-7

Coyne, R. (2010). *The tuning of place*. MIT press.

Cullen, G. (1961). *Townscape*. The Architectural Press,.

Culnan, M. J. (1983). Environmental scanning: The effects of task complexity and source accessibility on information gathering behavior. *Decision Sciences*, *14*(2), 194–206.

Damschroder, L. J., Aron, D. C., Keith, R. E., Kirsh, S. R., Alexander, J. A., & Lowery, J. C. (2009). Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. *Implementation Science*, *4*(1), 50.

Davies, W. J., & Murphy, J. (2012). Reproducibility of soundscape dimensions. Presented at the Internoise 2012, New York: International Institute of Noise Control Engineering. Retrieved from http://www.i-ince.org/

Davies, William J., Adams, M. D., Bruce, N. S., Cain, R., Carlyle, A., Cusack, P., … Poxon, J. (2013). Perception of soundscapes: An interdisciplinary approach. *Applied Acoustics*, *74*(2), 224–231. https://doi.org/10.1016/j.apacoust.2012.05.010

De Coensel, B., Bockstael, A., Dekoninck, L., Botteldooren, D., Schulte-Fortkamp, B., Kang, J., & Nilsson, M. E. (2010). The soundscape approach for early stage urban planning: A case study. *Proc. Inter· Noise,(Lisbon, Portugal)*. Retrieved from

http://users.ugent.be/~bdcoense/content/data/pdf/conference/29_DecoenselIN10.pdf

De Coensel, B., Vanwetswinkel, S., & Botteldooren, D. (2011). Effects of natural sounds on the perception of road traffic noise. *The Journal of the Acoustical Society of America*, *129*(4), EL148–EL153.

Di, G., Li, Z., Zhang, B., & Shi, Y. (2011). Adjustment on subjective annoyance of low frequency noise by adding additional sound. *Journal of Sound and Vibration*, *330*(23), 5707–5715.

Doick, K. J., Sellers, G., Castan-Broto, V., & Silverthorne, T. (2009). Understanding success in the context of brownfield greening projects: The requirement for outcome evaluation in urban greenspace success assessment. *Urban Forestry & Urban Greening*, *8*(3), 163–178.

Drisko, J. W., & Maschi, T. (2015). *Content analysis*. Pocket Guides to Social Work R.

Dubois, D., Guastavino, C., & Raimbault, M. (2006). A Cognitive Approach to Urban Soundscapes: Using Verbal Data to Access Everyday Life Auditory Categories. *Acta Acustica United with Acustica*, *92*(6), 865–874.

Ekman, M. R., Lundén, P., & Nilsson, M. E. (2015). Similarity and pleasantness assessments of water-fountain sounds recorded in urban public spaces. *The Journal of the Acoustical Society of America*, *138*(5), 3043–3052.

Eliasson, I. (2000). The use of climate knowledge in urban planning. *Landscape and Urban Planning*, *48*(1–2), 31–44. https://doi.org/10.1016/S0169-2046(00)00034-7

Erickson, B., & Lloyd-Jones, T. (2001). Design problems. *Approaching Urban Design: The Design Process, Harlow: Pearson Education Ltd*.

Evans, J. M., & Schiller, S. D. (1996). Application of microclimate studies in town planning: A new capital city, an existing urban district and urban river front development. *Atmospheric Environment*, *30*(3), 361–364. https://doi.org/10.1016/1352-2310(94)00138-3

Fiebig, A., Acloque, V., Basturk, S., Di Gabriele, M., Horvat, M., Masullo, M., … Genuit, K. (2010). Education in Soundscape-A seminar with young scientists in the COST Short Term Scientific Mission "Soundscape-Measurement, Analysis, Evaluation." In *Proceedings of the 20th International Congress on Acoustics ICA 2010*.

Filipan, K., Boes, M., De Coensel, B., Lavandier, C., Delaitre, P., Domitrović, H., & Botteldooren, D. (2017). The personal viewpoint on the meaning of tranquility affects the appraisal of the urban park soundscape. *Applied Sciences*, *7*(1), 91.

Flanagan, J. C. (1954). The critical incident technique. *Psychological Bulletin*, *51*(4), 327–358. https://doi.org/10.1037/h0061470

Forssén, J., Hornikx, M., Van Der Aa, B., Nilsson, M., Rådsten-Ekman, M., Defrance, J., … Van Maercke, D. (2014). Toolbox from the EC FP7 HOSANNA project for the reduction of road and rail traffic noise in the outdoor environment. In *Transport Research Arena 2014*.

Forsyth, A. (2007). Innovation in Urban Design: Does Research Help? *Journal of Urban Design*, *12*(3), 461–473. https://doi.org/10.1080/13574800701602569

Freund, L. (2015). Contextualizing the information-seeking behavior of software engineers. *Journal of the Association for Information Science and Technology*, *66*(8), 1594–1605. https://doi.org/10.1002/asi.23278

Gehl, J. (2011). *Life between buildings: Using public space*. Island Press.

Gidlöf-Gunnarsson, A., & Öhrström, E. (2007). Noise and well-being in urban residential environments: The potential role of perceived availability to nearby green areas. *Landscape and Urban Planning*, *83*(2–3), 115–126. https://doi.org/10.1016/j.landurbplan.2007.03.003

Glaser, B. G. (1965). The Constant Comparative Method of Qualitative Analysis. *Social Problems*, *12*(4), 436–445. https://doi.org/10.2307/798843

Good practice guide on quiet areas. (2014, April 29). [Publication]. Retrieved from https://www.eea.europa.eu/publications/good-practice-guide-on-quiet-areas

Guastavino, C. (2006). The Ideal Urban Soundscape: Investigating the Sound Quality of French Cities. *Acta Acustica United with Acustica*, *92*(6), 945–951.

Guastavino, C. (2007). Categorization of environmental sounds. *Canadian Journal of Experimental Psychology/Revue Canadienne de Psychologie Expérimentale*, *61*(1), 54–63. https://doi.org/10.1037/cjep2007006

Guastavino, C., Katz, B. F., Polack, J.-D., Levitin, D. J., & Dubois, D. (2005). Ecological validity of soundscape reproduction. *Acta Acustica United with Acustica*, *91*(2), 333–341.

Guastavino, C., & Pijanowski, B. C. (2011). Soundscape ecology: A worldwide network. *The Journal of the Acoustical Society of America*, *130*(4), 2531–2531.

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods*, *18*(1), 59–82.

Guyatt, G., Cairns, J., Churchill, D., Cook, D., Haynes, B., Hirsh, J., … Nishikawa, J. (1992). Evidence-based medicine: A new approach to teaching the practice of medicine. *Jama*, *268*(17), 2420–2425.

Hall, D. A., Irwin, A., Edmondson-Jones, M., Phillips, S., & Poxon, J. E. (2013). An exploratory evaluation of perceptual, psychoacoustic and acoustical properties of urban soundscapes. *Applied Acoustics*, *74*(2), 248–254.

Harriet, S. (2013). *Application of auralisation and soundscape methodologies to environmental noise*. University of York.

Hemsley-Brown, J., & Sharp, C. (2003). The Use of Research to Improve Professional Practice: A systematic review of the literature. *Oxford Review of Education*, *29*(4), 449–471. https://doi.org/10.1080/0305498032000153025

Herranz-Pascual, K., García, I., Aspuru, I., Díez, I., & Santander, Á. (2016). Progress in the understanding of soundscape: Objective variables and objectifiable criteria that predict acoustic comfort in urban places. *Noise Mapping*, *3*(1).

Hertzum, M., & Pejtersen, A. M. (2000). The information-seeking practices of engineers: searching for documents as well as for people. *Information Processing & Management*, *36*(5), 761–778. https://doi.org/10.1016/S0306-4573(00)00011-X

Hiramatsu, K. (2006). A Review of Soundscape Studies in Japan. *Acta Acustica United with Acustica*, *92*(6), 857–864.

Hjørland, B. (2011). Evidence-based practice: An analysis based on the philosophy of science. *Journal of the American Society for Information Science and Technology*, *62*(7), 1301–1310. https://doi.org/10.1002/asi.21523

Holden, M. (2015). *Acoustics of Multi-Use Performing Arts Centers*. CRC Press.

Holland, W. E., Stead, B. A., & Leibrock, R. C. (1976). Information channel/source selection as a correlate of technical uncertainty in a research and development organization. *IEEE Transactions on Engineering Management*, (4), 163–167.

Hong, J. Y., & Jeon, J. Y. (2015). Influence of urban contexts on soundscape perceptions: A structural equation modeling approach. *Landscape and Urban Planning*, *141*, 78–87. https://doi.org/10.1016/j.landurbplan.2015.05.004

Horswill, M. S., & Plooy, A. M. (2008). Auditory feedback influences perceived driving speeds. *Perception*, *37*(7), 1037–1043.

Hutchinson, A. M., & Johnston, L. (2004). Bridging the divide: A survey of nurses' opinions regarding barriers to, and facilitators of, research utilization in the practice setting. *Journal of Clinical Nursing*, *13*(3), 304–315. https://doi.org/10.1046/j.1365-2702.2003.00865.x

Innes, J. E. (1998). Information in Communicative Planning. *Journal of the American Planning Association*, *64*(1), 52–63. https://doi.org/10.1080/01944369808975956

Irvine, K. N., Devine-Wright, P., Payne, S. R., Fuller, R. A., Painter, B., & Gaston, K. J. (2009). Green space, soundscape and urban sustainability: an interdisciplinary, empirical study. *Local Environment*, *14*(2), 155–172. https://doi.org/10.1080/13549830802522061

Ising, H., & Kruppa, B. (2004). Health effects caused by noise: Evidence in the literature from the past 25 years. *Noise and Health*, *6*(22), 5.

ISO 12913-1: 2014. (2014). Acoustics–soundscape–part 1: Definition and conceptual framework.

ISO/TS 12913-2:2018. (2018). Acoustics -- Soundscape -- Part 2: Data collection and reporting requirements.

Jennings, P., & Cain, R. (2013). A framework for improving urban soundscapes. *Applied Acoustics*, *74*(2), 293–299. https://doi.org/10.1016/j.apacoust.2011.12.003

Jeon, J. Y., Hong, J. Y., Lavandier, C., Lafon, J., Axelsson, Ö., & Hurtig, M. (2018). A cross-national comparison in assessment of urban park soundscapes in France, Korea, and Sweden through laboratory experiments. *Applied Acoustics*, *133*, 107–117.

Kajermo, K. N., Nordström, G., Krusebrant, Å., & Björvell, H. (1998). Barriers to and facilitators of research utilization, as perceived by a group of registered nurses in Sweden. *Journal of Advanced Nursing*, *27*(4), 798–807.

Kajermo, K. N., Undén, M., Gardulf, A., Eriksson, L. E., Orton, M.-L., Arnetz, B. B., & Nordström, G. (2008). Predictors of nurses' perceptions of barriers to research utilization. *Journal of Nursing Management*, *16*(3), 305–314. https://doi.org/10.1111/j.1365-2834.2007.00770.x

Kang, J. (2006). *Urban sound environment*. CRC Press.

Kang, J. (2010). From understanding to designing soundscapes. *Frontiers of Architecture and Civil Engineering in China*, *4*(4), 403–417. https://doi.org/10.1007/s11709-010-0091-5

Kang, J., Aletta, F., Gjestland, T. T., Brown, L. A., Botteldooren, D., Schulte-Fortkamp, B., … Fiebig, A. (2016). Ten questions on the soundscapes of the built environment. *Building and Environment*, *108*, 284–294.

Kang, J., & Schulte-Fortkamp, B. (2016). *Soundscape and the Built Environment*. CRC press.

Kato, S., & Ahern, J. (2008). 'Learning by doing': Adaptive planning as a strategy to address uncertainty in planning. *Journal of Environmental Planning and Management*, *51*(4), 543–559.

Kluizenaar, Y. de, Salomons, E. M., Janssen, S. A., van Lenthe, F. J., Vos, H., Zhou, H., … Mackenbach, J. P. (2011). Urban road traffic noise and annoyance: The effect of a quiet façade. *The Journal of the Acoustical Society of America*, *130*(4), 1936–1942.

Koussa, F., Defrance, J., Jean, P., & Blanc-Benon, P. (2013). Acoustic performance of gabions noise barriers: Numerical and experimental approaches. *Applied Acoustics*, *74*(1), 189–197.

Krizek, K., Forysth, A., & Slotterback, C. S. (2009). Is there a role for evidence-based practice in urban planning and policy? *Planning Theory & Practice*, *10*(4), 459–478.

Krumdieck, S., Page, S., & Dantas, A. (2010). Urban form and long-term fuel supply decline: A method to investigate the peak oil risks to essential activities. *Transportation Research Part A: Policy and Practice*, *44*(5), 306–322. https://doi.org/10.1016/j.tra.2010.02.002

Kwasitsu, L. (2003). Information-seeking behavior of design, process, and manufacturing engineers. *Library & Information Science Research*, *25*(4), 459–476. https://doi.org/10.1016/S0740-8188(03)00054-9

Lavandier, C., Aumond, P., Gomez, S., & Dominguès, C. (2016). Urban soundscape maps modelled with geo-referenced data. *Noise Mapping*, *3*(1).

Lavandier, C., & Delaitre, P. (2015). Individual and shared representations on "zones calmes"("quiet areas") among the French population in urban context. *Applied Acoustics*, *99*, 135–144.

Leckie, G. J., Pettigrew, K. E., & Sylvain, C. (1996). Modeling the Information Seeking of Professionals: A General Model Derived from Research on Engineers, Health Care Professionals, and Lawyers. *The Library Quarterly: Information, Community, Policy*, *66*(2), 161–193.

Lercher, P., & Schulte-Fortkamp, B. (2003). The relevance of soundscape research to the assessment of noise annoyance at the community level. In *Proceedings of the Eighth International Congress on Noise as a Public Health Problem* (pp. 225–231).

Levitt, H. M., Motulsky, S. L., Wertz, F. J., Morrow, S. L., & Ponterotto, J. G. (2017). Recommendations for designing and reviewing qualitative research in psychology: Promoting methodological integrity. *Qualitative Psychology*, *4*(1), 2.

Lindqvist, S., & Mattsson, J. O. (1989). Planning-topography and climate: Local climate maps for planning activities, including definitions in these surveying techniques. *Building Research and Practice*, *17*(5), 299–304.

Liu, J., & Kang, J. (2015). Soundscape design in city parks: exploring the relationships between soundscape composition parameters and physical and psychoacoustic parameters. *Journal of Environmental Engineering and Landscape Management*, *23*(2), 102–112. https://doi.org/10.3846/16486897.2014.998676

Lynch, K., Lynch, K. R., & Hack, G. (1984). *Site planning*. MIT press.

Mackrill, J., Jennings, P., & Cain, R. (2014). Exploring positive hospital ward soundscape interventions. *Applied Ergonomics*, *45*(6), 1454–1460. https://doi.org/10.1016/j.apergo.2014.04.005

Maffei, L., Masullo, M., Aletta, F., & Di Gabriele, M. (2013). The influence of visual characteristics of barriers on railway noise perception. *Science of the Total Environment*, *445*, 41–47.

Makri, S., & Warwick, C. (2010). Information for inspiration: Understanding architects' information seeking and use behaviors to inform design. *Journal of the American Society for Information Science and Technology*, *61*(9), 1745–1770. https://doi.org/10.1002/asi.21338

Marquis-Favre, C., Premat, E., & Aubrée, D. (2005). Noise and its Effects – A Review on Qualitative Aspects of Sound. Part II: Noise and Annoyance. *Acta Acustica United with Acustica*, *91*(4), 626–642.

McCartney, A., Paquette, D., Augoyard, J.-F., & Torgue, H. (2006). *Sonic Experience: A Guide to Everyday Sounds*. McGill-Queen's Press-MQUP.

Meijers, J. M. M., Janssen, M. A. P., Cummings, G. G., Wallin, L., Estabrooks, C. A., & Y.G. Halfens, R. (2006). Assessing the relationships between contextual factors and research utilization in nursing: Systematic literature review. *Journal of*

Advanced Nursing, *55*(5), 622–635. https://doi.org/10.1111/j.1365-2648.2006.03954.x

Moudon, A. V. (1994). Getting to know the built landscape: Typomorphology. *Ordering Space: Types in Architecture and Design*, 289–311.

Neuendorf, K. A. (2016). *The content analysis guidebook*. Sage.

Niessen, M. E., Van de Cruys, T., Cance, C., & Dubois, D. (2013). Sound and noise in sonic environmental studies: Comparing word meaning in discourses of community noise and soundscape research. *Acta Acustica United with Acustica*, *99*(6), 853–862.

Nilsson, M. E., Alvarsson, J., Rådsten-Ekman, M., & Bolin, K. (2010). Auditory masking of wanted and unwanted sounds in a city park. *Noise Control Engineering Journal*, *58*(5), 524–531.

Nilsson, M. E., & Berglund, B. (2006). Soundscape quality in suburban green areas and city parks. *Acta Acustica United with Acustica*, *92*(6), 903–911.

Öhrström, E., Hadzibajramovic, E., Holmes, M., & Svensson, H. (2006). Effects of road traffic noise on sleep: Studies on children and adults. *Journal of Environmental Psychology*, *26*(2), 116–126.

Oke, T. R. (1984). Towards a prescription for the greater use of climatic principles in settlement planning. *Energy and Buildings*, *7*(1), 1–10.

Oranta, O., Routasalo, P., & Hupli, M. (2002). Barriers to and facilitators of research utilization among Finnish registered nurses. *Journal of Clinical Nursing*, *11*(2), 205–213.

Pallasmaa, J. (2012). *The eyes of the skin: Architecture and the senses*. John Wiley & Sons.

Papas, M. A., Alberg, A. J., Ewing, R., Helzlsouer, K. J., Gary, T. L., & Klassen, A. C. (2007). The Built Environment and Obesity. *Epidemiologic Reviews*, *29*(1), 129–143. https://doi.org/10.1093/epirev/mxm009

Parahoo, K. (2000). Barriers to, and facilitators of, research utilization among nurses in Northern Ireland. *Journal of Advanced Nursing*, *31*(1), 89–98.

Passchier-Vermeer, W., & Passchier, W. F. (2000). Noise exposure and public health. *Environmental Health Perspectives*, *108*(Suppl 1), 123–131.

Payne, S. R., Davies, W. J., & Adams, M. D. (2009, October). Research into the practical and policy applications of soundscape concepts and techniques in urban areas [Monograph]. Retrieved December 6, 2015, from http://randd.defra.gov.uk

Payne, Sarah R. (2008). Are perceived soundscapes within urban parks restorative. *Journal of the Acoustical Society of America*, *123*(5), 3809–3809.

Pedersen, E., & Larsman, P. (2008). The impact of visual factors on noise annoyance among people living in the vicinity of wind turbines. *Journal of Environmental Psychology*, *28*(4), 379–389.

Pheasant, R., Horoshenkov, K., Watts, G., & Barrett, B. (2008). The acoustic and visual factors influencing the construction of tranquil space in urban and rural environments tranquil spaces-quiet places? *The Journal of the Acoustical Society of America*, *123*(3), 1446–1457.

Pijpers-van Esch, M. M. E. (2015). *Designing the Urban Microclimate: A framework for a design-decision tool for the dissemination of knowledge on the urban*

microclimate to the urban design process. TU Delft, Delft University of Technology.

Pressman, N. E. (1996). Sustainable winter cities: Future directions for planning, policy and design. *Atmospheric Environment*, *30*(3), 521–529.

Radovac, L. (2011). The" War on Noise": Sound and Space in La Guardia's New York. *American Quarterly*, *63*(3), 733–760.

Radovac, L. (2015). Muting Dissent: New York City's Sound Device Ordinance and the Liberalization of the Public Sphere. *Radical History Review*, *2015*(121), 32–50.

Rådsten-Ekman, M., Axelsson, Ö., & Nilsson, M. E. (2013). Effects of sounds from water on perception of acoustic environments dominated by road-traffic noise. *Acta Acustica United with Acustica*, *99*(2), 218–225.

Raimbault, M. (2006). Qualitative Judgements of Urban Soundscapes: Questionning Questionnaires and Semantic Scales. *Acta Acustica United with Acustica*, *92*(6), 929–937.

Raimbault, M., & Dubois, D. (2005). Urban soundscapes: Experiences and knowledge. *Cities*, *22*(5), 339–350. https://doi.org/10.1016/j.cities.2005.05.003

Rasmussen, S. E. (1964). *Experiencing architecture* (Vol. 2). MIT press.

Ricciardi, P., Delaitre, P., Lavandier, C., Torchia, F., & Aumond, P. (2015). Sound quality indicators for urban places in Paris cross-validated by Milan data. *The Journal of the Acoustical Society of America*, *138*(4), 2337–2348.

Riddell, R. (2008). *Sustainable urban planning: Tipping the balance*. John Wiley & Sons.

Sackett, D. L., Straus, S. E., Richardson, W. S., Rosenberg, W., & Haynes, R. B. (2000). How to practice and teach EBM. *Edinburgh: Churchill Livingstone*.

Sandberg, U. (1999). Low noise road surfaces-A state-of-the-art review. *Journal of the Acoustical Society of Japan (E)*, *20*(1), 1–17.

Savolainen, R. (2008). *Everyday information practices: A social phenomenological perspective*. Scarecrow Press.

Schafer, R. M. (1977). *The tuning of the world*. New York, NY: Alfred A. Knopf.

Schreckenberg, D., Griefahn, B., & Meis, M. (2010). The associations between noise sensitivity, reported physical and mental health, perceived environmental quality, and noise annoyance. *Noise and Health*, *12*(46), 7.

Schulte-Fortkamp, B., Brooks, B. M., & Bray, W. R. (2007). Soundscape: An approach to rely on human perception and expertise in the post-modern community noise era. *Acoustics Today*, *3*(1), 7–15.

Schulte-Fortkamp, B., & Kang, J. (2010). Soundscape research in networking across countries: COST Action TD0804. *The Journal of the Acoustical Society of America*, *127*(3), 1801–1801.

Schurch, T. W. (1999). Reconsidering urban design: Thoughts about its definition and status as a field or profession. *Journal of Urban Design*, *4*(1), 5–28.

Siebein, G., Bettcher, A., Fisher, J., Robinson, T., & Skelton, R. (2008). An architect's perspective on acoustics. *The Journal of the Acoustical Society of America*, *124*(4), 2462–2462. https://doi.org/10.1121/1.4782674

Siebein, G. W., Kwon, Y., Smitthakorn, P., & Gold, M. A. (2007). Case study of soundscape assessment and design methods. *The Journal of the Acoustical Society of America*, *121*(5), 3113. https://doi.org/10.1121/1.4782061

Sobin, N. (2011). *Syntactic analysis*. Wiley-Blackkwell.

Southworth, M. F. (1967). *The sonic environment of cities.* Massachusetts Institute of Technology.

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

Steele, D., Bild, E., & Guastavino, C. (2016). Evaluation of an urban soundscape intervention with music: Quantitative results from questionnaires. In *INTER-NOISE and NOISE-CON Congress and Conference Proceedings* (Vol. 253, pp. 4627–4637). Institute of Noise Control Engineering.

Steele, D., & Guastavino, C. (2013). How do urban planners conceptualize and contextualize soundscape in their everyday work? In *INTER-NOISE and NOISE-CON Congress and Conference Proceedings* (Vol. 247, pp. 5964–5970). Institute of Noise Control Engineering.

Steele, D., Steffens, J., & Guastavino, C. (2015). The role of activity in urban soundscape evaluation. In *Proceedings of the Euronoise* (pp. 1507–1512).

Steffens, J., Steele, D., & Guastavino, C. (2015). New insights into soundscape evaluations using the experience sampling method. In *Proceedings of Euronoise* (pp. 1496–1500).

Steffens, J., Steele, D., & Guastavino, C. (2017). Situational and person-related factors influencing momentary and retrospective soundscape evaluations in day-to-day life. *The Journal of the Acoustical Society of America*, *141*(3), 1414–1425.

Steiner, F. R., Butler, K., & Association, A. P. (2012). *Planning and Urban Design Standards*. John Wiley & Sons.

Stockfelt, T. (1991). Sound as an existential necessity. *Journal of Sound and Vibration*, *151*(3), 367–370.

Stokoe, E., & Hepburn, A. (2005). "You can hear a lot through the walls": Noise formulations in neighbour complaints. *Discourse & Society*, *16*(5), 647–673. https://doi.org/10.1177/0957926505054940

Sutherland, L.-A. (2010). Environmental grants and regulations in strategic farm business decision-making: A case study of attitudinal behaviour in Scotland. *Land Use Policy*, *27*(2), 415–423.

Sutherland, L.-A., Barnes, A., McCrum, G., Blackstock, K., & Toma, L. (2011). Towards a cross-sectoral analysis of land use decision-making in Scotland. *Landscape and Urban Planning*, *100*(1–2), 1–10. https://doi.org/10.1016/j.landurbplan.2010.10.005

Talen, E. (1996). After the plans: Methods to evaluate the implementation success of plans. *Journal of Planning Education and Research*, *16*(2), 79–91.

Talja, S., & Maula, H. (2003). Reasons for the use and non-use of electronic journals and databases: A domain analytic study in four scholarly disciplines. *Journal of Documentation*, *59*(6), 673–691.

Taylor, E. J., & Hurley, J. (2015). “Not a Lot of People Read the Stuff”: Australian Urban Research in Planning Practice. *Urban Policy and Research*, *0*(0), 1–16. https://doi.org/10.1080/08111146.2014.994741

Thompson, E. A. (2004). *The soundscape of modernity : architectural acoustics and the culture of listening in America, 1900-1933* (First MIT Press paperback edition., Vols. 1–1 online resource (ix, 500 pages) : illustrations). Cambridge, Mass.: MIT Press. Retrieved from http://hdl.handle.net/2027/heb.08832

Thompson, M. (2017). *Beyond unwanted sound: noise, affect and aesthetic moralism*. Bloomsbury Publishing USA.

Truax, B. (2001). Handbook of Acoustic Ecology, (CD-ROM version). *Computer Music Journal*, *25*, 93–94.

Urquhart, C., Light, A., Thomas, R., Barker, A., Yeoman, A., Cooper, J., … Spink, S. (2003). Critical incident technique and explicitation interviewing in studies of information behavior. *Library & Information Science Research*, *25*(1), 63–88. https://doi.org/10.1016/S0740-8188(02)00166-4

Van Herzele, A., & Wiedemann, T. (2003). A monitoring tool for the provision of accessible and attractive urban green spaces. *Landscape and Urban Planning*, *63*(2), 109–126. https://doi.org/10.1016/S0169-2046(02)00192-5

Vermersch, P. (1990). Questionner l’action: L’entretien d’explicitation. *Psychologie Française*, *35*(3), 227–235.

Wagner, K. (2018, February 20). City Noise Might Be Making You Sick. Retrieved August 24, 2018, from

https://www.theatlantic.com/technology/archive/2018/02/city-noise-might-be-making-you-sick/553385/

Warren, B. (1978). *Semantic patterns of noun-noun compounds*. Retrieved from https://gupea.ub.gu.se/handle/2077/14812

Weber, M., & Driessen, P. P. J. (2010). Environmental Policy Integration: The Role of Policy Windows in the Integration of Noise and Spatial Planning. *Environment and Planning C: Government and Policy*, *28*(6), 1120–1134. https://doi.org/10.1068/c0997

Weber, M., Driessen, P. P. J., & Runhaar, H. A. C. (2014). Evaluating environmental policy instruments mixes; A methodology illustrated by noise policy in the Netherlands. *Journal of Environmental Planning and Management*, *57*(9), 1381–1397. https://doi.org/10.1080/09640568.2013.808609

Weber, M., Driessen, P. P., & Runhaar, H. A. (2011). Drivers of and barriers to shifts in governance: Analysing noise policy in the Netherlands. *Journal of Environmental Policy & Planning*, *13*(2), 119–137.

White, R. W., Dumais, S. T., & Teevan, J. (2009). Characterizing the influence of domain expertise on web search behavior. In *Proceedings of the second ACM international conference on web search and data mining* (pp. 132–141). ACM.

Yang, W., & Kang, J. (2005). Soundscape and Sound Preferences in Urban Squares: A Case Study in Sheffield. *Journal of Urban Design*, *10*(1), 61–80. https://doi.org/10.1080/13574800500062395

Zhang, M., & Kang, J. (2007). Towards the evaluation, description, and creation of soundscapes in urban open spaces. *Environment and Planning B: Planning and Design*, *34*(1), 68–86.

Zumthor, P. (2006). *Atmospheres: Architectural environments - surrounding objects*. Basel: Birkhäuser.

8 Appendices

8.1 Interview guide

Interview Guide

1. **Introduction**
   - 1.1. What is the name of your position?
   - 1.2. Can you tell me about the role of your position in the Canadian context?
   - 1.3. What sorts of things do you do on a daily basis?
   - 1.4. What's the structure of your department?
   - 1.5. Is there anything unique about it?

2. **Listing of factors:**

Without talking about specific projects, when planning an urban space, what technical factors would you consider?

If sound has not been mentioned:

- 2.1. Are there any more factors that you consider?
- 2.2. You spoke about environmental factors. Could you list a few more factors you consider to be environmental?
- 2.3. Some other participants mentioned (*geology, noise, architecture, etc.*) Do you ever consider that?

3. **Conceptualization (cycling through each of two factors selected from the factor list)**
   - 3.1. What sorts of considerations do you make about *factor* when you're planning for a new place?
   - 3.2. Is *factor* something urban planners are expected to know something about?
   - 3.3. What role do consultants or internal experts play in your decision-making process about *factor*?
   - 3.4. Can you give a realistic expectation of the priority that *factor* gets relative to others?
   - 3.5. If there were something wrong with any of the specific considerations regarding *factor*, how would it play a role in your evaluation of the whole site?
   - 3.6. What is the best possible outcome for *factor*?
     - 3.6.1. What would that look like in a city?
   - 3.7. What do you feel you have the agency to change regarding *factor*?
   - 3.8. *If they mention activities, ask them about their process for understanding and designing/regulating for those activities.*

4. **Contextualization - Project 1 (recently completed project):**
   - 4.1. Intro
     - 4.1.1. What was your role in this project?
     - 4.1.2. What is the make-up of the team and its expertise?
     - 4.1.3. What were (some of) the major considerations for this project?
     - 4.1.4. Were you satisfied with the final outcome? Was your team satisfied? *If they say no, follow up.*
   - 4.2. Factors
     - 4.2.1. If we go back to the specific factors mentioned earlier, how did *factor* considerations get operationalized? (i.e. was it considered?)
     - 4.2.2. If *factor* was considered:

What weight did *factor* receive relative to other concerns?
Did you bring in internal or external expertise for *factor*?
Was there any element of public consultation for *factor*?
Are you happy with this specific outcome for *factor*?
What could have been better?

4.2.3. If *factor* was not considered:
Should *factor* have been considered?
Was *factor* left out for only this site plan or rather in general in (Montreal, etc.)?

4.2.4. Did the *factor* outcome have any role in your evaluation of the whole site?

4.2.5. How did the decision-makers on this project take *factor* into account?

5. Contextualization - Project 2 (in progress):

5.1. Intro

5.1.1. What is the goal of this project?

5.1.2. What is your role in this project?

5.1.3. What are some of the remaining issues to be solved before it is built?

5.1.4. Have you consulted any experts outside of the team?

5.2. Factors

5.2.1. How is *factor* factoring into the decision process?

5.2.2. If you had unlimited resources to work on this particular *factor* issue, in a perfect world, what would the outcome be?

5.2.3. As the resources become constrained, what are the first things to be cut regarding *factor*?

5.3. Did the program/intended use of these spaces play a role in how the specifications were determined in either project? If not, does that happen in general?

6. **Conclusion**

6.1. Could you tell me a little about the number of years of work experience and educational history you have?

6.2. What information sources, including informal sources like people, do you consult if you don't think you know enough about a topic?

6.3. Do you ever look into academic research? Please explain.

6.4. How do you feel about these types of (academic) sources?

6.5. What software and online tools do you find most helpful? Tools for visualization? Databases?

6.6. What would a tool look like that would be really helpful?

7. Soundscape debriefing

7.1. Have you ever heard of the term soundscape?

7.2. Have you had any positive experiences with noise outcomes in your work?

8.2 Ethics certificate

McGill University

ETHICS REVIEW
AMENDMENT REQUEST FORM

This form can be used to submit any changes/updates to be made to a currently approved research project. Changes must be reviewed and approved by the REB before they can be implemented.
1) Explain what these changes are, why they are needed, and if the risks or benefits to participants will change.
2) Attach relevant additional or revised documents such as questionnaires, consent forms, recruitment ads.
3) Significant or numerous changes to study methods, participant populations, location of research or the research question or where the amendment will change the overall purpose or objective of the originally approved study will require the submission of a complete new application.

REB File #: 450-0413
Project Title: How do urban planners conceptualize and contextualize soundscape in their everyday work?
Principal Investigator: Daniel Steele
Department/Phone/Email: School of Information Studies, 514.398.4204, daniel.steele@mail.mcgill.ca
Faculty Supervisor (for student PI): Dr. Catherine Guastavino

We will be adding a visiting student, Baptiste Guastavino (Ecole Spéciale d'Architecture in Paris), to assist with our interviews. We would like to amend the ethics review to include him and other potential assistants for the project.

Previously the interviews were conducted in the Netherlands, but now that they will be taking place in Montreal, we would like to offer them in French for the comfort of the urban planners we are interviewing, necessitating extra help and expertise. Baptiste will not have access to any identifying information from previous participants, but he will be assisting in data analysis involving anonymized transcripts. As he will be conducting interviews, he will be meeting and interacting with new participants, but he will be supervised during those interactions at all times.

Five amendments attached, not including the amended consent form (attached)

RECEIVED AUG 11 2014

Principal Investigator Signature: Daniel Steele as per attached email Aug 11/14 Date: 07May2014

Faculty Supervisor Signature: as per attached email Aug 11/14 Date:
(for student PI)

For Administrative Use **REB:** ___REB-I X REB-II ___REB-III

X Delegated Review ___ Full Review ___ Administrative Review

X This amendment request has been approved.

Signature of REB Chair/ delegate: Date: Aug. 15, 2014

Approved to : April 14, 2015

Submit to Lynda McNeil(lynda.mcneil@mcgill.ca), Research Ethics Officer, James Administration Building, 845 Sherbrooke Street West suite 429, fax: 398-4644 tel: 398-6831. Electronic submissions with scanned signatures are accepted but must come from the PI's McGill email.
(version 08-2011)

8.3 Recruitment letters

Le message en français suit…

Dear planner,

I am a doctoral student at McGill University in Montreal, conducting research on the state of urban planning in various countries. Montreal has received much attention for its successes in planning and design, and I am interested in learning about the factors that influence planning decisions. I would like to ask you for 60-70 minutes of your time to participate in a face-to-face interview on this topic. I am not interested in evaluating the quality or merits of your designs and plans, nor will I attempt any such analysis. I am interested in learning about the planning process only. Please contact me directly by e-mail at daniel.steele@mail.mcgill.ca if you are interested in participating.

Thank you for your time,

Daniel Steele, PhD Student
School of Information Studies

This research is being conducted under the supervision of Dr. Catherine Guastavino at the School of Information Studies at McGill University, Montreal, Quebec, Canada.

The interviews have been prepared in English for international purposes; however, we are happy to offer them in French as well.

Cher professionnel de l'urbanisme,

Nous sommes à la recherche de professionnels de l'urbanisme dans le cadre de mon doctorat à McGill sur l'aménagement urbain dans différents pays. Cette étude est menée au sein de l'université McGill. La ville de Montréal est reconnue pour ces succès en planification urbaine, et nous voulons en apprendre davantage sur les facteurs qui influencent les décisions de planification. Je voudrais vous demander 60-70 minutes de votre temps pour participer à une discussion en personne avec moi sur ce sujet. Je ne m'intéresse pas à évaluer la qualité de vos designs et plans, je m'intéresse plutôt au processus de planification. Je vous demanderais de me contacter directement en répondant à cet e-mail si vous êtes intéressé, daniel.steele@mail.mcgill.ca

Merci pour votre temps,

Daniel Steele, PhD Student
École des Sciences de l'Information

Les entrevues ont été préparées en anglais pour des raisons internationales. Cependant, nous vous proposons de faire l'entrevue en français si vous le souhaitez.

8.4 Informed consent form

Informed consent form - McGill University

WHY ARE WE DOING THIS RESEARCH? Our goal is to gain an understanding of urban planning in well-developed countries. We are speaking with a small number of planners here and abroad to gain an understanding of the state of the field. It has nothing to do with your personality or motivations or intelligence.

PRIVACY. We know that you value your privacy. All the responses that we collect will be aggregated and so your own responses will be analyzed with those of many other people. Select quotations may be used if they contain exemplary relevance or clarity, but your name or workplace will not be identified. However, since record of your worksites exists in the public record, you may be identified through the site's morphology or procedural elements, though we will not disclose the location of worksite. You will not be identified as an individual in any scientific report of this research. Only the researcher and the advisor will have access to identifiable data. Your identifiable data will be stored securely on password-protected files. A research assistant may have access to this conversation, but identifiable data will have been removed.

DISCUSSION OF RESEARCH IDEAS. Feel free to ask questions at any time during the study. We will be happy to talk with you about our research ideas and theories. Some of your questions may be redirected to the end of the interview.

WHAT WILL HAPPEN? This study involves an interview of 60 to 70 minutes; you will be free to skip any question or discontinue your participation at any time. The interview will be recorded (audio), for research purposes only. A research assistant may be present at the interview for training purposes or assistance in other languages.

Participant's Statement:
"I have read the description of the research project and hereby agree to participate. I am aware that the results will be used for research purposes only, that my identity will remain confidential, and that I can withdraw at any time, if I so wish."

Name:

Date:

Do you consent to having your responses used for future related studies? Yes / No

Signature:

If you have any questions or concerns regarding your rights or welfare as a participant in this research study, please contact the Manager, Research Ethics at 514-398-6831 or lynda.mcneil@mcgill.ca.

This research is conducted by Daniel Steele under the supervision of Professor Catherine Guastavino, McGill University
Contact: Daniel.steele@mail.mcgill.ca for more information.
McGill University, 3661 Peel St., Montreal, QC H3A 1X1.
Phone: (514) 398-1709. Fax: (514) 398-7193.